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Vaijanti Jain

Difference between Learning Style Preferences among Second Year MBBS and Second Year Engineering Students from Metropolitan City

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Abstract

Background: The manner in which a student learns is considered his or her learning style. Mismatches between teaching styles and students' learning styles can cause students to become inattentive and unproductive. Teaching methods also vary with some tutors lecturing. Since students have significantly different learning styles, their motivation and performance improves when instruction is adapted to suit their preferences. This study aims to analyze the learning preferences among MBBS and Engineering students of Mumbai.

Method: The study was conducted among 2nd year medical students (group 1, n=50) and 2nd year Engineering students (group 2, n=50), from various colleges in Mumbai. After obtaining informed consent, the students were instructed to fill the "Index of Learning Styles Questionnaire" by Felder and Solomon. The questionnaire assesses preferences on four dimensions: Processing (active/reflective), Perception (sensing/intuitive), Input (visual/verbal) and Comprehension (sequential/global). The data obtained was analyzed using descriptive statistics.

Results: In group 1, there were 23 (46%) males and 27 (30%) females. In group 2, there were 35 (70%) males and 15 (30%) females. In Group 1 (MBBS), there were more Reflective learners (52%) in Processing dimension, Sensory learners (64%) in the Perception dimension, Visual learners (90%) in Input dimension, Sequential learners (54%) in Comprehension dimension. In group 2 (Engineering), there were more Active learners (58%) in Processing dimension, Sensory learners (62%) in the Perception dimension, Visual learners (88%) in Input dimension, Sequential learners (60%) in Comprehension dimension.

Conclusion: It was concluded that the learning style preferences among MBBS and Engineering students is same. Students must analyze the skills required for understanding particular subject and change the learning style consciously. Similarly, teachers can be advised to be more self-reflective and understanding about the role of learning styles and this can help in making teaching more rewarding.

Key words: Learning styles, Index of Learning Style Questionnaire.

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Introduction

Learning is a process of acquiring new or modifying existing knowledge, behaviors, skills, values or preferences. The term *Learning Styles* refers to the concept that individuals differ in regard to what mode of instruction or study is most effective for them. ^[1] In

recent decades, the concept of learning styles has steadily gained influence. In this article, we describe the intense interest and discussion that the concept of learning styles has elicited among professional educators. [1]

Learning Styles influence how students learn, how teachers teach, and how they two interact. A benchmark definition of *Learning Styles* is “characteristic cognitive, effective and psychosocial behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment.” [2]

A student may learn best by seeing, hearing, being active, or reflecting. Learning styles are typically described by a student’s *sensory modality* (i.e. visual, tactile, auditory and kinesthetic) and *intellectual processes* (i.e. active, reflective, global or analytical). [3]

Mismatches between teaching styles and students’ learning styles can cause students to become inattentive and unproductive, do poorly on tests in class and get discouraged about the courses, the curriculum and oneself. [3] Teaching methods also vary with some tutors lecturing, others demonstrating or leading students to self-discovery; some focus on principles and others on applications; some emphasize memory and others understanding. [3]

Learning style preference is a complex manner in which learners most effectively perceives, process, store and recall what they are attempting to learn. Since students have significantly different learning styles, their motivation and performance improves when instruction is adapted to suit their preferences. [3]

Skills and Attributes required in Medical, Allied-Health and Engineering learning:

Aptitude and Attitude: Students must have cognitive abilities to understand and develop the theoretical knowledge and technical expertise to work collaboratively with their peers, clients and colleagues [4]

Problem solving skills: Students must have problem solving skills based on scientific principles and must be able to figure out where the problem stems from and hence, develop a solution. [4]

Information Gathering Skills: Gathering information typically includes reading charts or other written documentation, listening to clients, observing body languages and use of assessment tools acquired through visual, auditory and tactile senses. [4]

Communication Skills: Students must be able to communicate effectively and sensitively with clients, families and colleagues. They must be able to speak, hear and observe in order to elicit information, describe mood, activity, posture and perceive non-verbal communication. [4]

Critical Thinking Skills: Students must demonstrate the effective skills necessary to analyze, integrate and synthesize information. They must use relevant models, frameworks and theories of their field to apply relevant and current scientific knowledge. [4]

Psychomotor/Physical Skills: Students must consistently demonstrate the physical health/skills required to provide safe, effective and efficient service for their clients. [4]

Emotional Health: Students must consistently demonstrate emotional health required for full utilization of their intellectual abilities. They must also be able to tolerate the physical, emotional and mental demands of the program and perform effectively under stress. They must be able to adapt to changing environments and function well in the face of uncertainties. [4]

Methodology

Design:

Type of study: Cross sectional, Comparative study.

Inclusion Criteria:

- Undergraduate students of 2nd year MBBS field.
- Undergraduate students of 2nd year Engineering field.

Exclusion Criteria:

- Undergraduates of any other years.
- Postgraduates.

Materials:

- Index of Learning style questionnaire (ILS). [5]
- Pen, Pencil.
- Laptop.

Process:

The study was conducted between 2nd year MBBS

and 2nd year Engineering students from different colleges in Mumbai. The total sample of 100 was selected for study. Group 1: MBBS (n=50) and Group 2: Engineering (n=50). Selection was done through ‘*Convenience Sampling Method*’. Informed consent was taken from each student.

Instructions:

The students were instructed to read the Questionnaire carefully and to mark either “a” or “b” for each question. Students may choose one answer for each question and must answer every question. If both “a” and “b” seem to apply to them, they may choose the one that applies more frequently. [5] Index of Learning Styles Questionnaire (ILS) was developed by Felder & Soloman (Richard and Linda, 1988). This questionnaire was selected due to its free availability online and its simplicity, for students to know their Learning Style.

It has 44 Questions and assesses the preference for four dimensions [5]

Procession → Active & Reflective
Perception → Sensory & Intuitive
Input → Visual & Verbal
Comprehension → Sequential & Global

Data Analysis and Results

The Sex Distribution in both the groups is shown in *Table 1*

Table 1: Sex distribution

	MALES	FEMALES
MBBS	23 (46%)	27 (54%)
ENGINEERING	35 (70%)	15 (30%)

As shown in *Figure 1*, the Learning Styles observed among MBBS students is more *Reflective (52%)* in the Procession Dimension, *Sensory (64%)* in the Perception Dimension, *Visual (90%)* in the Input Dimension and *Sequential (54%)* in the Comprehension Dimension.

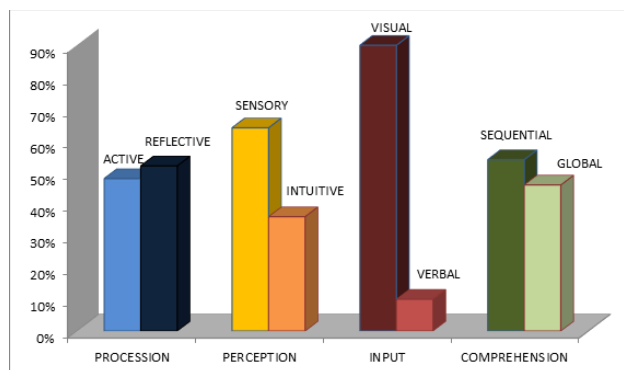


Figure 1: MBBS group

As shown in *Figure 2*, the Learning Styles observed among Engineering Students is more *Active (58%)* in the Procession Dimension, *Sensory (62%)* in the Perception Dimension, *Visual (88%)* in the Input Dimension and *Sequential (60%)* in the Comprehension Dimension.

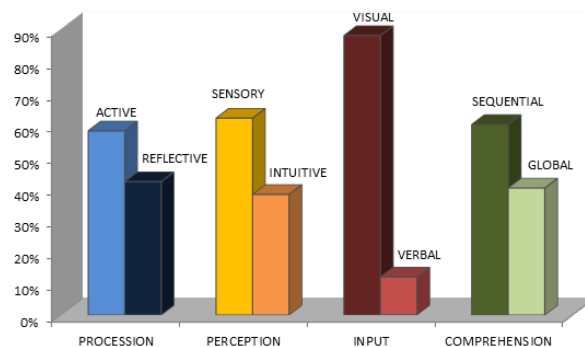


Figure 2: Engineering group

Using Chi-Square test (X² Test) values for each Dimensions was calculated and is shown in *Table 2*.

Table 2: Chi-Square test values between both groups

	MBBS	ENGIN-EERING	X ²
Active	24	29	1.003
Reflective	26	21	
Sensory	32	31	0.04
Intuitive	18	19	
Visual	45	44	0.10
Verbal	05	06	
Sequential	27	30	0.36
Global	23	20	

Since the X^2 values are less than the table value (2.71) at Degree of Freedom 1, and P value (0.1) being greater than level of significance decided for study i.e. 95% accuracy, comparison between the data is statistically insignificant.

Discussion

In present study, it was found that in the *Procession Dimension*, there were more **Reflective Learners (52%)** in MBBS Group. Study also showed very minimal difference between Active (48%) and Reflective (52%) learning.

This is in accordance to the study conducted by Daniel Hernandez-Torrano et al: First Year medical students Learning Style preferences (2017), showing minimal difference between the two types of learning (Active- 50.9% & Reflective- 49.1%).^[6]

Through the above mentioned study and ILS Questionnaire manual^[5] it is suggested that-

- Reflective learners prefer to think about things quietly first.
- Classroom environment these days allows little or no class time for thinking about new information, which makes it difficult for these learners. They should try to compensate for this lack when they study.^[5]

In Engineering Group, there were more **Active Learners (58%)** in the *Procession Dimension*. This is in accordance to the study conducted by Glen A. Livesay, Kay C Dee, "Test-Retest Reliability of the Index of Learning Styles for First-Year Engineering Students" (2005), showing more Active learners, in both Test (Active-55%) and Retest (Active-42%) of the study.^[7]

Through the ILS Questionnaire manual^[5] and in study by Heethal J.P et al^[3], it is suggested that-

- Active learners understand information best by doing something actively with it e.g. discussing or applying it or explaining it to others.
- Active Learner, when gets little or no class time for discussion or problem-solving activities, they should try to study in a group in which the members take turns explaining different topics to each other.

Most of the students in the *Perception Dimension* were **Sensory Learners (MBBS- 64% & Engineering- 62%)** in both the groups.

The same was found in studies conducted by- **1)** Heethal J.P et al titled "Learning Style Preferences: A comparison between students of an Indian and a Malaysian Medical school" (December 2014), showing more Sensory learners (India-63% & Malaysia- 64%)^[3] and **2)** Glen A. Livesay, Kay C Dee titled "Test-Retest Reliability of the Index of Learning Styles for First-Year Engineering Students" (2005) showing more sensory learners in both Test (42%) and Retest (54%).^[7]

Through the above mentioned study and the ILS Questionnaire manual^[5] it is suggested that-

- Sensing learners likes to learn facts. They are good at memorizing them and doing hands-on work and try to be more practical.
- To help such learners, information must be provided in form of specific examples of concepts and procedures, and must find how the concepts apply in practice.
- If not, they can try to find some in course text or other references or by group discussions.

The present study showed more **Visual Learners** in both the Groups (**MBBS- 90% & Engineering-88%**) in the *Input Dimension*.

This is similar to studies conducted by-**1)** Heethal J.P et al titled "Learning Style Preferences: A comparison between students of an Indian and a Malaysian Medical school" (December 2014), showing more Visual learners (India- 80% & Malaysia-74%)^[3] and **2)** Glen A. Livesay, Kay C Dee titled "Test-Retest Reliability of the Index of Learning Styles for First-Year Engineering Students" (2005), showing more Visual learners in Test- 83% & Retest-82%.^[7]

Through the above mentioned study and the ILS Questionnaire manual^[5] it is suggested that-

- Both, in Medical as well as Engineering field, Visual type of learning plays an important role. Visual learning involves what a learner can best see e.g. pictures, diagrams demonstrations etc. That's why, emphasis is placed more on teaching through the means of practicals, Diagrams etc. But in some classes, very little visual information is presented, which makes grasping of information difficult for these type of learners.
- These learners can try to find diagrams, sketches, schematics, photographs, flow charts, or any other visual

representation material that is predominantly verbal. They can also list key points, color-code their notes with a highlighter so that everything relating to one topic is the same color.

The present study shows more **Sequential learners** in both the groups (**MBBS- 54% & Engineering-60%**) in *Comprehension Dimension*.

This is in accordance to the studies conducted by- **1) Heethal J.P et al** titled “Learning Style Preferences: A comparison between students of an Indian and a Malaysian Medical school” (December 2014), showing more Sequential learners (India- 58% & Malaysia- 68%)^[3] and **2) Aidan O’ Dwyer** titled “Analysis of engineering Students Learning Style on level 7, level 8 and level 9 programs” (2010), showing Engineering students are significantly more Sequential learners (67%, 56% and 58% in level 7, level 8 and level 9 students respectively)^[8]

It is suggestive that-

- Sequential learners tend to gain understanding in linear steps. They may not fully understand the subject but they have logical understanding.
- Engineering field involves going through sequential steps and coming to a conclusion. Hence, this type of learning will suit the students best.
- MBBS field involves both Sequential as well as Global type of learning style. Global learners try seeing the bigger picture first and then putting them into steps. This type of learning helps the Doctors to come to a Diagnosis.
- Most lectures are taught in a Sequential manner. Students may have difficulty following and remembering, if the lecture involves 2-3 random topics altogether and not in a sequence. Also Sequential learning is more useful for Medical students as they come a diagnosis in a sequential manner and cannot directly jump on it. Hence, such students can help themselves by consulting references, outlining the lecture material in logical order while studying.

As shown in **Table 2**, the X^2 values are less than the table values (2.71) at Degree of Freedom 1; and P value (0.1) being greater than level of significance decided for study i.e. 95% accuracy, comparison between the data is statistically insignificant. Hence, *Null Hypothesis* is accepted i.e. **there is no significant difference in the**

Learning Styles between both groups.

Learning style preferences should not be considered as indicators of what students are and what they are not capable of doing. It indicates the preference style of learning in students. The preference of same student may change depending on the subject base for a particular subject and that people with every possible learning style can succeed in any profession or endeavor. Thus, student can analyze the skills required for understanding particular subject & can change the learning style consciously, once made to realize his shortcomings.

Similarly, the teachers can be advised to be more self-reflective and understanding about the role of learning styles and this can help in making teaching more rewarding. It will also enhance student’s learning.

As a student, they must be self-aware of preferences in order to adjust study techniques even when the information and instruction provided does not match their preferred style.

Advantages: ILS questionnaire was easily available, easy to understand and administer. Questionnaire can be forwarded through internet. The Questionnaire provides better results of different dimensions at the same time; helping the students knowing their learning style and teachers to understand and modify their teaching techniques. Cost effectiveness of the Study. *Limitations:* Due to small sample size, the results cannot be generalized to all Medical and Engineering students of the country. We cannot comment on the genuineness of Student’s answers since the Questionnaire was administered more through the Internet. Randomization of sample was not done.

Conclusion

- It was concluded that the Learning Styles Preferences among MBBS and Engineering students is same.
- Thus, the Learning Styles preferred by both the Science faculty is similar and they prefer the following learning styles: **MBBS-** Reflective (52%), Sensory (64%), Visual (90%) and Sequential (54%). **Engineering-** Active (58%), Sensory (62%), Visual (88%) and Sequential (60%).

Further research with a larger sample size may be required to come to more definite conclusions. Similar studies can be conducted on Occupational Therapy,

Physiotherapy and other Allied Health Sciences' Students. We can use Teaching Methodology/Preference Questionnaire like **Staffordshire Evaluation of Teaching Styles (SETS)** [9] on teachers as well, helping them to get an idea about their teaching style preferences, thereby helping them to know which teaching style they must adapt.

Conflict of Interest: NA

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Ethical Clearance: Declaration of Helsinki guidelines for medical research were followed for this.

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Comparison between Surged Faradic Current and Transcutaneous Electrical Nerve Stimulation (TENS) on Myofascial Trigger Points in Trapezius

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Abstract

Aim: To find out the effect of surged faradic current and transcutaneous electrical nerve stimulation (TENS) on myofascial trigger points in trapezius

Materials and Method: The study was conducted in clinically diagnosed subjects with myofascial trigger points present in trapezius with age group 18-25 years. Total 34 subjects were include in the study .They were randomly devided into the two groups each consisting of 17 subjects .Group A include the subjects who received Transcutaneous electrical stimulation and phonoporeis and Group B include the subjects who received surged faradic current and phonophoresis .Pre treatment outcome measures were visual analogue scale, Cervical range of motion and palpation of myofascial trigger points present in the trapezius. The specific protocol was given to the patients for 2 weeks for 4 days .At the end of the 2 weeks, past treatment outcome measures were performed for range of motion and pain. Paired T-test was used to analyse within the group statistical analysis and unpaired t test used for between the group statistical analysis and sees the result.

Result: Paired t-test was used to analyze the comparison between surged faradic current and transcutaneous electrical nerve stimulation on mayofacial trigger points in trapezius. There result was extremely significant for group A and group B.

Between the group comparison the unpaired t-test was used to analyze group A and group B post treatment values and there was significant difference between outcome variables in VAS, ROM and Palpation .

Conclusion: From this conducted study it concluded that, patient who treated with surged faradic current and phonophoresis had significant improvement clinically and statistically and improved in Range of Motion (ROM), Visual analogue scale and showed reduction in myofascial trigger points with palpation. So, this study accepts the alternate hypothesis

Keywords: *myofascial trigger points, transcutaneous electrical nerve stimulation, surged faradic current.*

Introduction

A myofascial trigger points is a site of increased irritability in a tissue that demonstrate a hypersensitive reaction to the mechanical stimulation such as pressure or traction and triggers an additional physiological reaction.¹

MTPs can be painful on compression and can produce characteristics effects, Such as alteration of

muscle activation, increased muscle tension, restricted ROM, muscle weakness, fatigability and autonomic phenomena.²

MTPs are classified into two, 1) Active myofascial trigger points 2)Latent trigger points.³

An active myofascial trigger point which is already symptomatic at rest and/or during psychological strain (spontaneous activity) and feel tender and sensory,

motor function and or autonomic phenomena in its related transfer zones.¹

A latent trigger points is not symptomatic at rest or during physiological strain but still demonstrates localized tenderness and causing regional motor ,sensory functions autonomic phenomenon in its related transfer zone.¹

Another common observation is that among all the neck muscles the trapezius is most likely to have trigger points. Any overuse injury such as using a computer, hand held electronic devices, repetitive strain from lifting, poor posture, muscle tensing due to stress, traumas and injuries, prolonged bed rest and sitting causes shortening of muscles creating spasm and trigger points in the trapezius muscle.⁴ Although myofascial trigger points are common, but they are frequently ignored and inadequately treated. Some of the modalities commonly used in the physiotherapeutic management of 5 trigger points include ultrasound, laser. Electrical nerve stimulation is also used to treat trigger points. Some of them include TENS, interferential current, strong surged faradic current.^{5,6}

Surged faradic current is used for the improving strength and vascularity of muscle. About 90 contraction will be given in each session to avoid muscle fatigue.⁷

Phonophoresis is a therapeutic method that may be helpful for the treatment of Myofascial trigger points (MTP). Phonophoresis using hydrocortisone 1 % (Pulse mode, 1.2W/cm², 1 MHz, for 5 min) will be used.⁸

Transcutaneous electrical nerve stimulation has been used to treat a variety of painful acute and chronic conditions .There are four types of TENS devices used in the clinical practice,1) High frequency 2) Low frequency 3)Burst frequency 4)Hyper stimulation. For the treatment of myofascial trigger points (MTP) present in trapezius frequency ranging from 40-150 Hz with

µsec pulse width.⁹Duration of transcutaneous electrical nerve stimulation is 20 min.¹⁰

Materials and Methodology

- An ethical clearance was taken prior to conduction of study from institutional ethical committee of KIMSDU Karad. An experimental study was conducted at Physiotherapy department of Krishna college of physiotherapy. Total 34 subjects having myofascial trigger points were selected as per inclusion and exclusion criteria of the study. Inclusion criteria was 1. Male and female having active myofascial trigger points on trapezius, 2. Age group 18-30 years. Exclusion criteria were 1. Cervical fracture 2. Scapular fracture. Total 34 subjects were include in the study. They were randomly divided into the two groups each consisting of 17 subjects. Group A include the subjects who received Transcutaneous electrical stimulation and phonophoresis and Group B include the subjects who received surged faradic current and phonophoresis .All the participant had myofascial trigger points on trapezius. Written informed consent was taken from the subjects and whole study was explained to them. Pre and post assessment for visual analogue scale (VAS), cervical range of motion and Palpation of myofascial trigger points (MTP) present in the trapezius was used to assess the subjects. The interpretation of the study was done on the basis of comparison between pre test and post test assessment.

- **MATERIAL USED:** VAS Scale, Universal Goniometer.

- **RESULTS/FINDINGS:**

OUTCOME MEASURES:

VISUAL ANALOGUE SCALE

- **WITH IN THE GROUP**

- **GROUP A**

1.) Visual Analogue Scale(VAS)

VAS(At Rest)	Pre interventional	Post interventional	VAS(On Activity)	Pre interventional	Post interventional
Mean \pm SD	5.05 \pm 0.658	4.23 \pm 0.664	Mean \pm SD	6.82 \pm 0.727	5.11 \pm 0.857
N	17	17	N	17	17
DOF	16	16	DOF	16	16
T Value	8.641	8.641	T Value	10.253	10.253
P value	<0.0001(Extremely significant)	<0.0001(Extremely significant)	P value	<0.0001(ES)	<0.0001(ES)

Table no.1 Mean of Pre and Post VAS at rest and on activity.

2) Range of motion (ROM)

➤ Cervical flexion , Cervical Extension, Cervical side flexion and Cervical Rotation:

	Cervical flexion		Cervical Extension		Cervical side flexion		Cervical Rotation	
	Pre interventional	Post interventional	Pre interventional	Post interventional	Pre interventional	Post interventional	Pre interventional	Post interventional
Mean \pm SD	50.88 \pm 4.608	60.70 \pm 3.601	50.76 \pm 4.323	60.52 \pm 3.939	38.94 \pm 4.085	44.52 \pm 2.918	52.00 \pm 5.000	59.82 \pm 4.531
N	17	17	17	17	17	17	17	17
DOF	16	16	16	16	16	16	16	16
T	12.196		9.967		10.170		8.286	
P	<0.0001(Extremely significant)		<0.0001(Extremely significant)		<0.0001(Extremely significant)		<0.0001(Extremely significant)	

Table no.2 Mean of Pre and Post ROM Cervical flexion ,Cervical Extension , Cervical side flexion and Cervical Rotation.

3) 8Palpation

There was 17 subjects in group A having Mayofascial trigger points present pre interventionally and post interventionally it was 7 this shows reduction in mayofascial trigger points on trapezius. .

➤ **GROUP B**

1) Visual Analogue Scale(VAS)

2) VAS(At Rest)	Pre interventional	Post interventional	VAS(On Activity)	Pre interventional	Post interventional
Mean \pm SD	4.4 \pm 0.93911	2.764 \pm 0.970	Mean \pm SD	6.35 \pm 0.996	3.70 \pm 1.047
N	17	17	N	17	17
DOF	16	16	DOF	16	16
T Value	8.641	8.641	T Value	13.887	13.887
P value	<0.0001(ES)	<0.0001(ES)	P value	<0.0001(ES)	<0.0001(ES)

Table no.3 Mean of Pre and Post VAS at rest and on activity.

2) Range of motion

➤ Cervical flexion , Cervical Extension, Cervical side flexion and Cervical Rotation:

	Cervical flexion		Cervical Extension		Cervical side flexion		Cervical Rotation	
	Pre interventional	Post interventional	Pre interventional	Post interventional	Pre interventional	Post interventional	Pre interventional	Post interventional
Mean	49.76 ±	63.82±	50.64 ±	64.64 ±	39.00 ±	49.00±	54.05 ±	62.47±3.9
±SD	3.437	2.811	4.623	2.206	3.674	3.062	4.069	23
N	17	17	17	17	17	17	17	17
DOF	16	16	16	16	16	16	16	16
T	13.688		9.967		11.603		8.286	
P	<0.0001(Extremely significant)		<0.0001(Extremely significant)		<0.0001(Extremely significant)		<0.0001(Extremely significant)	

Table no.4 Mean of Pre and Post ROM Cervical flexion ,Cervical Extension , Cervical side flexion and Cervical Rotation.

3) Palpation

There was 17 subjects in group A having Mayofascial trigger points present pre interventionally and post interventionally it was 2 this shows reduction in mayofascial trigger points on trapezius.

BETWEEN THE GROUP

1)VAS (At rest) and VAS(On activity)

Parameter	Group A	Group B	P value	T value
VAS(At rest)	4.23±0.664	2.76±0.971	<0.0001(ES)	5.157
VAS(On activity)	5.11±0.857	3.70±1.047	0.0001(CES)	4.302

Table no.5 . Mean of post values of group A and group B for visual analogue scale (VAS) at rest and on activity.

ES-Extremely Significant

CES-Considered Extremely Significant

3) RANGE OF MOTION

➤ Cervical flexion and cervical extension

Parameter	Group A	Group B	P value	T value
Cervical Flexion	60.70±3.601	63.80±20811	0.0083(CVS)	2.813
Cervical Extension	60.52±3.979	64.64±2.206	0.007(CVS)	3.761
Cervical side flexion	44.52±2.918	49.00±3.062	0.001(CES)	4.358
Cervical rotation	59.82±4.531	64.47±2.778	0.0011(CVS)	3.602

Table no.6 . Mean of post values of group A and group B cervical flexion,cervical extension,cervical side flexion and cervical rotation range of motion (ROM) .

CVS-Considered Very Significant

4) Palpation

In palpation out of 17 subjects in group A 10 subjects were found with reduction of myofascial trigger points and in group B 15 subjects were found with reduction of myofascial trigger points.

Discussion

The purpose of the study to find out Comparison between surged faradic current and transcutaneous electrical nerve stimulation (TENS) on myofascial trigger points in trapezius .

The objectives of this study were to determine the effect of surged faradic current on myofascial trigger points in trapezius, to determine the effect of transcutaneous electrical nerve stimulation (TENS) on myofascial trigger points in trapezius and to determine the comparison between surged faradic current and transcutaneous electrical nerve stimulation myofascial trigger points in trapezius.

The study was conducted on clinically diagnosed subjects with myofascial trigger points present on trapezius with age group 18-25 years. Total 34 subjects were include in the study .They were randomly divided into the two groups each included 17 subjects .Group A include the subjects who received Transcutaneous electrical stimulation and phonoporeis and Group B include the subjects who received surged faradic current and phonophoresis .All the participant had myofascial

trigger points present on trapezius. Pre treatment outcome measures were visual analogue scale, Cervical range of motion and palpation of myofascial trigger points .The specific protocol was given to the patients for 2 weeks for 4 days .At the end of the 2 weeks, post treatment outcome measures were performed for range of motion and pain. Paired T-test was used for within the group statistical analysis and unpaired t test used for between the group statistical analysis and sees the result.

The average mean age of participants in Group A was 21.64 ± 1.869 and group B was 20.82 ± 1.741 , which showed their is no significant difference in age of subjects in both groups($t= 1.330$, $p=0.1931$) which was down by unpaired t-test.

➤ Within the group statistical analysis

In group A pre interventional Mean and SD of VAS at rest was 5.05 ± 0.658 and post interventional Mean and SD of VAS at rest was 4.23 ± 0.664 . The P value was <0.0001 which is statistically extremely significant ($t=8.641$) this shows improvement in visual analogue scale (VAS) at rest.

The pre interventional Mean and SD of VAS on activity was 6.82 ± 0.727 and post interventional Mean and SD of VAS on activity was 5.11 ± 0.857 . The P value was <0.0001 which is statistically extremely significant ($t=10.253$) this shows improvement in visual analogue scale (VAS) on activity

The pre interventional Mean and SD of cervical flexion ROM was 50.88 ± 4.608 and post interventional

Mean and SD of cervical flexion ROM was 60.70 ± 3.601 . The P value was <0.0001 which is statistically extremely significant ($t=12.196$) this shows improvement in cervical flexion ROM. .

The pre interventional Mean and SD of cervical Extension ROM was 50.76 ± 4.323 and post interventional Mean and SD of cervical Extension ROM was 60.52 ± 3.939 . The P value was <0.0001 which is statistically extremely significant ($t=9.967$) this shows improvement in cervical Extension ROM .

The pre interventional mean and SD of cervical side flexion ROM was 39.00 ± 3.674 and post interventional mean and SD of cervical side flexion ROM was 49.00 ± 3.062 . The P value was <0.0001 which is statistically extremely significant ($t=8.505$) this shows improvement cervical side flexion ROM.

The pre interventional Mean and SD of cervical rotation ROM was 54.05 ± 4.069 and post interventional Mean and SD of cervical rotation ROM was 62.47 ± 3.923 . The P value was <0.0001 which is statistically extremely significant ($t=28.150$) this shows improvement in cervical rotation ROM .

There was 17 subjects in group A having MTPs present pre interventionally and post interventionally it was 7 this shows reduction in MTPs on trapezius.

In group B the pre interventional Mean and SD of VAS at rest was 4.4 ± 0.93911 and post interventional Mean and SD of VAS at rest was 2.764 ± 0.970 . The P value was <0.0001 which is statistically **extremely significant** ($t=8.641$) this shows improvement in VAS at rest.

The pre interventional Mean and SD of VAS on activity was 6.35 ± 0.996 and post interventional Mean and SD of VAS on activity was 3.70 ± 1.047 . The P value was <0.0001 which is statistically **extremely significant** ($t=13.887$) this shows improvement in VAS on activity.

The pre interventional Mean and SD of cervical flexion ROM was 49.76 ± 3.437 and post interventional Mean and SD of cervical flexion ROM was 63.82 ± 2.811 . The P value was <0.0001 which is statistically extremely significant ($t=13.688$) this shows improvement in cervical flexion ROM.

The pre interventional Mean and SD of cervical Extension ROM was 50.64 ± 4.623 and post interventional Mean and SD of cervical Extension ROM

was 64.64 ± 2.206 . The P value was <0.0001 which is statistically extremely significant ($t=11.603$) this shows improvement in cervical Extension ROM. The pre interventional Mean and SD of cervical side flexion ROM was 39.00 ± 3.674 and post interventional Mean and SD of cervical side flexion ROM was 49.00 ± 3.062 . The P value was <0.0001 which is statistically extremely significant ($t=8.505$) this shows improvement cervical side flexion range of motion.

The pre interventional Mean and SD of cervical rotation range of motion was 54.05 ± 4.069 and post interventional Mean and SD of cervical rotation range of motion was 62.47 ± 3.923 . The P value was <0.0001 which is statistically extremely significant ($t=28.150$) this shows improvement in cervical rotation range of motion.

There was 17 subjects in group A having MTPs present pre interventionally and post interventionally it was 2 this shows reduction in MTPs on trapezius.

Paired t-test was used to analyze the comparison between surged faradic current and transcutaneous electrical nerve stimulation (TENS) on myofascial trigger points in trapezius. There result was extremely significant for group A and group B.

For Between the group comparison the unpaired t-test was used to analyze group A and group B post treatment values and there was significant difference between outcome variables in VAS at rest ($P=5.157$), VAS on activity ($P=4.302$), range of motion and Palpation .Following are the p values which leads to analyse improvement in cervical flexion ($P=0.0083$), cervical extension ($P=0.007$), cervical side flexion ($P=0.001$) and cervical rotation ($P=0.0011$). In palpation out of 17 subjects in group A 10 subjects were found with reduction of myofascial trigger points and in group B 15 subjects were found with reduction of myofascial trigger points

The result from the statistical analysis of present study support the alternative hypothesis which stated that there will be beneficial effect to the subject treated with surged faradic current than the transcutaneous electrical nerve stimulation (TENS).

Hence above result showed that group B subjects treated with surged faradic current on myofascial trigger points in trapezius.

Conclusion

From the above conducted study it concluded that, patient who treated with surged faradic current and phonophoresis had significant improvement clinically and statistically and improved in Range of Motion (ROM), Visual analogue scale (VAS) and showed reduction in myofascial trigger points (MTP) with palpation. So, this study accepts the alternate hypothesis.

Conflict of Interest: The authors declare that there are no conflict of interest concerning that content of present study.

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Prevalence of Myofascial Trigger Points in Brachioradialis, Biceps Brachii, Triceps Brachii, Supinator and Extensor Carpi Radialis Brevis in Lateral Epicondylitis

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Abstract

Introduction– Myofascial pain syndrome (MPS) is a myalgic condition in which muscle and musculotendinous pain are the primary symptoms. Some muscles are likely to develop Myofascial trigger points in cases of lateral epicondylitis and become possible cause of mainstay of symptoms. Hence the study was undertaken to find the prevalence of myofascial trigger points in such muscles.

Methodology & Results – 40 individuals aged between 20-50 years fulfilling the inclusion criteria were selected for the study with acute and chronic lateral epicondylitis. Brachioradialis, Biceps Brachii, Triceps Brachii, Supinator and Extensor carpi radialis brevis were checked for the presence of trigger point by palpation. Pressure algometer was used to check the pain threshold of each point. When the subject reports feeling pain the action of pressure is stopped and reading is recorded.

Results showed a higher prevalence in females than males. The most prevalent area for trigger point was the brachioradialis followed by biceps brachii, extensor carpi radialis, triceps brachii and the least prevalent was the supinator.

Conclusion - This study provides that the relation between myofascial trigger points in lateral epicondylitis is relatively high especially in Brachioradialis, It also shows that latent trigger points don't lead to severe functional disability.

Key words – Tennis Elbow; taut band; patient related tennis elbow evaluation; myalgia

Introduction

Myofascial pain is characterized by hyper irritant points called trigger points. They are caused by muscle injury due to repeated movements or pure posture. In case of lateral epicondylitis these trigger points are caused by repeated injury over the lateral epicondyle in the forearm. ^[1]

To understand the physiology of trigger points we must know that, Muscles are composed of fibers and for any movement to occur they contract and relax in response a stimuli from higher centers. When these fibers become over stimulated they cannot contract and relax and form contraction knots. A trigger point consists of contraction knots and the muscles become shortened. The persistent contraction of these muscles leads to decreased blood supply and irritation of nerves causing pain.

The trigger point is a small, painful, locus of abnormal muscle which is the source of the muscular dysfunction. Myofascial pain syndrome (MPS) is a form of myalgia that is characterized by local regions of muscle hardness that are tender and that cause pain to be felt at a distance, i.e., referred pain. Clinical diagnosis

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of a MPS is made by history and by palpation of muscle to identify the taut band. Myofascial trigger points (MFTrP's) are considered active if the palpation evokes same pain as before, and if it is a latent MTrP it does not evoke the usual pain.

Criteria for diagnosis MFTrP are palpable taut band, patient pain recognition, exquisite spot tenderness and painful range of motion at the end of range.^[2] Once all these criteria's are fulfilled a region on the muscle can be confirmed as a trigger point.

Muscle pain is a common problem that is underappreciated and often undertreated. Myofascial pain syndrome (MPS) is a myalgic condition in which muscle and musculotendinous pain are the primary symptoms. The following muscles are likely to develop MFTrP's in cases of lateral epicondylitis.^[1]

- **Brachioradialis:** There is pain at the muscle bulk on the lateral side of the elbow which is palpated my thumping palpation. There are active Trigger points (TP's) felt at the muscle bulk as a part of lateral epicondylitis.^[1]

- **Biceps Brachii:** The biceps referred pain pattern covers the anterior shoulder and sometimes extends to the elbow. The long head of this muscle crosses two joints and requires both elbow extension and horizontal extension of the arm at the shoulder for full stretch.^[1] As the muscle is closely related to the elbow joint, development of TP's can might occur in case of lateral epicondylitis due to compensation and increased work load.^[1]

- **Supinator.** This muscle refers pain to the dorsal web space of the thumb and to the region of the lateral epicondyle, which becomes tender to finger taps. The finger and wrist extensors, which form the extensor muscle mass attached to the lateral epicondyle, frequently also develop TP's as part of the "tennis elbow" syndrome. These TP's are readily located by palpation of the extensor muscles for taut bands and local twitch responses.^[1]

- **Extensor carpi radialis brevis :** The hand and finger extensor group of muscles is essential for strong grip. Patients with TPs in these muscles frequently develop a painful hand grip and an impaired sense of grip strength; a cup or a glass unexpectedly drops from their grasp. Active TPs in the extensor carpi radialis refer pain to the lateral epicondyle and dorsum of the

hand.^[1]

- **Triceps brachii:** The three heads of the triceps muscle have five TP's locations that refer separate pain patterns. The long head is a two joint muscle; TP's in it restrict flexion both at the elbow and at the shoulder. The long head of the triceps is commonly involved with other shoulder-girdle muscles and is a frequently overlooked cause of shoulder dysfunction. The taut bands of the long head TP's are readily felt by pincer palpation of the belly of the long head just above mid-arm adjacent to the humerus. The muscle is examined for taut bands as the muscle fibers slip between the finger tips that start palpating outward from the groove between the muscle and the humerus.^[1]

Pain complaints were found in 32% of a university primary care general internal medicine practice series of 172 patients of which 30% were found to have myofascial pain (9% of the total number of patients) (Skootsky et al. 1989). In a pain treatment referral program known for its interest in myofascial pain, within a larger neurological practice, 93% of persons with musculoskeletal pain had MTrPs (Gerwin 1995).^[1]

Myofascial trigger points are overlooked in cases of tennis elbow because it clinically presents itself as radiating pain due to lateral epicondylitis. The myofascial pain usually goes unrecognized at trigger points. Hence, there is a need to determine the prevalence of myofascial trigger points in the following muscles for better management and prognosis.

Methodology

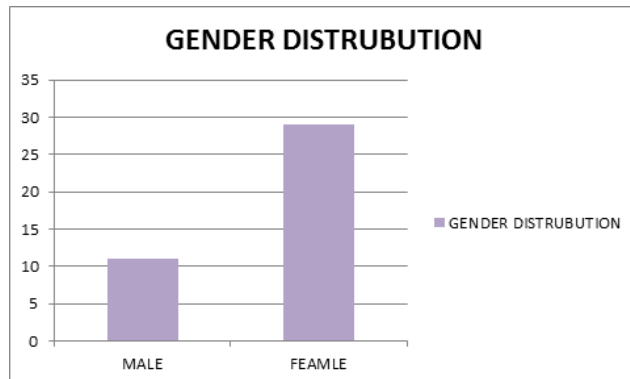
After the institutional ethical committee approval, 40 individuals diagnosed with acute or chronic lateral epicondylitis and positive for trigger points in Brachioradialis, Biceps Brachii, Triceps Brachii, Supinator and Extensor carpi radialis brevis participated in this observational study. They were 20-50 years of age who visited outpatient department of Dr. D.Y. Patil College of Physiotherapy, Pimpri. Patients who had any previous fracture and fall, any recent surgery In the upper extremity or bilateral lateral epicondylitis were excluded. All the participants were informed about the content and purpose of the study and written informed consent was taken from the participants in the study.

The principal investigator (trained physiotherapist) undertook a standardized history and physical examination of patients. Demographic data like age,

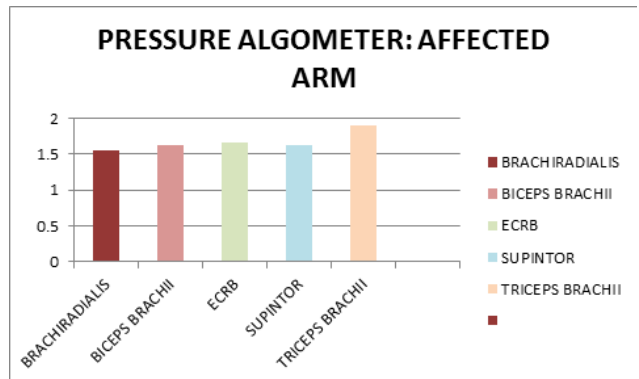
gender, location and nature of patient’s symptoms were noted. Cozen’s mill’s and Maudley test was used to test the subjects clinically. During the test, standardized verbal instructions were given by the examiner to explain the test to each subject. Each subject was asked to lie on plinth in supine position. The patient is asked extend the wrist and the therapist puts enough pressure to resist this motion. Pain elicited at the lateral epicondyle shows a positive for cozen test. Patient Is then asked to extend the middle finger and resistance is applied against the same. Pain at the lateral epicondyle confirms the diagnosis. Mills test is performed by flexing the wrist passively with the elbow completely extended. Pain at the lateral epicondyle is positive foe lateral epicondyle.

This was followed by checking Brachioradialis, Biceps Brachii, Triceps Brachii, Supinator and Extensor carpi radialis brevis for the presence of trigger point by palpation. After which, in case the trigger points were felt in any of the following muscles pressure algometer was used to check the pain threshold of each point. The Pressure algometer is placed perpendicular to the tissue surface and pressure applied steadily at a constant rate. When the subject reports feeling pain the action of pressure is stopped and reading is recorded. Subjects were then asked a series of question from the patient rated tennis elbow evaluation and given the total score. The total score will determine the degree of pain and difficulty in doing daily activities.

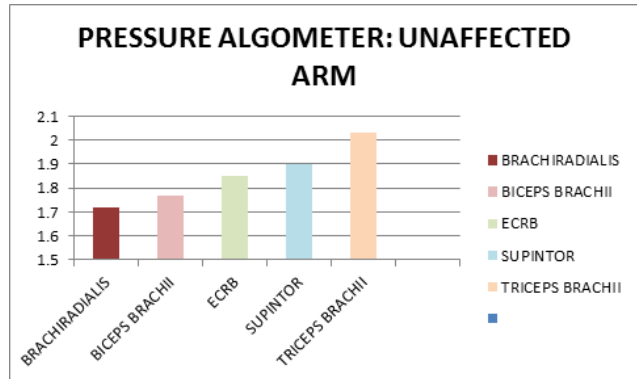
Data Analysis



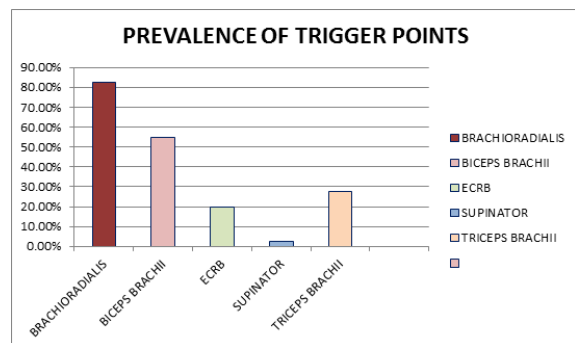
Graph 1 shows sample distribution of male and female population for sample size n=40



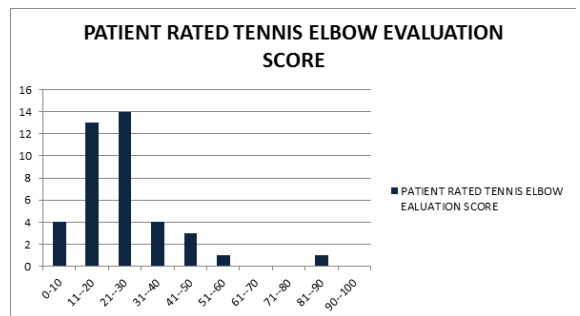
Graph2 shows average painsensitivity in brachioradialis, biceps brachii, Extensor carpi radialis brevis, Supinator and triceps brachii in affected arm.



Graph3 shows average painsensitivity in brachioradialis, biceps brachii, Extensor carpi radialis brevis, Supinator and triceps brachii in unaffected arm.



Graph 4 shows Prevalence of trigger points in brachioradialis, biceps brachii, Extensor carpi radialis brevis, Supinator and triceps brachii



Graph 5 shows subjects categorized according to the score in evaluation

(0: bestscore 100: worst score)

Results

- Out of 40 patients 11 were males and 29 were females indicating that there is a high prevalence of lateral epicondylitis in females due to repeated activities especially household chores.

(Graph 1)

- The average pressure pain sensitivity in the affected arm in the following muscles are as follows
(Graph 2)

1. Brachiradialis:1.55
2. Biceps Brachii: 1.63
3. Extensor carpi radialis brevis: 1.66
4. Supinator:1.63
5. Triceps brachii:1.85

- The average pressure pain sensitivity in the unaffected arm in the following muscles are as follows
(Graph 3)

1. Brachiradialis:1.72
2. Biceps Brachii: 1.77
3. Extensor carpi radialis brevis: 1.85
4. Supinator:1.90
5. Triceps brachii:2.03

- Out of the 40 patient's prevalence of trigger points was seen most in brachioradialis followed by biceps brachii then extensor carpi radialis brevis the triceps and least in supinator.

(Graph 4)

- According to the patients related tennis elbow evaluation most of the patients had a score below 50/100 showing low levels of pain and disability in functional activities.**(Graph 5)**

Discussion

In this study we found that in subjects who have lateral epicondylitis the presence of trigger points is maximum in brachioradialis (82.5 %) followed by biceps brachii (55%) extensor carpi radialis (20%)

triceps brachii (27.5%) and supinator (2.5%). Out of which, some spots are more irritable than others; this was tested with pressure algometer. There were varying readings of pain elicited on these MFTrP's on applying the pressure algometer. The brachioradialis was the most pain sensitive (1.72 kg) while the triceps brachii was the least sensitive (2.03 kg). Most of the patients complained of pain at the elbow while doing household chores, carrying heavy bags, riding a bike or recreational activities like playing badminton, cricket etc. The pain sensitivity in males is much lower than females. Pain sensitivity is also more in the affected arm as compared to the unaffected arm.

Kao et al found that every subject has a hyper irritable spot in the brachioradialis muscle with is latent in nature. This can be caused by any minor injury which was ignored leading to subsequent chronic inflammation.

The findings suggested that MFTrP's are most prevalent in brachioradialis followed by biceps brachii, extensor carpi radialis, triceps brachii and the least in supinator. This can be explained as they are closely related to the elbow joint and most of the functional activities are done with the flexion and extension of the elbow joint which can be caused by any micro injury.^[9]

Simons et al^[1] proposed that excessive acetylcholine secretion may induce electrotonic potentials (endplate noise observed in the MTP region) and cause focal contraction of sarcomeres (contraction knot1) near the endplate zone, and these may subsequently develop an energy crisis (excessive energy consumption due to persistent muscle contraction). The sensitizing substances released during an energy crisis may cause peripheral sensitization of the nociceptors near the endplate. An MTP may be formed in this way.

In a subject with lateral epicondylitis the myofascial pain usually goes unrecognized or misdiagnosed. Once these trigger points are palpated and confirmed it can be treated with MFR and ultrasound, thus reducing the pain and help in clinical practice. The limitation for this study is the proper palpation technique and experience which varies between examiners. Findings suggested an acceptable agreement on MTrPs classification in both ECRB and EDC muscles between the expert examiners. Nevertheless, when comparing expert and non-expert evaluators, the agreement level decreased dramatically ^[2] when comparing MTrPs location between expert evaluators and the inexperienced examiner, a strong decrease

in the percentage of agreement was found, suggesting that an evaluator's manual skills may play a key role in diagnostic accuracy.^[2]

Results of patient rated tennis elbow evaluation questionnaire where the patient was asked a series of question from their personal activity to functional where pain was subjectively noted on those specific activities. Most patients reported mild to moderate pain which can be explained as the trigger points present were mostly latent and not active. Thus, indicating that latent trigger points do not cause severe functional impairments but elicit pain only on repeated activity due to over use and strain on the particular muscle.

This study can be future continued by finding the better line of treatment for these trigger points with physiotherapy interventions and suggesting ergonomics by which trigger points will not reoccur.

Thus, from this study we can say that evaluation of lateral epicondylitis must include the palpation of trigger points and appropriate treatment must be given to reduce myofascial pain.

Conflict of Interest – None

Source of Funding- Self

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Upper Limb Fitness Testing in Gymnasium Going People

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Abstract

Introduction – Fitness is important for all. To reduce the incidence of injuries in the gymnasium going people, especially in weight lifters, proper training should be given. For giving proper training, proper musculoskeletal assessment is required. This study is an effort to assess various components of fitness in young gym going people.

Methodology & Results – 50 gymnasium going males with minimum 3 months of gymnasium training and age 18-24 years participated in present observational study. Upper limb muscular strength and muscular endurance were recorded using bench press and push up test. Also for flexibility grading, shoulder wrist elevation test was done.

For upper limb maximum participants have shown good muscular strength and above average muscular endurance though flexibility was found average only.

Conclusion - The general muscular fitness was seen in the average category in young gym going people.

Key words – Strength, Endurance, Flexibility, Upper limb injury

Introduction

Fitness is the condition of being physically fit and healthy. It is the quality of being suitable to fulfill a task. Fitness is far more than simply exercising on a consistent basis. With variety of components, there are many ways to measure the same. Demand for working out is increasing rapidly. Working out can reduce stress and boost the body's ability to deal with existing mental tension. Lower risk of coronary artery disease, hypertension, osteoporosis, diabetes, and many other diseases will be associated with regular physical activity¹. Sedentary people with good physical fitness are at a lower risk of cardiovascular diseases compared to those with less physical fitness². Similarly, significantly less

sickness absence³ and the capability to produce a higher quality of work⁴ can be seen in the physically fit people.

The activities performed by the upper limb in the gymnasium are pushups, pull ups, bench press; exercises for the chest, triceps, biceps, etc. For lower limbs squats with and without weights, leg press, hams, quads, calf's, etc. are done. Also abdominal strengthening, indoor cycling, treadmill etc. are part of gymnasium exercises. There are limited studies conducted to investigate injuries that has been suffered in gymnasium⁵. Also most focus only on describing the types of injuries sustained⁶ or the rate/frequency with which they occur⁵ The most common injuries during the workout seen are wrist sprain or dislocation, shoulder injuries⁷, muscle pull or strain, knee injuries, ankle sprain. Commonly the injuries are seen in the upper limb⁸. A study conducted by Shannon Gray showed that 45.1% of the injuries reported were of upper limb in weight lifters in the age group of 15-24 years and in male participants mostly (78%)⁹.

In another study conducted by Carman Quatman, they stated that the mechanism of injury was considered non-accidental if it resulted from exertion (sprain/strain,

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fatigue failure, headache), equipment malfunction (cable snapping, resistance bands breaking), or from overuse (tendonitis). The mechanism of injury was considered accidental if it resulted from dropped weights, improper use of equipment, or tripping over equipment⁵.

Maintaining an appropriate level of health related physical fitness allows a person to reduce the risk of disease and injury, work efficiently, participate and enjoy physical activities. Fitness facilities provide an avenue to engage in physical activity, which is widely encouraged to improve health. However, there is risk of injury⁸. This study emphasizes on the assessment of fitness level in these individuals to prevent any future fitness related injuries.

Materials & Methodology

After the approval from ethical committee, 50 gymnasium going males with minimum 3 months of gymnasium training and age 18-24 years participated in present observational study. Those who reported any shoulder instability or recent history of fracture were excluded. Demographic data recording was followed by assessment of upper limb fitness using the following tests.

For evaluating the fitness for strength, subjects had performed the bench press test¹⁰. For endurance, push up test¹¹ and for flexibility range of motion of the shoulder joint¹².

Data Analysis And Interpretation

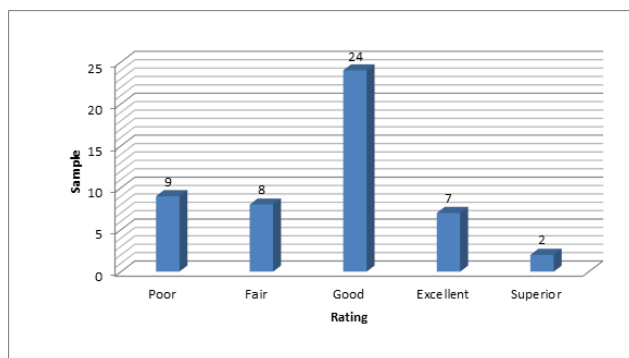


Figure 1: Bench press strength test among n=50 gymnasium participants

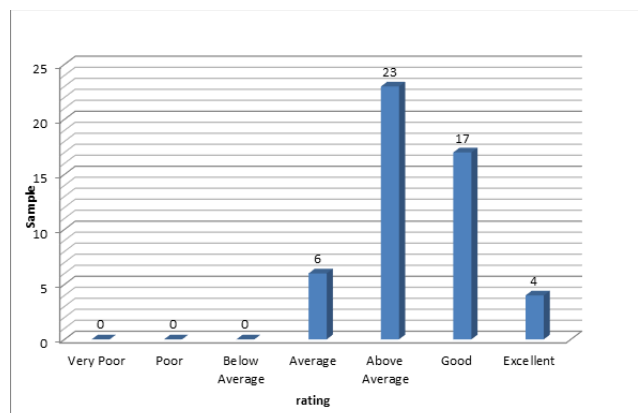


Figure 2: Pushups endurance test among n=50 gymnasium participants

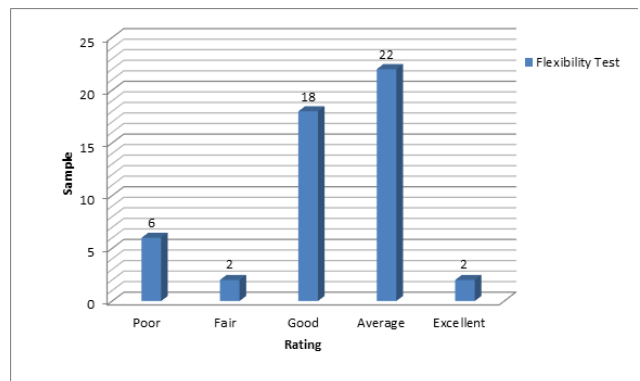


Figure 3: Shoulder wrist flexibility test among n=50 gymnasium participants

Result

For the figure 1, the participants were tested for muscular strength using the bench press test where 18% of the population was in the poor, 16% in the fair, 48% in the good, 14% in the excellent and 4% in the superior category.

For the figure 2, muscular endurance was tested using the pushup test. 12% were in the average, 46% in the above average, 34% in the good and 8% in the excellent category.

For figure 3, flexibility of the upper limb was tested by the shoulder wrist elevation test where 12 % fell in the poor, 4% in the fair, 36% in the good, 44% in the average and 4% in the excellent category.

Discussion

The primary objective of this research was to check the muscular strength, endurance and flexibility of the upper limb in gymnasium people. There is higher incidence of upper limb injuries being reported at fitness centers⁹. Findings from this study showed that all the

participants had good performance in upper limb strength test. If the participant is lacking in any aspect of fitness such as low muscle strength, tightness, early fatigue etc. it may cause injuries to that particular group¹³.

In fitness centers young age group people are involved with continuous workout. They tend to build up their muscles and maintain their body shape. Based on sports requirement, some even concentrate on strengthening specific group of muscles. This often leads to over use and in turn muscle fatigue¹⁴. This is also one of the causes for the rise in the injuries in the gymnasium facilities. A study in 2015 concluded that the injuries in the fitness facilities are due to overexertion⁹.

For resistance training exercises, the majority of the injuries are reported due to accidents, improper technique or lack of qualified supervision¹⁵. A study by Grey et al stated that 71.4% of the injuries can take place due to fall of weights, crush injuries or by neighboring fellow exercisers⁹. Idiopathic or acquired abnormal anatomy or biomechanics of the limbs also predispose to injuries. Also, it is not necessary that those with good fitness are not susceptible to injuries. Other factors like, improper use, unqualified trainers, overuse of the weights, unplanned protocols, psychological factors etc. even predispose to the injuries sustained at fitness centers¹³.

Pushups is an endurance activity involving pectoralis major, anterior deltoid, triceps along with external oblique muscles¹⁶. Most of gymnasium activities are involved with strength training. No studies have been found indicating training injuries due to lesser endurance.

The benefits of working out and fitness are widely known, but the risk of musculo-skeletal injury is an unfavorable consequence. Some modifiable risk factors reported for same are muscular strength and tightness¹³. In our study average flexibility of upper limb is reported. Such tightness issues¹³ can be a reason for higher incidence of injuries in fitness trainees.

If there are high number of gymnasium participants with a comparatively low trainers¹⁷, attention to every single one of them would be difficult. Second, the trainers should be qualified to know the exact positions for the particular exercise so that no excess strain or stress should be experienced. Large amount of injuries can be prevented if the trainers or coaches can correctly understand the principles and apply them¹⁸. Also the

trainees should workout under guided supervision of them.

Conclusion

From the data analysis, we have concluded that the general muscular fitness was in the average category.

Source of Funding- Self

Conflict of Interest- None

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Effect of Backward Walking in Subjects with Mechanical Neck Pain

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Abstract

Background: Population based studies showed that a lifetime prevalence of neck pain was 70% and a point prevalence was between 12-34%. Most common causes of neck pain include:- myogenic positional faults, septic arthritis, osteomyelitis, ankylosing spondylitis, fractures, torticollis, paget's disease, neurogenic causes as well as soft tissue injuries, vertebral tumor. Backward walking has shown potential benefits in lengthening of posterior muscular chain and stretching the posterior myofascial. There is greater amount of hip extension and knee flexion in backward walking as compared to forward walking. As there is greater amount of hip extension, there occurs greater amount of extension of lumbar spine which loads up the facet joint opening up the disc space. The unloading of the discs occurred may lead to reduction in the pain.

Objectives: To study the effect of backward walking in subjects with mechanical neck pain

Method: Ethical clearance was obtained from the Institutional Ethical Committee. 38 subjects were selected between the age group 20 to 40 years suffering from mechanical neck pain from 1 month. Male and female subjects were selected according to inclusion and exclusion criteria. Pre values of numeric pain rating scale and cervical lordotic index were taken. Study was carried out for 5 days for 1 week. Post data analysis was note and data analysis was done.

Result: A statistical analysis using paired t test within the group comparison was done and conclusions was estimated. Result found from analysis was significant.

Conclusion: There was a reduction in pain status and cervical curve between the values of pre study and post study. Hence, this study concludes that there is effectiveness in backward walking in subjects with mechanical neck pain

Keywords: Backward walking, neck pain, facet joint, posterior fascia, cervical index

Introduction

Neck pain is the pain perceived in a region bounded superiorly by the superior nuchal line, laterally by the

lateral margins of the neck and inferiorly by an imaginary transverse line through the T1 spinous process.¹

Population based studies showed that a lifetime prevalence of neck pain was 70% and a point prevalence was between 12-34%.

Skov et al found that the 1-year prevalence of neck symptoms to be 54% in men and 76% in women in sales people. Most common causes of neck pain include:- myogenic positional faults, septic arthritis, osteomyelitis, ankylosing spondylitis, fractures, torticollis, paget's disease, neurogenic causes as well as soft tissue injuries,

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vertebral tumor.³ Neck pain is a common problem in the community. In any one year, 30% adults will report neck pain and 5-10% will be disabled because of it.

Various interventions like cyriax method, MFR, intermittent musculoskeletal inhibitory technique, pilates, etc. are followed to reduce neck pain in patients, one among which can be backward walking.⁵

Backward walking has shown potential benefits in lengthening of posterior muscular chain and stretching the posterior myofascial. While performing backward walking, toe contacts the ground first as the heel-strike phenomenon with the ground is uninvolved.⁴

There is greater amount of hip extension and knee flexion in backward walking as compared to forward walking.⁵ As there is greater amount of hip extension, there occurs greater amount of extension of lumbar spine which loads up the facet joint opening up the disc space. This further reduces compressive force on intervertebral discs.⁶

The unloading of the discs occurred may lead to reduction in the pain caused in the neck region. Studies have shown that myofascial is the commonest cause of neck pain in working population. There are various exercise programs that enhance the flexibility of the spinal muscles which indeed helps in reducing pain.⁷ Backward walking is one of the exercise interventions which significantly reduces low back pain due to induced flexibility within the posterior muscular sling, myofascial and hence aligning the lumbar spine on the scrum thus reducing the lumbar lordosis. This theory may also work for reducing the neck pain following same principle of stretching the posterior fascia and the muscular sling.⁸

Walking has been used for rehabilitation as well as for fitness professionals for improving cardiovascular fitness and rehabilitate musculoskeletal injuries.² Hence, primary purpose of this study is to find out the effect of backward walking in patients with mechanical neck pain.⁹ there is a need for these muscles to have optimal motor control, strength and endurance to avoid pain in lower back as well as neck region.¹⁰ hence motor control impairment, lack of endurance among athlete and non athlete population is a contributing factor for muscle imbalance.¹¹

Need of Study

Neck pain is a major health problem occurring in

general population. A number of factors causing neck pain proven statistically significant are long working hours, maintaining same position for longer period of time, physical and mental tiredness, no breaks between work, monotonous routine. Other aspects like postural patterns, work design, myokinetic chain patterns also cause neck pain which are least considered. This neck pain caused may limit in day to day activities like working, activities of daily life, swimming, driving, etc. if no intervention is provided then myofascial chain pain may lead to positional faults of the vertebrae leading to alignment changes in the spine.⁹ Various interventions are performed to resolve the pain caused in the neck region.

Few studies have concluded that release of the suboccipitalis muscle a part of posterior fascia, myofascial release for upper trapezius, reducing mechanical neck pain. Methods considered here were direct inhibition of posterior fascia and the muscular sling relating to neck region. Conventional intervention like hot moist pack have also been used in treating neck pain because of the feature of muscle relaxation.

Very few studies carried out have shown backward walking to be effective in treating low back pain, according to our knowledge studies showing backward walking treating neck pain are limited. Hence, this study has been taken into consideration. Backward walking is one such intervention that can be used to deteriorate the pain caused in neck region as it causes stretching of posterior fascia, unloading the pressure on the facet joints that leads reduction in pain.

Aim and Objectives

Aim : To study the effectiveness of backward walking in subjects with mechanical neck pain

Objectives : To determine the effectiveness of backward walking in subjects with mechanical neck pain.

Review of Literature

1. Dufek JS, House AJ, Magnus BC, Melcher GG, Mercer JA. Backward walking: A possible active exercise for low back pain reduction and enhanced function in athletes. *J of Exercise Physiology*. April 2011; 14 :17-26

A study was done in athletes between age group 21 to 27 to find the effect of backward walking in low back pain reduction and enhanced functions among them. Subjects were instrumented with two light weight uniaxial accelerometer and biaxial electrogoniometer was secured externally to the back spanning T12-S2. the study concluded that backward walking can reduce low back pain and enhance function for athletes.

2. Borghouts AJ, Koes BW, Bouter LM. The clinical course and prognostic factors of non-specific neck pain: a systemic review. Pain 1998;1-13

A study was done on factors leading to non specific neck pain where subjects were divided into 2 groups, 1 group was given medication while the other group was kept on placebo treatment. Pattern of mechanism of neck pain is explained and treated in this study.

3. Nikolai Bogduk. The anatomy and pathophysiology of neck pain. Phys Med Rehabil Clin N Am 2003;14: 455-472

This study was done on anatomy and pathophysiology of neck pain. It is a review of literature regarding the aging process in different perspectives of neck pain. Various causes, origin, mechanism of neck pain has been stated in this study.

Materials and methodology

Type of study : Experimental study

Study design: Pre test and post test study design

Place of study: Krishna Institute of Medical Sciences
Deemed to be University

Target population: all adult male and female of 20-40 years who are experiencing non specific neck pain

Sampling method: convenient sampling

Sample size:38

Formula =
$$\frac{4 \times SD^2}{(X \times E)^2}$$

where SD is standard deviation = 1.2

X is mean = 0.3

E is epsilon = 0.5

Duration of study: 6 months

Inclusion criteria

1. Male and female within the age group : 20-40 years

2. Patients suffering from mechanical neck pain with duration of 1 month

3. Patients willing to participate

Exclusion criteria

1. Pain radiating to upper extremity or back

2. Spinal deformities

3. History of physiotherapy treatment for neck pain

4. Neurological issues regarding balance

5. Tumours

6. Cervical Spinal stenosis

7. Fractures relating to spine

8. Whiplash injury

9. Ankle, knee and hip pathologies

Materials

1. Pen and paper

2. Informed consent form

3. Data collection sheet

Procedure

Study will be explained to the subject, interested subjects will be screened for inclusion and exclusion criteria. Informed consent form will be taken from each subject prior to the treatment. Instruction about the exercise to be performed will be given to the subject. Demographic data and Pre-assessment of the baseline values of outcome measures will be noted down in the subjects. A set protocol of exercise will be demonstrated and taught to the subject. Intervention will be carried out for 9 minutes per subject per day for 5 days a week. Post values of outcome measures will be noted down.

Outcome measures

1. **NUMERIC PAIN RATING SCALE**

A.

Select the number that best describes your neuropathic pain during the past 24 hours (circle one number only)

0 1 2 3 4 5 6 7
8 9 10

No pain possible pain worst

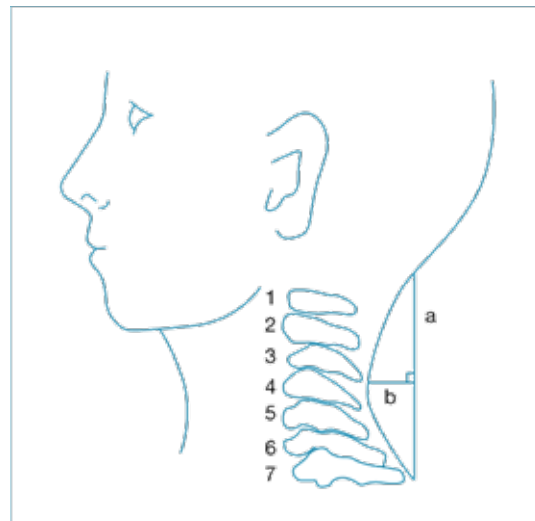
B.

Since the start of the study, my overall status is:

- 1 Very much improved
- 2 Much improved
- 3 Minimal improved
- 4 No change
- 5 Minimal worse
- 6 Much worse
- 7 Very much worse

2. CERVICAL LORDOTIC INDEX

Subjects will receive instructions concerning the procedure of the experiment. The seventh cervical spinous process and right acromion will be marked for measuring purposes. A measurement will be taken from the ear lobe to the acromion to detect any alterations in head movement. The subjects will be instructed to sit in a chair, feet flat on the ground, with both elbows on the armrest directly below the acromion. Therapist will firmly place the flexible ruler against the subject's erect cervical spine and will take a measurement between the occiput and the seventh cervical spinous process. The shape of the Spinocurve will be traced on paper with the endpoints clearly marked. The subject will then be instructed to flex the cervical spine as far as possible without strain. Measurements with the flexible ruler will be taken in the flexed position. After tracing the cervical curve onto the paper, a mathematical equation will be used to calculate the angle Measurement of cervical



curve with flexible ruler

Figure no.1

a = Length between the two endpoints of the cervical curve

b = Length of the perpendicular from the midpoint of line a to the curve.

The following equation as discussed by Frey and Tecklin (6) was used to formulate the angle:

$$Q = 4 \text{ arc tan } (2 b/a).$$

Statistical Analysis

Data of all outcome measures was measured as pre treatment & post treatment values. Mean & standard deviation was calculated for each outcome measure.

- **Within the Group Comparison:**

Within group comparison was done by applying 'Paired t-test' to pre and post treatment values of same group for all outcome measures.

Data Presentation

Table no. 1: Age group distribution

AGE GROUP	DISTRIBUTION
20-25	22
26-30	12
31-35	4

The above table shows data presentation of age group. Most of the subjects belong to 20-25 years followed by 26-30 years and 31-35 years.

Table no. 2: Gender distribution

GENDER	NUMBER
MALE	18
FEMALE	20

The above table shows representation of sex distribution. Female participants were more than male participants.

Data Analysis

Table no. 3: Within the Group Comparison:

Sr. No.	PARAMETERS	PRE	POST	t value	p value	INFERENCE
1	numeric pain rating scale	5.84±1.15	3.02±1.21	17.19	<0.0001	significant
2	cervical lordotic index	11.64±1.23	11.13±1.23	10.5	<0.0001	Significant

Discussion

This study “effect of backward walking in subjects with mechanical neck pain” was conducted to find out the effectiveness of reduction of pain status in subjects suffering from mechanical neck pain. This neck pain caused may limit in day to day activities like working, activities of daily life, swimming, driving, etc. if no intervention is provided then myofascial chain pain may lead to positional faults of the vertebrae leading to alignment changes in the spine. Hence, early rehabilitation must be provided to the subjects suffering from neck pain due to their positional faults.

The study was conducted with 38 subjects. Subjects were selected according to the inclusion and exclusion criteria. Inclusion criteria was age group between 20 to 40 years, patients suffering from mechanical neck pain and patients willing to participate. Exclusion criteria was pain radiating to upper extremity or back, spinal deformities, history of physiotherapy treatment for neck pain, neurological issues regarding balance, tumours, cervical Spinal stenosis, fractures relating to spine, whiplash injuries and subjects with hip, knee or ankle pathologies.

During backward walking, hip extension and knee flexion occurs as greater than forward walking. Greater hip extension and a concomitant extension of the lumbar spine increasingly load the facet joints opening up the disc space, causing a reduction in compressive loads to the intervertebral discs. The unloading of the discs maybe a mechanistic outcome of backward walking by way of an increase in hip extension.

Effects of natural trunk inclination (eg. Forward or backward lean) on low back joint moments during forward walking. Studies have proved that peak flexor moments at L5 during specific phases of support that were 1.4 times greater for the backward inclined group versus the forward inclined group. Although it is not known if this result would change if the direction of walking is reversed. Furthermore, Leteneur⁵³ concluded that different walking patterns existed for two groups, for forward inclined group subjects utilized hip muscles throughout the stance phase while backward inclined individuals relied more on a strong hip flexor moment at takeoff. Hence, there is reduction of pain status, as unloading of discs occur via increased hip extension during backward walking.

According to studies, reversing to backward walking among older individuals may show decrease in gait velocity, stride length and swing phase, an increase in double support phase and no cadence. Ability of older people to increase backward ambulation is limited and relies solely on increasing cadence.

In a comparative study done between forward and backward walking on treadmill, it was found that percent maximum heart rate and percent maximum oxygen consumption for subjects walking on treadmill was higher in backward walking as compared to forward walking in the same condition. Hence, it provides better cardiopulmonary output.

According to previous study done by Mulla Farhin, effect of reversal treadmill walking and low intensity cycle ergometry in chronic knee osteoarthritis subjects- a comparative study; reverse treadmill group was found to have a greater improvement in exercise tolerance and endurance as compared with cycle ergometry. However, this study did not conclude effect of unloading of facet joints and stretching of posterior fascia that further helped in reduction of mechanical pain caused in neck and low back region.

This study concluded that backward walking for 9 minutes which followed by 10 minutes of hot moist pack, gave subjects a decrease in the status of pain as well decreased cervical lordotic index. According to the data analysis performed, paired t test was done and the value resulted was significant for pain status according to numeric pain rating scale and in cervical curve measured by cervical lordotic index.

Conclusion

This study concluded that there was a significant difference in pain status and cervical lordotic index calculated in subjects having mechanical neck pain with treatment of backward walking.

Limitations, Suggestions and Recommendations

Limitations:

- The study is limited to a small geographic area.
- The study duration was short and limited.

Suggestions and Recommendations:

- A future study with large sample size can be done.

- A future study for any other painful soft tissue can be done.
- Randomised control study can be undertaken with control group.

Ethical Clearance: The Institutional Ethical Committee has given clearance to conduct this project titled “EFFECT OF BACKWARD WALKING IN SUBJECTS WITH MECHANICAL NECK PAIN” with protocol number 0400/2018-2019

Source of Funding: This project was self-funded.

Conflict of Interest: There were no conflicts of interest during the conduction of project.

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Effect of Structured Bladder Training in Urinary Incontinence

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Abstract

Introduction: Urinary incontinence is considered a very distressing condition affecting multiple domains of human life i.e. social, physical, psychological, occupational, domestic, and sexual aspects experienced by all ages. However, only pathophysiology varies according to each condition, and therefore demanding different therapeutic approaches according to the mechanism of urine loss. This study was designed to find out the effect of structured bladder training in urinary incontinence. To find out effect of conventional bladder training in urinary incontinence. To compare the effect between two on the basis of demographic variables.

Method: This was an experimental study with the total of 28 spinal cord injury patients who had urinary incontinence were selected with random allocation from the Krishna Institute of Medical Sciences, Karad in this study. Their ages were 20 years and above according to inclusion and exclusion criteria. Prior consent was taken. They were divided into two groups: group A and group B. Group A received conventional therapy and group B received structured bladder training with conventional training. Pre assessment was taken prior to the treatment. These subjects were treated for 4 weeks, 3 days per week, 30 – 45 min. After 4 weeks the post treatment assessment was taken. The outcome measures were included King's Health Questionnaire and 1 hour Pad Test.

Results: The obtained results showed a statistically highly significant improvement ($p < 0.0001$) noted in the urinary incontinence in spinal cord injury patients.

Conclusion: It was concluded that structured bladder training was effective in controlling urinary incontinence secondary to spinal cord injury.

Key words: Spinal cord injury, Urinary Incontinence, King's health questionnaire, Pad test.

Introduction

Spinal cord injury (SCI) results in tremendous change in individual's life therefore, a relatively high cost – injury¹. The well known consequence of SCI is paralysis². It also affects other body functions, including

bladder, bowel, respiratory, cardiovascular and sexual function². Generally SCI affect young adults. The majority of population with SCI are male accounting (78.3%). Females accounting for (21.7%)¹.

Etiologically, SCI can be classified as traumatic and non – traumatic injuries. Traumatic injuries being the most frequent cause resulting from motor vehicle accidents (40.4%), falls (27.9%), violence (15%) and sports (8.0%). Non – traumatic damage occurs in adult population mainly from disease or pathological influence accounting for 39% of all SCIs. SCI can results in either tetraplegia, cervical tensions being the cause (56%) or paraplegia due to thoracic, lumbar and sacral involvement (43%)¹.

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Bladder dysfunction is one of the most frequent complaint noted after SCI³. Within first year of injury, about 74 – 80% of SCI individuals reports some degree of bladder dysfunction⁴. SCI individuals experiences neurogenic bladder or areflexic bladder with neurogenic being more common with detrusor overactivity⁵. Neurologically, continence is controlled at three levels spinal, pontine and cerebral level working harmoniously by means of combined somatic and autonomic pathways⁶.

The spinal control for micturition occurs at sacral level (S2, S3, S4) with main co-ordination center is located in the pontine mesencephalic reticular formation. This intact pathway between them (pontine and sacral centers) allows for co-ordinated voiding i.e. relaxation of urethral sphincter and contraction of detrusor muscle⁷. SCI alters this complex reflexive and voluntary control of micturition.

Initially, during the stage of spinal shock, the urinary bladder seems flaccid with all bladder reflexes and muscle actions are abolished³. As spinal shock weans off which lasting from few days to several weeks, bladder can either turn automatic or autonomous³. Individuals with lesions above the conus medullaris and sacral segments develop a ‘spastic (UMN or automatic bladder)’¹. It commonly develops with transverse spinal cord lesion above T10 – T11. The reflex arc remains intact, thereby reflex emptying of bladder takes place³. With lesion at conus medullaris or sacral segments, ‘flaccid (LMN or autonomous bladder)’¹. There is no reflex action of detrusor muscle due to involvement of micturition reflex center³.

Common urinary symptoms noted after SCI are urinary retention, incontinence and increased urinary frequency/urgency⁴. Urinary incontinence is most common, affecting 40 – 50% of SCI population⁵. Prevalence rate being more in women between 15 – 64 years of age⁸ with decrease in the quality of life in individuals with SCI⁹. Inappropriate bladder management can lead to high pressure within the bladder resulting in the further complications i.e. recurrent urinary tract infection, urosepsis and progressive renal failure and renal calculi, etc⁴.

Bladder management is one of the important component of the treatment in individuals with SCI⁹. Primary goal of bladder management is to minimize these urinary tract complications¹. Bladder training

program can be achieved by intermittent catheterization or timed voiding program³. Bladder training for urinary incontinence is an upcoming area for physiotherapist because medical and nursing healthcare professionals often overview strength training for bladder muscles. Structured bladder training program contains physiotherapy interventions such as pelvic floor muscle strengthening (PFMs), behavioural training, surface electrical stimulation¹⁰. Often physiotherapy treatment proves to be long lasting and better for strengthening of bladder muscles.

Materials and Methodology

Study Type: Experimental Study.

Study Design: Comparative Study.

Place of Study: Krishna Institute of Medical Sciences, Karad.

Sampling Method: Simple Random Sampling with Random Allocation.

Sample Size: 28.

Study Duration: 3 Months.

Inclusion Criteria:

- Subjects with urinary incontinence secondary to spinal cord injury.
- Subjects with both genders.
- Age group 20 years and above.

Exclusion Criteria:

- Complications other than bladder dysfunction.
- Bladder dysfunction secondary to other causes than spinal cord injury.

Outcome Measures:

• King’s Health Questionnaire – It consists of 21 questions, which can specifically reflect the influence of urinary problem on individual’s quality of life. There are two main parts, first part is related to general health and incontinence impact. The second part contains six health domains. In addition, the third part is related to symptom severity scale. Each domain score is scale from 0 to 100 and higher scores mean a worse quality of life.

- Pad Test – It is standardised method for

quantifying urine loss that can be performed at work or home. The short – term pad test is most commonly used which is performed over 1 hour. For this, an increase of 1 to 10 g represents mild incontinence, 11 – 50 g represents moderate incontinence and > 50 g represents severe incontinence.

Procedure:

Total 28 participants were divided into two groups. In Group A, total 14 participants were included in which 9 males and 5 females. In Group B, total 14 participants were included in which 8 males and 6 females. The informed consent were taken from the participants after approval of ethical committee. Participants were assessed for urinary incontinence secondary to spinal cord injury prior to the treatment for which King's health questionnaire and 1 – hour Pad test were used. Participants were explained about the procedure of the study. Group A received conventional exercises and Group B received structured bladder training with conventional exercises. In Group A, Pharmacological Therapy, Physiotherapy : Electrical stimulation (TENS: Frequency- 100 Hz, Pulse width- 200 to 400 ms, Intensity- tolerable limit, Duration- 20 min) and exercise training, External Appliances, Medical and Nursing Care – Timed Voiding Program, Intermittent Catheterization. In Group B, Pelvic floor muscle exercises – Kegel's exercises, Breathing Exercises, Relaxation Exercises, Strength Training for abdominals, back and thighs. These participants were treated for 4 weeks, 3 days per week, 30 – 45 min. After 4 weeks the post treatment assessment was taken with the help of King's health

questionnaire and 1 – hour pad test. The interpretation of the study was done on the basis of comparing pre and post test assessment. Thus, statistical analysis was done.

Data of all outcome measures was measured as pre treatment and post treatment values. Mean and Standard deviation was calculated for each outcome measure using Instat. Within group comparison was done by applying 'Paired t - test' to pre and post treatment values of same group for all outcome measures. Between groups comparison was done by applying 'Unpaired t - test' which included Group A: Conventional Exercises and Group B: Structured bladder training with conventional exercises.

Results

The distribution of study participants based on gender showed that males accounted for (61%) and females (39%). However, the severity of urinary incontinence was found in females. King's Health Questionnaire showed that Group B has more significant improvement levels with decreased mean values than Group A (Table No. 1, 2, 3, 4, 5, and 6). Within the group comparison for pad test, pre and post training there was extremely significant improvement noted in Group A ($p = <0.0001$) and Group B ($p = <0.0001$). Between the group comparison for pad test, post training there was significant improvement noted in Group A and Group B ($p = 0.0288$). Thus, Pad test showed significant improvement that is decrease in mean weight. Group B had greater efficacious mean value as compared to Group A.

1) Within The Group Comparison:-

A. KING'S HEALTH QUESTIONNAIRE-

Table No. 1: King's Health Questionnaire – Part I

Part I	Group	Pre Training	Post Training	p value	t value	Mean Difference	Result
GHP	Group A	57.14±15.28	33.92±12.43	< 0.0001	13.000	23.214	ES
	Group B	64.28±18.89	23.21±11.86	<0.0001	12.362	41.071	ES
II	Group A	52.32±17.10	40.43±14.18	0.0186	2.687	11.893	S
	Group B	49.95±17.27	28.54±12.09	0.0003	4.837	21.407	ES

Table No. 2: King's Health Questionnaire – Part II

Part II	Group	Pre Training	Post Training	p value	t value	Mean Difference	Result
RL	Group A	47.58±15.81	39.25±15.48	0.0285	2.463	8.336	S
	Group B	44.00±18.02	24.96±18.21	<0.0001	7.984	19.043	ES
PL	Group A	45.20±18.98	39.24±19.18	0.0186	2.687	5.964	S
	Group B	42.82±22.39	24.96±15.68	<0.0001	6.514	17.864	ES
SL	Group A	38.85±17.81	35.67±18.56	0.0401	2.280	3.171	S
	Group B	31.71±16.20	21.00±14.79	<0.0001	5.687	10.707	ES
EM	Group A	35.67±16.96	30.12±15.95	0.0032	3.606	5.550	VS
	Group B	41.24±20.61	18.23±10.30	0.0008	4.368	22.993	ES
SE	Group A	44.02±18.04	33.29±14.62	0.0022	3.801	10.729	VS
	Group B	48.76±22.13	23.75±8.57	0.0003	4.839	25.007	ES
SM	Group A	44.82±11.66	34.5±13.02	0.0022	3.799	11.321	VS
	Group B	40.45±11.72	24.37±12.43	<0.0001	7.236	16.079	ES

Table No. 3: King's Health Questionnaire – Part III

Part III	Group	Pre Training	Post Training	p value	t value	Mean Difference	Result
SSS	Group A	8.21±2.72	7.21±2.51	0.0001	5.508	1.000	ES
	Group B	8.50±2.56	5.28±1.63	<0.0001	7.398	3.214	ES

2) Between The Group Comparison:-**A. KING'S HEALTH QUESTIONNAIRE-****Table No. 4: King's Health Questionnaire – Part I**

Part I	Group A	Group B	p value	t value	Result
GHP	33.92±12.43	23.21±11.86	0.0277	2.333	S
II	40.43±14.18	28.54±12.09	0.0245	2.388	S

Table No. 5: King's Health Questionnaire – Part II

Part II	Group A	Group B	p value	t value	Result
RL	39.25±15.48	24.96±18.21	0.0342	2.236	S
PL	39.24±19.18	24.96±15.68	0.0405	2.156	S
SL	35.67±18.56	21.00±14.79	0.0289	2.313	S
EM	30.12±15.95	18.23±10.30	0.0271	2.343	S
SE	33.29±14.62	23.75±8.57	0.0452	2.104	S
SM	34.50±13.02	24.37±12.43	0.0452	2.104	S

Table No. 6: King's Health Questionnaire – Part III

Part III	Group A	Group B	p value	t value	Result
SSS	7.21±2.51	5.28±1.63	0.0237	2.403	S

Discussion

In general, major goal of this study was to correct the incontinence levels of patients with spinal cord injury and thereby improving quality of life of the patients. Also, secondly to compare the two treatments that are conventional treatment and structured bladder training program with conventional treatment, and find out which best improves the incontinence.

Urinary incontinence is considered a very distressing condition affecting multiple domains of human life i.e. social, physical, psychological, occupational, domestic, and sexual aspects experienced by all ages. However, only pathophysiology varies according to each condition, and therefore demanding different therapeutic approaches according to the mechanism of urine loss ¹¹.

In previous study, "Effects of different bladder management methods on the quality of life in patients with traumatic spinal cord injury" by Y Akkoc was found that voiding dysfunction is observed in most individuals with spinal cord injury even in patients who can ambulate. It is associated with further increase in complications and decrease in quality of life ⁹. Another study, "Treatment of Urinary Incontinence in Women With Spinal Cord Injury" by Marlene Elmelund was stated that spinal cord injury individuals often experience neurogenic bladder dysfunction with neurogenic detrusor overactivity or

areflexic bladder ⁵.

According to the epidemiological studies, it is found that upto 81% of individuals with spinal cord injury reports with neurogenic bladder ¹⁰.

The present study was conducted with 28 subjects. It was found that male gender (61%), was more affected than females (39%). Also, the study stated that majority of population with spinal cord injury are male (78.3%) ¹. However, it was found that level of incontinence was high in women. In a study, "Single blind, randomised controlled trial of pelvic floor exercises, electrical stimulation, vaginal cones, and no treatment in management of genuine stress incontinence in women" by Kari Bø stated that urinary incontinence is more common in women than in men ⁸.

In present study, we used King's Health Questionnaire and pad test. In a study, by Kikuo Okamura stated that King's Health Questionnaire was reliable and valid for investigating relationship for general lower urinary tract symptoms in future studies for both gender ¹². Also, short – term pad test was second outcome measure stated a strong specificity which varies between 65 and 89% ¹³. Results indicated significant improvement in both outcome measures for both conventional and experimental group.

Furthermore, when outcome measures were compared between groups, there was significant difference between both. Though, both groups are effective, group B with structured bladder training along with conventional training proved far more efficacious.

The efficacy of group B can be marked with significant difference in mean improvement values seen in outcome measures using 'Unpaired t - test'. When King's Health Questionnaire was analyzed, it showed that group B has more significant improvement levels with decreased mean values. Part I including two components, general health perceptions and incontinence impact showed mean improvement with 23.21 and 28.54 respectively. Part II including role limitations, physical limitations, social limitations, emotions, sleep / energy, and severity measures showed 24.96, 24.96, 21.00, 18.23, 23.75, and 24.37 respectively. One component that is personal relationships was excluded in the study from part II because possible response of this component treat as missing value. Part III includes symptom severity scale showed mean improvement with 5.28. According to previous study, "The relationship between bladder management and health – related quality of life in patients with spinal cord injury in the UK" by CW Liu had used King's Health Questionnaire in which the mean improvement value gained significantly co – relate with the findings in present study¹⁴. Second outcome measure, short – term pad test showed mean improvement with 7.28. But, however there are no such literature to support the above finding and therefore need to be investigated further.

In last few years, several studies have demonstrated different results regarding effect of structured bladder training in urinary incontinence. Structured bladder training with conventional treatment are a valuable treatment option. Additionally, there are no much published studies that specifically uses structured bladder training program in control of incontinence in spinal cord injury individuals. This study had some limitations like small sample size. More studies are needed to evaluate a longer followup time and also compare treatment in other conditions.

Conclusion

The study concluded that structured bladder training was effective in controlling urinary incontinence secondary to spinal cord injury.

Conflict of Interest: There is no any conflicts of

interest.

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Prevalence of Foot and Ankle Pain among Housekeeping Staffs – A Cross Sectional Study

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Abstract

Background: Any kind of pain or uneasiness in the ankle or foot is referred as ankle and foot pain. The housekeeping workers habitually suffer from various musculoskeletal disorders due to many of the tasks which are repetitive in nature. Foot and ankle pain is the most significant problem faced in daily work in wide range of population among hospital cleaning staff. Thus the aim of this study is to determine the prevalence of foot and ankle pain among housekeeping staffs. **Objectives:** To assess the prevalence of foot and ankle pain among housekeeping staffs. **Study Design:** A cross-sectional study. **Method:** Ninety six (n=96) participants who had an experience in housekeeping department for at least 6 months were included in the study. The participants were selected through convenience sampling technique. Each participants BMI was calculated. Standardized Foot and Ankle Outcome Questionnaire developed by American Academy of Orthopaedic Surgeons was used to collect the data purely on voluntarily basis. **Result:** Out of the (n=96) participants, 89 were females (92.7%) and 7 were males (7.3%). Majority of the housekeeping staffs had difficulty to walk on uneven surface with the prevalence of 64.5 %. This study concluded that the prevalence of foot and ankle pain that interfered with their normal life was 23.9%. **Conclusion:** A relationship was evidenced with mild symptoms of foot and ankle pain and reduced health related quality of life associated with uneven surfaces in the working environment.

Keyword: Foot and Ankle Pain, BMI, Standardized foot and ankle outcome scale, Housekeeping staff.

Introduction

Individuals who are involved in prolonged standing, putting great pressure over the joints by lifting the heavy objects and high physical demand are at high risk of musculoskeletal pain. Musculoskeletal pain is the most common cause in general population which can increase in sick leaves, loss of interest in work and also leads to early retirement from their jobs¹. Among general population daily activities are often interfered due to musculoskeletal pain. One of the risk factor for developing musculoskeletal pain is considered to

be poor ergonomics during the physical work which can be repetitive movements, overuse, overexertion, faulty posture. Housekeeping work includes many tasks which is a very physically demanding job. The housekeeping workers frequently suffer from injuries at work due to many of the tasks which are repetitive in nature such as bed making, a vacuuming, carrying biomedical wastes, emptying garbage, tidying, dusting, cleaning floors, walking on uneven surfaces, poor ergonomics. Female housekeeping staffs are more compared to the male housekeeping staffs as they can be recruited by low wages and studies had shown that low wage work results in higher burden of pain and injuries². As human foot provides base of contact with the ground, it plays an important role in all weight bearing activities, walking, provides stability, balance, helps to adapt to the surfaces, and even act as shock absorption. When an individual develops any kind of foot pain it interrupts the biomechanical function of the foot which can lead to abnormal gait, difficulty in

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walking, balance impairment³. A cross sectional study on prevalence and associated factors of foot and ankle pain in nurses showed that foot and ankle pain has occurred frequently in nurses and this pain prevents them from performing their daily living and work activities. This study also shows that factors associated with pain were footwear comfort, psychosocial and several personal factors¹. Another population based study on prevalence and correlates of foot pain proved that, in community nearly one in five of population has been effected with foot pain & it is commonly correlated with old age, obesity and female gender⁴. A study on prevalence and distribution of ankle pain and symptomatic radiographic ankle osteoarthritis in community dwelling older adults reported that, In community based sample of older adults ankle osteoarthritis is less frequently affected whereas one in nine individuals are affected with ankle pain and also it has been reported that in females, younger adults (50-64 yrs.) and manual workers the prevalence is higher⁵. The risk situation that are favourable to develop musculoskeletal pain in housekeeping staffs include prolonged standing, in certain movements the burden put on the body segments, repetitive movements, excessive strength to accomplish some tasks, walking and unbalanced bodily postures, besides the poor ergonomic conditions during their work and the environmental factors⁶. Thus the aim of our study is to determine the prevalence of foot and ankle pain among housekeeping staffs in Indian population.

Materials and Method

This study was conducted among healthy housekeeping staffs who had at least 6 months of experience with the sample size of 96. Prior to the study, permission letter was obtained from the concern housekeeping executive and the participants were explained about the study and an informed consent was obtained from them. Ethical clearance was obtained from University ethics committee. Participants were screened based on the inclusion and exclusion criteria. Inclusion criteria were: Housekeeping staffs of both genders, workers who had at least 6 months of experience. Exclusion criteria were: workers who had any congenital or any musculoskeletal injuries within past 6 months. Eligible participants were then selected

through convenience sampling technique.

Method

This cross sectional study was conducted among healthy housekeeping staffs that had at least 6 months of experience in housekeeping department. Prior to the data collection, permission letter was obtained from the housekeeping executive and the participants were explained about the study and an informed consent was obtained from them in local vernacular language. Ethical clearance was obtained from University ethics committee. Participants were enrolled based on the inclusion criteria. Total strength of housekeeping staff was identified 150 and selection of participants were selected through convenience sampling technique (n=96). Participant's information regarding age, sex, height, weight through subject intake form was obtained by college wise after making grouping of the participants. The body mass index (BMI) of each participant was calculated. The self-administered standardized foot and ankle outcome questionnaire to each participant was given in local vernacular language. The time spent to complete the self-administered questionnaire was 10 minutes and same was returned to the investigators.

Statistical Analysis

Data was analyzed with SPSS window software. Descriptive statics like percentage and frequency was calculated.

Findings

Out of the 96 participants, 89 were females (92.7%) and 7 were males (7.3%) with an average age of 45yrs (9.096) The prevalence of foot and ankle pain was 58.3% during walking on uneven surface and 60.4 % reported pain while going up and down stairs. Standing for an hour was painful with prevalence rate of 58.4%. Majority of the participants had difficulty to walk on uneven surface (64.5 %) and (23.9%) participants felt that their daily activities were interfered with pain.

Table: 1 Frequencies of pain during the past week

	1)walking on uneven surface		2)walking on flat surface		3)going up or down stairs		4)lying in bed at night	
	Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
not at all	40	41.70%	83	86.50%	37	38.50%	83	86.50%
Mildly	33	34.40%	10	10.40%	31	32.30%	6	6.20%
Moderately	17	17.70%	2	2.10%	19	19.80%	4	4.20%
Very	5	5.20%	1	1.00%	8	8.30%	2	2.10%
Extremely	1	1.00%	0	0.00%	0	0.00%	1	1.00%
Couldn't do because of pain	0	0.00%	0	0.00%	0	0.00%	0	0.00%
could not do because of other reasons	0	0.00%	0	0.00%	1	1.00%	0	0.00%

*58.3% had pain during walking on uneven surface while 86.50% had no pain during walking on flat surface and 60.4% had pain during going up and down stairs while 86.50% had no pain during lying in bed at night

Table: 2 Frequencies of ankle giving way during the past week

	during Strenuous activity such as heavy physical work		during Moderate activity such as moderate physical work, jogging ,running		during Light activity, such as walking, house work	
	Count	Column N %	Count	Column N %	Count	Column N %
did not give way at all	69	71.90%	85	88.50%	90	93.80%
Partially gave away but did not fall	23	24.00%	6	6.20%	6	6.20%
completely gave way so that I fell	1	1.00%	1	1.00%	0	0.00%
could not do the activity because of foot/ankle giving way	2	2.10%	0	0.00%	0	0.00%
could not do for other reasons	1	1.00%	4	4.20%	0	1.

*24.00% had ankle partially gave way during strenuous activity while 88.50% ankle did not give way at all during moderate activity.

Table: 3 Ability to get around most of the time during the past week.

	Count	Column N%
I did not need support or assistance at all	92	95.80%
I mostly walked without support or assistance	4	4.20%
I mostly used one cane or crutch to help me get around	0	0.00%
I mostly used two canes, two crutches or a walker to help me get around	0	0.00%
I used a wheelchair	0	0.00%
I mostly used other supports or someone else had to help me get around	0	0.00%
I was unable to get around at all	0	0.00%

* Data represents that 95.80% did not needed support or assistance at all to get around most of the time during the past week.

Table: 4 Frequencies of painful foot/ankle during the past week.

		not at all	mildly	moderately	Very	Extremely	couldn't not because of pain	could not because of other reasons
How painful was it during Strenuous activity, Such heavy physical work. Skipping , tennis	Count	38	27	19	9	3	0	0
	Column N %	39.60%	28.10%	19.80%	9.40%	3.10%	0.00%	0.00%
how painful was it during Moderate activity, such as moderate physical work, jogging, running	Count	61	24	7	0	0	0	4
	Column N %	63.50%	25.00%	7.30%	0.00%	0.00%	0.00%	4.20%
how painful was it during Light activity, such as walking, house work, yard work	Count	87	7	2	0	0	0	0
	Column N %	90.60%	7.30%	2.10%	0.00%	0.00%	0.00%	0.00%
how painful was it during Standing for an hour	Count	36	34	18	2	2	1	3
	Column N %	37.50%	35.40%	18.80%	2.10%	2.10%	1.00%	3.10%
how painful was it during Standing for a few minutes	Count	79	15	2	0	0	0	0
	Column N %	82.30%	15.60%	2.10%	0.00%	0.00%	0.00%	0.00%
Q9) How much difficulty do you have walking on uneven surfaces	Count	34	37	23	1	1	0	0
	Column N %	35.40%	38.50%	24.00%	1.00%	1.00%	0.00%	0.00%

* Data represents 28.10% had mildly painful foot/ankle during strenuous activity, 35.40% had mild painful foot/ankle during standing for an hour and 38.50% had mild difficulty to walk on uneven surface.

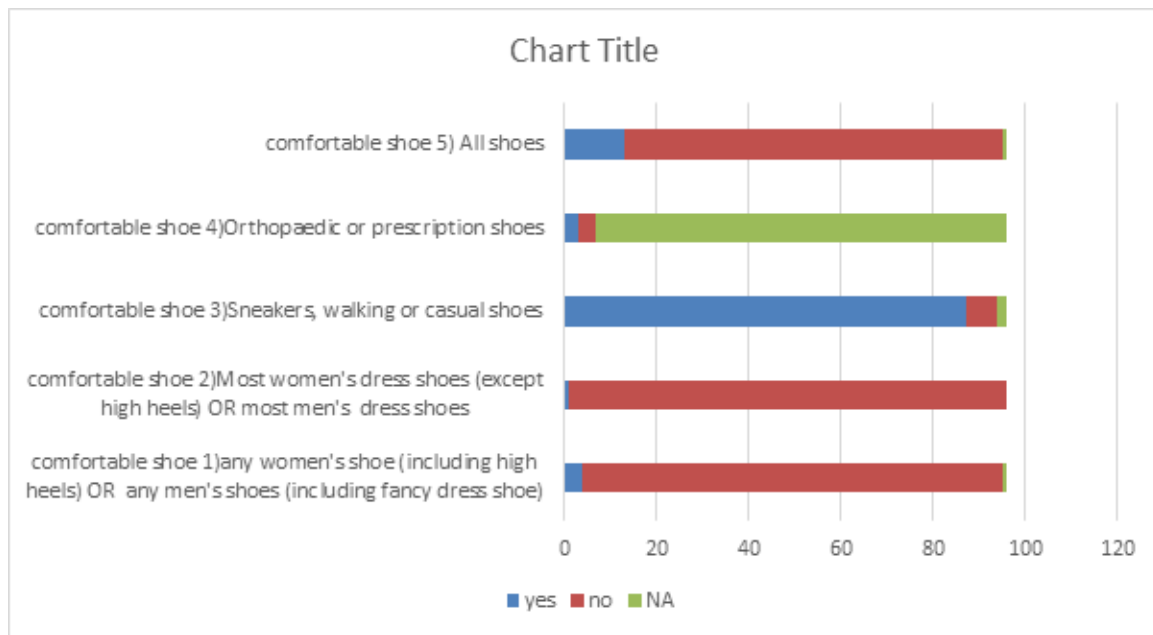


Figure: 1

Table: 5 Frequencies of interference of foot or ankle problem with normal work.

	count	Percent
not at all	66	68.80%
a little bit	23	24.00%
moderately	7	7.30%
quite a bit	0	0.00%
extremely	0	0.00%
unable to work due to foot problems	0	0.00%

*24% had a little bit of interference of foot or ankle problem with their normal work.

Discussion

The findings of this present study proved that the foot and ankle pain was common and during walking on uneven surfaces, during climbing up and down the stairs, prolonged standing and during the strenuous activity among housekeeping staffs at a private university hospital in India. The result showed that 23.9% of the participants found pain from their daily life activity. This result is in parallel to the study done by Maki Tojo *et al.*, (2016), with 17% of prevalence of pain in ankle and foot among nurses¹. This study also revealed that 60.4% faced difficulty during climbing stairs up and down and 34.40 faced trouble during walking on uneven surface and 58.4% during prolonged standing. This result is no parallel with the study which indicated that 30.4% prevalence of foot and ankle pain. Our study shows

significant results in link with foot and ankle pain⁷. The prevalence rate of foot and ankle stiffness in this study is higher than reported by Catherine *et al.*, (2008)². These variances can be linked with the prevalence of foot and ankle pain during walking on uneven surface which needs participants to have an experience of pain lasting at least for a month. Regardless of the causes our study reported the association between ankle and foot pain during walking on uneven surface and reduced health related quality of life. However this differ from a study reported higher percentage of 79.6% workers having a good capacity to work without significantly associated with health related quality of life⁸. Previous studies concluded that foot and ankle pain is more likely to be related to overuse physical activity, however our findings line up with the present study where participants felt mild

pain during strenuous activities⁴. This present study has numerous limitations, as this study was done at a single Private university in India, thus the outcome might not be concluded to other university housekeeping staffs who have other occupational backgrounds, and furthermore the sample size of the study was less. Further research is recommended with larger sample sizes in this direction.

Conclusion

The findings of this study revealed poor quality of life associated with climbing up and down the stairs, standing for long period of time, walking on even surfaces, irrespective of gender, culture and habit. Therefore there is a necessity to develop foot health behavior in campus surroundings that might allow improving the quality of life among housekeeping staff.

Conflict of Interest: Authors declare no conflict of interest.

Source of Funding: Self funded

Ethical Clearance: Informed written consent in local vernacular language was obtained from the participants. Ethical clearance protocol number: 2019/008 was obtained prior to the data collection from Yenepoya ethics committee-1

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Documented Physiotherapeutic Approach in Post Corrective Osteotomy Procedure for Gunstock Deformity Caused by Old Supracondylar Fracture Malunion

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Abstract

Background: Physiotherapeutic intervention in a phasic manner has been in practice after orthopedic surgeries .graded physiotherapy has a great value in reducing post surgical inflammation pain and improving mobility .this work is done towards presenting the data regarding post surgical condition of corrective osteotomy for cubital varus on left side^[7] the treatment techniques were choosen on the basis of phasic evaluation and post treatment evaluation was done in order to check the prognosis in terms of inflammation^[8], pain and ROM .several exercise therapeutic techniques and electro therapeutic techniques have been selected periodically on a basis of pre- treatment assessment. In this data presentation electro therapeutic techniques like, faradism under tension^[1] for correction of deformity, TENS, ULTRA SOUND^[23], PARAFFIN WAX BATH (pain relief and extensibility) where the treatment modalities selected.

Method : Treatment techniques were selected based on the evaluation in every particular session. . faradism under tension^[1], Paraffin wax bath, TENS^[23] ,muscle energy techniques^[17], cyriax deep friction massage^[2] and ultrasound therapy^[23] modalities were used selectively.

Results : Faradism under tension ,Paraffin wax bath, TENS ,muscle energy techniques, cyriax deep friction massage and ultrasound therapy modalities were used selectively with range of movement exercise in four phases and evaluation was done in every session. each phase was of 3 days at the end of 12 days re evaluation was done and found that there was a marked decrease in pain, inflammation^[9] and increased range of motion.

Conclusion : after the selective physiotherapy approaches there was reduction of pain, oedema and range of motion was improved. graded physiotherapeutic intervention is important to most of the orthopedic post operative conditions in reducing pain, decreasing inflammation, increasing mobility^[4].

Keywords : CYRIAX deep friction massage, faradism under tension, muscle energy techniques.

TOOLS : Inch tape, goniometer .

Case Study

A case of a old supracondylar fracture malunion corrected for gunstock deformity (cubitus varus) reported for further physiotherapeutic intervention .

SUBJECTIVE DATA:

NAME : G . SHIVA

AGE : 20yrs

GENDER : MALE

IP/OP NO : 3972605

CHIEF COMPLAINTS : 1. pain around elbow.

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2. unable to do elbow folding activities in either direction.

History of present medical condition : corrective osteotomy for cubitus varus leftside

Past medical history: above mentioned patient reported to the orthopedic department of mims hospital with, supracondylar fracture and it was treated with k-wire fixation in the year 2010.

In 2018 the same case reported at mims orthopedic department with cubitus varus of the injured limb (left). French osteotomy was performed on 19-11-2018. and patient was discharged.

Again on 15-2-2019 the patient reported with a flexion deformity after 3 months of discharge to the mims orthopedic department for which he was referred to department of physiotherapy mims hospital.

SURGICAL HISTORY : on 19-11-2018 the patient gone through French osteotomy for cubitus varus deformity followed by 4-6 weeks of immobilization

Surgical procedure: LATERAL CLOSED WEDGE OSTEOTOMY (French Osteotomy) .

There are several fixation techniques of corrective osteotomies of the distal humerus. Cubitus varus is the most common delayed complication that results following supracondylar fracture of humerus^[1]. Immediate and late causes of cubitus varus deformity are medial angulations, medial rotation, over growth of lateral condyle and delayed growth of medial condyle. Lateral closed wedge osteotomy is the easiest, safest and inherently the most stable osteotomy. Osteotomy is done on lateral to medial side and periosteum is intact on medial side and it is followed by fixation of osteotomy by using 2 screws and k-wire with figure of eight. Between them for stabilizing the fixation the additional fixation by k wires controls rotational forces effectively besides angulation and translation forces and maintains the correction achieved prospectively^[7].

Objective Data

ON OBSERVATION

1. Ectomorphic built
2. Pain on VAS scale is 5 (moderate pain).

3. Left fore arm with flexed attitude
4. less of arm swing during walk.
5. Muscle girth at lower 1/3rd of left arm is less when compared to right arm.
6. Surgical scar is noticed on lateral aspect of left elbow joint.

ON PALPATION

1. Pitting oedema on lateral aspect of elbow.
2. Tightness of triceps (high tone compared to unaffected side).
3. Mild tenderness(on lateral aspect of elbow).

ON EXAMINATION

DEFORMITY : attitude of the elbow- flexed at 35 degrees.

SCAR : 5cm scar on lateral aspect of left elbow was measured by using inch tape.

MUSCLE GIRTH : there was a loss of muscle mass around the forearm which was measured 2cms less compared to unaffected side.

RANGE OF MOTION (goniometry)

ACTIVE R O M : patient was instructed to bend and straighten the forearm within the available range (35 degrees -85 degrees).

Passive R O M : passive range of movement (flexion and extension) was performed within the available range of movement(35 degrees -85 degrees), with a elastic endfeel in terminal flexion as well as terminal extension .

Goals of management is to gain patient confidence and to decrease pain and swelling and to increase range of motion. treatment techniques were selected followed by the evaluation in every particular session .

faradism under tension^[1]

Paraffin wax bath^[23],

Muscle energy techniques^[17],

Cyriax deep friction massage^[2],

ultrasound therap^[23],

modalities were used selectively . patient attended 12 days of physical therapy sessions ,treatment modalities were selected from the above mentioned list ,total period was divided into four phases,each phase was of 3days each.

PHYSIOTHERAPY MANAGEMENT:

(1-3 DAYS)

DAY 1 (PATIENT COMPLAINTS AND EXAMINATION):

On the day 1 patient was evaluated for stiffness and pain, decreased ROM (85 degrees-90 degrees flexion) (30-35 degrees extension) pitting oedema seen around the joint. On VAS scale pain is 5.(ref. Fig:1)

Objectives of treatment:

1. To decrease pain
2. To decrease oedema
3. To increase ROM

Treatment:

1. Faradism under tension
2. Ultrasound therapy (continous Mode ,1mhz ,duration :5mis,transverse strokes).

DAY (4-6):

On the day 4 patients was evaluated for pain and stiffness around joint and ROM (95degrees-100degrees flexion) (20-30 degrees extension). On VAS scale pain is 2.

Objectives of Treatment:

1. To decrease pain.
2. To decrease stiffness .
3. To increase ROM.

TREATMENT:

1. Wax therapy
2. Ultrasound therapy
3. Cyriax deep friction massage.

DAY (7-9):

On the day 7 patient was evaluated for pain and stiffness decreased and ROM (100degrees- 110 degrees flexion) (10-20 degrees of extension).(ref Fig :2)

OBJECTIVES OF TREATMENT:

1. To increase ROM

TREATMENT:

1. Muscle energy techniques.
2. Active ROM exercises in gravity assisted position^[6].

DAY (10-12):

On the day 10 patient was evaluated for ROM (110degrees-115 degrees flexion) (5-10 degrees extension)(ref Fig: 3)

Objectives of Treatment:

1. to increase ROM

TREATMENT

1. active ROM exercises in gravity resisted position .

IMPROVEMENT IN ROM ON OBSERVATION



Fig :1 (FIRST SESSION)



Fig:2. (INTERMEDIATE SESSION)



Fig : 3 (LAST SESSION)

Results

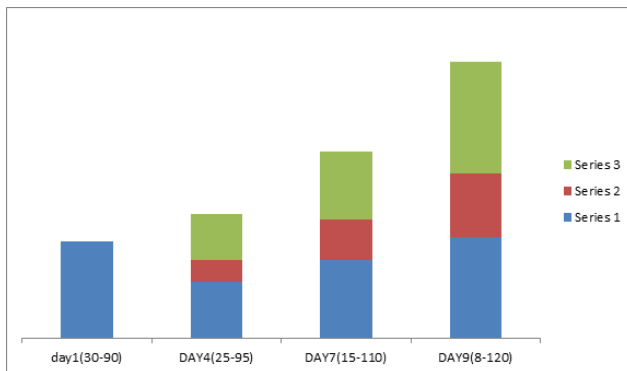


Fig : 4 (VARIATIONS IN ROM DURING INTERMITTENT SESSIONS BY USING GONIOMETER)

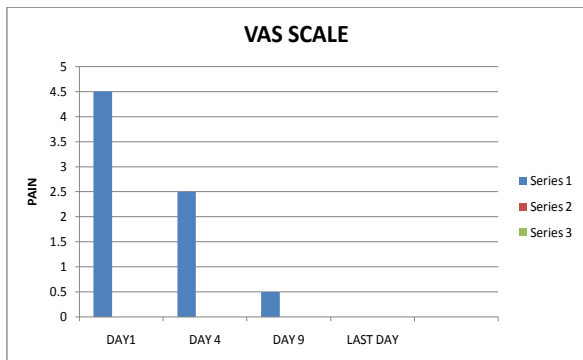


Fig : 5 (VAS scale measurements for pain in each session)

Discussion

The choice of techniques for management of post corrective osteotomy procedure^[7] provoked much debate and various conservative techniques have tried and shown to have varying levels of success. This case report showed the outcome of physical therapy approach for the management of stiffness after correcting gunstock deformity. In this case report involved a combination of faradism under tension^[1] and followed by deep friction massage^[2] and MET (muscle energy techniques)^[17] and

few other modalities like (TENS, PARAFFINWAX BATH, ULTRA SOUND)^[23] and educating gravity resisted exercises^[16] etc. The case report presented employed this and shows that there can be remarkable success if faradism under tension and deep friction massage and muscle energy techniques when properly timely applied^[16]. In this case deep friction massage and faradism under tension outlined its usefulness. Another major factor for this method is the subsequent cooperation from the subject. In this case report the central aim of physical therapy is to maximize functional ability and to decrease pain^[21] and stiffness. Individual plan of treatment are essential aspect of this case.

CLINICAL REASONING BEHIND CHOOSING THERAPEUTIC TECHNIQUES:

FARADISM UNDER TENSION:

Shortening of contractile soft tissues like muscles can be treated with faradism. Such contractures develop in Major Muscle groups After prolonged immobilization^[5]. It mainly occurs in Major Muscle groups like quadriceps and flexor groups^[4]. The aim of this Treatment is to stretch and loosen adhesions^[18]. The limb is fixed so that the muscles involved are in a stretched position. The current is then applied, either to individual motor points or to the whole group of muscles and increased until a contraction is obtained. Movement is not permitted and so the contraction is isometric, the increased tension in the muscle helping to stretch the adhesions. The current is usually surged, but may be interrupted. The later causes a more sudden stretch but the method should be used only by a skilled operator^[1].

CYRIAX DEEP FRICTION MASSAGE:

deep friction massage is to maintain the mobility within the soft tissues structures of ligaments tendons and muscles and prevent adherent scars from forming^[2,18]. The massage is deep and must be applied transversely to the capsule unlike the superficial massage given in the longitudinal direction parallel to the vessels which enhances the circulation. before friction massage can be performed successfully, the correct structure must be found through proper evaluation procedures. Precaution must be taken to prevent formation of subcutaneous bruising^[3].

USES

1. PAIN RELIEF

2. STIMULATION OF FIBER ORIENTATION IN REGENERATING CONNECTIVE TISSUE^[5]

3. PREVENTION OF ADHESION FORMATION

MUSCLE ENERGY TECHNIQUES:

Muscle energy techniques are used to treat somatic dysfunction, especially decreased range of motion, muscular hyper tonicity and pain. It is a direct and active technique meaning it engages a restrictive barrier and requires the patient participation for maximal effect. As the patient performs an isometric contraction, the following physiologic changes occur^[17]:

1. Golgi tendon organ activation results in direct inhibition of agonist muscles.

2. A reflexive reciprocal inhibition occurs at the antagonistic muscles.

3. As the patient relaxes, agonist and antagonist muscles remain inhibited allowing the joint to be moved further into the restricted joint range of motion^[16].

Conclusion

This study was done in physiotherapy department of MIMS ,nellimarla was an experimental clinical study to compare pre and post physiotherapeutic sessions for a post surgical French osteotomy^[7] case of elbow reported with pain, swelling and restriction of the movements both active and passive.

Faradism under tension^[1] ,Paraffin wax bath, TENS ,muscle energy techniques^[17], cyriax deep friction massage^[2,18] and ultrasound therapy modalities were used selectively with range of movement exercises in four phases ,evaluation was done on every phase . Each phase was of 3 days .at the end of 12 days, re evaluation was done and found that there was a marked decrease in pain, stiffness and pitting oedema and increased range of motion(ref Fig 1,2,3,4,5)

Source of Funding : Self

Conflict of Interest: The authors declare no conflicts of interest.

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Effect of Wobble Board Exercises on Star Excursion Balance Test in Athletes of Belagavi- An Experimental Study

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Abstract

Background: In every sporting activity, balance is important, be it static or dynamic. Balance training is a part of training sessions in sports so as to reduce the risk of injuries. Wobble board has shown effective results on decreasing the risk of falls and injuries

Aim: To determine the effectiveness of wobble board exercises on star excursion balance test in athletes.

Method: The study was a single group pre-post experimental design in which 32 athletes were included. The star excursion balance test was measured before and after the protocol. Wobble board training was given to the athletes for a period of 3 weeks with 3 sessions per week on alternate days.

Results: The results showed significant increase in the reach distances of SEBT scores at $p < 0.001$.

Conclusion: The present experimental study concluded that the three week wobble board training was effective in increasing dynamic balance in all 8 directions of the SEBT scores.

Keywords: Balance, SEBT, wobble board, athletes.

Introduction

Balance can be defined “statically as the ability to maintain a base of support with minimal movement and dynamically as the ability to perform a task while maintaining a stable position.”¹ Static balance, is when an individual can maintain a stable state during a still upright position, be it standing or sitting. Dynamic balance is when an individual is able to maintain balance while the center of gravity and base of support are moving^{2,3}

To maintain balance, the cerebellum and brainstem process the afferent information and initiate motor commands. While standing on an unstable surface, there is increase in postural sway and lower limb muscle

activity, as it stresses the sensory and motor feedback loops⁴.

Balance is maintained when vision, proprioception, vestibular function are interacting together.⁵ Any sporting activity requires visual proprioception to track the information about the activity in the environment around him, for example, the position of the opponent and flight of the ball, etc. Hence, the central nervous system has to count on the proprioceptive information for balance control from various body parts⁶.

Balance is considered as a prerequisite for sporting activities and used as a measure to indicate risk of injuries. Hence it is necessary to evaluate and train the athletes for balance^{7,6}. Various studies have been done using wobble board to improve balance and prevent injury. Hence the present study is designed to evaluate the effect of wobble board exercises on star excursion balance test.

Materials and Methodology

Ethical clearance was obtained from the

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Institutional Ethical Committee of KAHER Institute of Physiotherapy, Belagavi. Both male and female athletes above the age of 18 years from various sports clubs in Belagavi, Karnataka were included, only after obtaining a written informed consent prior to the study. The study included 32 athletes out of which 20 were males and 12 were females. The inclusion criteria of the study were a) athletes of various sports disciplines, b) age above 18 years, and c) subjects willing to participate. The athletes were excluded if they had a) any neurological deficits, b) been operated to the lower limb in the past 6 months, c) history of trauma to the hip, knee or ankle, d) pain in the hip, knee or ankle, e) mental illness and f) any vestibular problems (vertigo), visual problems (blind in one eye).

Outcome Measure:

Star excursion balance test

The test consists of a grid in eight directions. At the center of the grid is a tile surface where the subject stands with single leg stance⁸. The subject was asked to touch the most distal part of the great toe on each of the lines, without shifting weight or losing balance. The test was repeated if the athlete lifted the heel of the stance foot, lunged on the opposite foot while reaching or was not able to maintain balance while reaching. The athlete executed the test in 8 directions; namely, anterior, anterolateral, lateral, posterolateral, posterior, posteromedial, medial and anteromedial⁹. The test was performed for both the lower limbs and recorded on the first and last session of the study.

Procedure:



a) SEBT in anterolateral direction

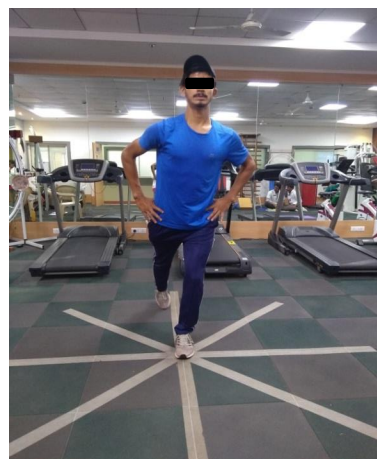
A warm up session of 5 minutes was given to the athletes prior to the training program which included jog in place, trunk rotation, high knees, side shuttle and sprint/back pedal. The training was done using a wooden wobble board of 40cm diameter and base height of 10cm. The training program was carried out for 25-30 mins per session. Familiarization session to the wobble board was administered prior to the protocol. Each of the exercises was given for 30s followed by 10s rest. The entire set was then repeated for 5 times. The following exercise regimen was given 3 sessions per week for 3 weeks.

The study protocol on the wobble board included the following exercises:

1. Double leg stance with eyes open
2. Double leg stance with eyes closed
3. Single leg stance
4. Rocking the board front and back
5. Rocking the board side to side
6. Rocking front of the board from side to side
7. Rotating on balance board
8. Performing physical activities

Statistical analysis:

Statistical analysis for the present study was done using statistical package of social sciences (SPSS) version 20 so as to verify the results obtained. Normality



b) SEBT in posterior direction



c) SEBT in medial direction



d) SEBT in posteromedial direction



e) double limb standing on wobble board



f) single limb standing

of changes from pre-test to post-test of different variables were done using Kolmogorov Smirnov test. Comparison of pre and post values score for the outcome measures were analyzed using Dependent-t test. Probability values less than 0.001 were considered significant.

The descriptive characteristics of the athletes included in the study were analysed statistically. The mean age of the athletes was 20.88 ± 2.11 . The mean BMI of the athletes was 21.96 ± 3.10 , suggesting that they had a normal BMI.

Table no. 1: Comparison of SEBT values between left and right lower limbs in 8 directions.

Variable	Time	Mean \pm SD	p-value
Anterior right	Pretest	98.38 \pm 15.93	<0.001
	Posttest	105.63 \pm 13.11	
Anterior left	Pretest	100.69 \pm 14.30	<0.001
	Posttest	105.91 \pm 13.38	
Anterolateral right	Pretest	103.22 \pm 13.57	<0.001
	Posttest	108.72 \pm 10.52	
Anterolateral left	Pretest	103.69 \pm 12.93	<0.001
	Posttest	108.81 \pm 10.08	
Lateral right	Pretest	106.06 \pm 10.77	<0.001
	Posttest	111.25 \pm 8.48	
Lateral left	Pretest	104.81 \pm 13.45	<0.001
	Posttest	111.44 \pm 8.84	
Poster lateral right	Pretest	102.84 \pm 11.02	<0.001
	Posttest	109.72 \pm 7.84	

Cont... Table no. 1: Comparison of SEBT values between left and right lower limbs in 8 directions.

Poster lateral left	Pretest	102.22 ±15.46	<0.001
	Posttest	108.19 ±11.94	
Posterior right	Pretest	94.22 ± 18.96	<0.001
	Posttest	102.94 ± 12.88	
Posterior left	Pretest	96.06 ±17.46	<0.001
	Posttest	103.19 ±12.49	
Poster medial right	Pretest	90.34 ±16.33	<0.001
	Posttest	96.75 ±13.65	
Poster medial left	Pretest	92.00 ±16.18	<0.001
	Posttest	94.72 ±19.98	
Medial right	Pretest	83.91 ±19.56	<0.001
	Posttest	91.41 ±16.61	
Medial Left	Pretest	81.72 ±19.10	<0.001
	Posttest	89.25 ±16.46	
Anteromedial right	Pretest	95.50 ±14.62	<0.001
	Posttest	102.09 ±12.09	
Anteromedial left	Pretest	95.91 ±14.97	<0.001
	Posttest	102.25 ±12.12	

Table no. 1 shows the results of the Star Excursion Balance Test in all the 8 directions following the wobble board training. There was significant increase in the reach distance in all the directions of the SEBT for both the lower limbs. The maximum pre-post difference was seen in the posterior direction on the right lower limb. The minimum pre-post difference was seen in the posteromedial direction in the left lower limb.

Discussion

The current study was done on athletes of various fields of sports, involving the lower extremities. Researchers in the past have examined balance abilities in athletes of various sports stating that balance abilities differ in athletes of various sports and also depending on their performance levels. A study compared balance on high school, collegiate and professional athletes which suggested that the professional athletes had better

dynamic balance than the other athletes. The more the experience of the athletes, more is the proprioception, range of motion, strength and movement abilities¹⁰

The present study assessed dynamic balance using the Star excursion Balance test in 8 directions. The results have shown significant improvement in all the direction for both the lower limbs following a 3 week wobble board training. A study suggests that the increase in the reach distance could have been due to increased neuromuscular control of the lower limbs which was seen by increasing the difficulty level of the exercise and number of repetitions¹¹.

A study done by Butler et al on dynamic balance has shown higher SEBT scores in anterior direction in high school athletes when compared to collegiate and professional athletes¹⁰. In contrast to that, Mccann et al who compared SEBT scores in high school and collegiate athletes did not find any difference in the scores¹². The present study included athletes playing at collegiate or professional level. The results of the same did not show any difference. Studies have proved that the anterior reach in professional athletes is lesser due to history of injuries in their career. Since the lower limb injuries was an exclusion criteria of the present study, we cannot relate with the previous studies.

Limitations:

The training sessions of the present study were conducted on alternate days. Hence the limitation of the study was that exercises were not monitored on the days when the training was not given.

Conclusion

The present experimental study concluded that the three week wobble board training was effective in increasing the reach distance in all the 8 directions of the star excursion balance test in athletes.

Future scope: This wobble board training can be incorporated in the training sessions for sports-specific activities. Further studies can examine the effect of wobble board exercises with progression in the training.

Source of Funds: Self

Conflict of Interest: Nil

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The Relationship between Emotional Status, Pain, Severity of Osteoarthritis on Radiograph and Quality of Life in Patients with Knee Osteoarthritis

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Abstract

Background: By 2050, India's 60 and older population is expected to encompass 323 million people, a number greater than the total US population in 2012

Osteoarthritis is the growing cause of social and economic burden to our aging society. It has been seen psychosocial status of patient with osteoarthritis have an impact on pain, functional ability and quality of life. The emotional status of osteoarthritis patient can have poor outcome on his/her Quality of life making the person disabled in their activities and functions.

The majority of osteoarthritis pharmacological and rehabilitation treatments are geared toward alleviating pain due to disease severity in the joint; therefore, it appears important to optimize treatment for people who have pain beyond peripheral sources.

Objective: This study will help to understand the association of emotional status, pain, radiographic severity and quality of life in patients with knee osteoarthritis so that a more holistic approach will be developed towards osteoarthritis.

Methodology: Study design was a cross sectional observational study. 100 subjects were assessed in the study. Participants were included in the study after screening for inclusion and exclusion criteria. All subjects were evaluated according to the assessment proforma for the following Pain on Visual Analogue Scale (VAS), Positive And Negative Affect Scale and Knee function on Knee Injury and Osteoarthritis Outcome Score (KOOS).

Conclusion: The findings of this study suggest an association between emotional status and pain, emotional status and quality of life. But no association is seen between emotional status and Kellgren Lawrence Scale.

Keywords : *Osteoarthritis, Emotional status, VAS, KOOS, Quality of Life, Radiographic Severity.*

Introduction

Osteoarthritis (OA) is a joint disorder characterized by the loss of articular cartilage, hypertrophy of bone at the margins, subchondral sclerosis, and range of biochemical and morphological alterations of the synovial membrane and joint capsule¹. Osteoarthritis is the second most common rheumatologic problem and it is the most frequent joint disease with a prevalence of 22% to 39% in India.^{2,3} By 2050, India's 60 and older

population is expected to encompass 323 million people, a number greater than the total US population in 2012.^{4,5} Nearly, 45% of women over the age of 65 years have symptoms while radiological evidence is found in 70% of those over 65 years.^{6,7}

Pain is the major clinical symptom in osteoarthritis of the knee and a key determinant for seeking medical care. Pain in osteoarthritis affects the ability to engage in activities of daily living, work, and other meaningful

activities, and is associated with a reduced quality of life⁹⁻¹⁰. Women with arthritis have more functional deficits than men, reporting more severe joint pain, more psychological distress, and greater limitations on activity¹¹. The chronicity of the disease can also produce emotional distress, depression and/or impairments of general health and vitality, reduced life quality, activity limitations¹², negative personal beliefs, as well as sleep disturbances.

Peripheral markers of disease severity (e.g., radiographs and magnetic resonance imaging) explain only a small to moderate proportion of the variability in OA-related pain and disability^{8,13-16}. Several investigators have shown discordance between these two features of osteoarthritis: people with clearly abnormal joint radiographs may have no or only mild pain, whereas others with pain may not have radiographic osteoarthritis, although this discordance is thought to be less with more severe stages of radiographic disease³. Radiographic severity of knee OA is frequently assessed using Kellgren Lawrence. This classification was proposed by Kellgren et al. in 1957 and later accepted by WHO in 1961.

There is growing evidence that central nervous system factors may be playing a prominent role in maintaining osteoarthritis pain in certain individuals. Central involvement in pain is often accompanied by non-region-specific symptoms that are systemically-mediated such as fatigue, cognitive problems, sleep problems, and perturbations of mood¹⁴⁻¹⁵.

Importantly, psychosocial factors have been consistently associated with symptoms of OA¹⁷. Psychological factors should also be considered with biological factors as potential factors prognostic for pain, because bio psychosocial perspective is now widely accepted as the most heuristic approach to chronic pain⁵.

In this respect, evidence from the chronic pain literature strongly suggests central nervous system influences of emotions and cognitions including individual behavioral characteristics along with psychosocial factors, and increased sensitivity to pain signals by the brain should not be ignored as potent factors that can mediate or moderate osteoarthritis outcomes in older adults².

It has been seen psychosocial status of patient with osteoarthritis have an impact on pain, functional ability and quality of life. The emotional status of osteoarthritis patient can have poor outcome on his/her Quality of

life making the person disabled in their activities and functions.

The majority of osteoarthritis pharmacological and rehabilitation treatments are geared toward alleviating pain due to disease severity in the joint; therefore, it appears important to optimize treatment for people who have pain beyond peripheral sources⁴. This study will help to understand the association of emotional status, pain, radiographic severity and quality of life in patients with knee osteoarthritis so that a more holistic approach will be developed towards osteoarthritis.

Materials and Method

Study design: Cross-sectional observational study

Participants:

The approval of the institutional ethics committee was taken for carrying out the study. The participants were screened based on the inclusion and exclusion criteria and then included in the study. A written informed consent was taken from all the participants

Inclusion Criteria-

1. Patients were selected according to the American College of Rheumatology criteria and minimum having Grade 1 on Kellgren Lawrence scale for Osteoarthritis of knee which will be assessed by a radiologist
2. In the age group of 45-70 yrs.
3. Those willing to participate.
4. Able to read English, Hindi or Marathi language.

Exclusion Criteria-

1. Patients with prosthetic knee replacement or other clinically significant surgery of the affected knee
2. Any cognitive impairment
3. Diagnosed Psychiatric illness
4. Hospitalization within the preceding year for psychiatric illness
5. Diagnosed Neurological illness
6. Rheumatoid arthritis, cancer, osteoporosis, joint infection and any other known illness

OUTCOME MEASURES

1. Visual Analogue Scale
2. Radiographic Classification of severity of osteoarthritis of knee using the Kellgren Lawrence scale. (Assessed by a radiologist of the institution.)
3. Positive Affect Negative Affect Scale
4. Knee injury and osteoarthritis outcome score (KOOS)

ASSESSMENT

All subjects were evaluated according to the assessment proforma for the following

1. Pain on Visual Analogue Scale
2. Positive Affect Negative Affect Scale
3. Knee Injury and Osteoarthritis Outcome Score

Data Analysis

Data was analyzed using the Graph pad prism 7 software.

Descriptive analysis of the data was done.

The data was checked for normality using the Shapiro- Wilk test. The data did not pass normality, thus, non-parametric tests were used.

Correlation of Positive PANAS with VAS, KOOS subcale pain, symptoms, ADL's and QOL, Kellgren Lawrence Scale using spearman test

Correlation of Negative PANAS with VAS, KOOS subcale pain, symptoms, ADL's and QOL, Kellgren Lawrence Scale using spearman test

The level of significance was set at 0.05

Findings

1. The total number of participant's were 100 who participated in the study. Out of which 64 were females and 36 were males.
2. The mean age group was 55.67 ± 7.85 years.
3. Distribution of grades of knee osteoarthritis divided according to Kellgren Lawrence Scales as follows Grade 1 -51, Grade 2 -30, Grade 3- 14, Grade -5.
4. There was a statistical significant difference ($p=0.02$) at 95% confidence interval between correlation

of Positive Panas and VAS , $r = -0.22$ showing weak negative correlation(graph1). This indicates higher positive emotions inhibit pain.

5. There is moderate negative correlation $r = -0.41$ between Positive PANAS and Symptoms of KOOS which is statistically significant ($p=0.00$) at 95% confidence interval. This indicates positive attitude or emotional status influences disability.

6. Statically significant($p=0.00$) difference was present between Positive PANAS and Pain of KOOS showing moderate negative correlation $r = -0.36$

7. There is weak positive correlation $r = 0.27$ between Positive PANAS and ADL of KOOS which is statistically significant ($p=0.00$) at 95% confidence interval.

8. There was a statistical significant difference ($p=0.00$) at 95% confidence interval between correlation of Positive Panas and QOL of KOOS (graph2), $r = -0.26$ showing weak positive correlation.

9. There was no statistically significant ($p=0.96$) correlation($r=-0.00$) found between Positive Panas and KL grade (graph3) .

10. Statically significant($p=0.00$) difference was present between Negative PANAS and VAS (graph4) showing moderate positive correlation $r = 0.38$

11. There is weak positive correlation $r = 0.26$ between Negative PANAS and Symptoms of KOOS which is statistically significant ($p=0.00$) at 95% confidence interval

12. There was a statistical significant difference ($p=0.00$) at 95% confidence interval between correlation of Negative Panas and Pain of KOOS, $r = 0.28$ showing weak positive correlation

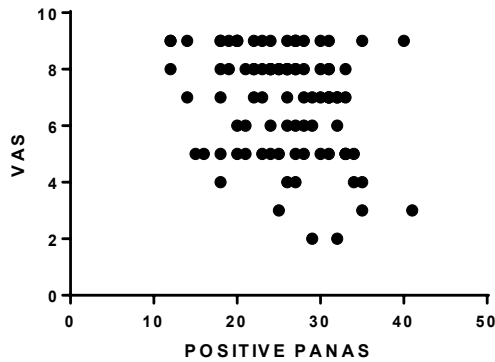
13. There is moderate negative correlation $r = -0.38$ between Negative PANAS and ADL of KOOS which is statistically significant ($p=0.00$) at 95% confidence interval

14. Statically significant($p=0.00$) difference was present between Negative PANAS and QOL of KOOS(graph5) showing moderate NEGATIVE correlation $r = -0.45$

15. There is no correlation $r = 0.03$ between Negative PANAS and KL grade(graph6) which is statistically not

significant $p=0.70$ at 95% confidence interval.

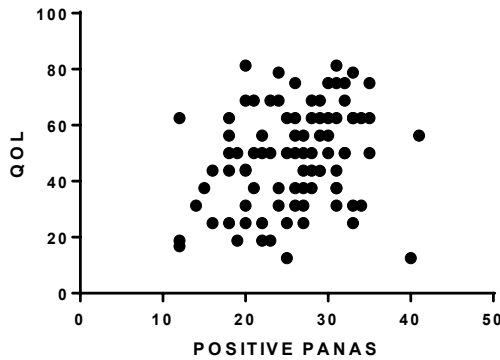
XY Data : Correlation of Positive Panas vs vas



Graph 1

Inference : There is weak negative correlation between Positive PANAS and VAS which is statistically significant at 95% confidence interval.

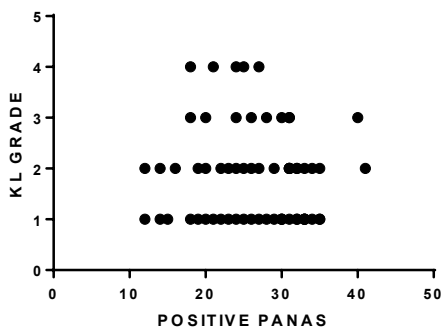
XY Data: Correlation of Positive Panas vs QOL



Graph 2

Inference : There is weak positive correlation between Positive PANAS and QOL which is statistically significant at 95% confidence interval

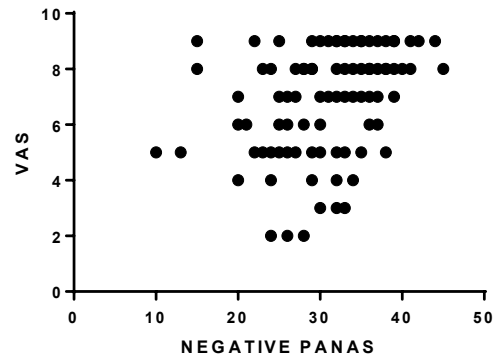
Correlation of POSITIVE PANAS VS KL grade



Graph 3

Inference : There is no correlation between Positive PANAS and KL grade which is statistically not significant at 95% confidence interval.

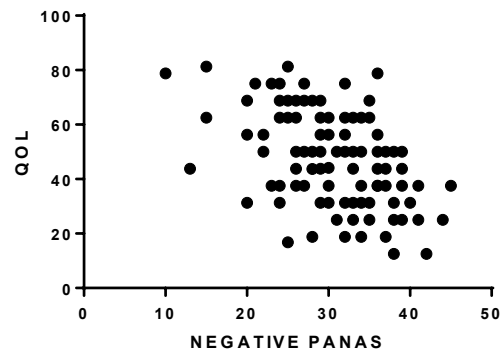
XY Data: Correlation of Negative Panas vs VAS



Graph 4

Inference : There is moderate positive correlation between Negative PANAS and VAS which is statistically significant at 95% confidence interval

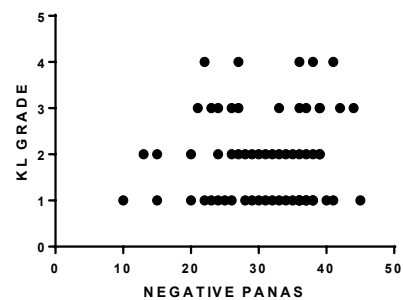
XY Data: Correlation of Negative Panas vs QOL



Graph 5

Inference : There is moderate negative correlation between Negative PANAS and QOL which is statistically significant at 95% confidence interval

XY Data: Correlation of NEGATIVE PANAS VS KL GRADE



Graph 6

Inference : There is no correlation between Negative PANAS and KL grade which is statistically not significant at 95% confidence interval.

Discussion

There are more females than males in the present study, as osteoarthritis of knee is more common in females than in males. This finding is supported by a meta-analysis by Srikanth VK, et al sows that osteoarthritis is more common in females than in males, and the most commonly affected joint in osteoarthritis is the knee joint.

Graph 1 shows negative correlation of Positive PANAS with Pain. This indicates that positive emotions inhibit pain. The more positive a person is they will experience less pain. Graph 4 positive correlation of Negative PANAS with pain. This shows that negative emotions increase pain perception of the individual. Almeida¹⁹ et al in a hierarchical cluster analysis study concluded that the participants with the greatest psychological distress experienced widespread pain and highest level of clinical pain and disability.

There is moderate negative correlation of Positive PANAS with symptoms subscale of KOOS. And positive weak correlation between Negative PANAS with symptoms subscale of KOOS. Riddle²¹ et al studied **Psychological Health Impact on Two-Year Changes in Pain and Function in Persons with Knee Pain** and concluded that persistent depressive symptoms may lead to self-reported pain and function worsening for patients with knee pain.

Weak positive correlation of Positive PANAS with Activities of Daily Living subscale of KOOS is seen. And moderate negative correlation of Negative PANAS with Activities of Daily Living subscale of KOOS. In a study conducted by Marks¹⁸ et al, variables assessed were pain, depression, levels of self-efficacy for pain and other-symptoms management, walking endurance, walking speed, and perceived exertion when walking. They imply that efforts to heighten self-efficacy for pain and other-symptoms management may influence the affective status, function, and effort-related perceptions of people with knee osteoarthritis quite significantly.

Graph 2 shows weak positive correlation of Positive PANAS with Quality of life subscale of KOOS . Graph 5 shows moderate negative correlation of Negative PANAS with Quality of life subscale of KOOS.

In a review article by Marks¹⁸ et al, it is seen anxiety is a serious health condition that may impact the extent of a chronic medical condition, as well as life quality and the ability to function optimally. Similarly, osteoarthritis, a progressive joint disease associated with pain and disability among aging adults has been linked to poor health outcomes and excessive usage of health resources. In particular, anxiety is commonly associated with poor adherence to self-care regimens and increased symptom burden. These factors can undoubtedly provoke or exacerbate osteoarthritis progression as suggested by findings of Katon et al.

Graph 3,6 shows no correlation of Positive PANAS and Negative PANAS with Kellgren Lawrence scale for grading severity of knee osteoarthritis . In a study conducted by Susan¹⁷ et al, the participants underwent knee radiographs, and had repeated assessments of pain severity and other centrally-mediated symptoms, such as fatigue, sleep quality, and depression accessed during a five day home monitoring period. The conclusion was both radiographic severity and centrally-mediated symptoms were independently and significantly associated with pain severity in women with knee osteoarthritis. In addition to more severe radiographic features, women with higher centrally-mediated symptoms had greater pain severity.

In addition, emerging evidence suggests the disability experienced by adults with osteoarthritis is not wholly explained by radiograph measures, and that some of the complaints experienced by affected individuals seeking medical help for painful symptomatic osteoarthritis may be related to psychological factors²⁰ .

However in the present study we did not find association between emotional status and radiographic severity of knee osteoarthritis using Kellgren Lawrence grade.

Conclusion

The findings of this study suggest an association between emotional status and pain, emotional status and quality of life. But no association is seen between emotional status and Kellgren Lawrence Scale.

Conflict of Interest: None

Source of Funding: None

Ethical Clearance: The ethical clearance for the study was obtained from Institutional ethics committee,

Ethics committee for Academic Research Project. (ECARP)

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Quality of Life using EORTC QLQ C-30 and EORTC QLQ BR-23 Marathi Version in Post-Operative Breast Cancer Women from Rural Region of Maharashtra

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Background: QOL (Quality of life) may be affected in most of the patients suffering from cancer irrespective of its stage. Hence, this observational study was conducted to understand the QOL in postoperative breast cancer women from rural region of Maharashtra, using Marathi versions of EORTC QLQ C-30 and EORTC QLQ BR-23 questionnaires.

Methodology: Out of 112 patients screened, 100 Post-Operative Breast Cancer in-patients and out-patients from Pravara Rural Hospital, Loni, Maharashtra, between age group of 20-60 years, were included in the study and questionnaires were administered to them.

Results: According to EORTC QLQ C-30, the Global QOL was 69.91 ± 23.4 . Emotional Functioning showed the lowest score (65.01 ± 24.06). In the symptom scale, the highest score were of Fatigue, Insomnia, Loss of Appetite and Pain. Financial Difficulties (48.33 ± 34.28) were faced by the patients due to medical treatment. In EORTC QLQ BR-23, score of sexual enjoyment (46.48 ± 31.52) was lowest and Hair Loss (38.44 ± 24.81) was the most affected symptom.

Conclusion: The study concluded that post-operative women in rural region from Maharashtra had low emotional functioning, less sexual enjoyment and faced financial difficulties due to medical treatment. Participants were most affected by hair loss symptom.

Key words: QOL, Post-operative, Marathi EORTC QLQ C-30, Marathi EORTC QLQ BR-23.

Introduction

Cancer is a major public health problem worldwide.¹ Women's cancer (breast, cervical, etc) causes more than 1 million deaths each year. The burden of cancer in India is estimated at over 1.5 million new cases, for both sexes, and is predicted to nearly two-fold in the next 20 years. Delayed diagnosis, and inadequate, or sub-optimum treatment are considerable causes of poor cancer survival in India.²

Breast cancer is the most frequent cancer among women in the world.³ With the rapid evolution in socioeconomic status and lifestyle, epidemic of breast cancer is growing worldwide imposing huge burden on healthcare system. There might be considerable

variations in risk factors and presentation of the disease regionwise.⁴

The risk factors for breast cancer are found to be age, diet, waist size, hip size, waist-hip ratio, body mass index, high-density lipoprotein cholesterol, triglyceride, more than three pregnancies, atypical hyperplasia in the previous biopsy, and history of carcinoma in relatives.⁵

In India, breast cancer has been ranked number one in cancer among females with age adjusted rate as high as 25.8 per 100,000 women and mortality 12.7 per 100,000 women. In rural registries, mortality-to-incidence ratio was found to be as high as 66 whereas it was as low as 8 in urban registries.⁶

Unfortunately, most women are unaware of breast

cancer symptoms/signs, prevention, and management. In rural regions with inadequate resources, fragmented health systems, cancer contributes to the cycle of indigence.⁸ In resource-limited countries like India where we do not have structured screening/awareness programs, a majority of women present with locally advanced breast cancer.⁷ Proven and cost-effective interventions are available for this common cancer, but access to these is beyond reach for women residing in rural region.⁸

QOL reflects the person's emotional, social, and physical aspects that influence well-being in everyday life. Alongside improvements in survival, it is important to maintain QOL. There is some evidence of cancer patients' symptom burden and decreasing QOL during oncological treatments. Hence, QOL is increasingly being used as a primary outcome measure in breast cancer patients to understand how the disease has an impact on general well-being of the individuals.⁹

The European Organization for Research and Treatment of Cancer (EORTC) has developed validated questionnaires to explore QOL in oncologic patients. This includes the EORTC QOL Questionnaire C30 (i.e. EORTC QLQ-C30), which is the core questionnaire for all cancer patients to evaluate QOL in clinical trials¹⁰ whereas the EORTC Breast Cancer-Specific QOL Questionnaire (QLQ-BR23) is a 23-item supplementary questionnaire module for evaluating the quality of life in breast cancer patients in particular which is most widely used.¹¹

The EORTC QLQ-C30 has been translated and linguistically validated into more than 60 languages. Translations include all major Western languages, and many Asian languages such as Marathi, Hindi, Persian, etc.¹² Also, EORTC QLQ BR-23 questionnaire is available in Indian languages such as Marathi, Hindi, etc. They were found to be reliable and valid for further use in clinical trials in Indian women with breast cancer.¹³

As there is no evidence of previous study done in rural region of Maharashtra this study was needed to determine the QOL among breast cancer patients. The rural population in Maharashtra is having Marathi as their native language and it is difficult for them to understand English. Hence, evaluating the quality of life of breast cancer patients in Marathi was indeed necessary for which Marathi versions of EORTC QLQ C-30 and EORTC QLQ BR-23 were used.

Materials and Method

The study received ethical approval from Institutional Ethical Committee of Dr. A. P. J. Abdul Kalam College of Physiotherapy, Loni (Reg. no: BPT/INT/2018/34). The study conducted was descriptive. Marathi versions of EORTC QLQ C-30 and EORTC QLQ-BR-23 questionnaires were used in this study. The QLQ-C30 questionnaire consists of 30 items covering five function subscales (physical, role, emotional, cognitive and social), nine symptom items (fatigue, nausea/vomiting, pain, dyspnoea, insomnia, appetite loss, constipation, diarrhoea and financial difficulties) and a global health/QOL subscale.¹⁴ The breast cancer specific EORTC QLQ-BR-23 questionnaire is grouped into six subscales: two functional subscales (body image and sexuality), three symptoms subscales (arm symptoms, breast symptoms and systemic therapy side effects) and a future perspective subscale.¹⁵ The score ranges from 0 to 100, with a higher score indicating better quality of life for the functioning and global QOL. For cancer-specific symptoms, a higher score shows the patients expressing greater symptoms and thus poorer quality of life.¹⁶

The permission to use the Marathi versions of EORTC QLQ C-30 and EORTC QLQ BR-23 was obtained from EORTC QOL Department. These questionnaires were copyright instrument to evaluate quality of life.¹³

The study was carried out at Pravara Rural Hospital, Loni from August 2018 to January 2019. The sample size was calculated using Openepi. The female population in Loni is approximately 6000 with prevalence of breast cancer being 10.2%. The confidence level was kept to be 90%, which concluded the sample size to be 98. The sampling method used was convenient sampling. All the breast cancer patients visiting the hospital were selected on basis of inclusion and exclusion criteria.

Participants included were females within age group of 20 to 60 years, diagnosed with breast cancer undergone surgery for it, had completed secondary education with SSC (Secondary School Certificate) and those willing to complete surveys in Marathi. Excluded participants were female patients with severe cognitive impairment, non co-operative, and not willing to participate.

Written informed consent was obtained from the patients before enrolling them in the study. The total number of patients screened was 112 out of which 12

were not willing to participate. Total time of 20 minutes was given to the patients to fill the questionnaires. The questionnaires were collected back and a raw score of the participant's response were calculated and later the scoring was done according to the EORTC scoring manual. The score ranges from 0 to 100, with a higher score indicating better QOL for the functioning and global QOL. For breast cancer-specific symptoms, a higher score shows the patients expressing greater symptoms and thus poorer QOL.¹⁶

Findings

The objective of the study was to determine the extent of the functions and the symptoms which were affecting the daily life of post-operative breast cancer women in rural region of Maharashtra. The statistical analysis was done using Microsoft Excel. Various statistical measures such as mean and standard deviation (SD) were used.

Table 0.1 shows the Mean and Standard deviation (SD) value of EORTC QLQ C-30 including Global QOL, Functional and Symptom scale/items of Marathi version. As higher score shows good QOL, the score of the Global QOL in women from rural population was not as near as 100 (considered to be fair). Comparison with similar studies on the quality of life performed in other countries showed that the quality of life scores evaluated using the same instrument were similar to those in Maharashtra, e.g. a population study performed in Saudi Arabia showed that the mean quality of life score was 64.0.¹⁷

The Functional scores were high in the following items: Physical Function, Role Performance, Cognitive Function and Social Function, indicating that the level

of functioning is satisfactory (regular). Most patients showed no confinement in bed, no trouble during strenuous activities, no help with bathing, dressing, eating, no interference in daily activities and pursuing hobbies, presented no difficulty with concentrating and / or remembering things and also the physical condition of the participants and the treatment did not interfere in family life and social activities. The item Emotional Functioning had the lowest score indicating that it was the most affected among all other functions. Facing a life-threatening health problem and the uncertainty of treatment outcomes is psychologically distressing.¹⁸ It was seen that psychological distress in patients with breast cancer is related to anxiety, irritation, depression and decreased QOL.

In the symptom scale, the highest score were of Fatigue, Insomnia, Loss of Appetite and Pain. Among the symptoms, Pain was the most prevalent symptom reported and source of high stress for patients. This symptom was associated with irritability, changes in taste, exhaustion and loss of concentration. Many published studies confirmed that insomnia and fatigue were the major important factors that affected quality of life in breast cancer patients¹⁷ which is similar to our findings. Also, there were low scores of the items Nausea and Vomiting, Dyspnea, Diarrhoea and Constipation. The physical condition and medical treatment caused financial difficulties to the participants. This suggests that the financial condition is affected more as it is almost 50%.

Since these symptoms are related to physical, emotional and psychological sequelae of the disease, different measures and strategies are required to improve the QOL of breast cancer survivors.¹⁷

Table 0.1: Mean and standard deviation of Marathi version of the Global health status, Functional and Symptom scales/items of EORTC QLQ C-30

EORTC QLQ-C30 version 3.0	MEAN \pm SD
Global health status/ QoL	
Global health status/ QoL (revised) (items 29, 30)	64.91 \pm 23.4

Cont... Table 0.1: Mean and standard deviation of Marathi version of the Global health status, Functional and Symptom scales/items of EORTC QLQ C-30

Functional scales	
Physical functioning (revised) (items 1 to 5)	80.34 \pm 16.63
Role functioning (revised) (items 6, 7)	76.59 \pm 26.45
Emotional functioning (items 21 to 24)	65.01 \pm 24.06
Cognitive functioning (items 20, 25)	85.52 \pm 14.97
Social functioning (items 26, 27)	83.71 \pm 22.47
Symptom scales/ items	
Fatigue (items 10, 12,18)	31.33 \pm 22.63
Nausea and vomiting (items 14, 15)	9.49 \pm 10.11
Pain (items 9, 19)	33.49 \pm 25.56
Dyspnea (item 8)	23.99 \pm 32.15
Insomnia (item 11)	29.66 \pm 29.92
Appetite loss (item 13)	30.33 \pm 37.03
Constipation (item 16)	22.33 \pm 32.49
Diarrhoea (item 17)	6.33 \pm 17.53
Financial difficulties (item 28)	48.33 \pm 34.28

The following Table 0.2, shows the Mean value of EORTC QLQ BR-23 including Functional and Symptom scale/items of Marathi version. The Functional scale consisted of Body Image, Sexual Functioning, Sexual Enjoyment and Future Perspective. The high score of Body Image indicated that there was good acceptance by the participants as they were satisfied with their body and were able to look at their self naked. Also they didn't experience less femininity or didn't find themselves physically unappealing. Answers to Sexual Functioning and Sexual Enjoyment questions pointed that the participants were sexually active, however low score of sexual enjoyment stated that women were not satisfied. This also showed that there was relative dissatisfaction in the quality of their relationship. Other studies also suggest that problems with sexual functioning are common in women with breast cancer undergoing chemotherapy.¹⁹ The mean value of future perspective stated that patients were moderately concerned about the future.

In the symptom scale, the most affected score was of Hair Loss showing women were much worried due to hair loss. Also, Systematic Therapy Side-Effects had high score, pointing that the side effects of the treatment were more. Items such as Breast Symptoms and Arm Symptoms were less affected showing that the patients didn't suffer from much pain, swelling, skin problems and over-sensitivity in the area of the affected breast along with less pain, swelling and difficulty in movement.

These findings were similar to a study done by S. Aguiar Lobo (2014), who had conducted a cross-sectional study in the city of Fortaleza undergoing chemotherapy using EORTC QLQ C-30 and EORTC QLQ BR-23 in Portuguese language. Their study concluded that the participants showed changes in following domains: financial, emotional, sexual satisfaction and future prospects. The most frequently mentioned symptoms were fatigue, insomnia and loss of appetite.¹⁹ In our study, except these symptoms the participants were most affected by the hair loss symptom.

Table 0.2: Mean and standard deviation of Marathi version of the Functional and Symptom scales/items of EORTC QLQ BR-23

EORTC QLQ BR-23	MEAN \pm SD
Functional Scales	
Body image (items 9 -12)	75.32 \pm 19.79
Sexual functioning (items 14,15)	84.16 \pm 17.48
Sexual enjoyment (item 16)	46.48 \pm 35.19
Future perspective (item 13)	48.67 \pm 31.52
Symptom scales/items	
Systematic therapy side-effects (items 1-4,6,7,8)	34.26 \pm 26.37
Breast symptoms (items 20-23)	27.98 \pm 23.29
Arm symptoms (items 17,18,19)	31.77 \pm 25.65
Upset by hair loss (item 5)	38.44 \pm 24.81

Conclusion

The study determined the extent of the functions and the symptoms which were affecting the daily life of post-operative breast cancer women and concluded that emotional functioning and sexual enjoyment was low, but financial difficulties were high. Participants were most affected by hair loss symptom.

Conflict of Interest:- Nil

Source of Funding:- Self

Ethical Clearance:- Received ethical approval from Institutional Ethical Committee of Dr. A. P. J. Abdul Kalam College of Physiotherapy, Loni (Reg. no: BPT/INT/2018/,34)

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Effects of Proprioceptive Training on Agility Performance in Male Football Players

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Abstract

Background and Purpose: Football is a high intensity intermittent sport which requires the successful and effective execution of the technical skill like agility, change of direction, acceleration, deceleration, sudden stops and shots largely depends on the football players' ability to control their balance and to adapt better and faster to their ever changing bodily postures and positions in the pitch. So to maximize the football performance the possible strategy could be proprioceptive training. Hence, the purpose of this research was to see the effects of proprioceptive training on agility performance in male football players.

Method: 90 football players participated were randomly selected and divided in two groups, experimental (n=45) and control group (n=45). Experimental group underwent Proprioceptive training on bosu ball with their regular football training program and control group underwent regular football training program. Athletes were trained for 3 times a week for 6 weeks. Agility assessment at pre and post intervention was done for all subjects using T-agility test.

Results: The results revealed a significant differences in comparison between pre and post agility for experimental group with p-value 0.000 (< 0.05) and insignificant difference for control group with p-value 0.220 (> 0.05).

Conclusion: Proprioceptive training was effective in decreasing the agility time in male football players.

Keywords: *Proprioceptive training, bosu ball, agility, football.*

Introduction

Powerful, precise and controlled movement were integral to a part of high intensity intermittent Sports like football⁽¹⁾. It requires physiological components and motor skills like agility, sprinting, rapid acceleration, sudden stops and shots^(2,3). The improvement of these attributes is the key in achieving the aim of the game by scoring goals in the opposing team which comes from short or long passes requiring an accurate technique combined with speed in the running movement^(4,5). For increase in the rate of success, it is important to improve techniques of kick, pass, agility, and running speed in football players^(6,7). It was found in some studies that

the ball's speed may be affected by characteristics, such as strength, speed, coordination of the lower limbs and technical capacity in small children who are still in their development period⁽⁸⁾.

Agility is often recognised as ability of a quick and efficient transfer of body in space due to change in direction, sudden start and stop^(6,7). A football player changes direction every 2-4 seconds and makes 1,200-1,400 changes of direction during a game^(9,10). In some studies it's been shown that improvement of balance should be considered as one of the key features of agility improvement⁽¹¹⁾. Agility has relationships with trainable physical qualities such as strength, power and technique, as well as cognitive components such as visual scanning techniques, visual scanning speed, anticipation and proprioception⁽⁷⁾. It is a systemic integration of neuromuscular coordination, reaction time, speed, strength, balance and proprioception.

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Enhanced power, balance, speed, and coordination are some of the objectives of their agility training⁽¹²⁾.

Proprioception is the central nervous system process of determining the relative position/ movement of limbs/trunk while balancing⁽¹⁾. Proprioceptive training is defined as “a series of exercise or situation that elicit a response from the nervous system in order to counteract external stimuli”⁽¹³⁾. It is based on training operators of balance as a dynamic episode comprising stability and mobility to maintain a position in space and/ or to move in controlled and coordinated manner⁽¹⁴⁾. There are certain assumptions about the effects of proprioceptive training on the central and peripheral level that can be related to the development of motor skills. Central effects include greater body awareness due to the improved sense of the position and movement of joints. Peripheral impacts of training are seen in a better reflex intermuscular coordination of agonists and antagonists, i.e. in an optimal regulation of the joints fixation by means of dynamic stabilizers⁽³⁾. Six weeks intervention programs consisting of balance and strength elements can increase the dynamic postural control of health young males and females⁽¹⁵⁾. The balance exercise provides additional challenge to maintaining core stability and appropriate alignment⁽¹⁶⁾. The balance exercise performed on unstable surfaces in the fields of rehabilitation and general fitness has been shown to be effective in increasing the sensory efficiency of soft tissues that stabilize the knee and ankle as well as improving the agonist-antagonist co-contraction⁽¹⁷⁾. Proprioceptive training can be given by various devices such as wobble board, BOSU (Both Side Utilised) ball, T- bow, dyna-discs⁽¹⁸⁾. A BOSU balance trainer, or BOSU ball as it is often called, is a fitness training device, invented in 1999 by David Weck, consisting of an inflated rubber hemisphere attached to a rigid platform measuring 24.6 x 24.6 x 6 inches⁽¹⁹⁾. The technical skills in football require static, semi-dynamic and dynamic balance⁽²⁰⁾. Most of these skills, such as passing, dribbling or receiving the ball, are achieved through standing on one leg. Dynamic balance plays a pivotal role in the harsh conditions, such as pushing opponents, slippery grass, changes to the ball's orbit, moving, etc. facing footballers during a football game. To maximise the football performance the possible strategy could be proprioceptive training.

Due to the complex nature of agility performance has led many researchers to conduct studies on agility training. Thus, the purpose of this study was to see the effect of proprioceptive training on agility performance in male football players.

Methodology

Total of 90 male football players were considered with age from 14-15 years with least 2 years of experience by convenient sampling method and those who have undergone any surgery or injury of lower limb in past 6 months of duration, obvious deformity of lower limb, goal keeper and players playing any other sports other than football were excluded from the study. Pilot study was done and sample size was statistically calculated.

Study Procedure

The 90 subjects were divided into 2 groups i.e. experimental group (n=45) and control group (n=45) by random allocation method (Lottery method). The informed consent was taken from the parents and ascent form was taken from all the players prior to the assessment.

Pre participation screening was done using Physical Activity Readiness Questionnaire (PAR-Q form)⁽²¹⁾. Performa for assessment was filled by the interviewing the subjects which include information about age, gender, years of experience, history of injury and surgery, height, weight, BMI, dominant leg for kick. The BMI was calculated by dividing the weight (kg) of the subjects by square of their height (m). A pre and post assessment for agility was done using T-agility test⁽²²⁾. The players in Experimental group were given Proprioceptive training on bosu ball along with their football training programme and control group underwent only football training programme. The total training session would last for 45 min 3 times per week for 6 weeks. There was 1 drop out in experimental group at 3rd week of training and 1 drop out in control group at 2nd week of training.

Table 1: Proprioceptive Training Exercise on bosu ball:

No.	EXERCISES	REPETITIONS/TIME	TIME
	Proprioceptive training	1 min rest between each exercise	Total: 10-15 Min
1.	Bosu ball squat jump	10reps × 1, 2 & 3 sets	
2.	Bosu ball lateral jump	10 reps × 1, 2 & 3 sets	
3.	Single Leg Hop on Bosu ball	10reps × 1, 2 & 3 sets	
4.	Scissor jump on bosu ball	10reps × 1, 2 & 3 sets	
5.	Single leg balance Volley kicks On Bosu ball	30 sec × 1, 2 & 3 sets	

Results

Statistically analysis for the data was done using SPSS version 23 and GraphPad InStat 3.

Table 2: Demographic Data:

		Experimental group	Control group
Age	Mean	14.44	14.47
	S.D.	0.546	0.548
Height (cm)	Mean	163.74	164.19
	S.D.	14.94	14.03
Weight (Kg)	Mean	54.266	54.222
	S.D.	9.784	8.759
BMI	Mean	20.431	20.336
	S.D.	3.269	3.282

Inference: The mean difference in age, height, weight and BMI for experimental and control group is statistically insignificant.

Inference: The mean difference in age, height, weight and BMI for experimental and control group is statistically insignificant.

Table 3: Comparison of Mean difference of Agility at Pre and Post between Experimental and Control Groups:

Paired Samples Test					
		Paired Differences		T	Sig. (2-tailed)
		Mean	S. D.		
Experimental	Pre Agility-post Agility	1.246	.435	19.20	.000
Control	Pre Agility-post Agility	.0424	.228	1.24	.220

Inference: For experimental group the average difference between Pre and Post mean agility was 1.24sec with Standard Deviation (SD) 0.43sec. The difference between mean agility at pre and post level is statistically significant since P-value = 0.000 which is <0.05. For control group the average difference between Pre and Post mean agility was 0.042sec with Standard Deviation (S.D.) 0.228sec. The difference between mean agility at pre and post level is statistically insignificant since P-value = 0.220 which is >0.05. The mean difference observed in of experimental group (1.246 +/- 0.435) is more than the mean difference of control group (0.424 +/- 0.228).

Discussion

The findings of the above study shows that after 6 weeks of proprioceptive training on bosu ball the time taken by the players to complete the agility test in experimental group showed significant difference in pre-post assessment with p-value 0.000 (< 0.05). For the control group there was insignificant difference i.e. negligible change in agility time at pre-post assessment with p-value 0.220 (> 0.05).

The above findings were supported by the study done by Ashutosh P. et al (2018), Moreira NB et al (2017) and Cergiz T. et al (2015) which states that proprioceptive training improves neuromuscular system for complex activity. While performing dynamic activity like agility, proprioceptors located in the muscle (muscle spindle) and joint (Golgi tendon organ) facilitates quick and faster movements and maintains a balanced position against particular stimulus from peripheral receptors through afferent- efferent pathway regarding movements

of the body in particular direction and directs the body to move quickly and rapidly. The articulate proprioceptive receptors are also related to sensations of position, direction movements and are sensible to variation of angular amplitude and speed as well as the intra-articular pressure^(23, 24, 25). This allows the central nervous system ability to monitor the effect of its commands, in feedback mechanism, until the movement is finished which is required for agility improvement. Football players during a specific training or game perform high speed runs with constant changes in direction, acceleration and deceleration, i.e. they have agility, as well as, a well-developed proprioception. Despite this fact, this study showed that the proprioceptive training was able to improve this skill even more. Possibly, the improvement happened in detriment to the specific development of the stability of articulation, conscience of position, movement, neuromuscular control and primordial mobility which were not worked with the athletes⁽²⁴⁾.

Conclusion

The 6 weeks of proprioceptive training on bosu ball was effective in decreasing the time taken to complete the agility test in male football players. This suggests that proprioceptive training on bosu ball can be part of other fitness training program for football players.

Ethical Approval: D.Y.Patil University, School of physiotherapy Ethical committee.

Source of Funding: Self.

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Conflict of Interest: Nil

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Rehabilitation of a Diabetic Amputee: Sequelae, Impact and Effect on the Precious Limb

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Abstract

Background: In a patient who has undergone a major amputation of one lower limb, the role and function of the precious limb is of paramount importance. We assume that once the patient has been rehabilitated with a prosthesis, the static plantar pressure distribution is equal over both the amputated limb and the precious limb. There is not much published literature that actually compares the distribution of the static plantar pressure over the precious limb available in India. This study aimed at studying the characteristics of static plantar pressure distribution after a major amputation in the precious foot of diabetic patients with and without prosthesis once they have been rehabilitated.

Objectives:

- 1) To compare the relationship between static plantar pressure distribution in the precious limb with and without the prosthesis in diabetic patients who have undergone a below knee amputation and have been rehabilitated.
- 2) To identify areas of high pressure over the precious limb and suggest appropriate modifications in the prosthetic footwear so as to reduce the static plantar pressure in those high-pressure regions.

Results: The static plantar pressure distribution was found to be significantly higher without the advocated prosthetic device on the amputated limb over the 1st, 2nd, 3rd, 4th, and 5th metatarsal. The ratio of the forefoot versus the hind foot pressures with and without a prosthesis was also noted to be significant ($p = 0.002$).

Conclusions: This variation in the pressure distribution over the precious foot disproved our hypothesis that there is an equal spatial redistribution in static plantar peak pressures in the precious limb following rehabilitation with a prosthetic device in a diabetic patient who has undergone a below knee amputation and that a prosthesis alone is not adequate to protect the precious limb.

Keywords: Diabetes mellitus, precious foot, static plantar pressures.

Introduction

The life of a diabetic amputee depends much on the

status of the precious limb. The precious limb is exposed to the same factors as the amputated limb and is under great risk. The rate of a major amputation involving the precious limb has been documented to vary between 6-30% and that too mostly within 1-3 years. This limb is therefore rightly referred to as the precious limb.

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This study aims to look at the redistribution of plantar pressures that can trigger the initiation of pathological changes and compound progression leading to an amputation. At the start of the study we assumed that the use of a prosthetic device addresses plantar pressure adequately to prevent further pathological changes in the precious limb. This study aims to look at the redistribution of plantar pressure, in such rehabilitated patients.

Diabetes mellitus is an epidemic with a projected estimate of 69 million affected by 2025 in India^[1]. The CURES study estimates that 50% of the population affected with diabetes mellitus will develop some sort of neuropathy, causing impairment resulting in foot ulcerations and subsequent amputations over the next twenty years ^[2]. Sinnock et al showed that diabetic patients had a 15-fold higher rate of lower limb amputations and Reiber et al—added that nearly 6%-30% of amputees had the possibility of undergoing a contralateral amputation within 1-3 years of the initial amputation^[3,4]. A similar trend was noted in our institution, hence it was decided to look closely at this group of patients with an aim to identify preventable causes. The prevention and management of diabetic foot pathology is very varied in the country with no common management protocols. The most dreaded of the various diabetic foot pathologies include a diabetic foot ulcer leading on to a major amputation. A combination of diabetic foot pathologies could result in increased financial burden on patients including a life long physical disability^[4,5].

The aim of this study was to identify areas of high plantar pressures on the contralateral precious limb and to see if the given prosthetic device had any deleterious effect on plantar pressures along with recommendations to alter the footwear.

Material and Method

This was designed as an observational study and approved by the Institutional Review Board (9682). A total of 48 consecutive diabetic patients who had undergone a trans-tibial amputation and were rehabilitated with a Jaipur foot prosthesis were recruited for the study. The precious limb was the main focus of the study and static plantar distribution was measured over the precious limb with and without the prosthetic limb. The Harris Mat was used as the tool to assess the static plantar pressure distribution. The following parameters were

also assessed: Sensory testing assessment, Vibration testing assessment, Temperature assessment, Fasting, post-prandial and glycosylated hemoglobin levels.

All subjects were subjected to the following as part of the assessment. A full medical history including age of onset of diabetes mellitus, type of antihyperglycemic therapy and history of foot ulceration was documented. Complete examination, anthropometric measurement, including height, weight and Body Mass Index (BMI) were assessed. Sensory assessment of the precious foot was achieved using the Semmes-Weinstein monofilament. Failure to sense the 10g monofilament was used as the determining factor for use of protective footwear and accommodative orthotics. The monofilament tests the single point perception test with a specificity being as high as 92%^[6].

Neurological assessment was carried out according to the modified neuropathy disability score (MNDS) designed by Young et al. The total maximum score was 5 and a score of >1 was defined as diabetic peripheral neuropathy ^[7]. All the 48 patients recruited in the study had an MNDS score of > 1.

Findings

The static plantar distribution over the first metatarsal was 15.5N/cm² compared to 72 N/cm² without the prosthesis, (Figure 1) similarly the pressure over the second metatarsal was 16.6N/cm² and 65N/cm² (Figure 1). The pressure distribution over the third metatarsal was 14.5N/cm² and 71N/cm² (Figure 1) and over the fourth metatarsal was 14.5N/cm² and 73.5N/cm² (Figure 1). The pressure distribution over the fifth metatarsal with and without the prosthesis was 9.5N/cm² and 84N/cm² (Figure 1). All the static plantar pressures over the precious foot with and without the prosthesis over the contralateral side were statistically significant. We also calculated the ratio of the forefoot pressures versus the hind foot pressures and that too was found to be statistically significant. (Figure 1). This implies that the prosthetic limb off-loads but transfers the pressure to the forefoot.

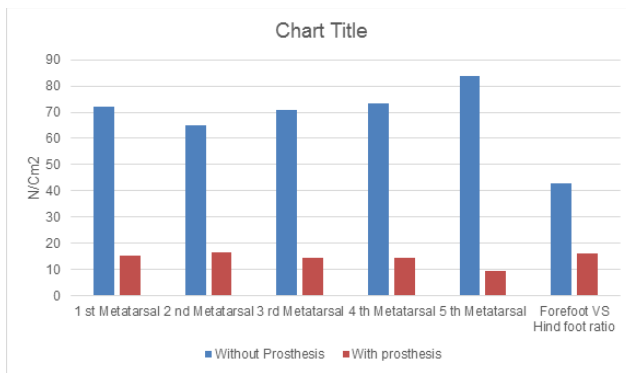


Figure 1

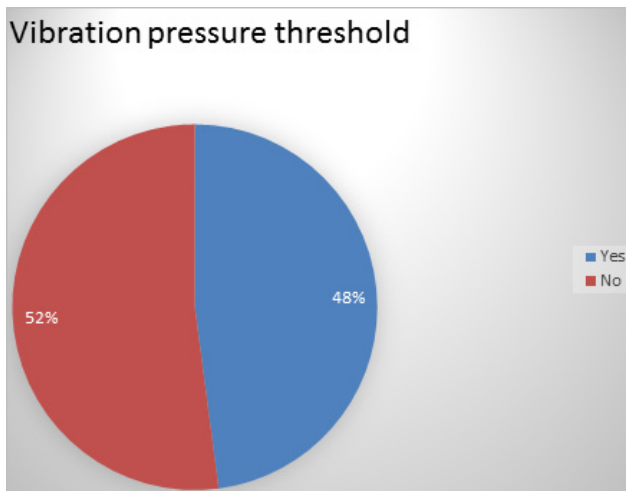


Figure 2

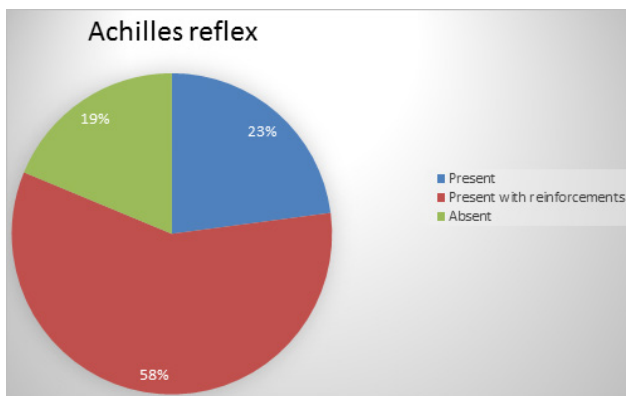


Figure 3

Discussion

Plantar ulceration, leading to amputation of a limb or part of a limb is a dreaded complication of diabetes mellitus. The etiology of diabetic ulceration is known to be multi-factorial, and while plantar pressure is thought to play an important role in triggering it, the direct association between elevated baseline plantar pressure and subsequent ulceration at that specific location has not been shown. Nearly 30-50% of diabetic patients suffer from Diabetic peripheral neuropathy of which

chronic sensorimotor distal symmetric polyneuropathy is the most common and the development of diabetic foot ulcers and subsequently limb amputation remains a major complication^[7,8,9,10].

Diabetics have a 15% chance of undergoing a lower extremity amputation during the course of their lives. Patients above the age of 65 years account for nearly 55% of people who have undergone a non traumatic cause of lower limb amputation^[11]. Nearly 65% of the lower extremity amputations were observed to be in those patient who had a chronic non healing diabetic foot ulcer and were diabetic for a duration of more than 30 months^[12,13].

The role of elevated plantar pressures in diabetic foot ulcers has been evaluated previously by a number of authors (Boulton et al, 1983, Frykberg et al, 1998, Pham et al, 2000). The role of plantar pressures over the precious limb has not been evaluated at any center to the best of our knowledge. The novel finding in our study therefore is that the static plantar pressures were found to be statistically significantly higher ($p < 0.001$) without the prosthesis over the fifth metatarsal head, in contrast to the work of DV Rai et al, where they found the highest pressures to be located over the second and third metatarsal head. The ratio of the forefoot versus the hind foot pressures with and without the prosthetic device was also found to be significant ($p < 0.002$). A similar study in the West by Ledoux et al proved elevated plantar pressures over the metatarsal heads^[14]. There are three most common sites over the precious foot which are prone for ulceration and these include, the metatarsal heads, the heel and the hallux. There are a number of theories that have been put forth as to why the metatarsal head is the most common of these sites. Bosjen-Moller, 1979 and Gooding et al 1986 have explained this phenomenon. They feel that the weight borne by the forefoot was significantly higher than that of the body weight. The anatomical factors such as a tight Achilles tendon and thin plantar fascia over the forefoot, as compared to the hind foot are also cited to be contributory factors (Orendurff, Rohr, Weaver 2006).

Peak plantar pressure can be defined as the highest value pressure experienced and this can be measured at both the forefoot and the hind foot. Caselli et al showed that the peak plantar pressure is a good measure of trauma to the plantar foot, and an important factor prior to skin breakdown and ulceration^[15]. Attempts to determine a peak plantar pressure threshold for ulceration have

failed and the absolute magnitude of pressure values among different studies is not consistent^[16]. In our study, the average pressure over the metatarsal heads were found to be 36.3N/cm², previous studies have shown the average non ulcer pressure in diabetic feet to be 19.428N/cm²^[17]. These differences seen in these plantar pressure measurements was possibly due to the differences in sensitivities of the instruments; Harris mat used in this study for economical reasons versus the F-scan Mat Tekscan used in other studies quoted.

We also found that ratio of the forefoot versus the hind foot pressures with and without the prosthesis was 16N/cm² and 42N/cm², was noted to be statistically significant ($p < 0.002$). We postulate the theory behind this phenomenon to the glycosylation of the body proteins resulting in a functional shortening of the Achilles tendon, leading to equines deformity and subsequently limited joint mobility, tip toeing and accumulative pressure on the forefoot^[18].

Sensory assessment was carried out using the 2g, 4g and 10g monofilament. There were only 9 patients who were able to sense the 2g monofilament and 19 patients who were not able to sense the 10g monofilament. Two studies conducted earlier prove that the prevalence of monofilament insensitivity among patients who went on to develop plantar ulcers was 69% and 91% respectively^[19].

The vibratory sensation of the precious foot was analyzed using a biothesiometer. There were 25 patients who were unable to appreciate the vibratory stimulus(52.1%).(Figure 2)

Temperature assessment revealed that 22 subjects had an areas of higher pressure distribution compared to the corresponding area.

The Achilles tendon reflex was evaluated as part of the complete examination of the precious foot. There were 11 patients in whom the reflex was absent, 28 patients who had the reflex present on re-enforcement and 9 patients in whom the reflex was present. (Figure 3)

This clearly strengthens the fact that there are many other reasons why a contralateral amputation is a serious threat.

Short comings of the study

In our study we concentrated only on static vertical plantar pressure. The importance of shear stress has been

suggested by a number of authors^[20]. We have initiated further studies using of an in-house designed device that will enable us to monitor dynamic plantar pressures over the precious foot this may add to the findings of the completed study.

Conclusions

This variation in the pressure distribution over the precious foot disproved our hypothesis that there is an equal spatial redistribution in static plantar peak pressures in the precious limb following rehabilitation with a prosthetic device in a diabetic patient who has undergone a below knee amputation and stresses that a prosthesis device alone is not adequate to protect the precious limb. Specific foot wear is to be designed to reduce plantar pressure induced anomalies. In addition regular inspection of the foot is of paramount importance.

Interest of Conflict: We declare no conflict of interests.

Source of Funding: Institutional fluid grant, approved by the Institutional Review Board.

Ethical Clearance: Taken from the Institutional Review Board at the Christian Medical College and Hospital, Vellore.

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Prevalence of Depression, Anxiety & Stress among First Year Students in Physiotherapy Colleges at Bangalore, India

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Abstract

Introduction: Physiotherapy students are important human resource in the field of health. Detection of potential anxiety, stress and depression developed in them during first year of academics is crucial since anxiety and stress can lead to low productivity, low quality of life, and suicidal ideas. This study was conducted to find the prevalence of depression, anxiety and stress among first year students in Padmashree Institute of Physiotherapy, Bangalore, Karnataka.

Methodology: 105 students have been selected for the study purpose irrespective of age, sex and personal habits. A cross-sectional descriptive research design was used for this study. Standardized, semi-structured questionnaire named DASS 21 (Depression Anxiety and Stress Scale) was used to collect data.

Results: Among all 105 students; Depression – 41.9% were reported in normal category, 21.9% of them in moderate, 18.09% in mild, 10.47% in severe and 7.61% fall in extremely severe category. The anxiety scale reported 27.61% in normal, 23.8% in moderate, 20.95% are in extremely severe, 18.09% in severe and 9.52% of them have been under mild category. The study reported 55.23% normal cases of stress scale, 19.04% were in moderate, 13.33% in mild, 11.42% in severe and 0.95% case in extremely severe score.

Conclusion: This study shows that the maximum number of students have raised level of anxiety and depression, whereas the number of students having increased stress are less in number.

Key Words: DASS-Depression Anxiety Stress Scale, Physiotherapy Students

Introduction

Stress & anxiety goes hand in hand as anxiety is a response to the stress in times of threat.¹ Anxiety is a term used to describe a normal feeling people experience when faced with threat, danger, or when stressed. Experiencing occasional anxiety is a normal part of life.²

Stress is an inevitable part of life, it is very present (Blanco et al., 2008) and becoming more prevalent among university students (Gallagher, 2008; Mackenzie et al., 2011). The transition into a post-secondary school has been reported to be associated with appetite

disturbance, concentration problems and depression (Lee et al., 2009; Price et al., 2007). Homesickness is a direct byproduct of this transition that affects university students, mainly freshmen (Thurber and Walton, 2012).

The World Health Organization (WHO) reported that of all illnesses, depression is the leading cause of ill health and disability worldwide. Depression and anxiety are prevalent problems in colleges across the country.³

Most of the students experience increased stress prior to their class adjustment because of ragging from their seniors, their written examinations, especially their finals. More paperwork & skill performance & evaluation system increase the tension round the year with very tight schedule. Academic sources of stress include long hours of study during examination, assignment & grades, lack of free time, lack of timely feedback.⁴ During college, students experience a new lifestyle, friends, roommates,

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exposure to a new culture. If students aren't prepared to cope, they can become easily susceptible to depression and anxiety.³

According to the latest estimates from WHO, more than 300 million people are now living with depression.³ It has been estimated that 10% to 30% students experience academic related stress that affects their academic performance.⁴

Stress is often described as a feeling of being overwhelmed, worried or rundown. It can affect people of all ages, gender & races. By definition, stress is "any uncomfortable emotional experience accompanied by predictable biochemical, physiological & behavioral changes".⁵

Stress has both physical & emotional effects & can create positive or negative feelings, where positive feelings can be beneficial at times, producing a boost that provides the drive & energy to help people get through situations like exams or work deadlines. However, an extreme amount or negative feeling of stress can have health consequences & adversely affect the immune, cardiovascular, neuroendocrine & central nervous systems.^{6,7}

Low level of anxiety are adaptive & can provide the motivation required for survival, whereas it becomes problematic when the individual is unable to prevent the anxiety from escalating to a level that interferes with the ability to meet basic needs.⁸

Studies suggest that high level of stress & psychological morbidity occur in health care profession students.⁹ Considerable research has investigated stressors & psychological morbidity in medical, dental & nursing students¹⁰⁻¹⁴, few studies have been undertaken in physiotherapy students.

Substantial amount of literature suggests that the physiotherapy education is a demanding field & students are subjected to different kinds of stressors such as the academic demands and pressures, competition for grades, social adjustment, interpersonal and family problems, uncertainty of future, lack of leisure time, coping with the high stimulating environment of college, exams, too much work load and financial concerns, unrealistic ambitions, limited opportunities, high expectations are some of the sources of stress which create tension, fear and anxiety.¹⁵⁻¹⁸

Methodology

Source of Data: Padmashree Institute of Physiotherapy

Study design: A cross-sectional study

Sample size: 105

Sampling design: Convenience sampling

Method: This cross sectional study was conducted in various colleges at Bangalore, Karnataka, during the month of May 2019 with a predesigned, pre tested, semi-structured questionnaire named DASS 21 (Depression Anxiety and Stress Scale) after taking Institutional approval. Participation in the study was voluntary. The participating students were briefed about the aim of study and informed that their data would be safe and was guaranteed confidentially.

DASS-21 questionnaire categorizes each condition into five subcategories, namely normal, mild, moderate, severe, and extremely severe.¹⁹

Results

1. Gender Distribution

Male	37(35.24%)
Female	68(64.76%)
Total Number of Students = 105	

2. Age Distribution of population

Age Group	Number of Students
17-19 years old	84
20-22 years old	19
23-25 years old	2

3. Mean scores of depression, anxiety and stress for all students.

Table: Severity distribution of DASS scores (%) among physiotherapy undergraduate students (n=105)

Subscale		Normal	Mild	Moderate	Severe	Extremely severe
Depression						
	All	41.9	18.09	21.9	10.47	7.61
	Male	51.35	8.1	27.02	5.4	8.1
	Female	36.76	23.52	19.11	13.23	7.35
Anxiety						
	All	27.61	9.52	23.8	18.09	20.95
	Male	37.83	10.81	27.02	13.51	10.81
	Female	22.05	8.82	22.05	20.58	26.47
Stress						
	All	55.23	13.33	19.04	11.42	0.95
	Male	51.35	8.10	27.02	5.4	8.1
	Female	54.41	13.23	20.58	10.29	1.47
Males n=37, Females n=68						

Fig. No. 1: Level of depression among students

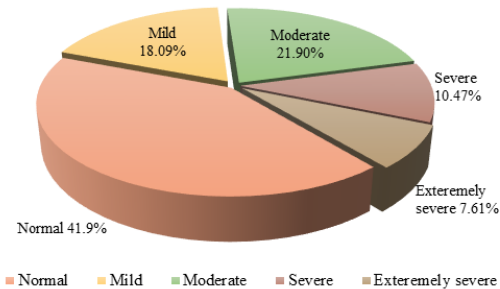


Fig. no. 1. Shows that out of 105 respondents, 7.61% respondents had extremely severe depression, 10.47% respondents severe depression, 21.90% respondents had moderate depression and 18.09% had mild depression.

Fig. No. 2: Level of anxiety among students

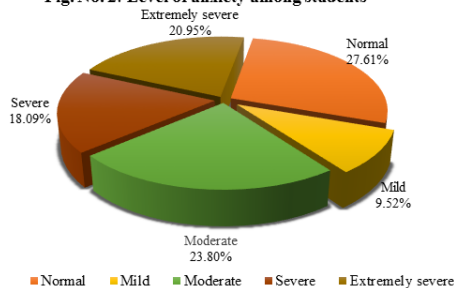


Fig. no. 2. Shows that out of 105 respondents, 20.95% respondents had extremely severe anxiety, 18.09% respondents had severe anxiety, 9.52% had mild anxiety and 23.8% respondents had moderate anxiety.

Fig. 3: Level of stress among students

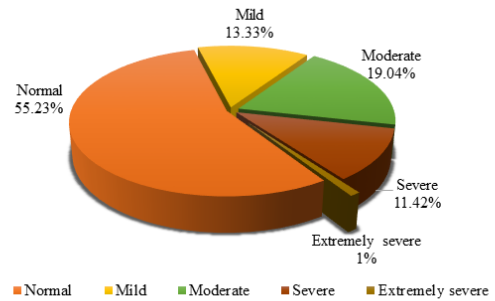


Fig. no. 3. Shows that out of 105 respondents, 1% respondent had extremely severe stress, 11.42% respondents had severe stress, 13.33% respondents had mild stress and 19.04% respondents had moderate stress.

Discussion

Our study shows that majority of the students, 80% were in the age group of 17-19 years old.

In our study it is seen that majority of the students had mild stress, anxiety and depression. This may be due to parental pressure, high expectation from parents, inadequate time management, low self-esteem, poor academic performance, peer competition, younger age etc.

Shendarkar conducted a study where he observed that anxiety was associated with feeling of loneliness,

peer competition, long hours and loss of social time. The probable reasons that the singles were anxious were looks, personality and academic performance. Likely reasons for committed being less anxious were companionship and satisfaction in their personal lives.²¹ He also found that independent living was an important factor for stress origin.²²

Studies conducted by Mehta P et al²⁰ shows that 10% were depressed, 23% were anxious and 5 % were stressed. Higher scores of depression, anxiety and stress were associated with female gender, lower semester, younger age and non-smokers.

Hostelites were susceptible to stress according to a study in Nepal²³, while females were more prone to stress in a study by Waghchavare²⁴.

Conclusion

After collection and analyzing the data which were collected from first year students it was found that the maximum number of students are in raised level of anxiety and depression. Whereas the number of students having raised level of stress are less in number.

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Conflict of Interest: There was no conflict of interest.

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Ethical Clearance : Ethical clearance was taken from research and ethic committee of Padmashree Institute of Physiotherapy, Bangalore, Karnataka.

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Dynamic Sitting Exercise versus Spinal Extension Exercise on Pain, Lumbar Mobility and Quality of Life in Adults with Mechanical Low Back Pain

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Abstract

Background: Now-a-days it is seen that busy work schedule and unhealthy environment leads to discontinuity in exercising despite of awareness and knowledge of its effectiveness on problems like low back pain. There are many factors including improper posture, over loading, immobility, trunk muscles weakness leads to mechanical low back pain in adults. Exercises of various types have been used in managing low back pain. Hence there is a need to find out a single functional and effective exercise for such problems so that they can be done anytime during work and without any equipment which is also economical.

Methodology: Thirty adults aged between 20-30 years participated in this comparative experimental study. After underwent physical screening for selection criteria mechanical low back pain followed by simple randomization participants were divided into group A and group B. Group A and group B received dynamic sitting and spinal extension exercise respectively for thrice a week for six weeks. Pre and post values were assessed using outcome measures Visual Analog Scale for pain, MMST used for lumbar mobility and Short Form-36 Health Survey Questionnaire for quality of life.

Results: In comparison of post test scores of outcome measures evidenced that the reduction of pain score, improvement in lumbar mobility and quality of life scores. There were significantly improvement among the adults with mechanical low back pain treated with Dynamic sitting exercise (DSE) than treated with Spinal extension exercise (SEE).

Conclusion: 6 weeks of dynamic sitting and spinal extension exercise can prevent in pain and improvement in lumbar mobility and quality of life in adults with mechanical low back pain.

Key words: Mechanical low back pain; dynamic sitting exercise; spinal extension exercise; lumbar mobility; quality of life.

Introduction

Low back pain (LBP) is defined as pain and discomfort that are localized below the costal margin and above the inferior gluteal folds with or without leg pain.⁽¹⁾

It is a very common leading cause of disability worldwide among all age groups. Globally, disability caused by low back pain increased by 54% between 1990 and 2015, more common among people with low socioeconomic status. People with physically demanding jobs, physical and mental comorbidities,

smokers and obese individuals are at greatest risk of low back pain with persistent and recurrence pain. So cost, health-care use and disability attributed to low back pain are going to increase in coming decades.⁽²⁾ In India, LBP is experienced among 60% to 80% of adults.⁽³⁾ Recurrent LBP is defined as a new episode of pain that occurs after a symptom-free period of 6 months and is not an exacerbation of chronic LBP. In general, acute low back pain resolves within weeks, but may recur in 24%- 50 % of cases within 1 year.^(1,3) There are also other signs and symptoms which can be classify as non- mechanical and mechanical. Non-mechanical pain originates from inflammatory, non-organic and medical

conditions whereas mechanical pains are those that are consistently influenced by movements and postures.⁽⁵⁾ Compared to standing posture prolonged sitting, decreases lumbar lordosis, increases low back muscle activity, disc pressure and pressure on the ischium which are associated with occupational LBP.⁽⁶⁾ Evidence suggests that signs of perceived body discomfort experienced by many individuals particularly at the buttock and low back regions during prolonged sitting. Discomfort during prolonged sitting has been leads to increased muscle fatigue, decreased intervertebral disc space, nutrition and reduced oxygen and blood flow in muscles. Prolonged sitting in the forward leaning posture significantly increased discomfort in low back compared with other sitting postures.⁽⁷⁾ In present days there are many treatment approaches are available to manage low back pain such as electrotherapy, manual therapy, exercise therapy and ergonomic modifications. Habitual improper posture with low muscle activity in daily life affects both lumbar muscle volume and strength. So exercise programs are effective at decreasing pain, improving physical function and increasing oxygenation and blood flow to the lower back of individuals. It is known that prolonged inactivity leads to decrease muscle strength, spinal flexibility and quality of life. In functional activities the back extensors are essential to bend, twist to move the upper body. To improve back extensors one of the treatment i.e. an Extension Oriented Treatment Approach (EOTA). This approach involves

combination of repeated active or passive extension movements to improve extension in the lumbar spine with the subject positioned prone.⁽⁸⁾ DR. Jerome Fryer started using a form of seated decompression using arms with sitting position. Dynamic sitting exercise was modified from the Chair-care decompression exercises. This exercise improves muscle activation frequency with a proper posture during sitting which can prevent a decrease in low back mobility. Dynamic sitting exercise uses the arms to lift the body weight temporarily off the lumbar discs while remaining seated, with a combination of lower back extension and abdominal drawing -in-exercises. While sitting the act of lifting resets the position of the spine that encourages the subject to sit more upright after this exercise.⁽⁹⁾

Methodology

Thirty adults were participated from Physiotherapy out-patient department in south Bangalore. After obtaining the ethical clearance from the ethical board of committee and informed consent from all the participants followed by the purpose of the comparative experimental study was explained in details including its benefits and risks; subjects were underwent physical screening according to the selection criteria.

The inclusion criteria of the screening examination were both male and female aged between 20 to 30 years (both male and female in 7:8 ratio) with mechanical low back pain and the exclusion criteria were acute low back pain, low back pain involving any disc pathology, a history of back, abdominal, hip joint and lower limb surgeries in the past 6 months, current pregnancy, congenital deformity of the spine, congenital deformity of limbs, musculoskeletal problems including tuberculosis, scoliosis, ankylosing-spondylitis, rheumatoid arthritis.

After the screening examination thirty subjects meeting the selection criteria were randomly assigned to two groups with each group fifteen sample followed by baseline assessment.

Group (A) Dynamic sitting exercise and group (B) Spinal extension exercise respectively.

Each group with 15 subjects was given 30 minutes exercise session 3 days per week. Both the groups A and B had performed exercises with 6 repetitions per minute with 5 second hold in a 30 minute session and a total of 3 sets of 6 repetitions each with 4 minute rest in between the sets were completed. Outcome measures like pain by VAS, lumbar mobility by MMST and quality of life by SF-36 were recorded before and after the intervention and statistical analysis were done.

Procedure for group A: (DSE) the subject was made to sit upright with arms in back of the chair and pushing downward by remaining the seated unloading the spine. The lumbar spine should be gently extended until they could feel slight stretching in the lower back. Then gently draw-in-abdomen to return to the neutral position. The subjects were holding this position for 5 seconds with the above instruction.



Figure-1 Dynamic sitting exercise in upright sitting position while unload the spine by arm Procedure for group B: (SEE) the subject was made to lie down on abdomen while the hands with palms down. Now the subject was asked to do press-up movement with straight arms and hold for 5 seconds and return to the neutral starting position.



Figure-2 Spinal extension exercise in prone on elbow position

Results

Compared with the baseline values, there was a reduction in pain intensity, increase in lumbar mobility and QOL for both the groups. Student’s paired t-test was used to compare the pain intensity for both the groups, before and after the treatment program. Both the groups showed significant ($p < 0.05$) reduction in pain intensity. On comparing the pain intensity between the groups using Mann- Whitney U- test, it showed that group A had maximum pain reduction (posttest mean, 3.53; SD, 1.06) where as it is group B, which showed pain reduction next to group A (posttest mean, 4.67; SD, 0.62)

Likewise paired t-test was used to compare lumbar mobility for both the groups, before and after the treatment program and both the groups showed significant ($p < 0.05$) improvement in it. On comparing lumbar mobility between the groups using Whitney U- test, it showed that group A had maximum improvement in lumbar mobility (posttest mean, 18.73; SD, 1.43) where as it is group B, which showed pain reduction next to group A (posttest mean, 17.93; SD, 1.41)

Similarly paired t-test was also used to compare QOL using SF-36 questionnaire for both the groups, before and after the treatment program and both the groups showed significant ($p < 0.05$) improvement in it. On comparing Quality of life between the groups using Whitney U- test, it showed that A had maximum improvement in QOL (posttest mean, 76.70; SD, 7.85) where as it is group B, which showed improvement in QOL next to group A (posttest mean, 62.56; SD, 4.08)

Table -1 Mean and SD of pre and post-test outcome measures of adults with mechanical low back pain in between groups.

Sl. No	Outcome measures	Pre test		Post test	
		Dynamic sitting exercise(DSE)	Spinal extension exercise(SEE)	Dynamic sitting exercise(DSE)	Spinal extension exercise(SEE)
		Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
1	Pain (VAS)	5.33±1.04	5.47±0.89	3.53±1.06	4.67±0.62
2	Lumbar mobility (MMST)	05.43±1.60	06.27±1.52	06.97±1.43	06.73±1.41
3	Quality of life (SF-36)	51.00±5.90	51.76±5.65	76.70±7.85	62.56±4.08
Between group comparison		VAS: $z=1.807$, $p>0.05$, NS MMST: $z=0.696$, $p>0.05$, NS SF-36: $z=0.249$, $P>0.05$, NS		VAS: $z=3.81$, $p<0.05$, S MMST: $z=1.986$, $p<0.05$, S SF-36: $z=4.159$, $p<0.05$, S	

S- Significant ($p < 0.05$); NS – not significant ($p > 0.05$)

Discussion

The obtained results of the study proved the fact that there is a reduction in pain intensity, improvement in lumbar mobility and quality of life in both the groups individually. From the available literature support and sources this is presumed that DSE has an effect to decompress the lumbar spine which in turn may unload the pressure over the mechanoreceptors in order to reduce the pain intensity. It may also be helpful in increasing the blood flow to the lumbar muscles and enhancing intervertebral disc oxygenation with nutrition.

In other hand isolated spinal extension exercise is believed to have an effect on conditioning of the lumbar muscles and impact on disc fluid content and its distribution to go back to its place.

However while comparing both the techniques the efficacy of the DSE was found to have a better result than SEE in this study and the reason behind this is believed that the decompress effect of the DSE may have an impact on unloading the disc without straining the lumbar muscles with activating the abdominal structures where as in case of SEE the lumbar muscles have to work for pushing the disc back into its place and it is known that these muscles are already influenced by being over used in such conditions.

Conclusion

Supporting evidence from the literature along with the outcome of this study with significant statistical changes leads us to conclude by accepting the hypothesis. Hence it is stated that “there is significant reduction in pain, improvement in lumbar mobility and QOL in both the groups, whereas 6 weeks of dynamic sitting exercise group is found to be more effective than spinal extension exercise group in adults with mechanical low back pain.

Conflict of Interest : There is no affiliation

Funding: Self

Ethical Clearance certificate taken from The Oxford College of Physiotherapy, Bangalore.

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Effectiveness of Instrument Assisted Soft Tissue Mobilization in Management of Athletes with Gleno-Humeral Internal Rotation Deficit

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Abstract

BACKGROUND: Athletes involved in overhead sports show limited ROM for internal rotation and increased external rotation. This condition of Gleno-humeral internal rotation deficit (GIRD) increases risk of shoulder injuries in athletes and need active management. Current interventions include static stretching, muscle energy techniques and warm-up exercises. Instrument assisted soft tissue mobilization (IASTM) has been hypothesized to lengthen the tissue and improve range by breaking adhesions in soft tissues, there is lack of research showing its effects in athletes with GIRD. This study explores the effectiveness of IASTM in athletes with GIRD following a three week protocol. **METHODOLOGY:** Thirty athletes with GIRD were enrolled in the study by purposive sampling. They received intervention of IASTM with M2T Blade for posterior shoulder musculature and capsule, on alternate days for three weeks. Pre and post-intervention measurements for gleno-humeral ROM for internal rotation, external rotation and horizontal adduction using goniometry; and Apley's scratch test were noted. **RESULTS:** Statistical analysis was done using ANOVA test. IASTM significantly improved ROM for internal rotation from 40.1 ± 5.76 to 74.17 ± 8.28 ($p < 0.001$). There was significant improvement in horizontal adduction ROM from 90.47 ± 10.12 to 105.5 ± 8.02 ($p < 0.001$). No significant difference was found for external rotation. Statistically significant changes were found on Apley's scratch test as well ($p < 0.001$). **CONCLUSION:** Three weeks intervention of IASTM using M2T Blade is effective in improving ranges and flexibility of athletes with GIRD.

Keywords: Gleno-humeral internal rotation deficit (GIRD), Instrument assisted soft tissue mobilization (IASTM), Apley's test

Introduction

Many sports require overhead activities which involve repetitive movements of shoulder joint. It is said that throwers' shoulder must be loose enough to throw but stable enough to prevent symptoms. In order to meet the demand of their sports, there should be delicate balance between shoulder mobility and functional stability, referred to as 'Thrower's Paradox'.¹

Overhead throwing activities are highly skilful movements performed with extremely high angular velocities.¹ It requires high level muscle activation as reported by EMG studies of shoulder musculature.² This overhead act of throwing occurs in 5 phases which include: wind-up, cocking, acceleration, deceleration

and follow-through. There occurs transfer of energy from body to throwing arm and the object being thrown, some of which being absorbed by the rotator cuff. Wind-up phase is mainly carried by the activation of deltoid muscle, while subscapularis and pectoralis minor cause the cocking phase³. The late cocking and acceleration phase have been shown to create tremendous forces on the anterior shoulder structures⁴. During the follow-through phase, there occurs activation of posterior shoulder soft tissues including supraspinatus, infraspinatus, teres minor and latissimus dorsi.³ During the deceleration phase, these posterior structures act eccentrically to aid the deceleration of the throwing arm. The entire throwing activity accounts in laxity of anterior shoulder due to stretching and repetitive micro-trauma. However, posterior soft tissue tightness results from eccentric

loading in deceleration⁴. Also, there occur adaptive structural changes and posterior capsulo-ligamentous changes in the shoulder joint.⁵

Because of this, most of the overhead athletes show obvious disparity of movements in dominant throwing shoulder where external rotation (ER) is excessive and internal rotation (IR) is limited when measured at 90° shoulder abduction.^{5,6} They also exhibit loss of horizontal adduction in throwing shoulder when compared with non-throwing shoulder.⁷ This is referred to as gleno-humeral internal rotation deficit i.e GIRD.⁸ The reasons for GIRD could be thickening and scarring of shoulder tissue resulting from the repetitive eccentric loading on posterior shoulder, especially during overhead throwing.⁴ Also, external shift of the shoulder occurs resulting in increased external rotation and reduced internal rotation range⁹. One theory suggest that an adaptive increase in humeral retroversion results in increased external rotation and that any considerable internal rotation deficit of more than 20° is related to soft tissue adaptations.¹⁰ In spite of these alterations, the total arc of rotation, measured by ER and IR together, remains similar for both the sides.¹

These structural adaptations and ROM alterations lead to pathological manifestations like secondary impingement, SLAP lesions and anterior instability of the shoulder and make the shoulder prone to the injuries.⁵ Hence there is a need to treat GIRD in overhead athletes in order to prevent further injuries to shoulder. Many researchers have examined the effects of warm-up exercises, thermal modalities and various stretching techniques for improving range of IR.⁸ however these techniques have resulted in variable outcomes adding to the confusion that which strategy could help the best.

Instrument Assisted Soft Tissue Mobilization (IASTM) is a simple and practical technique for soft tissue manipulation using specially designed instruments. M2T blade technique is newly emerging form of IASTM which is made of surgical stainless steel. Variation in curvature of the tool has enabled therapist to address specific tissues and anatomical regions providing comfortable grip. It allows therapist to reach at deeper levels of the treatment part of the body than only hands have potential to do. It enables to detect and treat soft tissue lesions by using variety of multidirectional stroke techniques over involved soft tissue structures¹¹. The efforts put by the therapist are minimized because of the surfaces of the instruments used but it maximizes the

force delivered to the tissues.¹



Image 1 M2T Blade

The M2T Blade (Image 1) is reported to increase the blood flow, facilitating supply of blood and oxygen to the area under treatment. It restarts the healing process by producing localized inflammation. It improves the fascial mobility, proliferation of extracellular matrix fibroblasts, mast cells production and phagocytic activity. Also, it has positive impact on re-synthesis, organization and maturation of collagen. It improves extensibility of the soft tissues by breaking the adhesions, thickenings, fibrotic nodules and scar tissue. Heat generated in the tissue due to the strokes applied by the instrument reduces the viscosity making the tissue softer; ultimately leads to improvement in range of motion.¹³

Thus, IASTM is not only effective in treating myofascia but also can stimulate tendons and other soft tissues like muscles to improve its function¹³. Literature review suggests that IASTM has been proven to be effective in treatment of soft tissue extensibility dysfunction¹², compartment syndromes¹³ chronic low back pain¹⁴, plantar fasciitis¹⁵, and also on shoulder pain in badminton players¹⁶. But there is lack of researches done which will show its effectiveness on shoulder ROM in overhead athletes.

This study explores the effectiveness of IASTM technique using M2T blade on shoulder ROM in athletes exhibiting gleno-humeral internal rotation deficit. It is hypothesized that athletes with GIRD would exhibit improved ROM for internal rotation and horizontal adduction following 3 weeks of IASTM treatment.

Methodology

Thirty professional athletes (20 males, 10 females) aged 18 to 30 years, involved in overhead sports like tennis, badminton, basketball, cricket etc, participated in the study. All had played at least till district level. Inclusion criteria was loss of minimum 20° range for internal rotation when measured at 90° shoulder

abduction, and minimum 5cm distance between finger tip and body landmark on Apley’s scratch test. Subjects who had shoulder injury or underwent any surgery for dominant upper extremity in last 6 months were excluded from the study. After an informed consent, they were enrolled. The protocol was approved by the Sub-Ethics Committee of the Institute.

Measurements for gleno-humeral ROM and Apley’s test (Image 2) were taken before and after 3 weeks of

intervention. Treatment with M2T blade was given with the participants in sitting position. Any adhesions or restrictions were assessed with the blade itself. Direction which elicited more resistance to the blade strokes was used for the first part of the treatment, followed by the opposite strokes. Treatment area included muscle fibres of posterior deltoid, latissimus dorsi, infraspinatus, supraspinatus, posterior joint capsule and around medial border of the scapula.

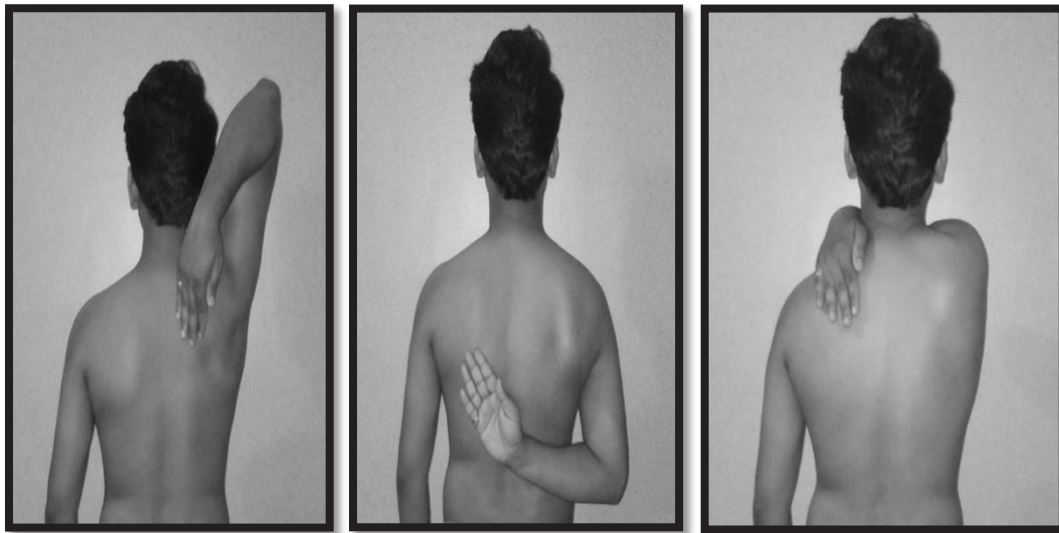


Image 2 Apley’s scratch test

Around 30-45 strokes were applied for each area with M2T blade angled at 45° and pressure as tolerated by the subject. Each session was completed in approximately 15 minutes and repeated 3 times a week for 3 weeks. Participants were asked to apply ice for 10 minutes to treatment area, for reducing soreness and redness. Measurements were recorded after the first session and at the end of every week.

Results

Data was analysed using SPSS Version 16.0. Repeated measure ANOVA was used to test the changes in pre- and post-measurements of the outcomes over the time of the study. All statistical analyses were tested at the 0.05 level of significance.

Mean age of the subjects involved in the study was 24.93 ±2.59. Table 1 provides summary about the

athletes involved in study and their sporting activities.

TABLE 1 Sports-wise categorization of the subjects

SPORTS	NUMBER
Badminton	16
Tennis	3
Cricket	4
Basketball	4
Volleyball	2
Handball	1
TOTAL	30

As seen from table 2, athletes showed significant improvement in ROM for internal rotation and horizontal

adduction, following 3 weeks of treatment with M2T blade. The mean range of IR changed from 40.1 ± 5.76 at baseline to 74.17 ± 6.28 at the end of 3rd week, which was statistically highly significant ($p < 0.001$ and $f = 224.6$). There was no significant difference found for ER ROM. But range for horizontal adduction improved significantly from 90.47 ± 10.12 at baseline to 105.5 ± 8.02 at the end of 3rd week. The results obtained were highly significant ($p < 0.001$, $f = 60.39$). There was no significant difference found between 2nd and 3rd weeks of treatment but appreciable change was noted..

TABLE 2 Gleno-humeral ranges of motion for internal rotation, external rotation and horizontal adduction (mean \pm SD in degrees) before and after the 3 weeks of treatment.

Session	Internal Rotation	External Rotation	Horizontal Adduction
Pre treatment – Session 1	40.1 \pm 5.76	108.03 \pm 11.27	90.47 \pm 10.12
Post treatment – Session 1	50.87 \pm 5.29	108.97 \pm 7.69	96.03 \pm 9.95
Post treatment – Session 3	65.2 \pm 4.86	112.33 \pm 6.67	101.8 \pm 9.00
Post treatment – Session 6	73.57 \pm 7.69	111.8 \pm 5.79	103.9 \pm 7.34
Post treatment – Session 9	74.17 \pm 6.28	112 \pm 5.68	105.5 \pm 8.02
<i>p</i> -value	<0.001	0.054	<0.001

As seen from table 3 below, participants also showed significant improvements in reducing the distance between tip of middle finger to the stated landmark on all three positions of Apley's test. The distance of 11.52 ± 2.99 at the baseline for reaching over the head reduced to 4.53 ± 2.61 post 3 weeks treatment. Also for reaching behind the back and across the body, the distances reduced from 9.23 ± 2.52 to 3.26 ± 1.81 and from 7.39 ± 1.68 to 2.84 ± 1.44 respectively, which were highly significant ($p < 0.001$).

TABLE 3 Mean differences in the distances reaching over the head, behind the back and across the body on Apley's test before and after 3 weeks of the treatment

Session	Over the head	Behind the Back	Across the Body
Pre treatment – Session 1	11.52 \pm 2.99	9.23 \pm 2.52	7.39 \pm 1.68
Post treatment – Session 1	9.47 \pm 2.77	7.33 \pm 2.44	5.92 \pm 1.48
Post treatment – Session 3	6.64 \pm 2.79	4.89 \pm 1.61	3.86 \pm 1.06
Post treatment – Session 6	5.15 \pm 2.82	3.83 \pm 1.76	3.22 \pm 1.34
Post treatment – Session 9	4.53 \pm 2.61	3.26 \pm 1.81	2.84 \pm 1.44
<i>p</i> -value	<0.001 ¹	<0.001 ¹	<0.001 ¹

Discussion

Shoulder of overhead athlete has to face tremendous forces and high speed torque during throwing activities in sports. This places the shoulder under extreme stresses, leading to soft tissue and bony changes which take place over time. These athletes exhibit alterations in ranges of motion as well. Studies have shown that athletes involved in overhead throwing activities display increased range for external rotation and reduced range of internal rotation at gleno-humeral joint. GIRD results due to tightness of posterior shoulder structures, capsule contracture, and osseous adaptations of humeral head and/ or glenoid due to repetitions of activities for longer time.⁹ GIRD is proven to be associated with increased occurrence of shoulder injuries in athletes.⁵ Many researchers have studied the effects of various treatments in order to reduce the risk of shoulder injuries by correcting GIRD.

Studies have examined effects of stretching and manual therapy in improvement of gleno-humeral ROM among athletes. Sleeper's stretch helps in increasing range of gleno-humeral horizontal adduction and internal rotation.¹⁷ Sleeper's stretch also significantly reduces recovery time.¹⁸

GIRD is more prevalent in athletes who don't do regular stretching exercises.⁹ Static stretching applied for 90 seconds to posterior deltoid in elite swimmers

resulted in significant improvement in internal rotation.¹⁹ Another variation of IASTM- the Graston technique helps increase the ROM and prevent further loss in ranges at dominant shoulder.⁸

IASTM is an approach for manipulation of soft tissues using an instrument that is made of surgical stainless steel. It helps releasing scar tissue, breaking adhesions and removing fascial restrictions. Using the M2T blade, therapists can not only localize and treat adhesions in soft tissues, but identify and address thickenings, fibrotic nodules, scar tissues and crystalline deposits more accurately²⁰. It allows the therapist to reach to the deeper levels of the body where the hands cannot. Addressing specific tissues and the anatomical regions by individualizing the treatment is made easy by the variations in curvature of the tool.²⁰

IASTM restarts the inflammatory process by producing localized micro-trauma to soft tissue, thereby causing capillary and micro-vascular haemorrhage and stimulated the healing and reparative response.²¹

Conclusion

The application of IASTM using M2T Blade on alternate days for 3 weeks to posterior shoulder muscles and capsule produced significant increase in both internal rotation and horizontal adduction ROM. Also, it improved flexibility of the shoulder musculature when measured on Apley's scratch test. This study concludes that IASTM using M2T Blade is effective in treating athletes with gleno-humeral internal rotation deficit improving the ranges and flexibility at dominant shoulder.

Conflict of Interest: Nil

Source of Funding: Nil

Ethical Clearance: Taken from Institutional Sub-Ethics Committee of Dr. D. Y. Patil College of Physiotherapy, Pune.

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Effect of Fast Tempo Vocal and Instrumental Music on Cardiovascular Parameters, Perceived Exertion and Stress Rate During High Intensity Interval Training in Asymptomatic Subjects: A Randomized Clinical Trial

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Abstract

Background and Purpose: ACSM defines physical activity as bodily movement that is produced by contraction of skeletal muscle. Music is said to be a sensory modality that can have effect on exercise. purpose of study was to study outcome of music with faster tempo and instrumental type, on cardiovascular, RPE, mood, stress and enjoyment thus improving observance to HIIT in asymptomatic subjects.

Methods: By random sampling method 40 subjects, male and female (20-30 years) with minimum to moderate amount of physical activity were selected and a two week trial with treadmill was done. Participants were be divided into 2 groups for HIIT: group A with fast vocal music and group B with instrumental music. Mood and stress was assessed pre and post using Abbreviated Profile Of Mood State (POMS) and Perceived Stress Scale (PSS) respectively, RPE was taken over time using Borg scale respectively, enjoyment was assessed post HIIT using Physical Activity Enjoyment Scale (PACES).

Results: Statistical significance was found in heart rate in vocal group, mood and enjoyment in both groups with a p value of < 0.005

Conclusion: present study of 2 weeks concluded that vocal and instrumental music had significant effect on heart rate, stress, enjoyment, mood during high intensity interval training

Key Word: *Enjoyment, High intensity interval training, Mood, Music, Rate of perceived exertion, Stress*

Introduction

American College of Sports Medicine (ACSM) defines physical activity as bodily movement that is produced by contraction of skeletal muscle and substantially increasing energy expenditure.¹ According to new ACSM guidelines adults aged between 18 to 65 years should continue to inculcate at least a minimum of 30 minutes of moderate intensity physical activity 5 days per week or engage in vigorous physical activity thrice a week.²

One among five in world is physically inactive.³ According to WHO guidelines, Global Health Observatory states that globally in 2010, 23% of 18+

adults were insufficiently active men (20%) and women (27%) that is y did less than 60 minutes of moderate to vigorous intensity of physical activity on daily basis. Countless studies have been done to find cause of lack of performing physical activity, and most commonly cited reason was found to be "lack of time".^{4,5}

High intensity interval training (HIIT) helps insufficiently active individuals overcome a major barrier of maintaining a physically active lifestyle, with that of a perceived lack of time. An added bonus is that from a time: benefit perspective, HIIT may prove to be a good example where less can be more.⁶ intense work periods may range from 5 seconds to 8 minutes long, and are performed at 80% to 95% of a person's

estimated maximal heart rate, that is maximum number of times heart beats in a minute without overexerting. recovery periods last equal as long as work periods and are performed at 40% to 50% of a person's estimated maximal heart rate. Many research also conclude that exercise relatively increases positive affect and decreases feelings of fatigue and can aid in successful translation of exercise intentions into behaviour and improve adherence to exercise⁷ and exercise induced feelings of fatigue and negative affect can act as a deterrent to continued participation. External stimuli may serve as mediating agent in diverting attention away from internal and painful stimuli.⁸

Music is one sensory modality that can have an effect on exercise. According to evidence, music captures attention, triggers a range of emotions, has positive effect on mood, evokes memories, increases work output, heightens arousal, reduces inhibitions and encourages rhythmic movement^{9,10} which have considerable application in exercise domain. Music has an ergogenic effect and is evident when music improves exercise performance by either delaying fatigue or increasing work output.

Psychological effects of music on exercise include way in which music influences mood, emotion, cognition and behaviour. There is a subcategory of psychological effects, referred to as psychophysical effects, which concerns with subjective perception of physical effort and fatigue. In music and exercise literature, sole psychophysical measure employed is Borg's Ratings of Perceived Exertion (RPE) scale; so psychophysical effects are synonymous with perceived exertion.¹¹

A varied number of psychoreapeutic interventions such as meditation and relaxation for alleviating such conditions. Many health professionals believed that exercise prevented onset of emotional problems and served as an effective treatment modality.¹² To our knowledge effects of music and its influences on subsequent values of cardiovascular parameters, and perceived state of exertion, stress or mood have not been evaluated using a high intensity exercise protocol.^{13,14} present study concentrated on effect of music with faster tempo on cardiovascular, RPE, mood, stress and enjoyment thus improving adherence to HIIT in sedentary subjects.

Materials & Methodology

MATERIALS:

- Consent (informed) form
- Data collection sheet
- Questionnaires

EQUIPMENTS:

- Treadmill (AeroFit AF-208)
- Pulse Oxymeter (Dr Trust- USA)
- Headphones

Methodology

Ethical clearance was obtained from Institutional Ethical Committee of KAHER Institute of Physiorapy, 45 sedentary subjects were scrutinized based on inclusion and exclusion criteria prior to their enrolment into study. demographic data was noted and written informed consent was obtained from all participants prior to commencement of study. Participants were from various constituent units of KAHER. Sedentary subjects within age group 20-30 years of both genders and willing to participate in study were included. Whereas, subjects with any existing cardiovascular, respiratory, neurological or musculoskeletal conditions (fractures, sprain/strain) along with any hearing impairment were excluded from study.

Outcome Measures:

- Heart rate
- Blood pressure
- Modified Borg Dyspnea scale (RPE)
- Perceived Stress scale (PSS)
- Physical Activity Enjoyment Scale (PACES)
- Profile Of Mood States (POMS)

Procedure: Participants were required to perform in 6 HIIT exercise trials: i.e; 3 session per week for two weeks

To control for order effects, trial order was counterbalanced, meaning there were 2 groups, group A performed with music and group B with instrumental music, Firstly, HRmax was calculated for each participant using age-estimated equation (220-age). From obtained HRmax value, target heart rates were determined: 85% HRmax and 20%HRmax. participants

were made to wear Pulse oxymeter.

Before start of exercise participants were required to fill profile of moods scale and enjoyment scale. n according to ACSM guidelines for high intensity interval training, participants started with 5 minutes warm up followed by 1 minute of high intensity (80% HRmax) 4 times with 3 minutes interval period between each exercise at low intensity (20% HRmax). During each trial measures of stress and RPE was taken. participants had to answer how hard physical activity was and how y felt about physical activity before, after and at half time of each phase of HIIT i.e. during warmup, high intensity bout 1, 2, 3, during rest period between bouts 1, 2, 3 and cool down, where participants simply pointed out to which number most closely reflected ir current state. Completion of 20 min trial was followed by a 3 min cool-down, performed at a self-selected intensity. To assess post-task enjoyment, PACES scale and post task mood using profile of moods scale was assessed. Participants were asked to rest for an additional 60 min

after exercise. next HIIT took place 1 day after first session (alternate).

Statistical Analysis

Statistical analysis was done using version 23 of SPSS software. Paired sample t-test was used for analysis of mean values of heart rate, blood pressure, perceived stress rate, enjoyment and mood. Independent sample t test was used for analyzing values of bouts of perceived exertion rate using Borg 6-20 scale.

Results

45 sedentary subjects were included in study. According to Table.1 it was observed that changes from pretest to post test in heart rate were better based on lower mean value in vocal group in comparison to instrumental which is shown in Table.2, and no significant changes were observed in values of Blood pressure in both groups

Table.1: Comparison of pre test and post test means of HR, BP in Vocal group

VOCAL	PRE TEST	POST TEST	PAIRED DIFFERENCE	t-test	p-value
HEART RATE	84.85 ± 12.96	78.00 ± 6.18	6.85 ± 13.11	2.336	0.031*
SBP	116.7 ± 10.78	120.5 ± 4.34	-3.80 ± 12.01	-1.414	0.173
DBP	74.7 ± 10.9	77.9 ± 4.56	-3.20 ± 10.18	-1.405	0.176
*Significant at 5% level					

Table.2: Comparison of pre test and post test means of HR,BP in Instrumental group

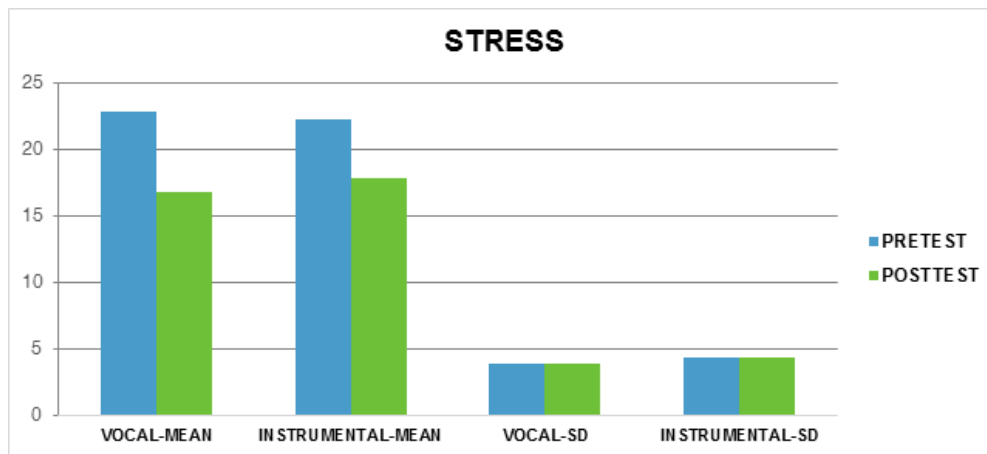
INSTRUMENTAL	PRE TEST	POST TEST	PAIRED DIFFERENCE	t-test	p-value
HEART RATE	81.36 ± 11.88	77.63 ± 7.22	3.73 ± 9.75	1.669	0.112
SBP	119.57 ± 9.53	118.42 ± 4.03	1.15 ± 7.81	0.646	0.526
DBP	76.52 ± 9.08	77.68 ± 6.50	-1.15 ± 6.64	-0.760	0.457

No significant differences were found in each bout of RPE in eir of groups which is shown in table.3

Table. 3: Comparison of means values of bout1, bout 2, bout3, and cool down between vocal and instrumental group

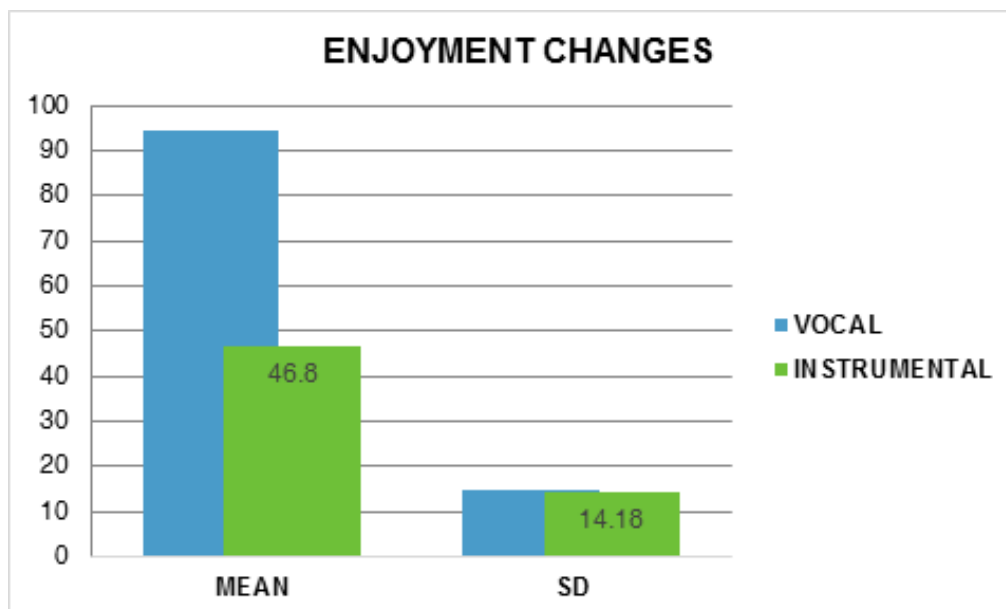
Particular	VOCAL MEAN ± SD	INSTRUMENTAL MEAN ± SD	t-test	p-value
BOUT1	11.0 ± 2.80	10.5 ± 2.64	0.581	0.565
BOUT2	10.55 ± 2.48	10.85 ± 2.51	0.380	0.706
BOUT3	11.35 ± 2.08	10.95 ± 2.03	0.615	0.542
COOLDOWN	11.05 ± 2.74	11.6 ± 1.93	0.734	0.468

Graph.1 indicates significant differences in between pre test and post test stress values in both goal as well as instrumental group



Graph.1: Comparison of pre and post stress values in vocal and instrumental groups

Graph.2 indicates significant changes in enjoyment levels were seen in both groups



Graph.2: Comparison of pre and post enjoyment levels in vocal and instrumental groups

Mood changes were significant in both goal and instrumental group as in Table 4 & 5

Table.4: Comparison of pre and post changes in mood for vocal group

VOCAL	PRE TEST	POST TEST	PAIRED DIFFERENCE	t-test	p-value
TENSION	6.4 ± 2.72	2.7 ± 1.94	3.7 ± 1.94	8.488	0.001*
DEPRESSION	2.85 ± 2.05	1.0 ± 0.97	1.85 ± 2.05	4.018	0.001*
ANGER	5.2 ± 3.33	1.2 ± 1.28	4.0 ± 2.8	6.367	0.001*
FATIGUE	5.85 ± 2.79	1.10 ± 0.85	4.75 ± 2.63	8.067	0.001*
CONFUSION	4.1 ± 2.91	0.9 ± 1.07	3.20 ± 2.87	4.975	0.001*
VIGOUR	12.85 ± 6.01	18.55 ± 2.39	-5.70 ± 1.0	-5.669	0.001*

Table.5: Comparison of pre and post changes in mood for instrumental group

Instrumental	Pre Test	Post Test	Paired Difference	t-test	p-value
TENSION	8.5 ± 3.44	3.7 ± 3.34	4.8 ± 2.6	8.232	0.001*
DEPRESSION	7.35 ± 4.80	4.10 ± 2.55	3.25 ± 2.93	4.951	0.001*
ANGER	8.0 ± 4.64	4.95 ± 3.59	3.05 ± 3.20	4.258	0.001*
FATIGUE	7.8 ± 3.25	4.15 ± 3.13	3.65 ± 2.77	5.877	0.001*
CONFUSION	5.95 ± 3.79	3.1 ± 2.33	2.85 ± 3.43	3.707	0.001*
VIGOUR	11.75 ± 3.72	14.9 ± 3.95	-3.15 ± 2.45	-5.737	0.001*

Discussion

Primary objective of study was to analyse effect of fast tempo vocal and instrumental track on cardiopulmonary parameters, perceived exertion and perceived stress rate during high intensity interval training. While secondary objective was study effect on mood and enjoyment change during high intensity interval training in sedentary subjects, which is proven right through alternate hypothesis of study.

Trial conducted by L. Bernardi to evaluate potential changes in cardiopulmonary systems induced by music, specifically tempo, rhythm, pause, individual preference, habituation, and previous musical training. Music induced an arousal effect, predominantly related to tempo. Slow or meditative music could induce a

relaxing effect; relaxation is evident during a pause. Music, in trained subjects, first indulge attention during faster rhythms, and induce relaxation while on slower rhythms.¹³

Study done by Martin J. Barwood, on Motivational Music and Video Intervention Improvement using High-Intensity Exercise Performance, in this study each participant completed three 30-minute exercise bouts on a motorised treadmill under three counterbalanced conditions on separate days: control, motivational music plus video intervention, non-motivational intervention. study proved that music conditioned High intensity exercise showed lower RPE as compared to control and non-motivational intervention high intensity exercise.¹⁵

re are contradictory results, that music might or might not decrease RPE during high intensity exercise. present study support finding that music reduces rate of perceived exertion during high intensity exercise. present study on effect of music on HIIT protocol that included alternate high intensity bouts, interspersed with moderate intensity, study shows reduction in RPE during high intensity bouts, thus proving participants having low fatigue less, thus making exercise effort more pleasurable and thus improving exercise adherence

Music listening is said to benefit health via stress-reducing effects. A study conducted by Roberto La Marca, indicated that music listening impacted psychobiological stress system. Listening to music prior to standardized stressor significantly affected autonomic nervous system (in terms of a faster recovery), and lesser degree of endocrine and psychological stress response.¹⁶

Results of this study showed re was extremely significant difference in perceived enjoyment of with and without music conditioned HIIT. STORK et al studied a similar study to see effect preferred music on perceived enjoyment of sprint interval exercise and found similar result. It has been suggested that increase in enjoyment of exercise can increase in adherence to that exercise.¹⁷ so it can be suggested that participants would adhere more to HIIT with music as y perceive it as been more enjoyable and would more adhere to exercise when music is added to it.

Listening to classical and self-selected relaxing music after exposure to a stressor result in significant reduction in anxiety, anger, and sympatic nervous system arousal, and increased relaxation compared to those who sit in silence or listen to heavy metal music. After exposure to a stressor, listening to self-select or classical music significantly reduces negative emotional states and physiological arousal.

A study done by Sterling K. MacNay, M.M.E., RMT-BC on Influence of Preferred Music on Perceived Exertion, Mood, and Time Estimation Scores of Patients Participating in a Cardiac Rehabilitation Exercise Program showed increase in positive mood with preferred music. In present study a single session, subjects demonstrated a statistically significant decrease in mean values of factors tension, depression, confusion and anger; an increase in vigour, and no differences in fatigue in both condition i.e. HIIT with music and HIIT without music.¹⁸

Present study shows that re was a significant difference in mood in both vocal as well as instrumental condition HIIT.

Conclusion

Present study of 2 weeks concluded that vocal and instrumental music have significant effect on heart rate, enjoyment, mood, stress and no significant effect on perceived exertion rate during high intensity interval training

Future Scope: Borg CR-10 scale could be used for future studies

Source of Funding: Nil

Conflict of Interest: Nil

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Immediate Effects of Kinesio Taping on Lung Functions, Chest Expansion and Dyspnoea in COPD Patients

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Abstract

Background: Dyspnoea is a major symptom of COPD and an independent predictor of mortality. It is caused by mechanical alterations adapted by shortened or deconditioned musculature. There is insufficient evidence regarding the efficacy of kinesio taping on the symptoms posed by respiratory conditions like COPD. This study investigates the immediate effects of kinesiology taping done for pectoralis major and rhomboid major, on chest expansion and lung functions along with dyspnoea. **Methodology:** By convenient sampling, 30 stable COPD patients with mild to moderate stage affection as per GOLD criteria, and having complaints of dyspnoea were randomly divided in two groups. Group A received kinesio taping along with conventional physiotherapy, group B was the control group where only conventional physiotherapy exercises were given twice a day for 3 days. Eligible patients were assessed for their lung functions, chest expansion and dyspnea. **Results:** Data analysis within the groups as well as between the groups was done using the WINPEPI and PRIMER software. Between groups comparison for lung functions showed significant improvement ($p < 0.05$) for FEV₁, FVC and PEF. Pre and post comparison of respiratory rate and SpO₂ between the groups showed significant improvement ($p < 0.05$). **Conclusion:** There was a significant improvement in the experimental group which suggests that kinesio tape application is beneficial in improving lung function and reducing rate of perceived exertion.

Keywords: COPD, dyspnoea, kinesio taping, lung functions, oxygen saturation.

Introduction

Chronic Obstructive Pulmonary Diseases (COPD) is a common condition encompassing patients having chronic bronchitis and emphysema¹. It is many times also associated with Bronchial asthma. Dyspnoea has also been a frequent and major symptom of patients with COPD, and is an established independent predictor of mortality.² When dyspnoea starts interfering with daily physical activities, it results in significant reduction in physical activity. In COPD, the persisting breathing symptoms and airflow restrictions are because of

alterations in the respiratory system as a result of hyperinflation of sacs of the alveoli and subsequent destruction.²

The global disease burden of COPD is estimated to be 210 million population, as per data collected by the Global Initiative for Chronic Obstructive Lung Disease (GOLD).³ Studies in India have reported the prevalence rate of COPD among smokers to be almost 44%.⁴

Kinesiotaping is an established effective intervention for peripheral nerve facilitation, muscle balance, and pain control.⁸ Taping has been proved to be effective in improving oxygen levels and respiratory function in stroke patients.^{5,6,7} However, a meta-analysis exploring the effectiveness of kinesiotaping concluded that there is not adequate evidence in support of Kinesio taping to enhance muscle activity.⁹

Kinesiotaping provides proprioceptive awareness over the area where it is applied. This will help normalise

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inappropriate muscle overactivity and re-educate the patient to adopt optimal body postures during work and daily activities.¹⁴ Similarly, for the respiratory muscles, kinesiotaping is said to promote muscle activation and reduce abnormal muscle tension, subsequently leading to an increase in muscle strength. A previous study using kinesio tape applied on the chest of the healthy individuals during heavy exercise has shown augmented ventilator efficiency.⁵

There is limited literature available which explores the effect of kinesiotaping in patients with chronic respiratory diseases, specifically COPD. For these patients, kinesiotaping may enhance breathing efficiency by reducing the work of breathing.¹⁰ When applied on the pectoralis major muscle from origin to insertion, inspiration will be facilitated, as the pectoralis major is an important accessory muscle for inspiration. This study investigates the immediate and short term effects of kinesiotaping on chest expansion and pulmonary function when applied to the pectoralis major and rhomboids.

Methodology

After Institutional Ethical committee approval, 30 COPD patients with mild to moderate stage of COPD (according to GOLD classification)² having complaints of dyspnoea were enrolled after an informed consent. Patients were divided to two groups- group A which was the study group and kinesio tape application was done; group B being the control group where only conventional physiotherapy exercises with incentive spirometry were given for 3 days. Patients on oxygen therapy, having respiratory failure, ribcage deformities or fixed kyphosis, any postural deformity of spine, skin disease or allergies were excluded. Patients were assessed for pulmonary function and the 6 minute walk test was conducted. Kinesiotape was applied in an inhibitory method over Pectoralis Major and facilitatory method for rhomboid major muscles, as shown in figures 1 and 2 respectively.



Fig 1: Inhibitory kinesio taping for Pectoralis Major



Fig 2: Facilitatory kinesio taping for Rhomboid Major

Conventional breathing exercises including incentive spirometry was given twice a day for both groups. Immediately after the application of the kinesio tape and treatment, re-assessment was done for the experimental group to see the immediate effects. The interventions were carried for 3 days and kinesio tape was removed on 4th day. The outcome measures were reassessed.

Results

Data analysis within and between the groups were done using WINPEPI and PRIMERS softwares. Normal distribution was calculated by WINPEPI applying the Shapiro-wilks test. The normally distributed values were analysed using t test. The data which were not distributed normally was analysed using Wilcoxon sum rank test. Significance was set at 95% confidence interval for the mean difference.

As seen in table 1 below, all values were statistically significant ($p < 0.05$), except FEV_1/FVC ratio.

Table 1: Comparison between the mean values and P value of both the groups on lung functions before and after treatment.

Lung function	FVC		FEV ₁		FEV ₁ /FVC		PEFR	
	EXP	CTRL	EXP	CTRL	EXP	CTRL	EXP	CTRL
Day 1 Pretreatment	60.2	58.6	41.7	50.07	40.4	83	42.9	65.6
Day 1 Immediate Post treatment	55.8		45.2		40.3		40.5	
Day 4 Post treatment	54.9	60.8	40.3	55.53	40.7	85.8	41.1	65.13
P value	0.01		0.02		0.38		0.004	

Table 2 below shows the pre and post treatment values for other outcome measures related to the 6 minute walk test and chest expansion. All values were statistically significant ($p < 0.05$), except chest expansion at both levels.

Table 2: Comparison of Mean values of other Outcome Measures for both groups before and after treatment.

Outcome Measure	Experimental group		Control group		P value
	Pre	Post	Pre	Post	
Distance (m)	114	136	108	110	0
SpO ₂ (%)	96.5	96.7	95.5	96.1	0
Respiratory rate (breath/min)	27.3	27.2	29.4	28.4	0.04
Borg score	3.3	3.06	3.3	3	0.03
Chest expansion- Axillary Level (cm)	2	1.8	2.2	1.8	0.16
Chest expansion- Nipple Level (cm)	1.4	2.1	2	2.1	0.06

Discussion

This study was carried out to investigate the immediate effects of Kinesio taping as an adjunct to the conventional breathing exercises to relieve dyspnea and increase the chest expansion as well improving the lung functions in COPD patients. There are rare evidences available on the proprioceptive effects of Kinesio tape, especially in conditions with respiratory impairments.¹¹ This study incorporated the use of proprioceptive stimulation to the secondary respiratory muscles and the muscles responsible for increasing the chest expansion by means of structural variations and adaptation.

Results shows a significant difference in the mean value of lung functions in experimental group including the FVC, FEV₁, FEV₁/FVC and PEFR. No significant improvement was found in the FEV₁/FVC ratio. The findings are similar to another study, which also additionally mentioned an increase in the oxygen saturation in patients with COPD after kinesio taping application after 24 hours of hospital admission.¹⁰ Although the experimental group had a slight improvement in all the components, the mean differences between groups did not indicate major difference of any one intervention over the other.

The distance covered in the 6 minute walk test was significantly different in the experimental group ($p < 0.05$), but not in the control group. But when the mean differences among both groups were compared the difference was statistically significant ($p < 0.05$). This may be due to the fact that there was reduced dyspnoea and better O_2 saturation. As a result the patient could cover more distance without difficulty.

There was no statistical difference ($P = 0.08$) seen in the SPO_2 values for experimental group. The short duration of treatment could be the possible reason for no significant effects as it requires adequate duration for changes occurring at cellular level and affecting the aerobic capacity.¹² Whereas the control group showed significant difference ($P = 0.01$) in the SPO_2 .

There was significant difference noted on the BORG score of both the groups, when compared within the group as well as between the groups ($p < 0.05$). These findings are similar to a previous study, which showed that the level of exertional dyspnoea significantly improved in the experimental group.¹³

Literature mentions that Kinesio taping enhances cutaneous stimulation of the mechanoreceptors, relieves pain, assists postural alignment and increases muscle bioelectric activity.¹² Another reason for the improvement in the experimental group may be the proprioceptive awareness because of the presence of the tape over the chest, also providing a visual and tactile stimulus for effective breathing rate and pattern, leading to better O_2 saturation level.^{14,15}

Conclusion

From this study, it can be concluded that application of kinesio tape can be an adjunct to conventional breathing exercises for COPD patients. There is improved lung function and reduced rate of perceived exertion after application of kinesio tape.

Conflict of Interest: Nil

Source of Funding: Nil

Ethical Clearance: Taken from Institutional Sub-Ethics Committee of Dr. D. Y. Patil College of Physiotherapy, Pune.

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Health Related Quality of Life among Bank Workers in Punjab: A Comparison with Normal Healthy Subjects

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Abstract

Objective: Health related problems can restrict with even the most elementary aspects of daily living. It is a significant reason of occupational complaint and diminished quality of life for the staffs. Health-related quality of life (HRQOL) is an assessment of the person's well-being. The purpose of this research is to determine HRQOL among the employees of the bank in India. **Method:** HRQOL were cross-sectionally measured over and done with short form of SF-36 questionnaire. Total 400 Subjects aged between 25-45 years who met the inclusion criteria were selected for the study where 200 bank employees and 200 normal healthy population. Results: HRQOL were significantly lower in bank employees as compare to the normal population ($P < .001$). **Conclusion:** The result of the study ascertained that HRQOL appears to be lower among bank workers in Punjab. Therefore it is essential for interventions aimed at justifying the HRQOL among employees of the banking sector.

Keywords: Health Related Quality of Life, Bank Workers and SF-36 Questionnaire

Introduction

In India, a bank is the helping hand of the nation and its people. Banks have encouraged the expansion of key sectors of the economy and a new era of progress on India's horizon^[1] and today, Indian banks are competing with the modern banks of the world with confidence.

Rapid scientific growth in the use of electronic data has also affected employees and the workplace.^[2] In recent years, the rapid use of computers has radically altered the work environment. Various factors, such as personal factors, work-related factors, psychosocial factors, can lead to many health risks, such as musculoskeletal disorders.^[3,4] Some studies have shown that the violation of the musculoskeletal system and the poor quality of life are very common among employees of the office, bank or computer users.^[5] Good mental health, healthy lifestyle and depression plays a central role in influencing the HRQOL.^[6] HRQOL can be assessed by using a valid tool that is SF-36. This questionnaire is used to evaluate the weight of several

components. The several components are, physical functioning, physical role limitation, emotional role limitation, general health perceptions, vitality, bodily pain, social role functioning, mental health and health transition.^[7] The postliberalization era has witnessed various environmental changes in the banking industry.^[8] Lifestyle-related factors such as obesity, drinking habits, diet, and physical inactivity are well-established determinants of hypertension.^[9] Workplace healthiness and wellness speaks about early identification of chronic disease and lifestyle-related preventable risks.^[10] The core objective of this study is to determine the incidence of health-related quality of life among bank employees working in the banking department.

Materials and Method

It is an observational cross-sectional study. This study was carried out during May 2018 to March 2019, Department of Physiotherapy, Lovely Professional University, Punjab. Total 400 subjects were participated for the study, 200 healthy subjects and 200 Bank workers from Ludhiana and Jalandhar in Punjab. All bank employees using a computer ($n = 200$) were selected for the study. SF-36 questionnaire was used for HRQOL assessment and all the data were compared to the normal population of Punjab. Institutional research and

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institutional ethical committee approval were obtained before recruiting the patient (LPU/IEC/2019/01/05) for the proposed study. Written, signed informed consent was obtained from all participants. Inclusion criteria: males and females, an employee working in bank more than two years, age between 25-45 years healthy individuals, full time workers, bank employees working in computer section, minimum workload of 20 hours, educational qualification-all level and willingness towards participation.exclusion criteria: subjects suffering from, hypertension and diabetes mellitus, spinal surgery or any other surgical history, workload more than 32 hours/week, subjects suffering from any

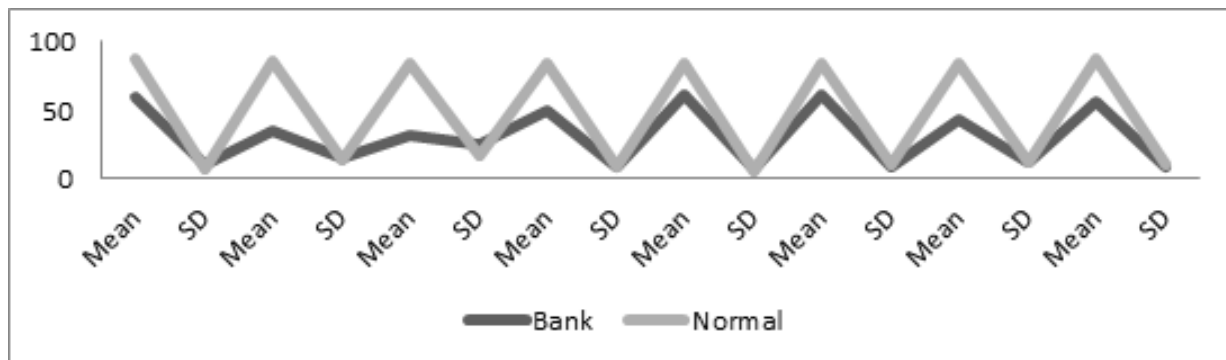
musculoskeletal disorder before joining the bank, any kind of postural impairment, any type of acute injury or accident, any neurological disorders, presence of any limb shortening or any lower limb deformity, pregnancy.

Results and Analysis

Statistical analysis was carried out using SPSS 16 and paired t-test was used to compare HRQOL among the bank wokers and normal healthy population. Demographic variables (age, weight, height, BMI) are showing in the (Table-1). Statistical analysis (Table-2) revealed low quality of life score among bank woker.

Table 1: Demographic data of the subjects (Mean±SD)

Variables	Bank workers	Normal population	P- value
	Mean ± SD	Mean ± SD	
Age(y)	38±11.31	37±10.12	<i>P</i> > 0.001
Weight(kg)	67.82±7.53	66.82±8.58	<i>P</i> > 0.001
Height(cm)	166.35±7.52	168.38±6.22	<i>P</i> > 0.001
Gender	Female (n=112) Male (n=88)	Female(n=105) Male (n=95)	<i>P</i> < 0.001
Body mass Index(kg/m2)	23.52±3.65	24.02±2.15	<i>P</i> > 0.001



Graph: 1 Analysis of HRQOL of bank workers and normal population

Table: 2 Comparison of HRQOL between bank workers and normal population

Variables	Mean	Std. Deviation	Std. Error Mean	p values
Physical functioning – BW	58.91	9.86	1.62	
Physical functioning - NP	87.83	6.82	1.12	<0.001
Role of limitation Physical health – BW	35.81	16.18	2.66	
Role of limitation Physical health – NP	86.48	13.93	2.29	<0.001
Role of limitation emotional health – BW	32.37	25.56	4.20	
Role of limitation emotional health–NP	83.94	16.72	2.74	<0.001
Energy – BW	50.27	8.97	1.47	
Energy – NP	84.45	8.56	1.40	<0.001
Emotional well being – BW	60.97	7.95	1.30	
Emotional well being -NP	83.62	5.88	.96	<0.001
Social life -BW	60.89	8.23	1.35	
Social life –NP	83.94	10.56	1.73	<0.001
Body pain – BW	43.59	12.06	1.98	
Body pain – NP	83.32	12.58	2.06	<0.001
General Health – BW	55.81	8.54	1.40	
General Health – NP	86.62	9.72	1.59	<0.001

BW=Bank Worker, NP=Nrmal Population

Discussion

This cross-sectional study calculated HRQOL in bankers using SF-36. The study provides data about the bank workers state of health, relevance of the assessment as base for planning future potential studies. Where possible, empirical data were compared to normative values obtained by general population surveys.

The first component for HRQOL of life is physical functioning with mean value (58.91). The second component was role limitation due to physical problems which was also affected(35.81).The third component was role limitation due to emotional problems (32.37) which has mostly affected the HRQOL of life for the SF-36 is each participant. The fourth component of SF-36 is Energy/Fatigue (50.27).The fifth component was Emotional well-being (60.97).The seventh component was social functioning (60.89).The eighth component was general health was (43.59).With the higher Mean values indicating the good HRQOL whereas lower Mean

value signifying poor HRQOL (Graph: 1). Therefore, the current study has shown that HRQoL is very poor for bank workers in Punjab. A study conducted by Adibe (2014) on occupational factors on the quality of life of office workers in southeastern Nigerian population and stated that negative impact on the quality of life of respondents in the sector of economy.^[11] It is obvious that workplace activities and performance influence the quality of life. Boberska M (2018) conducted a study and concluded that sedentary behaviours were related to better physical HRQOL but not reliably to mental and social HRQOL.^[12] Silva LS (2012) conducted another study on financial service employees in Brazil and suggested that suggest that exposure to adverse psychosocial work conditions has a negative impact on both domains of HRQOL among financial service workers.^[13] Therefore the results of these studies support the results of our study that HRQOL of bank workers in Punjab are very poor.

Conclusion

The result of the study concludes that HRQOL appear to be lower among bank workers in Punjab. Therefore, it is essential for interventions aimed at justifying the HRQOL of life among employees of the banking sector.

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Comparison of Endurance between Trained University Level Cricketers, Untrained University Level Cricketers and Non-Cricketers

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Abstract

Background: Endurance plays a significant role for sustaining the physical demand for the various formats of cricket. In relation to cricket, endurance is the ability of a player to sustain maximum speed, agility, and power in each play for an entire game. This study intended to check the levels of endurance among the various groups of trained university level cricketers, untrained university level cricketers and non cricketers.

Method: The study included 3 groups consisting of 10 individuals in each group. Group A – Trained cricketers playing club level and/or university level cricket; Group B – Untrained cricketers playing club level and/or university level sport. Group C – non-cricketers. The participants who met the inclusion and exclusion criteria performed the Yo-Yo intermittent recovery test. The levels completed, Vo_2 max, Speed and distance covered obtained through the test were compared across the 3 groups for statistical significance.

Result: The performance of the participants in Group A was significantly better than those in both Groups B and C at a p value of <0.05 across all the components of the test. Participants in Group A were significantly better in distance covered, Vo_2 max and levels completed, than those in Group B, at a p value of 0.003, 0.003 and 0.002 respectively. Participants in Group A were significantly better than those in group C in distance covered, speed, Vo_2 max, levels completed at a p value of 0.001, 0.002, 0.001 and 0.001 respectively. When Vo_2 max was correlated with distance the results showed $r=0.987$ at $p < 0.0001$.

Discussion: This study showed that participants in Group A had better Vo_2 max, completed more Levels and covered more distance as compared to participants in Groups B and C. A correlation of Vo_2 max with distance covered showed that as Vo_2 max improves, the distance covered will improve.

Conclusion: The results of the study conclude that regular Training would influence the performance.

Key words: Cricketers; Non cricketers; Endurance; Yo-Yo intermittent recovery test.

Introduction

In recent years cricket has become a professional multi-million-dollar sport with more than 100 countries

recognised by the International Cricket Council.¹

High profile international competitions have seen a corresponding increase in interest in the game.¹

It has been recognised that an indifferent culture towards planned physical preparation at all levels of cricket leaves many players inadequately physically conditioned, which in turn has been linked to injury occurrence.^{2,3}

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A collection of research provides an embryonic view of the professional cricketer's physiological needs. The fast bowlers delivering balls in the present day games at approximately 44.4 m/sec requires all other players to actually have high speed and agility facets, as well as fast reaction in modern game.¹

Alternatively, a batsman scoring hundred runs could possibly cover approximately 3.2 kms in 8 discontinuous "active" minutes running at approximately 24 kms/hr.¹

Endurance is "the ability of an organism to exert itself and remain active for a long period of time, as well as its ability to resist, withstand, recover from and have immunity to trauma, wounds or fatigue."⁴

Thus endurance constitutes a major role in any sport. Endurance is known to be affected by training.⁵

The Yo-Yo intermittent recovery test was specially designed to evaluate the ability of a player to repeat high intensity running efforts over short distances. The Yo-Yo test, by its nature, appears to have more relevance to team sports.⁶

This study thus intended to identify the difference in endurance level of students being regularly trained for cricket versus those who did not undergo any form of training.

Methodology

Study design: Observational study

The study intended to have 3 groups of 10 participants each.

Group A consisted of 10 participants who played for university and club level cricket and were trained regularly for skill, technique and fitness related to the sport.

Group B consisted of 10 participants who played for university level cricket but were not trained regularly for skill, technique and fitness related to the sport.

Group C consisted of 10 participants who did not play cricket even for leisure time activities. The study thus included totally 30 participants.

Inclusion criteria: All the participants were males in the age group of 18-25 years, without any history of major lower limb injuries 6 months prior to the data collection.

Exclusion criteria: Male participants with history of musculoskeletal problems, systemic conditions were excluded from the study. Participants not willing to perform the test were also excluded.

All the participants were explained the purpose and procedure of the test prior to beginning the Yo-Yo test.

Yo-Yo intermittent recovery test procedure

The test was performed according to the suggested procedure.⁶ It involved repeated 20 meter shuttle runs at progressively increasing speeds and reducing the time period. The shuttles were interspersed with 10 seconds of active recovery between every 20 m (out and back) shuttle.

The Yo-Yo intermittent test consisted of repeated 2 x 20 m runs, forth and back between the starting, turning, and finishing line at progressively increased speeds which was controlled by audio beeps.⁷ The application Yo-Yo Intermittent Recovery & Endurance Testing on the mobile phone was used.⁸

Between each running bout, the participants had a 10 seconds active rest period, consisting of 2 x 5 meter of rest. The distance covered was recorded and the test procedure terminated, when the subjects failed to reach the finishing line before the audio beep. The test results were recorded.⁷

The test may be performed with differing speed profiles (level 1 and 2) at two different levels.

The level 1 is designed for low level athletes and level 2 for well trained athletes. Level two starts at and maintains higher speeds than level one.⁶

However, for the purpose of similarity and homogeneity in the method of data collection, all the participants were evaluated from level 1 in this study, to avoid any biases among the groups.

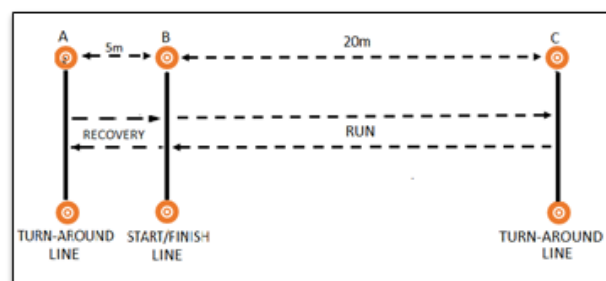


Figure 1: Diagrammatic representation of field set up for Yo-Yo test⁹

Results

The data obtained from the 30 participants divided into 3 groups was subjected to statistical analysis.

The mean age of all the participants was 19.73 (± 1.31) years, with the ages being 20.2 (± 1.48), 19.6 (± 1.5) and 19.4 (± 0.84) in Groups A, B, and C respectively. No significant difference in the mean ages of the three groups was noted.

Table 1: Post hoc analysis of the three groups across various components

	Tukey HSD	A Vs B	A Vs C	B Vs C	MEAN	S.D.
AGE (years)	Q Statistic	1.4474	1.9298	0.4825	19.73	1.31
	p Value	0.57	0.37	0.9		
BMI	Q Statistic	1.5691	1.9854	0.4163	21.33	3.96
	p Value	0.55	0.35	0.9		
DISTANCE (Mts)	Q Statistic	5.16959	5.1695	2.0584	852.0	552.98
	p Value	0.003*	0.001*	0.33		
SPEED	Q Statistic	2.9759	5.5549	2.5791	15.03	0.96
	p Value	0.11	0.002*	0.18		
VO₂max	Q Statistic	5.0286	6.7890	1.7604	43.47	4.68
	p Value	0.003*	0.001*	0.439		
LEVEL	Q Statistic	5.3060	8.0313	2.7253	15.12	1.89
	p Value	0.002*	0.001*	0.150		

$p < 0.05$ was statistically significant

The overall BMI of all the participants was 21.33 (± 3.96). The mean BMI of the participants in the Groups A, B and C were 19.85 (± 2.65), 21.81 (± 4.23) and 22.33 (± 4.68) respectively. There was no significant difference in the mean BMI of the participants of the 3 groups

The mean distance covered by all the participants during the test procedure was 852 (± 552.98) meters. The mean distance of the participants in the Groups A, B, and C were 1378 (± 636.90), 720 (± 158.89) and 458 (± 234.84) respectively. A statistically significant difference was noted in the distance covered by participants in Group A and B ($p = 0.003$) and also between Group A and C ($p = 0.001$). However there was no significant difference in the distance covered by participants in Group B and C ($p = 0.33$).

The mean speed of all the participants during the test procedure was 15.03 (± 0.96) km/h. The mean speed

of the participants in Groups A, B and C were 15.75 (± 1.01), 15 (± 0.82) and 14.5 (± 0.47) respectively. A statistically significant difference in the speed of the participants in group A and C ($p = 0.002$) was noted. However, the speed of participants in Group B was not significantly different from those in Group A and C.

The mean VO₂max value of all the participants during the test procedure was 43.47 (± 4.68). The mean VO₂max value of the participants in Groups A, B and C were 47.83 (± 5.53), 42.26 (± 1.53), 40.31 (± 1.98) respectively. The VO₂max of participants in Group A differed significantly from the participants in group B ($p = 0.003$) and C ($p = 0.00$). However there was no significant difference between the Groups B and C.

The mean of the Levels completed by all the participants during the test procedure was 15.12 (± 1.89). The mean Levels of the participants in Groups A, B and C were 16.94 (± 1.93), 14.74 (± 0.49) and 13.61 (± 1.09).

A statistically significant difference was noted in the Levels of the participants in Group A and B ($p=0.002$) and Group A and Group C ($p=0.001$). However there was no significant difference between Groups B and C.

The Karl Pearson's correlation analysis of Vo_2max with the distance covered showed a strong positive correlation with $r = 0.987$ which was statistically significant at a $p = 0.00001$.

A non-significant difference in the Vo_2max of the batsmen and the bowlers was found using the T test for two independent samples.

Comparison of the participants in Group B and Group C showed no significant difference for the Vo_2max , speeds, distance covered and levels completed.

Discussion

The ages and BMI of participants across the three groups were similar hence its effect on various components of the test could not be statistically analyzed among the groups. However studies have reported that age is an important factor influencing sports specific performance.¹⁰

This study also showed that participants in Group A had better Vo_2max , completed more Levels and covered more distance as compared to participants in Group B and Group C. This possibly could be the effect of regular training. Previous studies suggest that moderate to high intensity training had a positive effect on all these factors.⁵

A correlation of Vo_2max with distance covered showed a strong positive correlation which indicates that, as Vo_2max improves the distance covered will improve. There have been studies in the past which report that training improved Vo_2max thus increasing the distance covered.⁵

A comparison of Vo_2max among the batsmen and the bowlers suggested no significant difference. This result is however against the study which reported an increased Vo_2max in the batsmen.¹ This could be possibly due to a small sample size which included 11 bowlers and 9 batsmen in our study.

Comparison of trained cricketers versus non cricketers showed that cricketers outperformed the non cricketers in all aspects such as speed, levels completed distance covered, Vo_2max . These results are comparable

with the study which reports that professional cricketers have a "superior" level of aerobic fitness in comparison with the wider general population.¹

A comparison of untrained cricketers and non-cricketers showed no difference in the levels of performance, indicating that participation alone in any sport will not improve the performances. Appropriate training only could influence the performance of the participants.

Conclusion

The various components such as speed, endurance, distance covered, and Vo_2max are important prerequisites for participation in any sport. The results of the study conclude that regular training would influence the performance and success of an individual to a very great extent in the field of cricket not only in the international level but also at university and club level participants.

Source of Funding – Self

Ethical Clearance – Ethical clearance was obtained from the Institutional Ethical Committee.

Conflict of Interest – None

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Obstetric Brachial Plexus Palsy – A Retrospective Data Analysis

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Abstract

Background: Obstetric brachial plexus palsy is the condition seen during birth due to any injury to the nerves. There are mainly 3 type's brachial plexus injuries (BPI), namely Erb's palsy, Klumpke's palsy and total plexus palsy. The injury can cause paralysis of upper limb and may lead to deformity. Thus this study aimed at analyzing the prevalence and influences of few physical factors noticed during the clinical practice.

Method: Retrospective data of 28 children with obstetric brachial plexus injury (OBPI) was subjected to statistical analysis. The collected data included age, gender, weight, side of affection, type of delivery and the instrumentation used.

Result: Statistical analysis of the data showed that there was more affection in boys than girls. The frequency of non instrument assisted deliveries was higher in the sample included. There was only one child born through LSCS. Right sided brachial palsy was more in frequency as compared to left sided and bilateral plexus injury. Erb's palsy was most commonly reported than Klumpke's palsy and total plexus palsy. The mean weight of boys was relatively higher than the girls.

Conclusion: The study concluded that gender and birth weight of the new born along with mode of delivery and instrument assisted deliveries influenced the occurrence of OBPI.

Keywords: *Obstetric brachial plexus injury; Birth weight; Vaginal delivery; Erb's palsy*

Introduction

Obstetric brachial plexus palsy (OBPP) is "a flaccid paresis of an arm at birth, with the passive range of motion greater than the active." Erb-Duchenne palsy which resolves within a year is the most commonly occurring injury affecting the C₅-C₆ nerve roots. Klumpke's palsy is the next most commonly occurring affecting the C₈-T₁ nerve roots.¹ Erb's palsy produces a classic "waiters tip" with the forearm being adducted, internally rotated, and the elbow being extended. Total brachial palsy is characterized by complete arm paralysis, decreased sensation, and a pale extremity. Obstetric brachial plexus injury occurs more frequently in males.² The incidence of brachial plexus injuries has been shown to vary from 1 to 5 in 1000 deliveries, and this incidence is dependent on the level of healthcare. In Sweden the incidence of brachial plexus palsy as a birth injury is 1.3

in 1000 deliveries, in England it is less than 1 in 1000 deliveries, and in developing countries it is 5 in 1000 deliveries.³

Methodology

Ethical permission for the study was obtained from the institutional ethical committee. Consent for publishing the data without revelation of the subjects identity was obtained from the parents of the children who met the inclusion and exclusion criteria. Files of 39 children with upper extremity paresis were identified as being treated for rehabilitation from 2012 to 2019. 11 children were found to have paresis due to nerve injury following post-traumatic reasons such as supra-condylar fractures, road traffic accidents or chemical neuritis etc. The study thus included the data of only 28 children diagnosed with obstetric brachial plexus palsy.

Data like age, gender, type of delivery, birth weight and instrumentation for child birth were collected from the files. The data collected was subjected to analysis.

Inclusion criteria: Data of children, both girls and boys, from 2 days to 6 yrs of age who were born between 37 – 41 weeks of gestation and diagnosed with brachial plexus palsy at birth were included in the study.

Exclusion criteria: Data of children having monoplegia due to causes other than obstetric brachial plexus injury were excluded.

Result

Data of 28 cases with brachial plexus palsy were assessed. The participants included 6 (21.42%) girls and 22 (78.57%) boys with the mean age of 11 months and 5.5 months respectively. The z-score for population proportion showed the proportion of boys being significantly higher than girls with a z-value of -4.2762 and p-value of <0.00001. The birth weight of all the children ranged from 2400 - 5800 gms with a mean weight of 3485.8 gms (± 1049.531) The mean birth weight of girls and boys were 3183.3 gms (± 799) and 3568.4 gms (± 1133) respectively. Out of 28 children 3 children were found to be low birth weight. Highest prevalence of 28.6% children were found to be in the range of 2500 gms - 3000 gms followed by 25% in the range of 3500 - 4000 gms. Children in range of 3000 - 3500 gms and 4000 - 4500 gms were found to be 10.7% each. 14% of the children weighed greater than 4500 gms.

The number of children with left sided, right sided and bilateral brachial plexus injury were 11 (39.28%), 16 (57.14%) and 1 (3.5%) respectively. Prevalence of right sided brachial plexus palsy was significantly higher as compared to the others.

One child out of 28 children was delivered by LSCS, which shows that vaginal deliveries are in significant numbers in case of children with brachial plexus injury.

A comparison of instruments used at the time of delivery showed that 11 out of 28 deliveries used vacuum or forceps at the time of delivery (8 vacuum and 3 forceps assisted). Our results showed a significantly higher proportion of non instrument assisted deliveries with a value of z-value of -1.6036 and p-value of 0.1096.

The prevalence of Erb's palsy was the highest at 93% followed by total plexus injury at 7%. No cases of Klumpke's palsy were found in the collected data.

Discussion

The results showed that boys were more likely to be affected than girls. This result is supported by previous articles dated a couple of decades ago⁴ till the most recent ones². The mean weight of the boys was found to be approximately 380 gms greater than that of the girls. This result is consistent with studies which report that average mean birth weight of the male infants is generally higher than the average mean birth weight of female neonates.² Our result showed that the highest prevalence of children OBPI were in the range of normal average birth weight for Indian children according to a study.⁵ Children weighing above 3000 gms were twice those in the normal weight range. When compared amongst the normal weight and above normal weight this number was significant.

The right sided brachial plexus injury was more prevalent than the left sided and bilateral brachial plexus injury as suggested in the results, however no studies reporting a prevalence of affected sides in BPI were found during the search for review of literature.

The study showed that majority of children who suffered with BPI were delivered through vaginal delivery. This result is supported by a study which reports that vaginal deliveries were 5 times more frequent in cases with plexus injury.⁶ Approximately 40% of the children were delivered with instrument assistance (forceps or vacuum). This result is consistent with the study which reports that 41% of children with OBPI had an instrument - assisted delivery (forceps, vacuum or both).⁷ Erbs palsy was the most prevalent type of OBPI in the population studied. No cases of Klumpke's palsy were identified. This result is consistent with the report that the upper brachial plexus is most commonly affected and isolated injury to the lower plexus is rare.⁸

Conclusion

We would like to conclude that child's birth weight, gender, type of delivery and instrument assistance for delivery play an important role in the occurrence of OBPI. However these results may be difficult to generalize as the sample size included in this study was small and various other factors like maternal history, etc. were not included. Future studies including all the various foetal,

maternal and obstetric risk factors in our population with the larger sample size may be more appropriate.

Source of Funding: Self

Conflict of Interest: The authors have no conflicts of interest to declare.

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The Prevalence of Musculoskeletal Problems in Architects

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Abstract

Aim: Architects are required to work on a computer for several hours a day which mainly requires sitting in prolonged static postures, along with bending and flexing the neck which might put strain on the back, cervical and wrist area.^[1]The purpose of the study was to identify the prevalence of common musculoskeletal problems in Architects.

Methodology: A community based cross-sectional survey was conducted on 106 architects working for more than 2 years by administering the Extended Nordic Musculoskeletal Questionnaire to quantify the musculoskeletal pain and activity limitations in 9 body regions. A Self-Designed Questionnaire was administered aiming at getting information regarding the various musculoskeletal problems faced by architects, various postures attained and activities performed throughout the day.

Results: Out of total architects investigated, 80% architects experienced musculoskeletal pain. Neck, lower back and shoulders were the most commonly affected body regions. The results showed that the work-related risk factors like arms below shoulder activities (77.4%), frequent bending (41.5%), arms above shoulder activities (25.5%), twisting (17.9%) and awkward postures were highly associated with musculoskeletal disorders.

Conclusion: The study concluded that there was 80% prevalence of musculoskeletal problems in Architects. Neck was the most commonly affected body region followed by low-back, shoulder and upper back. Majority of architects required to work on computer in continuous sitting and also required to perform arm activity below shoulder level and bending constantly which may have contributed to the high prevalence of work-related musculoskeletal disorders in this population. The study also concluded that the implementation of ergonomic intervention strategies at the workplace may eliminate ergonomic hazards and minimize the risk of work-related musculoskeletal disorders.

Keywords: *Work-related musculoskeletal disorders, Architects, Extended Nordic Musculoskeletal Questionnaire, Ergonomic hazards.*

Introduction

The word “Architecture” is derived from a Latin word, which is derived from German word “Arkhitekton” meaning “chief builder”. “Architecture” is defined as both the process and product of planning, designing and construction. Architectural works, in the material form of buildings, are often perceived

as cultural symbols and as works of art. Historical civilizations are often identified with their surviving architectural achievements. The term architecture is also used metaphorically to refer to the design of organizations and other abstract concepts. The demands on the profession over the years have become much more complex in nature and wider in scope. There are various specifications in the field such as structural design, urban design, city planning, landscape architecture, interior architecture, construction management. Each of these compliments support each other.

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Job requirements of architects are taking client's instruction and preparation of design brief, site evaluation, analysis and impact of existing and proposed development on its immediate environs, design and site development, periodic inspection and evaluation of construction, drafting of plans and making miniatures of the same.

Architects are required to work on a computer for several hours a day which mainly requires sitting in prolonged static postures, along with bending and flexing the neck which might put strain on the back, cervical and wrist area^[1]. They visit construction sites for around 3-4 hours a week which might require them to stand under the sun, climbing stairs, walking on uneven terrains for long duration and are prone to various risks associated when working on a construction site^[2] such as falling objects, injuries due to contact with hazardous materials etc. Also, they travel for long distances depending on their project's site, travelling by car might cause pain in various areas due to bumpers, potholes and uneven roads in the city. Thus, the above-mentioned work profile and job requirements may place the architects at a risk of various musculoskeletal problems, which may result in damaging physiological changes that can lead to pain^[3]. If regularly occurring pain or discomfort is ignored, the physiological damage can lead to an injury.

A work-related disorder, according to the World Health Organization (WHO) definition as, multifactorial and the work environment and the performance of work contribute significantly, but in varying magnitude, to the causation of the disease^[4]. Work-related musculoskeletal disorders cause severe pain and functional impairment for many people, impose heavy costs on society for treatment, sick-leave and retirement and reduce productivity in working life^[5].

There exist a few studies regarding Common Musculoskeletal Problems in architecture students^[6,7]. However, there is a paucity of studies regarding the prevalence of musculoskeletal problems in practising architects, especially in India. Hence the current study aims to find out the prevalence of musculoskeletal problems in practising architects.

Materials and Method

The study was approved by the Institutional Ethics and Research Committee at D.Y. Patil University.

Inclusion criteria:

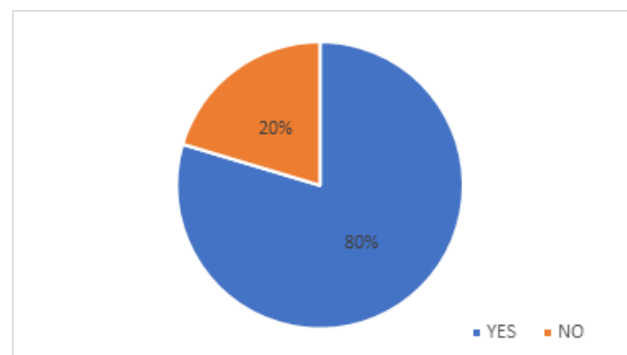
Architects practising for more than 2 years who were willing to participate in the study willingly gave an informed consent for the same, were included in the study.

Exclusion criteria:

- Architects not willing to participate in the study.
- Architects with no work experience or practising since less than 2 years.
- Architects with pre-existing chronic musculoskeletal, neurological or cardiopulmonary conditions.

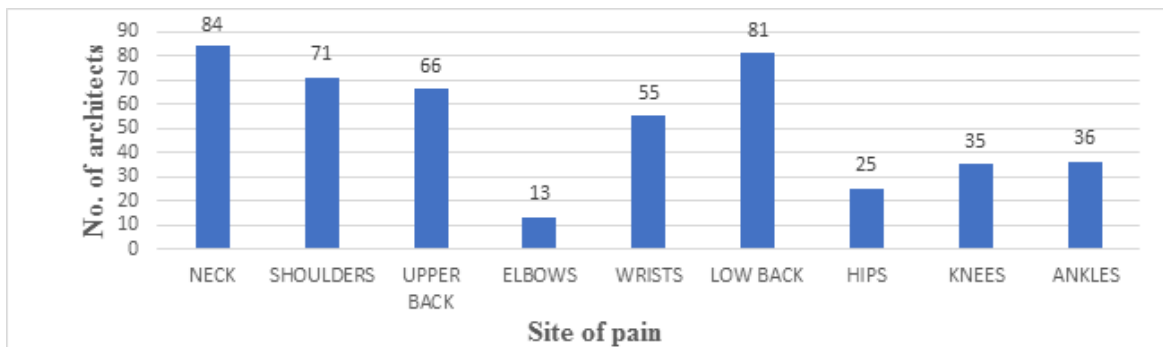
The participants were assured that the information regarding their identification obtained during the study would be strictly kept confidential. The demographic details including name, age, gender, dominance etc were obtained. A study was conducted by distributing a Self-Designed Questionnaire aimed at getting information regarding the various musculoskeletal problems faced by architects, various postured attained and activities performed throughout the day. The Extended Nordic Questionnaire was also used to quantify the musculoskeletal pain and activity limitation in 9 body regions. 106 architects participated in the study. The obtained data was statistically analysed and results were obtained

Data Presentation and Analysis



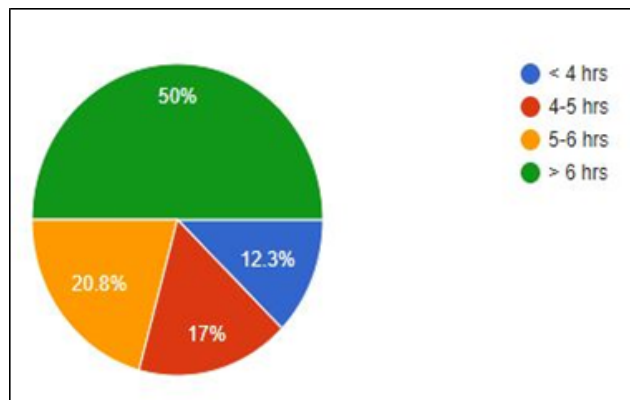
Graph 1: Pain Experienced

Inference: The above pie chart shows that 80% architects experienced pain after they started practising.



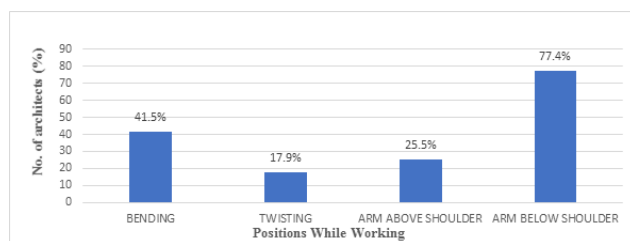
Graph 2: Prevalence Of Pain In Various Body Regions.

Inference: The areas of maximum pain reported by the architects were neck, low back followed by shoulder and upper back.



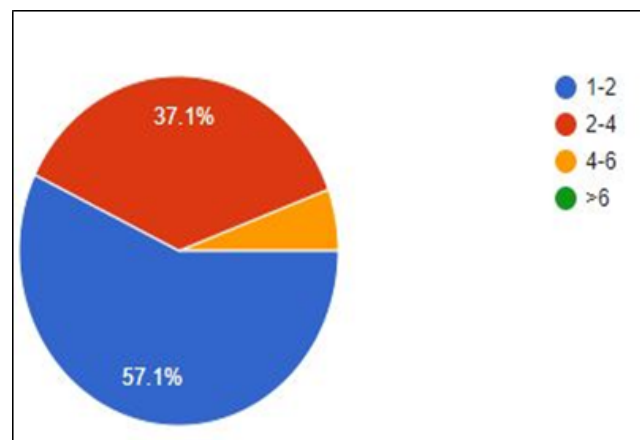
Graph 3: Number Of Working Hours On Computer.

Inference: The above graph shows that out of their total working hours, 50% architects spent more than 6 hrs on the computer.



Graph 4: Positions Required While Working

Inference: The commonest positions the architects required to attain while working were arm activity below shoulder level (77.4%) followed by bending (41.5%).



Graph 5: Number Of Breaks Taken/Day

Inference: 57.1% of subjects took 1-2 breaks/day followed by 37.1% who took 2-4 breaks/day.

Discussion

The purpose of our study was to report the prevalence of musculoskeletal problems among architects. The participants were 106 architects practising in Mumbai who fulfilled inclusion and exclusion criteria. Among 106 subjects who participated in survey, 48.1% were females and 51.9 % were male. The mean age of the subjects was 29.20 years with SD ±6.68 years. 91.7% were right-handed by dominance whereas 8.3% were left-handed by dominance.

The primary objectives of the study were to study the prevalence of musculoskeletal problems faced by Architects and to identify the areas causing maximum pain. Prevalence of musculoskeletal problems in architects was found to be quite high with 80% of architects reporting the presence of pain after they started practising [Graph1]. According to the study, majority of the architects reported lack of adequate breaks and the need to frequently visit sites. These factors may have contributed to the high prevalence of WRMD's in this

population^[8].

The musculoskeletal problems faced by architects may range from minor discomfort, aches and pains to more serious medical conditions requiring medical intervention, hospitalisation and rehabilitation. Out of the 106 architects who had pain, the most commonly affected areas were neck (84) followed low back pain (81), shoulder pain (71), upper back pain (66), wrists (55), ankles (36), knees(35), hips and elbows(13) [Graph2].

- **Neck and shoulder pain:**

According to the findings of the present study, 84 architects had neck pain and 71 had shoulder pain. In a study conducted by Nejati P et al^[9] on 'The Relationship of Forward Head Posture and Rounded Shoulders with Neck Pain in Iranian Office Workers', he reported that use of computers has increased drastically over the past decade in various offices, these rapid changes may be accompanied by increased prevalence of poor posture and resultant neck pain. Factors such as long duration sitting at work and improper posture of head during work may have a huge role in neck pain occurrence among office employees, particularly among those who work with computers^[9]. Straker et al^[10] reported that even tiny changes in the position of the head can increase the load put onto the musculoskeletal system of the body. With information of the movements of the head and neck being inserted into the muscle spindles, forward head posture is produced by lower cervical flexion and upper cervical spine extension with associated rounded shoulders, which is considered as a dysfunctional posture^[11]. Szeto et al^[12] reported that forward posture and rounded shoulders triggers the upper trapezius muscle. In a study conducted by Seulgi Lee et al^[11] on 'Effect of changes in head postures during use of laptops on muscle activity of the neck and trunk addition' he reported that forward head posture expands muscle activity of the upper trapezius and cervical erector spinae activity and a slumped position can be noted. Forward head posture leads to inadequate coordinated movements for neck control and performs as a high risk to the neck and upper limbs causing neck pain^[11].

- **Back pain:**

According to the data analysis 81 architects had low back pain and 66 architects had upper back pain. 97.1% use chair for sitting out of which 74.5% use adjustable chair for sitting. 93% individuals sit for longer duration

and 36 out of the total architects sit for around 4-5 hrs in static posture. Occupational musculoskeletal disorders (especially chronic LBP) are ubiquitous and modern office jobs require extended periods of static sitting [Roland Zemp et al^[13]]. Prolonged static sitting is thought to be linked with an increased possibility of musculoskeletal disorders^[14]. In a study conducted by Angela Maria Lis et al^[15] on 'Association between sitting and occupational LBP', she reported that sitting for more than half a workday, along with awkward postures, does increase the likelihood of having LBP or sciatica. An increased possibility of LBP (including all types) was found in relation to all signs of disc degeneration. An increased risk of sciatic pain was found in relation to posterior bulges. Low back pain is strongly associated with occupation^[16]. The prevalence rate of reported LBP in occupations that require the worker to sit for the majority of a working day is significantly more than the prevalence rate of the general population. Occupational groups revealed to awkward postures while sitting have an increased risk of having LBP^[15]. Lumbar spine movement impacts mechanical changes and the potential injurious effects of prolonged flexion associated with seated postures [Dunk NM et al^[17]].

In a study conducted by Jennifer Pynt et al^[18] on 'Kyphosed Seated Postures: Extending Concepts of Postural Health Beyond the Office', she reported that long duration of sustained kyphosed sitting creates spinal ill health. Sustained kyphosed postures are insidious, they contribute to degeneration but there is no pain until degenerative changes appear. Sustained kyphosed postures affect ligaments, muscles and joints and cause cumulative traumatic disorders and loss of spinal stability.

Our secondary objective was to study various postures architects acquire during the day. According to the study, 50% of architects work for more than 6 hrs on a computer daily [Graph3]. This may lead to acquired static Forward head posture and rounded shoulders because of poor ergonomic alignment, vision disturbances, glare on screen which puts strain on eyes. Overuse of upper cervical extensors and lower cervical flexors and back muscles leads to weakness of scapular muscles and tightness of anterior neck muscles. Due to static forward head there is also reduction in cervical lordosis of the spine that leads to compression of intervertebral disc. All these factors eventually can lead to pain.

Sometimes Architects attain incorrect postures for long hours like excessive bending, twisting, arm activity below shoulder level, continuous sitting while working [Graph4]. 57% architects take only 1-2 breaks/day. Also 93% architects sit continuously without break. Architects face various risks and difficulties at the construction sites. In the present study amongst 77% architects visiting sites 60% are involved in walking on uneven terrains, climbing repetitive stairs and are exposed to direct sunlight for longer duration. Additionally, they are also exposed to risks such as falling objects, roadway hazards, injuries due to contact with hazardous materials etc and hence are prone to develop MSD over the period of time.

Awkward postures lead excessive force on joints and overload the muscle and tendons around the effected joint ^[1]. Exposure to various factors such as static postures, risks at construction sites put architects at a higher level of MSD risk beyond their ability to recover, leading to a musculoskeletal imbalance and eventually a MSD.

The authors thus concluded that there was a need to suggest corrective measures and bring awareness among Architects to minimise the risk of these problems. In a study conducted by Marcus M et al ^[19] he reported that improving postures and giving ergonomic advice and modifications have shown to decrease the risk of musculoskeletal symptoms and musculoskeletal disorders According to the A.C.S.M guidelines, Regular exercise and some physical activity to maintain muscle strength and endurance along with core strengthening is essential to maintain one's health. Change of positions at frequent intervals and use of ergonomic furniture is recommended. According to the study conducted there were minimal number of breaks taken by the Architects while working [Graph5]. Frequent short rest breaks from computer work show profit in worker's productivity and well-being when the breaks integrate with task demands. [Henning Ra et al⁸]

Conclusion

Based on the study conducted amongst 106 architects in Mumbai, the following are the conclusions: -

- Out of the total study population, 80% of the Architects had pain after they started practising.
- The most common sites of pain were neck, low back, shoulder and upper back.

- Most architects required to work on computer in continuous sitting (93.4%) and also required to perform arm activity below shoulder level (77.4%) and bending (41.5%) constantly.

- There is a need to create awareness among architects regarding the association between poor and sustained postures and musculoskeletal disorders.

- Ergonomic advice and modifications along with postural correction exercises may help in minimising the risk of WRMD's in architects.

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Ethical Clearance: The study was approved by Institutional Ethical Committee of D.Y.Patil School of Physiotherapy.

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Relationship between Anthropometric Parameters and Jumping ability among Male Undergraduate College Students- A Cross Sectional Study

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Abstract

Background: Vertical Jump (VJ) is a key skill for many athletes. Whether its basketball, volleyball, football or tennis, it is very important in many sports. There are very limited studies on the topic and those available are mainly conducted on sports specific events and athletes. In this study, the subjects selected were non-sports healthy individuals. The purpose of this study was to investigate the relationship between anthropometric parameters and jumping ability among undergraduate college students.

Method: Undergraduate college students (n=62) aged between 18-25 years were included in the study. Twenty six parameters of International Society for Advancement of Kineanthropometry (ISAK) were selected along with lower limb Manual Muscle Testing (MMT) and Range Of Motion (ROM) prior to the study. The participants were evaluated for their jumping ability. Data was analyzed using Pearson's correlation. Level of significance was set at $p < 0.05$.

Result: Out of the 58 parameters, 1 parameter showed excellent negative correlation (weight), 17 parameters showed good negative correlation, 12 parameters showed moderate correlation, 16 parameters showed poor negative correlation and 12 parameters showed poor positive correlation.

Conclusion: There exist a significant relationship between the anthropometric parameters and jumping ability. The most significant parameter affecting jumping height was found to be Weight, which gave an excellent negative correlation and the other parameter were muscle girth and skin fold.

Keywords: Strength, ISAK protocol, Skin fold, Muscle girth, BMI, Body weight

Introduction

In many of the sports events around the world, jumping is a necessary action. Vertical Jump (VJ) is the act of raising one's own center of gravity higher in the vertical plane by the use of one's own muscles.¹ Measurement of how high one can elevate off the ground from a standstill is known as VJ. Physical performance assessment is essential in both the sporting

and rehabilitation fields. The fundamental logic is that these measurements and records provide a quantification of muscular capability which is relevant in the diagnosis of muscle function and/or athletic performance. VJ has shown that the height of various types of vertical jumps could serve for assessment of muscular strength and power.² Power is given higher attention since muscular power output is the main determinant of success in many activities and sports.³ During a VJ, muscle force is produced primarily from the back extensors, gluteus maximus, quadriceps, gastrocnemius, and soleus resulting in a powerful ground reaction force that propels the body upward against gravity.²

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Young people are usually motivated to play games that require short-duration high intensity efforts. Several motor tasks like jumping and throwing are involved in these efforts. They are generally used in schools as an indicator of a specific aspect of muscular strength.⁴ Muscular strength can be described as the maximal force or tension that a muscle or a group of muscles can generate at a particular velocity. Young people are usually motivated to play games that require short-duration high intensity efforts used in schools as an indicator of aspect of muscle strength. Athletes, train muscle strength and power specifically to achieve higher jumps for much longer.⁵

VJ is affected by various physiological and biomechanical parameters. VJ is determined through vertical velocity components and gravity during takeoff phase. Jumping process requires an external force as the ground reaction force which is the result of torques generated towards the ground. Moreover, amount of force is also dependent to muscular properties. Ground reaction force should be greater than weight, which will be transmitted to the body and determine velocity of center of mass.⁶ Studies investigated the relationships between muscle strength performance and sprinting have had different limitations and reported only weak to no relationships so far. The reason stated for these weak correlations were due to the examination of only one type of muscle contraction or joint action, or an incomplete investigation of the relationship between strength and sprint performance measurement.⁷

Although the method of choice for assessing the strength of muscles was manual muscle testing, the measurements that it provides are far less precise and sensitive than those obtained with various instruments. A hand-held dynamometer (HHD) is a portable device that can be used to obtain more discrete, objective measures of strength during MMT than can be achieved via traditional MMT. The probability of Hand-held devices makes them unique and desirable for muscle strength testing in most situations. Traditional MMT offers a subjective measure of strength based on a 0 to 5 scale, it is largely dependent on the providers educational and clinical experience.⁸ Among these trunk and ankle MMT was measured with Modified Sphygmomanometer test (MST) which is another low-cost clinical method providing the objective measures.⁹

Material and methods: This study was conducted among 62 undergraduate males aged between 18 to

25 years. Prior to participation, the participants were explained about the study and an informed consent was obtained from them. Ethical clearance was obtained from University ethics committee. **Inclusion criteria:** Male undergraduate college students aged between 18 to 25 years with full ROM of all joints. **Exclusion criteria:** Presence of any musculoskeletal, neurological and cardiovascular condition or any other pathological condition contraindicating exercise participation and those who actively participated in sports in last 6 months.

Evaluation of Jumping Ability: The participants were made to stand beside the wall to reach up with his hand, keeping the feet flat on the ground. A black chart on the wall was marked with horizontal lines that had 1 cm between each line. At first the participants were made to dip their hand in chalk powder and then to touch the black chart forming a mark, the highest point of the fingertip was marked on the wall. This point was termed as standing reach height. The second point marked was the highest point that the person could achieve by jumping vertically. The participants were allowed to perform a squat during the jump. This highest point was marked and recorded. The difference between the first and second point marked was the score. Prior to the jump, 10-15 minutes of warm up exercises including stretching of hamstrings, tendoachilles, iliopsoas, adductors and mobility exercises of the lower limb and also, stretching of biceps, triceps, shoulder, pectorals, trunks was done. Slow skipping and marching was included too. The best of three attempts was recorded.¹ Anthropometry evaluation was done by using ISAK protocol. The following 26 parameters were chosen. Basic parameter: Height (measured by a measuring tape in cm), Weight (measured by a weighing scale in kg); Skin folds (Measured using skin fold caliper) – Biceps, Triceps, Subscapularis, Forearm, Iliac crest, Abdominal, Front thigh, Medial calf; Girths – Arm (relaxed), Arm (flexed and tensed), Forearm, Wrist, Chest (mesosternal), Thigh, Calf, Abdomen, Gluteal; Length – Acromione – radiale, Radiale – stylium, Distylium – dactylium, Trochanterion – tibiallaterale, Tibia laterale – sphyrontibiale; Breadth – Humerus, Femur; Lower limb and trunk Manual Muscle Testing: Evaluated by HHD and MST; Range of Motion: Using goniometry.

Statistical analysis: Data was expressed in terms of Mean and SD. Pearson's correlation was used to correlate between the parameters. $P < 0.05$ is considered statistically significant.

Result

Out of the 58 parameters selected for this study, 1 parameter showed excellent negative correlation (weight), 17 parameters showed good negative correlation (BMI, Skin fold of triceps, Front thigh, Girth of right arm relaxed, right arm flexed, right wrist, chest, abdomen, gluteal, right upper thigh, right calf, left arm relaxed, left arm flexed, left wrist, left upper thigh, left calf and breadth of femur), 12 parameters showed moderate correlation, 16 parameters showed poor negative correlation and 12 parameters showed poor positive correlation.

Discussion

The baseline parameters selected for the study were Age (years), Height (cm), Weight (kg). The result of this study showed that among 58 parameters, the most important and significant parameter affecting jumping height was found to be Weight (kg), which gave an excellent negative correlation with jumping height (cm), (p value >0.001) and persons correlation of -0.655 . These findings were supported with the findings of Chhaya Verma et al. (2014) where the study focused on the effects of Plyometric training on VJ height and they found a significant negative correlation with BMI in untrained boys and girls, suggesting that as the BMI increases, the VJ height decreases.¹ This was in tandem with present study which showed weight as an excellent negative correlation with jumping height. This negative correlation may be due that the velocity of the VJ will be lesser with the increase in body mass and ground reaction force.

The present study showed good significance in skin fold measurements. A study by Ali Fattahi et al. (2012) supported these findings in their study on volleyball players. They found that high vertical jumps require forces greater than gravity as the negative force. Fat also showing positive correlation with body weight and body mass. More fat causes more body weight that requires greater forces in order to overcome gravity force. The present study showed similar results with body weight being the parameter showing excellent correlation with jumping height. Muscle size effects force production and jump performance. It can also be considered that, greater physiological cross section of muscles contains more sarcomers contributing in muscular contractions which leads to more cross bridges foundation and finally greater force production.⁶ But this study was conducted on trained athletes and hence, cannot be compared to normal untrained healthy individuals as higher girth does

not mean higher muscle power for jumping in untrained individuals.

Matthew Wyon et al. (2006) found jump height was seen to be specific to company position and gender in ballet dancers, showing a significant influence on calf and thigh girth circumferences.⁵ This may be due to them being trained individuals, possessing stronger muscles and their muscle girth being fat-free unlike untrained individuals. The present study focuses on untrained healthy individuals and hence, gives an opposite result, where the decrease in muscle girth and weight, increases jumping height.

D. Scott Davis et al. (2003) in their study concluded that a significant correlation exists between vertical jump performance and percent body fat, age, balance, right calf girth, and the time required to perform Margaria-Kalamen anaerobic power test. The present study also showed similar results of significance on the correlation of jumping height with body-fat (using skin-fold measurement), calf girth and body weight. Their study concluded that increased calf girth was either related to cross sectional area of a muscle or the degree of body fat present in the calf area. Since cross sectional area of a muscle is related to maximum force capability of a muscle, it may be a better predictor of VJ than simply measuring girth.¹⁰ Percent body fat and weight were measured using the Bod Pod (Life Measurement Co. Concord, CA) in their study. Lack of measurement of girth by skin-fold was seen to be a limitation of their study. The present study measured muscle girth and it showed a negative significant correlation with jumping height.

Body fat percentage was found to have significant correlation to jumping height in many research studies. A study conducted by Nahdiya Zainal Abidin et al. (2013) on male and female martial artists, stated that male athletes had the advantage in VJ.¹¹ The present study supports this conclusion as it was determined that body fat percentage was inversely proportional to jumping height. Both the studies agreed upon body fat percentage being an anthropometrical factor that had a significant negative correlation with jumping height.

Limitation: Samples were selected exclusively from south zone population of India.

Female participants were not included in this study.

Conclusion

There exist significant relationships between the anthropometric parameters and jumping ability. The most significant parameter affecting jumping height was found to be Weight, which gave an excellent negative correlation and the other parameter were muscle girth hand skin fold.

Conflict of Interest: There is no conflict of interest.

Source of Funding: Self

Ethical Clearance: Yenepoya (Deemed to be University) Ethics Committee

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Latent Trigger Point Therapy for Smartphone Users

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Abstract

Multi-touch smartphones are used for a wide variety of tasks, including accessing the Internet, social media, etc. Trigger points (TrPs), causes referred pain in characteristic areas for hand and forearm muscles. Latent TrPs cause stiffness and limitation of ROM but no pain. Self Myofascial release (SMFR) is a simple and effective technique in which the therapy is done by the patient themselves often using a tool. Objectives: To find out the effectiveness of Self Myofascial Release therapy and Educational booklet among college students with latent trigger points. Methodology: 120 subjects, male and female having latent TrPs with mean age 22.3 (± 2.36), fulfilling the selection criteria were included. Subjects were examined to find out latent trigger point PPT with help of Pressure Algometer on muscles of hand. Subjects were instructed SMFR therapy via tennis ball (2 mins, twice a day for 2 weeks) on the affected muscles. Post test examination of PPT was taken. Result: The mean age was calculated to be 22.3 (± 2.36) were analyzed. Right hand Adductor Pollicis muscle and Left hand 1st dorsal interosseus muscle was found to be most affected ($p < .00001$) and Opponens pollicis on both sides were least affected. Educational booklet was given for creating awareness and was found to be helpful. Conclusion: Smartphones with greater dimensions promotes predominant usage of thumb while typing. SMFR and Educational booklet appears to be effective in reducing pain and addictive behaviour among Smartphone users.

Keywords: Myofascial release; latent trigger points; pain pressure threshold (PPT).

Introduction

Multi-touch smartphones have since the first generation of iPhone and Android devices changed the way we interact with mobile phones. In early 2000s, that is phones were mainly used for calls and texting. In contrast, we now use our smartphones for a wide variety of tasks, including accessing the Internet, social media and games^[1].

The incidence of musculoskeletal and cumulative disorders of hand, wrist, forearm, arm and neck has been increasing all over the world due to prolonged, forceful, low amplitude, repetitive use of hand-held devices. ^[2] Knowing the pattern of these movements can give us scientific information about sources of above stated problems and perhaps, methods for controlling and eliminating them^[3].

Texting thumb”, “Playstation thumb” or “Blackberry thumb are some of the common repetitive strain injuries

which occur as a result of extensive movements of finger while playing video games, browsing or texting in smartphone^[2]. Sustained gripping and repetitive movements with thumb and fingers have identified as risk factors which may lead to disorders of thumb^[3].

Myofascial pain is a chronic condition that affects the fascia. It may involve either a single muscle or a muscle group. In some cases, the area where a person experiences the pain may not be where the myofascial pain generator is located. Experts believe that the actual site of the injury or the strain prompts the development of a trigger point that, in turn, causes pain in other areas. This situation is known as referred pain^[4].

A latent Myofascial trigger point (MTP) is defined as a focus of hyperirritability in a muscle taut band that is clinically associated with local twitch response and tenderness and/or referred pain upon manual examination. ^[5] Pressure pain thresholds (PPT), the minimal pressure when the sensation of pressure changes to pain. Pressure

algometers are designed to measure deep pressure pain thresholds or tenderness resistance. When a particular site of the body is pressed with a rubber disk having an area of 1 cm², the device displays the pressure^[6].

Self Myofascial release (SMFR) is a simple and effective technique in which the therapy will be done by the patient themselves rather than a clinician doing for them, often using a tool. Following are the common SMR tools available such as Cylindrical foam rollers, Textured cylindrical foam rollers, Vibrating textured cylindrical rollers, Hand-held massage rollers, Massage balls (tennis ball, lacrosse ball, squash ball) etc^[7].

High level of addiction to the Smartphone is one of the main reasons for distractions from studies. Furthermore, touch screen is very simple and user friendly which will act as catalyst in the addiction scenario. Upper extremity musculoskeletal problems like repetitive strain injuries (RSI) especially the thumb have been lately stated for touch screen device users due to text messaging, browsing, gaming etc.

Treating latent MTPs will decrease pain sensitivity, improve motor functions and prevent latent MTPs from transforming into active MTPs, and hence, prevent the development of myofascial pain syndrome.

Methodology

Single group experimental pre and post test design. 120 target sample was identified based on selection criteria using cluster sampling method. College going students- 18- 25 years, both genders, Smartphone usage of minimum 6 months, Minimum 4 inch screen size and

maximum 7 inch screen size, Presence of Latent trigger points were included in the study. Students indulged in fine movement activities, vascular disorders, connective tissue disorders, recent immobilization of upper limb were excluded from the study.

Test Procedure:

- Subject was in sitting position and the area to be tested was exposed. Procedure was explained to the subject and was asked verbally to indicate the onset of pain with a “Yes.” Subject pointed to the specific area of discomfort. Researcher palpated the area with fingertip to identify the point of maximum sensitivity and the point was marked with a pen and its location was documented with reference to an anatomical landmark for future testing.

- Then the subject was remind to say “Yes” upon the onset of pain and the researcher placed the applicator tip (algometer) over the mark and applied force perpendicular to the skin’s surface at a gradually increasing rate of 2 pounds per second. Researcher will remove the algometer when the patient says “Yes,” and algometer will automatically record the result. In the same way contra-lateral side was tested.

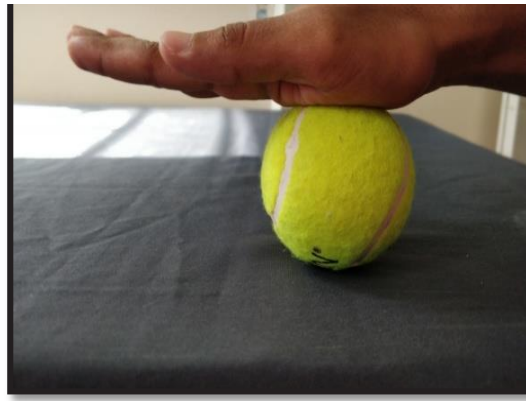
- The mean of 3 trials was calculated for each tested location and was used for the analysis. Thirty seconds of rest was given between each trial. Then the proforma was distributed to the respondents and was asked to fill it up in the presence of researcher.

Treatment protocol:



Adductor Pollicis

Figure-1: Presssure Pain Threshold measurement by Algometer



Adductor pollicis

Figure-2: Self Myofascial Release Therapy

- Participants was instructed to roll a tennis ball (keeping it over a table) on the thenar aspect on the affected muscles for 2 minutes, twice a day for 2 weeks. Participants was instructed to apply as much pressure as they can, pushing into discomfort but not pain, as greater pressures have shown to have better benefits on flexibility.

- The participants was organized together with a whatsapp group for follow up and to clarify queries; if any. After 2 weeks, again subjects were assembled in a group as in pre-assessment and post-assessment was done using pressure algometer.

Findings

Table-1: Distribution of subjects with Latent trigger points according to gender

S. No.	Gender	No. of subjects	Percentage
1.	Male	47	39%
2.	Female	73	61%

Table-1 Shows gender distribution of 120 subjects among smartphone users with latent trigger points, out of which 47(39%) were males and 73(61%) were females.

Table- 2: Mean ± S.D of baseline characteristics

S. No.	Variables	Mean	S.D
1.	Age (years)	22.3	±2.36

The table 2 presents the outcomes of baseline characteristics of 120 subjects who underwent self-myofascial release in which Mean and SD of Age (22.3 ±2.36years) was obtained among smartphone users with latent trigger points

Table-3: Range, Mean and SD of pre and post test PPT (Right extremity) of subjects with latent Trps.

S.no.	Muscles affected	Self- Myofascial Release Therapy				Wilcoxon test	p-value
		Pre-test (PPT)		Post- test (PPT)			
		Right		Right			
		Range	Mean \pm SD	Range	Mean \pm SD		
1.	Adductor Pollicis	0-6.13	3.21 \pm 1.79	0-8.96	4.76 \pm 5.52	Z= -7.75	< .00001
2.	Opponens pollicis	0-6.56	2.79 \pm 2.26	0-8.6	3.44 \pm 2.71	Z=-6.42	< .00001
3.	1 st dorsal interossei	0-6.6	3.54 \pm 1.21	0-6.5	4.37 \pm 1.34	Z=-7.76	< .00001

The above table shows the pre and post test outcome measure Pain pressure threshold (PPT) in subjects with latent trigger points. In Pre test, Adductor Pollicis muscle was most affected and ranging within 0-6.13 with mean and SD of 3.21 \pm 1.79. In Post test, it was found to be increased to the range 0-8.96 with mean and SD of 4.76 \pm 5.52.

The non-parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be statistically significant ($p < 0.001$). It evidence that there is a significant increase of pain pressure threshold among the subjects with latent trigger points treated with Self- Myofascial Release Therapy.

Table-4: Range, Mean and SD of pre and post test PPT (Left extremity) scores of subjects with latent TrPs.

S.no.	Muscles affected	Self- Myofascial Release Therapy				Wilcoxon test	p-value
		Pre-test (PPT)		Post- test (PPT)			
		Left		Left			
		Range	Mean \pm SD	Range	Mean \pm SD		
1.	Adductor Pollicis	0-6	3.06 \pm 1.57	0-6.83	3.99 \pm 2.08	Z= -7.61	< .00001
2.	Opponens pollicis	0-6.06	2.72 \pm 2.35	0-8.46	3.22 \pm 2.76	Z=-5.16	< .00001
3.	1 st dorsal interossei	0-6.9	3.46 \pm 1.35	0-7.06	4.22 \pm 1.44	Z=-6.63	< .00001

The above table shows the pre and post test outcome measure PPT in subjects with latent trigger points. In pre test, 1st dorsal interossei muscle was most affected and ranging within 0-6.9 with mean and SD of 3.46 \pm 1.35. In post test, it was found to be increased to the range 0-7.06 with mean and SD of 4.22 \pm 1.44.

The non-parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be statistically significant ($p < 0.001$). It evidence that there is a significant increase of pain pressure threshold among the subjects with latent trigger points treated with Self- Myofascial Release Therapy.

Discussion

The present study was conducted in order to find out the effectiveness and behaviour of the muscles during texting and to examine whether self-myofascial release, using a tennis ball is effective in reducing MTrP sensitivity.

There has been a dramatically increased use of mobile phones for texting especially among young people. Due to intensive texting on mobile phones, there is a widespread musculoskeletal disorders of the hand and forearm^[8].

While it is thought that latent MTrPs are precursors to active MTrPs, factors that facilitate the transformation remains difficult to identify. Prolonged postural activities, may contribute to the formation or propagation of MTrP^[5].

Myofascial therapies cover a numerous and varied spectrum of techniques, including osteopathic soft-tissue techniques, structural integration (Rolfing), massage including connective tissue massage (CTM), instrument assisted fascial release, myofascial trigger point therapy, strain-counter strain and muscle energy technique (MET). Myofascial release (MFR) techniques have evolved as a result of current research^[9]. Self Myofascial release (SMFR) is a simple and effective technique in which the therapy is done by the patient themselves rather than a clinician doing for them, often using a tool.

The current study revealed that Right hand Adductor Pollicis and Left hand 1st dorsal interossei muscle was found to be most affected. [Pre-test PPT (3.21±1.79), Post test, (4.76±5.52), Pre-test PPT (3.46±1.35). Post test, (4.22±1.44)], respectively.

Deepak Sharan et al, in his study revealed that while texting in mobile, the thumb covers motions in all planes of extension, flexion, abduction-adduction and opposition which is one of the main triggering factor. The continuous contraction of Adductor Pollicis, opponens pollicis and 1st dorsal interossei during typing results in microscopic damage to the muscles^[3]. Small buttons and flexion-extension orientation increase the muscle fatigue in 1st dorsal interossei, which is a prime muscle for thumb movements. This was reported by one of the study done by Xiong and Muraki (2014). Abductor Pollicis Brevis and 1st dorsal interossei were the two muscles measured with the use of EMG instruments for investigating smartphone operation and muscle fatigue.

They revealed that touch key size and thumb moving orientation affect the thumb performance^[10].

Eapen et al 2010, in his study revealed that Static loading by constant holding of the hand held devices and an overuse of the hand muscles are a possible cause for the development of myofascial pain syndrome of forearm muscles^[11].

In current study, it was found that there is an elevation in PPT after a treatment of 2 weeks (Everyday rolling the ball for 2 mins, twice a day on affected muscles). A significant increase in PPT was detected between pre and post test for the affected muscles.

Ergonomic booklet was given to reduce the addictive behaviour and for following recommendations like to support the forearms, to use both thumbs, to avoid sitting with the head bent forward, to avoid texting with high velocity in order to prevent the formation of trigger points or preventing the latent to transform it into active trigger points when using mobile phones for texting^[8].

35% of subjects found the educational booklet to be very helpful. 25% of subjects found it to be oftenly helpful and rest 40% of subjects did not reported only. From the result we can conclude that Ergonomic recommendations via educational booklet can help as an adjunct in decreasing the pain and development of trigger points.

Convenience does not mean that we should pay lots of attention on smartphone but try to find an appropriate way to make it as a useful tool. MTrPs because of smartphone usage are very common and are unavoidable. So, it can be prevented by Self- Myofascial Release therapy and educational awareness.

Limitations:

Gender equality not taken into account and no quantification of the pressure applied on the tennis ball was attempted.

Conclusion

Smartphones with greater dimensions that promotes the predominant usage of thumb while typing are associated with higher prevalence of myofascial trigger points.

Educational booklet has been shown to be effective in creating awareness for correct usage of mobile phones.

Hence, the users are advised to perform self-myofascial release which has proven to increase PPT and follow the guidelines of educational booklet.

Future Recommendations:

1. To find out the normative value of pain pressure threshold of hand using this as reference.
2. Recruitment of samples from professions which require high usage of hand held device.

Conflict of Interest: Manuscript title: “Latent Trigger Point Therapy For Smartphone Users “

I certify that there is NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers’ bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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Review Board on Ethics for Research

Review Category: *Exemption from Review*
Expedited Review *Full Review*

We hereby declare that the project titled, “Latent Trigger Point Therapy For Smartphone Users” carried out by Dr. Namrata Mehta, of II Year M.P.T. has been brought forward for scrutiny to the board members.

Involvement of Special groups: No

Type of Study: Experimental Study AV Needs: Yes

After analyzing the objectives, subjects involved and the methodology of the study, the following conclusions were drawn. The study does not cause any

mental or physical harm to the subjects involved and there are no risks involved in the study. The performance of the study procedure will not cause any injury to the subjects. The board has evaluated and confirmed that the experimenter is trained and qualified in measuring outcome. The informed consent form ensures that the experimenter explains the procedure of the study to the subjects, their voluntary participations is confirmed and the identification of subjects is maintained confidential.

More over the finding of the study will benefit similar subjects, the profession and the society. Hence the review board has no objections on the conduct of the study.

Chairman: Dr. C. Prabhu

Vice Chairman: Prof. Ahamed Thajudeen

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Comparison of Handwriting Legibility and Visual Motor Integration in Different Age Groups

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Abstract

Comparison of handwriting legibility and visual motor integration in different age groups was performed on adults and old age person . Three group were formulated of 20-39, 40-59 and 60-79. Handwriting Assessment Battery for Adults and Bender Visual Motor Gestalt Test were assessed for all three groups. It was analysed that Handwriting Legibility decreases with age. The most affected factors were Word Legibility and Letter Legibility. Whereas Visual motor integration is maximum in 40-59 and least in Group 60-79.

Keywords: Handwriting legibility, Visual- motor integration

Introduction

Legibility as per Cambridge dictionary is degree to which writing or text can be read easily because the letters are clear. Handwriting is considered a complex skill involving an intricate interchange of not only visual and motor abilities, but also cognitive and perceptual processes, psychosocial, biomechanical, and environmental factors.^[1,2]

Handwriting is a perceptual-motor skill that is dependent on the maturation and integration of a number of cognitive, perceptual, and motor skills and is developed through instruction. It is an academic skill that allows individuals to express their thoughts and feelings and communicate with others. The ability to copy geometric shapes is considered an indication of writing readiness in young child, as it requires crossing the body midline and has been implicated as the root of reversal problems.^[2]

As a complex upper limb task, handwriting requires

underlying motor, sensory, cognitive and perceptual skills. Impairment of any of these underlying skills can result in poor handwriting performance or output.^[3]

Visual motor integration is defined as a smooth integration between the visual-perceptual and motor skills, which requires the ability to translate the visual perception of motor function, or the ability to coordinate hand and eye. The learning of writing skills depends on visual perception, as it is used to construct internal representations of visual information that provides characteristics such as shape, size, position in space and distance of letters.^[1]

Visual-motor integration (VMI) is the ability of the eyes and hand to work together in smooth, efficient patterns. VMI consists of coordinating visual perceptual skills together with gross-motor movement and fine-motor movement. It is the ability to integrate visual input with motor output. This is how individuals plan, execute, and monitor motor tasks, such as threading a needle, tying shoelaces, and catching or hitting a ball. It is also essential in academic performance. It has been observed that as patient's ability to copy the forms on the VMI increases, a concomitant increase in ability to copy letters accurately is seen.^[2]

The predictive value of visual-motor integration of

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the quality of handwriting is considered positive in some studies but not in others.^[4]

It is evident from literature that handwriting is an essential skill for adults and it is affected by VMI. Based on the above literature, this study will aim to compare and correlate various factors of handwriting legibility and VMI. It will also compare the effect of horizontal and vertical planes on VMI. The Aim of this study was to Compare handwriting legibility and visual motor integration in different age groups.

Methodology

Research design:

Comparative study

Sampling:

Convenient sampling

Sample Size:

30 adults of ages 20-79 years. There were 17 females and 13 males who participated.

They were then divided into 3 groups:

Group A: consisted of 10 adults of 20-39 years of age

Group B: consisted of 10 adults of 40-59 years of age

Group C: consisted of 10 adults of 60-79 years of age

Collection of data:

Community

Outcome measures:

1) Handwriting Assessment Battery for Adults
The permission was taken by the Author

The Handwriting Assessment Battery (HAB) contains three sections with items selected and adapted from eight subtests of the MAS, the Jebsen, and the ETCH. Each of the HAB subtests provides a profile of performance in the areas of pen control and manipulation, writing speed, and writing legibility. Section 1 of the HAB (Pen Control and Manipulation) contains two subtests from the MAS. These subtests require a person to (1) draw at least 10 horizontal lines

with a pencil in 20s on an A4 page with two premarked vertical lines, with the person starting and stopping at the vertical lines, and (2) make 10 or more rapid consecutive dots with a pencil in 5s. Participants are scored on the best of three attempts. Each subtest is scored as either "Achieved" (score of 1) or "Not achieved" (score of 0). Section 2 of the HAB (Writing Speed) consist of subtest which involves the timed copying of a sentence of third-grade reading difficulty using the dominant hand only. One prewritten sentence is selected randomly from a set of three, each containing 24 letters. Participants copy the sentence as quickly as possible using printed or cursive writing. The time, in seconds, is recorded and compared with published norms for adults. Section 3 of the HAB (Writing Legibility) contains five legibility subtests derived from the ETCH: (1) lowercase alphabet (a to z); (2) uppercase legibility (A to Z); (3) numeral legibility (numbers 1-12); (4) sentence composition-words; and (5) sentence composition-letters. Each subtest provides a percentage legibility score, which is determined by comparing letters and words to acceptable or unacceptable. Maximum legibility score is 100%.^{[5][6]}

The manual contains standardized administration instructions for three sections. The training, administration and scoring. The manual for the Handwriting Assessment Battery for Adults provides therapists with quantifiable outcomes.. Scoring tables increase the ease of marking by reducing calculation time.^[7]

2) Bender Visual Motor Gestalt Test (BVMGT)
:Test was Purchased This test consists of nine simple figures characterized by their Gestalt. It is not a test of visual memory or imagery, rather is one of perception and visual motor functioning. It measures the visual acuity and motor functioning. The test can be administered on children or adults. After seating comfortably, the therapist should ask the patient to copy the card design on the paper and make it as like the drawing on the card as possible.. It is a quantitative procedure. The protocol is searched for 15 signs. Each sign is scored only once. Each sign is given a numerical weight. Each sign is scored on the basis of 'All or None'. No sign is partially present. Numerical weight for a sign remains the same whether that particular sign is observed only in one design or in all the nine designs.

Inclusion criteria:

1) Adults from 20-79 years old who could

communicate, understand the purpose of the research and give their consent for the participation in the study

- 2) No history of psychological problem

Exclusion criteria:

- 1) Conditions such as amnesia, CVA etc
- 2) Subjects below 20 years or above 79 years of age
- 3) Subjects who could not communicate in the English language

Procedure:

- 1) Convenient sampling was done and 30 subjects of 20-79 years were selected to participate in the study.
- 2) The participants gave their informed written consent. They were informed that they could withdraw themselves at any time during the study.
- 3) The participants were made to perform the HAB and the BVMGT.
- 4) Scores obtained from both the tests were analyzed.

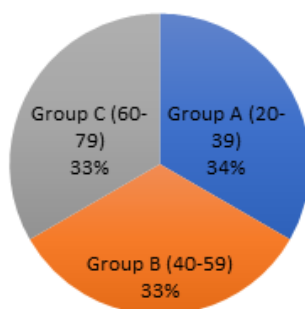
Results

Basic characteristics:

30 subjects were divided into 3 groups {A(20-39), B(40-59) and C(60-79)} 10 in each group as reflected in Graph 1:

Comparison between handwriting legibility and visual motor integration in different age groups:

GRAPH 1



I. Comparison of handwriting legibility mean and standard deviation for 3 groups as shown in table 1:

- 1) Lower Case Legibility
- 2) Upper Case Legibility
- 3) Number Legibility
- 4) Word Legibility
- 5) Letter Legibility

1) Lower Case Legibility

a) Lower Case Legibility between 3 groups, namely Group A, Group B, Group C was compared.

b) Group A had the highest mean (98.9) while Group C had the lowest mean (89.5).

c) This shows that the Lower Case Legibility is better in Group A (age group 20-39) than both the other groups. It can be seen in Graph 2.

2) Upper Case Legibility

a) Upper Case Legibility between 3 groups, namely Group A, Group B, Group C was compared.

b) Group A had the highest mean (100) while group C had the lowest mean (96.5).

c) This shows that the Upper Case Legibility is better in Group A (age group 20-39) than both the other groups. It can be seen in Graph 2.

3) Number Legibility

a) Number Legibility between 3 groups, namely group A, Group B, Group C was compared.

b) Group A had the highest mean (100) while group C had the lowest mean (98.3).

c) This shows that the Number legibility is better in Group A (age group 20-39) than both the other groups. It can be seen in Graph 2.

4) Word Legibility

a) Word Legibility between 3 groups, namely Group A, Group B, Group C was compared.

b) Group B had the highest mean (96) while Group C had the lowest mean (81.3).

c) This shows that the Word Legibility is better in Group B (age group 40-59) than both the other groups. It can be seen in Graph 2.

5) Letter Legibility

a) Letter Legibility between 3 groups, namely Group A, Group B, Group C was compared.

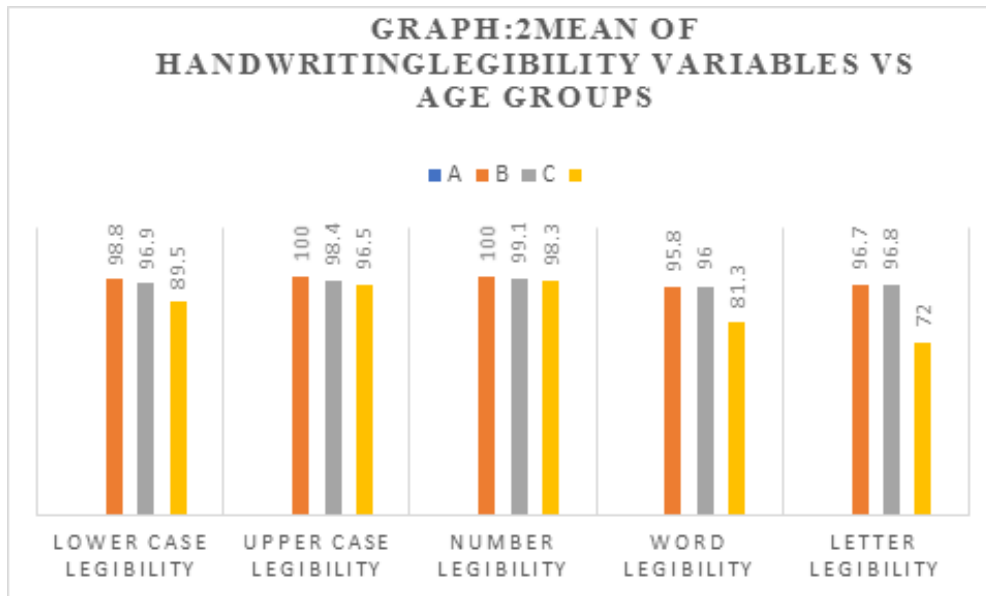
b) Group B had the highest mean (96.8) while Group C had the lowest mean (72).

c) This shows that the Letter Legibility is better in Group B (age group 40-59) than both the other groups. It can be seen in Graph 2.

Table 1: Mean and Standard deviation of handwriting eligibility variables

Groups	LOWER CASE LEGIBILITY		UPPER CASE LEGIBILITY		NUMBER LEGIBILITY		WORD LEGIBILITY		LETTER LEGIBILITY	
	MEAN	STD. DEV	MEAN	STD. DEV	MEAN	STD. DEV	MEAN	STD. DEV	MEAN	STD. DEV
A	98.8	1.8	100	0	100	0	95.8	6.8	96.7	4.8
B	96.9	4.7	98.4	2.7	99.1	2.6	96	12.6	96.8	10
C	89.5	8.1	96.5	3.8	98.3	3.5	81.3	22	72	29.4

II. Comparison of visual motor integration mean and standard deviation for 3 groups



Visual Motor Integration between 3 groups, namely Group A, Group B, Group C was compared. Table 2 represents Mean and standard deviation of visual motor Integration in all three age groups

a) Group C had the highest mean (11.6) while Group B had the lowest mean (6.8).

b) The difference between the mean of Group C and Group B is 4.8.

c) This shows that the Visual Motor Integration is better in Group B (age group 40-59) than both the other groups.

Table3: Mean and Standard Deviation of Visual motor integration in all three groups.

Group	Visual Motor Integration	
	MEAN	STD. DEV
A	10.1	4.8
B	6.8	4.1
C	11.6	4.5

Discussion

The study aimed to compare the changes in handwriting legibility factors (lower case legibility, upper case legibility, number legibility, word legibility and letter legibility) and visual motor integration (VMI) individually.. A sample of 30 subjects were taken and were divided into three groups of 10 each , according to age. Group A,BandC consisted of subjects of age group 20-39 , 40-59 and 60-79 years respectively.

Handwriting legibility (HL) cannot be compared whole. It is a broad term, which consists of various factors such as lower case legibility (LCL), upper case legibility (UCL), number legibility (NL), word legibility (WL) and letter legibility (LL). The Handwriting Assessment Battery for Adults, version 5 (HAB) and the Bender Visual Motor Gestalt Test (BVMGT) were used for measuring handwriting legibility and visual motor integration, respectively.

For comparing legibility in the three groups, HAB scoring was carried out for individual factors and mean of each factor was calculated for each group. These were further compared with each other. The results indicated that LCL (98.9), UCL (100) and NL (100) was the most in Group A while WL (96) and LL (96.8) was most in Group B. Group C had the least Legibility in all factors (LCL: 89.5; WCL: 96.5; NL: 98.3; WL: 81.3; LL: 72). When comparing VMI, it was observed that the more the subjects made errors in copying the designs, higher they scored on the BGVMT. After scoring each subject, the mean of the BGVMT scores were taken for each of the three groups and compared with each other. The mean values decreased from Group A (10.1) to Group B (6.8), but increased again in Group C (11.6). Thus, it can be said that VMI was maximum in Group B and least in Group C.

The study conducted by Eunhwi Kim et al (2014) [8] supported this result. It stated that the VMI decreased with age. Among the 10-year age groups from the 20s to 70s, the youngest population had the highest mean score, and the oldest had the lowest scores. It also studied the effect of Age on decrease in VMI and concluded that there is cognitive decline with age. However, a study conducted by Bronwyn Simpson et al (2015) [3] investigating the feasibility of a home-based program to improve handwriting after stroke, provided contradictory views. They concluded that as writing the alphabet is not a task most adults perform, these outcome measures for legibility may be less meaningful.

Conclusion

The results of this study showed that age group 60-79 years had the lowest Handwriting Legibility scores in comparison to age group 20-39 years and age group 40-59 years. It implied that Handwriting Legibility is affected by age and Handwriting Legibility decreases with age. The most affected factors were Word Legibility and Letter Legibility.

For Visual motor integration analysis it was found that it is maximum in 40-59 and least in Group 60-79. It can be because of aging process, as age increases the eye hand coordination decreases.

Conflict of Interest – Nil

Source of Funding- Self

Ethical Clearance – observational study , study was done in community.

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A Study to Compare the Effect of Inverse Ratio Breathing and Diaphragmatic Breathing on Pulmonary Functions in Obese Female – An Interventional Study

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Abstract

INTRODUCTION: Obesity has become a major public health concern in many parts of the world. Obese individuals have alteration in respiratory mechanics, decreased chest wall and lung compliance, decreased respiratory muscle strength and endurance, decreased pulmonary gaseous exchange and limitation in exercise capacity. In Inverse ratio breathing, the ratio of inspiration to expiration becomes 2:1, While diaphragmatic breathing involves slow and rhythmic breathing.

AIM OF THE STUDY: To compare the effect of inverse ratio breathing and diaphragmatic breathing on pulmonary functions in obese female.

METHOD: This study was carried out in and around Rajkot city. Subjects who fulfil inclusion and exclusion criteria were selected by purposive sampling and were assigned to group A and group B by simple random sampling. They were explained about the study, its usefulness and written consent was taken. 30 subjects were divided into two groups: Group A: 15 subjects were given diaphragmatic breathing, Group B: 15 subjects were given inverse ratio breathing.

DATA ANALYSIS: Data were analysed using SPSS 20 software by applying Paired and Unpaired t-test.

RESULT: Pre-treatment and post-treatment FVC, FEV1 and FEV1/FVC ratio were analysed, it was statistically significant (P value < 0.05) in both the groups but when comparison was done between two groups, it was statistically non-significant (P value > 0.05).

OUTCOME MEASURE: FVC, FEV1 and FEV1/FVC ratio.

CONCLUSION: Inverse ratio breathing and Diaphragmatic breathing both were effective in improving pulmonary functions in Obese female after performing breathing techniques for consecutive 3 days (once a day). But there was no significant difference between the two groups in improving pulmonary function in obese female.

KEYWORDS: FVC, FEV1, FEV1/FVC ratio, BMI, Waist Circumference, Obese Female.

Introduction

Obesity becomes a major public health concern in many parts of the world.¹ World health organization

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(WHO) defines Obesity as : An abnormal or excessive fat accumulation that presents a risk to health.¹ **Individual having Body Mass Index (BMI) greater than 30kg/m²** is termed as obese individual by WHO.¹ Women having waist circumference greater than 80cm is termed as having Abdominal Obesity as per World Health Organization Asia Pacific prospective guidelines.²

Prevalence of obesity among Indian women is 7.8% in 2016 and particularly in Gujarat obesity in women is

17.7% in 2016.³

The normal inspiration to expiration ratio is 1:2 that is the duration of expiration is twice that of inspiration. Inspiration can be prolonged till the tidal volume increases three times the normal, after which the stretch receptors in the lungs are activated and that transmit signals to the Dorsal Respiratory Group of Neurons when the lungs become overstretched and this stops the emission of inspiratory signals. In this manner one can prolong the duration of inspiration such that it becomes double the duration of expiration. This is called as inverse ratio breathing in which the ratio of inspiration to expiration becomes 2:1.

Diaphragmatic breathing is done by contracting the diaphragm, a muscle located horizontally between the thoracic cavity and abdominal cavity. Air enters the lungs and the belly expands during this type of breathing; deep breathing is marked by expansion of the abdomen rather than the chest wall.

Among Obese individual, Accumulation of the fat in abdominal and chest wall alters the relationship between lung, chest wall, and diaphragm. Which leads to alteration in respiratory mechanics, decreased chest wall and lung compliance, decreased respiratory muscle strength and endurance, decreased pulmonary gas exchange and limitations in exercise capacity. Obesity promotes abnormalities in ventilation/perfusion balance which leads to hypoxemia at rest and in supine position probably due to the closure of small airways. Hence there is a need to improve pulmonary functions in obese individual. Till now studies have been found which improves pulmonary functions using techniques like MET, Chest mobility exercise, Respiratory PNF, Diaphragmatic breathing etc. Yet no study have been found which shows effect of inverse ratio breathing and diaphragmatic breathing on pulmonary functions in obese individual.

So the purpose of these study is to find out effect inverse ratio breathing on pulmonary functions in obese female and then to compare it with effect of diaphragmatic breathing on pulmonary functions in obese female. If inverse ratio breathing shows positive result in improving pulmonary function in obese individual then it can be used as an adjunct to other forms of exercises in individuals who have reduced lung volumes and capacities.

Aim & Objectives

To find out the effect of inverse ratio breathing on FEV1, FVC and FEV1/FVC ratio in obese female.

To find out the effect of diaphragmatic breathing on FEV1, FVC and FEV1/FVC ratio in obese female.

To compare the effect of diaphragmatic breathing and inverse ratio breathing on FEV1, FVC and FEV1/FVC ratio in obese female.

Hypothesis :

Null Hypothesis :

There is no significant difference between the effect of inverse ratio breathing and diaphragmatic breathing on pulmonary functions in obese female.

Alternative Hypothesis :

There is a significant difference between the effect of inverse ratio breathing and diaphragmatic breathing on pulmonary function in obese female.

Method

This study was carried out in and around Rajkot city. Subjects who fulfil exclusion and inclusion criteria were selected by purposive sampling and were assigned to group A and group B by simple random sampling. They were explained about the study, its usefulness and written consent were taken. 30 subjects were divided into two Groups : Group A: 15 subjects were given diaphragmatic breathing, Group B: 15 subjects were given inverse ratio breathing.

Inclusion Criteria:

Age group between 35-50 years.

Gender : Only female participants.

Subjects with BMI : between 30 – 39.99 kg/m².

Subjects with Waist Circumference greater than 80 cm.

Individual with ability to understand and follow the command.

Exclusion Criteria:

Subjects with neurological disorders, cardio respiratory disorders, Musculoskeletal disorders related

to spine which may affect respiratory mechanics.

Subjects who do exercise or yoga on regular basis.

Uncooperative subjects.

Subjects who denied for participation.

Co-morbidity of obesity

Body Mass Index (BMI) measurement procedure:⁷

The height (in m) and weight (in kg) of women, with shoes off and wearing the least possible clothing, was measured. The same measurements were taken for each subject.

$$\text{BMI} = \text{Body weight in Kg} / (\text{Height})^2 \text{ in m}$$

Waist circumference (WC) measurement Procedure:²

Waist circumference (WC) measurement were done with minimal, adequate clothing (light clothes) with feet together where minimum girth lies in standing position without compression of the skin.

Diaphragmatic breathing

Subjects were ask to sit in semi fowler's position. They were told to place their hand below the anterior costal margin and feel the movement occurring. Then the subjects were told to breathe in slowly and deeply through the nose allowing the abdomen to rise slightly and then relax and exhale slowly through the mouth. These breathing technique was performed for continuous 5 minutes such that patient takes 6 to 8 deep breath per minute. These breathing technique was given for 3 consecutive days (once a day).



Figure 1 : Group A

Inverse ratio breathing

Subjects were ask to sit erect on a chair. An Auditory commands was given to the subjects. The subjects were instructed to carry out inspiration for 4 seconds at a constant speed and to carry out expiration for 2 seconds. These breathing technique was performed for 1 minute, then 1 minute rest was given, again breathing technique was given for 1 min followed by 1 min rest. Likewise for total 10 minutes. These breathing technique was given for 3 consecutive days (once a day).



Figure 2 : Group B

Before and after performing breathing technique for consecutive 3 days PFT measurements were taken.

PFT procedure

Pre and post pulmonary function test was taken as per the standard outlined by American Thoracic Society. Subjects were given comfortable position on table without back support and foot resting on the floor, a soft nose clip was placed to prevent air escaping from nose and test was performed. For measurement of FEV₁, FVC and FEV₁/FVC ratio, patients were asked to take the deepest breath as much as possible than place the mouthpiece in mouth with lips sealing it and immediately exhale hard and fast for as long as possible, preferably atleast 6 seconds followed by a rapid inspiration from the mouthpiece. Three trials were given for each procedure and best trial was selected. The trial was considered "unacceptable" if it showed evidence of cough, early termination of expiration or inconsistent effort. After collection of data, pre and post value for FEV₁, FVC and FEV₁/FVC were analyzed by statistical software and results were found.



Figure 3 : Group A & B performing PFT

Table 1: shows number of subjects and distribution of age in treatment group.

Number of subjects	30
Mean Age	43.33
Std. Deviation	5.28
Minimum	35
Maximum	50

Results and Tables

Data was analyzed by using SPSS 20 software using paired and unpaired t-test. Normality was checked using Shapiro-Wilk test. The mean age was 43.33 + 5.28(SD)

Table 2 : Intra group comparison of FVC, FEV1 and FEV1/FVC ratio for GROUP A- Diaphragmatic Breathing.

Parameters	Mean ± Std. Deviation		p	Result
	Pre	Post		
FVC(l)	1.99 ± 0.29	2.15 ± 0.30	<0.05	Significant
FEV ₁ (l)	1.80 ± 0.28	1.89 ± 0.24	<0.05	Significant
FEV ₁ /FVC (%)	90.15 ± 6.16	87.94 ± 4.73	>0.05	Non-Significant

The result shows significant difference for pre and post FVC (t= -4.994, p<0.05) and FEV₁ (t= -2.863, p<0.05) but no significant difference for FEV₁/FVC ratio (t = 1.492, p>0.05) of GROUP-A.

Table 3: Intra group comparison of FVC, FEV₁ and FEV₁/FVC for GROUP B- Inverse Ratio breathing.

Parameters	Mean ± Std. Deviation		p	Result
	Pre	Post		
FVC(l)	2.10 ± 0.34	2.24 ± 0.34	<0.05	Significant
FEV ₁ (l)	1.90 ± 0.27	1.98 ± 0.26	<0.05	Significant
FEV ₁ /FVC (%)	90.81 ± 5.02	88.73 ± 4.45	>0.05	Non-Significant

The result shows significant difference for pre and post FVC (t= -4.271, p<0.05) and FEV₁ (t= -4.572, p<0.05) but no significant difference for FEV₁/FVC ratio (t = 2.028, p>0.05) of GROUP-B.

Table 4: Between group comparison of FVC, FEV₁ and FEV₁/FVC values

Parameters	Mean ± Std. Deviation		p	Result
	GROUP A	GROUP B		
FVC(l)	0.15 ± 0.12	0.13 ± 0.12	>0.05	Non-significant
FEV1(l)	0.09 ± 0.12	0.07 ± 0.06		
FEV1/FVC (%)	2.21 ± 5.75	2.07 ± 3.95		

The above table shows no significant difference in the FVC (t= 0.504, p>0.05), FEV1 (t=0.388, p>0.05) and FEV₁/FVC ratio (t= -0.079, p>0.05) between the two Groups.

There is no statistical difference when Group-A was compared with Group-B. Hence, Null Hypothesis was accepted and experimental hypothesis was rejected.

Discussion

In the present study, when the values of pre-treatment and post-treatment FVC, FEV1 and FEV1/FVC ratio were analysed, it was statistically significant in both the group but when comparison was done between them, both the technique were equally effective in improving pulmonary functions.

During normal breathing after a particular degree of stretching, pulmonary stretch receptors in alveoli are stimulated and send impulse to respiratory centers for inhibition of inhalation and to begin with exhalation. But during diaphragmatic breathing, continuation of the phase of inhalation expands the lung considerably and the walls of alveoli are stretch to the maximum extent.^{9,10}

The stretch receptors are thus trained to withstand more and more stretching, so that the duration at which inhibitory neural impulse generated by stimulation of such pulmonary stretch receptors increases, thus it improves the ventilation.^{9,10}

Some studies suggested that diaphragmatic breathing increases the lung compliance and reduces the airway resistance.^{9,10}

The reason behind it is believed that during diaphragmatic breathing the maximum deflation of lungs occurs, which is an important physiological stimulus for the release of surfactant and prostaglandin into the alveolar spaces, surfactant reduces the surface tension and improves the lung compliance, allowing the lung to

inflate more easily and reduces the airway resistance.^{9,10}

Kyochul Seo et al stated that there was a significant increase in tidal volume, inspiratory capacity, inspiratory reserve volume and breathing capacity in experimental group (Diaphragmatic group) than the control group after performing 30mins session for 3 times a week for 4 week in male smokers.¹¹

According to **Lynelle N b Pierce and Zhang WP** during Inverse ratio ventilation, inspiration time is more than expiration time which increases Mean Airway Pressure. Increase in Mean Airway Pressure, increases alveolar stability and recruitment, decreases dead space ventilation thus improves the oxygenation.¹² Along with these, as expiration time is less than inspiration time, so alveoli may not get sufficient time to empty completely during exhalation and the gas gets trapped in the lung.^{13,14} These trapped gas creates pressure in the alveoli which is called as Auto-PEEP. These will recruit those alveoli which requires more time to get recruited. increases.¹⁴ Due to this alveolar surface area increases, as more surface area is available for gaseous exchange, thus ventilation.

W.P. Zhang et al demonstrated that Inverse ratio ventilation increase Mean airway pressure, improves oxygenation and dynamic compliance of respiration in obese patient undergoing gynaecological laparoscopy and also stated that Inverse ratio ventilation is superior to the conventional ratio ventilation.¹⁴

Clinical Implication

Inverse ratio breathing and Diaphragmatic breathing showed statistical significant difference in pulmonary functions after performing breathing technique for consecutive 3 days in obese female. Hence both the technique can be alternatively used as an adjunct with other techniques for improving pulmonary functions in individual who have reduce lung volumes and capacities.

Limitations

- The Sample size was relatively small.
- Study duration of the treatment protocol was short.
- Only female participants were included in the study population.
- Blinding was not done in the study.
- Only Obese class 1 & 2 were included in the study.

Further Recommendations

- Study can be done with large sample size.
- Treatment can be given for longer duration with follow up.
- Study can be carried out including both the gender.
- Other pulmonary function parameters and outcome measures like PEFr, Chest expansion can be used.
- Different populations who have reduced lung volume and capacities can be studied.
- Blinding could be done in future study.

Conclusion

Inverse ratio breathing and Diaphragmatic breathing both were effective in improving pulmonary functions in Obese female after performing breathing techniques for consecutive 3 days (once a day). But there was no significant difference between the two Groups in improving pulmonary function in obese female.

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Ethical Clearance: From K.K.SHETH PHYSIOTHERAPY COLLEGE, RAJKOT.

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Effect of Muscle Energy Technique with Deep Friction Massage on Pain, Disability and Internal Rotation Range of Motion of Hip Joint in Individuals with Piriformis Syndrome

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Abstract

Background: Piriformis Syndrome (pseudo sciatica) is caused by pressure of an injured or irritated piriformis muscle which leads to neuritis of branches of the sciatic nerve; mimics the signs and symptoms of low back pain. Due to high incidence of low back pain in our society, P.S frequently goes unrecognized or misdiagnosed in clinical settings.

Method: Patients with piriformis syndrome were screened for inclusion and exclusion criteria after detailed assessment. 30 patients who meet the inclusion criteria were grouped into 2 groups (15 patients in each group). Control group received UST and piriformis muscle stretching and experimental group received MET with DFM. Treatment period was about 30-40min each session in regular period of 6 days for a week for both groups.

Outcome Measures: Oswestry Disability Index, Visual Analogue Scale, Standard Goniometer

Results: Statistical analysis of intergroup significance by Mann Whitney U-test for IR ROM (sig.0.000 < p = 0.05) and independent sample t-test for VAS (t = 2.895 > table value, t = 2.048) and ODI (t = 4.842 > table value, t = 2.048) reveals that experimental group shows significant difference between pre test and post test values of IR ROM, VAS and ODI than that in the control group.

Conclusion: experimental group who received MET along with DFM shows greater improvement on pain, disability and IR ROM in individuals with piriformis syndrome than those in the control group who received U.S.T and piriformis muscle stretching.

Key words: Piriformis Syndrome, MET, DFM

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Introduction

Piriformis syndrome also referred as pseudo sciatica¹ or pseudo disc² is defined as a neuritis of branches of the sciatic nerve caused by pressure of an injured or irritated Piriformis muscle³. The term “sciatica” was coined in Florence in the 15th century for the leg pain thought to originate at the ischium⁴. When the term is used, most

people think of intervertebral disc pathology as a source of the problem, radiating down the lower extremity posteriorly.

Piriformis syndrome (PS) is a painful musculoskeletal condition, characterized by a constellation of symptoms that include buttock or hip pain. There are two types of P.S: Primary P.S is caused by an anatomic variation like split Piriformis muscle, split sciatic nerve etc. The Secondary P.S, caused by precipitating factors such as macrotrauma, local ischemia, microtrauma due to overuse or direct compression (e.g.: wallet neuritis) etc⁵. In 50% of cases, piriformis syndrome is caused by a macro trauma to the buttocks⁶.

Piriformis syndrome occurs most frequently during 4th and 5th decades of life and affects individuals of all occupations and activity levels. Reported incidence rate for P.S among patients with LBA vary widely, from 5-36%^{7,8}. It is more common in women than men (6:1), possibly because of biomechanics associated with the wider 'Q' angle in the oscoxae of women⁵. A Morton foot can predispose the patient to develop piriformis syndrome. A fraction of population is at high risk, particularly skiers, truck drivers, tennis players and long distance bikers⁹.

It was first described by Yeoman in 1928¹⁰. Contemporary use of piriformis syndrome begin with Robinson⁴ 1947, who delineated five salient features; (1) History of local trauma, (2) Pain localized to SI joint, greater sciatic notch and piriformis muscle which extends along the course of the sciatic nerve and presents difficulty in walking, (3) Acute pain brought on by stooping or lifting, (4) Palpable spindle or sausage shaped mass at the anatomic location of the piriformis muscle, (5) Positive Lasegue sign. Pace and Nagle⁷ have reported dyspareunia as a symptom of P.S. Steiner et al¹¹ found the most trigger area to be located 3cm caudal and lateral to the midpoint of the lateral border of the sacrum. Another positive sign of the P.S is a persistent external rotation of the ipsilateral foot (splay foot), which is easily detectable when lying in supine^{5,6}. Thus ROM evaluation may reveal decreased internal rotation of the ipsilateral hip in such cases.

The FAIR test¹², the FREIBERG's test, LASEGUE's test, the PACE and BEATTY maneuver¹³ etc shows a positive sign to diagnose piriformis syndrome. EMG can be beneficial in differentiating P.S from inter-vertebral disc herniation. MRI and CT scanning reveal enlargement

of the Piriformis muscle, which are most useful in ruling out disc and vertebral pathologic conditions⁵.

Several studies reported physical therapy modalities such as heat therapy, cold therapy, and ultrasound therapy along with stretching of the Piriformis muscle have a beneficial effect on treatment. Also manual therapy approach may combine muscle stretches, muscle energy techniques, soft tissue and myofascial techniques to address all somatic dysfunctions in the patients with Piriformis syndrome.

STUDY PROCEDURE

Subjects (40-60yrs, both males and females) with low back pain are taken into consideration, in which the piriformis syndrome subjects are selected by the proper screening and fulfilling the inclusive and exclusive criteria. Informed consent was taken from each subject prior to participation. Instructions were given to the subjects about techniques performed. A total of 30 subjects was divided equally into two groups [Group A (n=15) and Group B (n=15)]. Group A was received ultrasound therapy (UST) and piriformis muscle stretching and Group B was received Muscle Energy Technique (MET) with Deep Friction Massage (DFM), for treatment duration of about 30-40min in each session for regular period of 6 days for a week. Both groups received hot pack application for 10min prior to muscle stretching in order to induce muscle relaxation. Home care programs were taught in both groups.

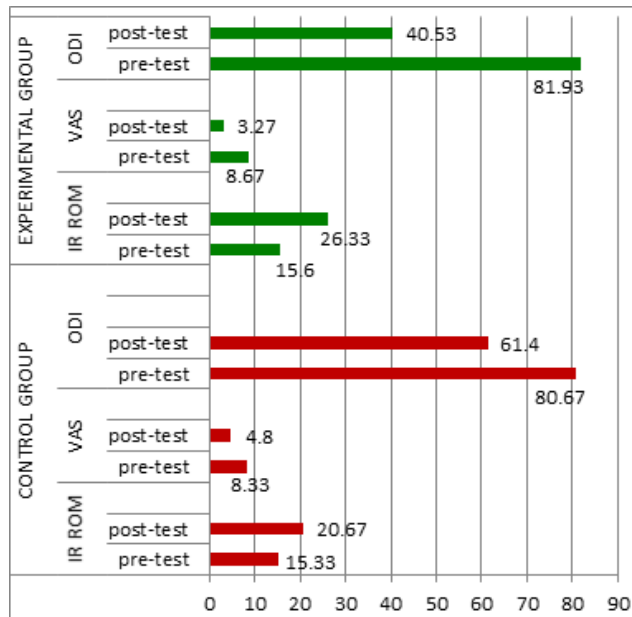
Control group:

Patient was positioned in side lying FAIR position. Ultrasound therapy, with intensity 2.0w/cm² using 1MHz frequency pulsed ultrasound apparatus administered in broad strokes longitudinally along the piriformis muscle from the tendon to the lateral edge of the greater sciatic foramen for 10min. After that, positioned the patient in prone lying for application of hot pack on the myofascial trigger point area for 10min. Then passive stretching of the piriformis muscle 5 times each session with stretch period 15secs each was given by positioning the patient in supine.

Experimental group:

The patient was positioned in prone lying, close to the edge of the table then applied hot pack over the myofascial trigger point area for 10min, then in the same position knee flexed at 90° grasping the ankle and

brought the hip joint to internal rotation. A degree of compression was applied via the elbow for 5-7secs while the muscle is kept at a reasonable but not excessive degree of stretch. Maintain contact on the point but eases the pressure and asks the patient to introduce an isometric contraction for 5-7secs to piriformis by bringing the lower leg towards external rotation against resistance. After the contraction ceases and the patient relaxes, the lower limb was taken to its new resistance barrier and elbow pressure was reapplied. The procedure was done 10times in each session.



GRAPH: MEAN VALUES OF IR ROM, VAS AND ODI

Result

Statistical analysis was done by using SPSS.16. When comparing the post test values of IR ROM, VAS & ODI of both control and experimental group through analysis of inter group significance; IR ROM shows sig.value 0.000 in Mann Whitney U-test ($p < 0.05$), VAS shows calculated t -value=2.895(>table value=2.048,df-28 at $p=0.05$) and ODI shows calculated t -value=4.842(>table value=2.048,df-28 at $p=0.05$) in independent sample t -test. This shows that experimental group shows significant difference from control group in all outcome measures. Hence, ***“there is significant effect by MET along with deep friction massage on pain, disability and IR ROM of hip joint in individuals with piriformis syndrome”***.

Discussion

In this study, Subjects with low back pain are taken into consideration in which the piriformis syndrome

subjects are selected by the proper screening and fulfilling the inclusive and exclusive criteria. The control group received U.S.T and piriformis muscle stretching and experimental group received MET along with D.F.M, for treatment duration of about 30-40min each session in a regular period of 6days for a week. Both group received hot packs application for about 10min prior to muscle stretching in order to induce relaxation.

The outcome measures used were Oswestry disability index to measure pain and disability, Visual Analogue Scale to measure pain intensity and standard goniometer to detect IR ROM deficit. Each measurement was done on the first day of treatment (pre test) and on the last day of the treatment (post test). Then datas were analyzed statistically.

Statistical data reveals that MET along with DFM shows significant effect over standard physical therapy treatment on pain, disability and IR ROM of hip joint in individuals with P.S.

According to Fred Mitchell, MET can be defined as, technique where the patient voluntarily moves body as specifically directed by the physician from a precisely controlled position, in a specific direction and against a distinctly execute counter force.

Clinical uses of MET are:

- Lengthen tight muscle fibers and fascia
- Mobilize joints in which movement is restricted.
- Strengthen muscle fibers that become weak and hypotonic.
- Regain overall muscle balance.

Main physiological effects proposed by the application of MET are:

- It has been shown to improve joint ROM.
- It has been shown to improve muscle extensibility more effectively than passive stretching – both the short term and long term effect.
- Myofascial trigger point deactivation has been shown to be enhanced by the use of MET.

The reason behind this physiological effect is due to the neurological mechanism that may follow use of MET.

- The effect may result from the inhibitory Golgi tendon reflex activated during the isometric contraction that leads to reflex relaxation of the muscle as a result of Post Isometric Relaxation (PIR), (Mitchel et al 1979 & Lewit 1986)¹⁴.

- An alternative reflex effect has been suggested in which an isometric contraction of the antagonists of affected muscle induce relaxation via Reciprocal Inhibition (RI), (Liebenson 1996 & Levin 1954)¹⁴.

According to Cyriax¹⁶, DFM technique temporarily reduces pain by activating the gate mechanism and increases the destruction of Lewis substance P thought to be the principal chemo mediator of pain impulses from the periphery to the CNS. Movement imparted through friction results in stimulation of the mechano receptors that transmit impulses along large fiber afferent pathways to the spinal cord. They serve to decrease nociceptor transmission to higher pain centers. It appears that as the patient responds to friction massage on subsequent treatment the time for anesthesia to occur lessens. The temporary relief at the end of the treatment session of friction massage permits other treatment.

DFM provide deep pressure over myofascial trigger points to produce a reflex effect. Friction over a trigger point may create exquisite pain and elicit 'jump sign' with referred pain in a specific pattern. After a trigger point is reduced, friction may be used to eliminate the taut fascia that can be the promoter of the trigger point.

In a study done by Peggy Honig¹⁸, it says that deep tissue compressions and cross-fiber friction of the piriformis muscle and tenoperiosteal attachment at the sacrum and the greater trochanter gave the greatest softening and improvement of impingement of the sciatic nerve in piriformis syndrome.

In this study, there has been an increase in IR ROM of hip joint and reduction of pain and disability by the application of MET along with DFM. Studies hypothesis that the effects may result from the inhibitory Golgi tendon reflex activated during the isometric contraction that leads to reflex relaxation of the muscle as a result of PIR. The relaxation of the muscle might have caused the reduction in low back pain due to P.S. some studies support the concept of neurological muscle inhibition following MET isometric contraction and thereby increase in muscle length and reducing the restriction.

Pre test evaluation of control and experimental group shows that there is no significant difference between the groups before treatment. When analysis of intragroup significance were done within the groups in both control and experimental, there shows significant difference between the pre test and post test values of IR ROM, VAS & ODI in both groups. But when the analysis of inter group significance was done between the post test values of IR ROM, VAS & ODI of control group and experimental group; it is evident that experimental group shows significant improvement in pain, disability and IR ROM of hip joint in individuals with P.S

Conclusion

In this study, 2 groups with P.S were treated with 2 different treatment approaches. Control group were treated with standard physical therapy approach i.e. U.S.T and piriformis muscle stretching and the experimental group with manual therapy approach i.e. MET with deep friction massage. The group treated with manual therapy approach had significant improvement in IR ROM of hip joint, pain and disability due to piriformis syndrome than those treated with standard physical therapy treatment.

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Effect of Secondary Motor Task on Performance of Stair Descent in People with Idiopathic Parkinson's Disease

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Abstract

In people with Parkinson's disease (PD), dual tasking is difficult because of the impaired motor functions of the basal ganglia. It causes postural instability, reduction in gait speed, decreased stride length, increased festination and freezing. So it can also influence performance on stair ambulation. This creates a need to study the effect of dual tasks on stair ambulation, especially stair descent. 30 subjects were selected from various hospitals in Delhi. After taking the informed consent, the subjects were made to descend down the stairs under two conditions: stairs descent only and stairs descent with secondary motor task. The time taken in both the activities was recorded along with the scores on Observational Stair Parameter Scoring System (OSPS). Time taken by the subjects and the scores on OSPS for performing secondary task was more than the normal stair descent. The performance of stair descent with secondary task became more difficult than descent without the secondary task.

Keywords: Idiopathic Parkinson's disease, stair descent, secondary motor task, dual task.

Introduction

Parkinson's disease is a chronic, progressive neurodegenerative disorder that is pathologically defined by degeneration of the dopaminergic neurons in the substantia nigra and development of Lewy bodies in the residual dopaminergic neurons. The diagnosis of Parkinson's disease is clinical and relies on the presence of cardinal features of bradykinesia, rigidity, tremor, and postural instability, coupled with gradual symptom progression and a sustained response to therapy with levodopa. Pathologic changes in Parkinson's disease may be detected upto 20 years before the onset of motor symptoms, and are accompanied by non-specific symptoms like hyposmia, constipation and fatigue. It is estimated that about 1% of population above the age of 60 years and about 4% above age of 80 years suffer from PD.^{1, 21}

The causes of PD are unknown, although complex interactions between genetic and environmental factors are probably involved.²

Patients of Parkinson's disease show signs of cognitive dysfunctions even in the early stages of disease. The highest frequency of clinically significant cognitive impairments was found to be in attention,

executive function and memory.³ These impairments occur due to the dysfunction in fronto-striatal circuits.⁴ In the domain of automatic processing these patients compensate by maintaining activation in more cortical areas, suggesting increased dependency on cognitive control. In the domain of controlled processing the compensatory mechanisms also occur due to increased pre-frontal activation, depicting cortico-cortical and subcortico-cortical shifts of activation.⁴

Patients with Parkinson's disease also experience deterioration in gait and balance abilities, causing increased fear of falling leading to decline in physical activity and hence the quality of life. Balance in such patients is impaired due to, sensory problems compromising equilibrium, bradykinesia, impaired coordination and inflexible motor commands. All of the above features causes constrain in the efficacy of postural adjustments to anticipate upcoming perturbations or to allow recovery from instability.⁵

Such patients also have marked features of gait disturbances, which include difficulties with the execution of well learned movement sequences (like walking, turning and transfers) and episodes of freezing and fall incidences occur. Along with this, limitations are also seen in climbing stairs causing considerable

anxiety in them.^{6,7,8}

During many activities of daily living, people need to perform dual task, that involves the execution of a primary task, which is the major focus of attention, and a secondary task, performed at the same time. In people with Parkinson's disease, dual task becomes a significant problem because of the impaired motor functions of the basal ganglia.⁹

People with Parkinson's disease have difficulty performing simultaneous upper extremity motor task as well as motor tasks coupled with cognitive tasks⁹. Dual task interference produces increased excursion of the centre of pressure, but this effect is reduced with increased task complexity as these individuals overconstrain their posture in order to focus attention on the cognitive task without losing their balance.¹⁰

Gait impairments in such patients are exacerbated under dual task conditions with further reduction in gait speed and stride length, decreased symmetry and coordination between left and right steps, and increased stride to stride variability¹¹. Other than gait, mobility of a person also includes stair ambulation. The activity of stair ambulation when assessed in elderly people, it was found that subjects exhibited more cautious behaviour during stair descent than during ascent. Also greater number of subjects exhibited upper-body frontal plane instability during stair descent.¹²

So a study is required to know how the secondary tasks influence the performance of stair descent in Parkinson's patients. Thus the aim of the study was to determine the effect of secondary motor task on performance of stair descent in people with idiopathic Parkinson's disease.

Method

This single group, experimental study was conducted at Indian Spinal Injuries Centre, vasant kunj, New Delhi, India. A sample of 30 subjects diagnosed with idiopathic Parkinson's disease, were selected on the basis of inclusion and exclusion criteria. The Participants were recruited from the Neurology Dept. OPD of the hospital.

Inclusion criteria

1. Subjects diagnosed with Idiopathic Parkinson's Disease aged 31-85 years (mean age 64.5 years)¹¹
2. A score of ≥ 24 on MMSE¹³

3. Subjects with Hoehn yahr score 1-3¹⁴
4. Able to ascend and descend stairs independently with/without assistive device
5. Have basic mathematical abilities
6. Subjects willing to sign the consent form to participate in the study

Exclusion criteria

1. Patients with any other neurological or musculoskeletal disorder which may affect gait
2. Patients with history of fall in preceding year.¹⁵
3. Patients with unstable or progressing medical conditions
4. Patients with sensory disturbances
5. Patients with severe or uncorrected visual deficits.¹⁶
6. Patients with hearing deficits

Demographic data (gender, age, height and weight) of the subjects, who fulfilled the inclusion criteria were taken for the study. Procedure was adequately explained to the subjects and written consent was taken from each one before starting the test.

Procedure

The procedure was always performed in the morning to avoid the problem of fatigue. The testing procedure includes two activities-

- Stair descent only
- Stair descent with motor task

During stair descent only, the participants climbed down the stairs at a preferred pace, defined as the speed at which they could climb down most comfortably. Each participant stood at the edge of the platform and started climbing down after receiving the command "start" and the stopwatch was pressed to measure time. As soon as both the feet touches the ground the stopwatch is paused and the time is recorded. Videos of the activities were recorded by a camera, to be viewed later to rate participants on OSPS. During stair descent with motor task, the participants simultaneously climbed down the stairs and performed a motor task. A coin-transfer task was used as a motor task wherein participants

transferred one coin at a time from one hand to another. Participants transferred coins from the dominant hand to the non-dominant hand. A set of 15 Indian one rupee coins was used. The rules governing the stair descent with motor task were the same as those for stair descent only. No feedback was given to the participants during the performance of any of the two conditions of stair descent.

Total time taken by each participant during stair descent from the starting point to the finishing point was measured using a stopwatch, and the time was measured in seconds. Observational Stair Parameters and Scoring System measures factors like handrail use, walking style (two feet per step or step over step), sideways positioning on the stairs, medial/lateral position on the stairs, assessment of exaggerated frontal plane movement of the upper body, and hesitation at the transition region.

The whole procedure is completed in a single session, which lasts for approximately one hour with

one patient. The clinical outcomes were obtained and recorded in the data collection form and then analysis of the same was done.

Statistics were performed using IBM SPSS software version 21. Paired t-test was used to find out the difference of means of time taken and OSPS scores among the two conditions. A significance level of $p \leq 0.05$ was fixed.

Results

The sample consisted of 30 subjects (14 males and 16 females) with a mean age of 61.87 ± 10.517 years, mean hoehn yahr score of 1.97 ± 0.809 , mean MMSE score of 26.90 ± 2.074 , mean height of 169.77 ± 6.26 metres and mean weight of 68.48 ± 5.98 kg. The values of mean of time taken (in sec) by the patients are 10.63 ± 7.199 in stair descent only, and 18.40 ± 10.102 in stair descent with secondary motor task. The mean values of the OSPS score are 3.60 ± 1.632 in stair descent only, and 4.53 ± 1.871 in stair descent with secondary motor task.

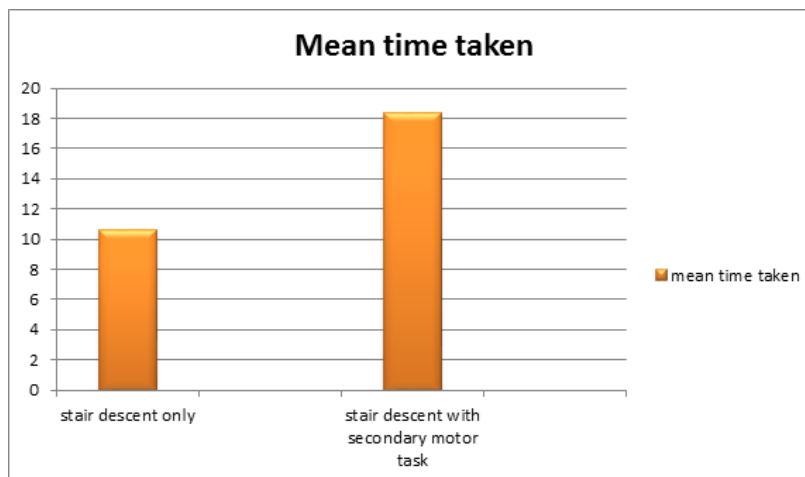


Figure 1. Comparison of time measured among the two stair descent conditions (N=30)

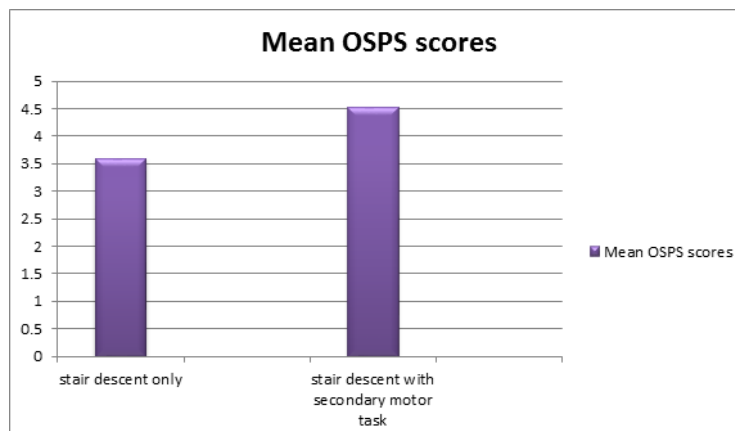


Figure 2. Comparison of OSPS scores among the two stair descent conditions (N=30)

Discussion

This study was designed to evaluate whether there is an effect of secondary motor task on performance of stair descent in people with idiopathic Parkinson's disease.

The results of this study show marked differences in the performance of stair descent when the subjects performed it with secondary motor task. In this study the result shows that the subjects with idiopathic Parkinson's disease have demonstrated increase in the values of mean time and mean score of OSPS. Thus interference in performance of stair descent was inferred, when secondary task was undertaken with stair descent. This may be possibly explained by central nervous system processing mechanisms which were being used to perform the coin transfer task as supported by the findings of the study conducted by O'Shea et al (2002)⁸ on dual task interference in people with Parkinson's disease. Theoretically, this requires gait to be controlled by impaired basal ganglia, which leads to increase in time taken to complete the activity.

The mean time taken was increased by 7.77 seconds when the secondary motor task was added to the stair descent task in people with Parkinson's disease.

The mean value of OSPS score was increased by 0.93 when the secondary motor task was added to the task of stair descent. Hence produces greater instability than the normal stair descent. This increased value of time taken and OSPS score in secondary motor task is similar to the findings of the study by Yadav M et al¹⁷.

Our study confirmed previous findings of O'Shea et al⁸ on dual task interference during gait in people with Parkinson's disease. They concluded that people with PD experienced marked difficulty when they were instructed to perform a complex secondary task while walking. In our study also this difficulty might have aroused because central nervous system processing mechanism was being used to perform the coin transfer task. In theory, this requires stair ambulation activity to be controlled by impaired basal ganglia causing more instability and making the person more protective to prevent falls thereby increasing the time taken by them to complete the activity.

In the study by J D Holmes et al⁹, it was found that dual task interference produced increase excursion of center of pressure. This suggest that participants with Parkinson's disease may be overconstraining their

postural adjustments in order to focus attention on the secondary task without losing their balance. They apply the "posture-first principle" to a pathological level, this reduces proprioceptive feedback and may increase co-contraction, both of which diminish the individual's ability to respond to unexpected perturbations of balance. This explains the increased amount of time taken by them to complete the descent on stairs with secondary task in our study. But this overconstraining (undertaken by participants to prevent falls) predisposes them to a greater risk of falls.

Another study by M Plotnik¹⁸, says patients with Parkinson's disease employ cognitive resources for maintaining regular walking and once these resources are diverted from this to another task (secondary task), the overall gait resources are compromised and this increases the risk of fall. This again support the results in our study which shows increased time taken by the patients with Parkinson's disease to perform the dual task in order to prevent them from falls. If more than one task is performed simultaneously at a given moment, the available processing capacity is shared between the two tasks and the performance of one or both the tasks is impaired¹⁸. And the secondary tasks were more complex and less familiar than the primary task, so the participants required higher attention resources to descend stairs with secondary tasks. And a large proportion of attention was directed towards the secondary tasks at the expense of the performance of stair descent¹⁷. Thus the results of this study show similarities and differences with other studies conducted on patients with idiopathic Parkinson's disease.

Clinical Relevance

The data obtained in our study suggest that there is a significant effect of secondary tasks on the performance of stair descent in people with idiopathic Parkinson's disease. So it is advisable to avoid any simultaneous task while using stairs to prevent falls. But it is not always possible to avoid dual tasks in our daily routine, so while designing a rehabilitation program for such patients, dual task training should be made a part of it as it will increase their confidence to perform their ADLs, and reduced risk of falls. Thereby, helping them in becoming more independent and improving their quality of life.

Limitations

1. Only patients with idiopathic Parkinson's disease were selected and not the other variants of

Parkinson's disease.

2. Patients having freezing episodes were not included in the study.

Future Research

Effect of secondary cognitive task can also be checked on stair descent activity in Parkinson's patients. Patients with other than idiopathic Parkinson's should also be tested for dual task interference. There is also a need to conduct a study to see effects of dual tasking on freezing of gait on such people. Effect of dual tasking can also be checked on more challenging activities like crossing a road, moving in a market place, etc. Based on the results of this study, a standard protocol must be made and administered to train such patients for performing dual tasks in their activities of daily living.

Conclusion

The data obtained from the study showed that performance of stair descent with secondary task was difficult for people with idiopathic Parkinson's disease. Thus the hypothesis that there is a significant difference in performance of stair descent with secondary motor task in patients with idiopathic Parkinson disease holds true.

So it is concluded that decline in physical and cognitive functions in people with Parkinson's disease puts them at higher risk of falling during dual task performances leading to poor quality of life. So strategies should be made to help minimize task interference by either avoiding such tasks or by training patients to deal with it.

Ethical Clearance: Taken from Institutional Ethics Committee, Indian Spinal Injuries Centre-Institute of Rehabilitation Sciences, Vasant Kunj, New Delhi.

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Conflict of Interest: Nil

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A Computer Game- Assisted Repetitive Task Practice based Upper Extremity Therapy Program for Children with Spastic Unilateral Cerebral Palsy: A Single Case Study

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Abstract

A case study is to provide evidence of the feasibility, acceptance, and benefits of a computer game-assisted repetitive task practice platform (G-RTP) in Upper extremity (UE) motor function of a child with Cerebral Palsy (CP).

Method: 4 year old left spastic CP was provided an individualized game-assisted therapy of 16 weeks. Outcome measures included PDMS-2, QUEST, computerized assessment of a broad range of object manipulation tasks.

Results: Findings demonstrated the feasibility and acceptability of the G-RTP program for use by children with UE motor impairment

Conclusion: The findings are positive and support a future definitive RCT needed to prove the efficacy and applicability.

Keywords: Repetitive Task Practice, Cerebral Palsy, Game Based Exercises

Introduction

Canada and India face a growing population of children with neurodevelopmental disorders (NDD) ¹. CP is the most common neurodevelopmental disorders (NDD) occurring in 2 to 4 of every 1000 live births in North America and India, respectively². Children with CP often present with upper extremity sensory-motor impairments that hamper the physical and functional abilities that are necessary for daily activities of living and participation in social events such as in school, play

and leisure activities in various environments. These impairments will result in reduced pace of development, cause future complications, and will require remedial training^{3,4}. The ability to perform functional tasks with the Upper Extremity (UE) is an important predictor of success in daily activities and participation in school, play/leisure, and social activities⁵.

Therapy programs designed to improve UE motor and visual-spatial processing skills in children must strive to maximize neurodevelopmental capacities and prevent secondary impairments⁶⁻⁸. The effectiveness of these programs is proportional to the intensity and amount of training and the task-specificity of the exercise regime, for example, constraint-induced movement therapy (CIMT) ⁹⁻¹¹. There is growing evidence to support the idea of activity-dependent central nervous system (CNS) plasticity¹². Simulating close-to-normal movements and repetition is taking shape^{12,13}. However,

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it is difficult to engage these children in therapy for long periods and sustain motivation during intense repetitive task practice. Thus, there is a need for innovative, cost-effective approaches that motivate children with CP to complete long-term neuro-rehabilitation programs to improve neurodevelopmental outcomes. For improving adherence to therapy and for determining motor and functional outcomes in children with CP¹⁴. An emerging, promising therapy approach is to incorporate “fun” computer games with a range of interactive cognitive challenges help children to positively engage in activities. Studies have provided evidence of the benefits of video games in rehabilitation training^{15,16}

For this purpose, we have developed a low-cost computer-aided, game-assisted repetitive task practice rehabilitation platform (G-RTP)¹⁷⁻¹⁹.

Case Description

4 year old child with Lt spastic hemiplegia, having increased tone in upper extremity, grade one on the Modified Ashworth Scale (MAS)²⁰, level 1 on the Gross Motor Functional Classification Scale (GMFCS)²¹, level 2 on the Manual ability classification system (MACS)²² and scored 26 on the Mini Mental State Examination (MMSE)²³.

Ethical clearance for this case study was obtained from Sri Dharmasthala Manjunatheshwara College of Medical Science & Hospital and the parent provided informed consent. Assessment tools were used for pre- to post-intervention and follow up assessment.

1. Peabody Developmental Motor Scale Version 2 (PDMS- 2)^{24,26}
2. The Quality of Upper Extremity Skills Test (QUEST).
3. The child was also assessed using a computer-based assessment tool to quantify object manipulation skills^{17,18}.

An inertia-based mouse was attached to five test objects presented in Figure 2. The objects were chosen with different physical properties.

As shown in Figure 1B the assessment game displays a moving target game object. The target objects appear at random locations at the top of the display and moves to the bottom in two seconds and then disappear. One game event is defined as the time between target

appearance and its disappearance. The game paddle at the bottom of the display is slaved to the object motion. The child was seated at a table with adjustable height. Each test object was placed on the table at a comfortable distance from the child. A 50 cm computer monitor was placed 1.5 meters in front of the participant at eye level, which displayed the computer game. The child used each of the five mouse equipped objects to move the game paddle and catch the moving target objects. The assessment game software logged the coordinates of the game paddle and target objects at a sampling frequency of 100Hz for the off-line analysis described below.

Figure C presents overlay plots of all game movement responses in each direction for one game trial. Each game was played for 60 seconds, (each game event was two seconds). Therefore, 30 game movement responses were obtained for analysis. Based on time indices of target appearance and disappearance, the software segments all 30 game movement trajectories for each 60-second game trial (15/direction). Figure D presents the trajectory of a typical game movement response. For a detailed description of the game movement, indexing and segmentation see Lockery et al., (2011)¹⁸. Following are the performance measures

(a) Success Rate (SR): it is the percentage of the total number of Target Objects that were caught in one game trial

(b) Movement Variance (MV): For each game trial, there were 15 game movement responses in each direction. For each game movement trajectory, MATLAB (The Math Works, Natick, MA, version 2010a) was used to compute the outcome measures described above.

Intervention

The child attended 16 weeks for 2-3 days per week of 45-60mins of session, consisted of stretching exercises, game-assisted exercises. Similar to the concept of “shaping” consistent with Constraint-Induced Movement Therapy (CIMT) principles, the G-RTP takes advantage of ergonomic properties of common objects to amplify limited and small amounts of voluntary movement and then allows opportunities for an appropriate switch to objects having more demanding movement requirements or functional demands. These “mouse-equipped” objects can be used for assessment and to practice many gross or fine motor skills.

In a manner similar to interval training, 6-8 objects were initially selected for specific therapy goals and were instrumented with the inertial mouse. Sensory-motor skill training of finger/wrist and elbow and shoulder motions, and of bimanual controls. The motion of the objects was used to play computer games in a manner identical to that of a standard optical computer mouse, game-assisted. Each object-manipulation exercise was used for 2-4 minutes.

Results

Tables 1 and 2 (PDMS-2) and (QUEST). Based on the scores of PDMS-2, substantial improvements in grasp and visuomotor test scores following the 16 weeks intervention were observed. There was a 15% improvement in grasp (41% to 49%) and a 12.5% improvement in visuomotor ability (87% to 105%).

Table 1. PDMS-2 raw test scores

PDMS-2 ITEMS (MACS score 2)	BASELINE SCORES	POST INTERVENTION SCORES				
		4 weeks	8 weeks	12 week	16 week	28 weeks
GRASP (Maximum 52)	41	43	43	44	49	49
VISUOMOTOR (Maximum 144)	87	96	96	99	105	105

Based on the scores of QUEST. There was a 47.26% improvement in grasp (40.74 to 88) and a 22.96% improvement in the total average score (69.04 to 92).

Table 2. QUEST scores

QUEST ITEMS	BASELINE SCORES	POST INTERVENTION SCORES				
		4 weeks	8 weeks	12 week	16 week	28 weeks
DISSOCIATED MOVEMENTS (Maximum 100)	78.12	82.81	85.92	85.92	80	100
GRASP (Maximum 100)	40.74	44.44	51.84	51.84	88	88
WEIGHT BEARING (Maximum 100)	74	100	100	100	100	100
PROTECTIVE EXTENSION (Maximum 100)	83.32	83.32	83.32	83.32	100	100
TOTAL average SCORE (Maximum100)	69.04	77.64	80.27	80.27	92	97

As shown in table 3, the CUE assessment scores showed substantial improvements in success rate and movement variance. Success rate improved ranging from 25% to 50% increase for all five tasks from pre to post intervention scores (16 weeks). These improvements were maintained for two out of five objects during the

follow up period with the scores ranging from 87% to 89%. The success rate scores were maintained to a lesser extent in case of the soccer ball, ring and tennis ball manipulation tasks with the scores ranging from 27% to 90%. Movement variance decreased for four of

the five tasks ranging from 9% to 47% for pre to post intervention scores (16 weeks). These improvements were maintained during the follow up period with the scores ranging from 30% to 49%.

Figure 2 shows representative plots of game movement responses of the five test object manipulation tasks that were used for pre-, post intervention (16 weeks) and follow up assessments (28 weeks). Compared to the pre-intervention plots, the number of valid traces are higher in post intervention and follow up assessment plots. Pre intervention game plots showed small amplitude movements with no interaction with the target.

The pre-intervention plots present jerky movement responses with irregular trajectories moving in the opposite direction on-screen than the target. Compared to the pre-intervention, post-intervention plots show less movement variance with high amplitude trajectories that depict left sided (upwards) and right sided (downwards) movements. As a result of less number of movement errors during the post-intervention performances, the success rates are higher and were maintained during the follow up assessment. These improvements are maintained till the follow up assessment.

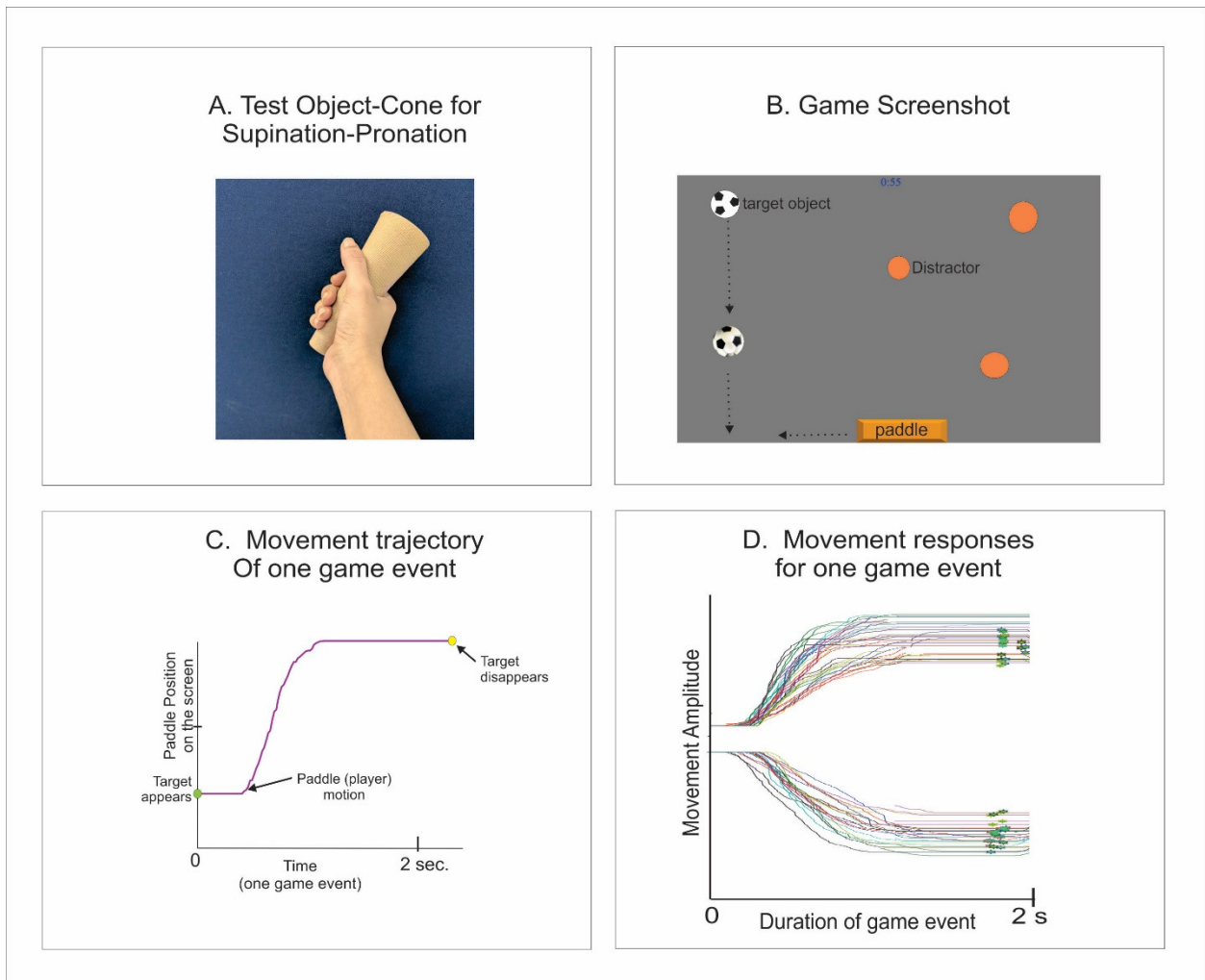


Figure 1

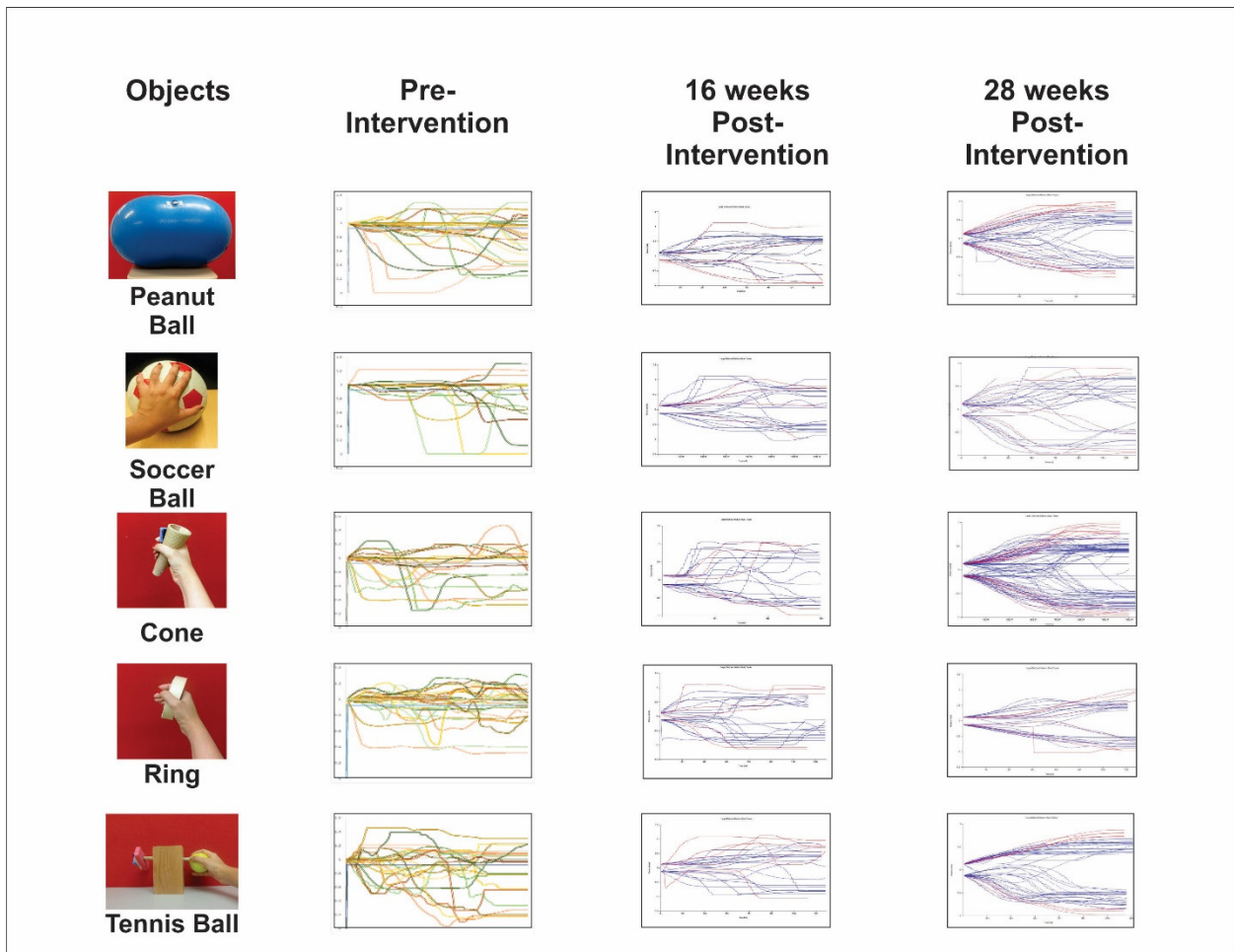


Figure 2

Table 3 Game Performance Outcome

Outcome Measures	Assessment time	Peanut Ball	Soccer Ball	Cone	Ring	Tennis Ball
	0 weeks	20	75	33.3333	0	50
Success Rate	16 weeks	66.66	100	50	42.8	100
	28 weeks	88.88	90	87.50	28.57	40.00
	0 weeks	55.5658	38.395	36.6807	44.6107	46.2837
Movement	16 weeks	46.7965	n/a	54.5773	18.3739	n/a
Variance	28 weeks	29.4965	47.8074	29.6765	48.5628	45.7173

The child’s mother was interviewed at the end of 28 weeks using a semi-structured interview. In her opinion she said,

“My child found it fun-filled and the objects used in therapy will help in my child’s hand and finger movements. Mainly, definitely, I like the program

because there are changes in (the child’s) hand, improvements in that hand.”- Mother of the child.

Discussion

Emerging game-assisted rehabilitation technologies have the potential to improve child participation in

repetitive task practice and therefore facilitate functional recovery. Results of this pilot study demonstrated the feasibility and acceptability of the G-RTP program for use by children with motor impairment of the upper extremity due to CP. The present preliminary results did show substantial improvements in the PDMS-2, QUEST, and in performance metrics of a broad range of goal-directed object manipulation tasks. Buttoning and unbuttoning task was not achieved which is more fine aspects to develop. These changes can be attributed towards the repetitive practice and object manipulation tasks. These tasks were focused on finger and wrist movements and practicing object manipulation because the child had poor control in fine motor tasks using hand and fingers as compared to gross movements at proximal joints. Other scores showed significant improvements in PDMS-2 scores. Based on CUE assessment tool success rate scores, the child showed improvements from pre to post intervention in all five objects. The movement variance reduced from pre to post intervention in four out of five tasks. At pre-intervention, many of the responses were of very low amplitude so they were deemed invalid. Since the movement variance is computed from only a few valid responses, the variation is low whereas, during the post intervention tasks, there is a higher number of valid responses.

One main limitation of this approach is that it requires an IB computer mouse, a computer, and a source of common/modern computer games. It also requires the client to have a basic knowledge of computer operation. There are a number of fine motor skills that cannot be performed with the game-assisted repetitive task practice approach using the IB mouse, such as, writing, doing up buttons, tying shoelaces, cutting food. Another limitation is that the IB mouse detects angular motion; therefore, it is not possible to practice tasks that require only linear motion.

Conclusion

A future definitive RCT needed to prove the efficacy and applicability of G-TRP for young children with Cerebral Palsy.

Conflict of Interest : None

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Effect of Combined Pallof Press and Kegels Training for Urinary Incontinence in Multigravida Women and Quality of Life

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Introduction

Urinary incontinence has become one of the main health issue faced by women after pregnancy. It's mainly due to inadequate care and neglect to the pelvic floor muscles in regaining strength leading to muscle weakness and Urinary incontinence. Traditional Kegel's focus only on pelvic floor muscles while core stability and abdominal strength also plays important role in preventing the occurrence of urinary incontinence. Aim and objective: The aim of the study was to find out the effects of combined Pallof press and Kegel's exercise for urinary incontinence in multigravida women and quality of life. Methodology: 30 women (group A-15, group B-15) of age group between 30 - 40 years, participated in simple experimental study for a duration of 8 weeks. Subjects were assessed by RUIS - Revised urinary incontinence scale and IIQ7 - Incontinence impact questionnaire. Result : The critical value of U at $p < 0.5$ is 64 which means it is statistically significant in controlling incontinence and critical value is not significant for IIQ7. Urinary incontinence occurrence frequency is high in women without core stability and abdominal strength. The study also revealed group of Kegel's exercise's alone still faces the occurrence of urinary incontinence more than those practiced both pallof press and kegels. If the core muscles doesn't have adequate strength and stability Kegels can't alone control the issue in a successful and satisfactory way. Conclusion: Subjects who practiced both Kegel's & Pallof press exercise shows less frequency of Urinary incontinence.

Keywords: Urinary incontinence, Kegel's, Pallof press, RUIS Revised urinary incontinence study form, IIQ7 form, Core stability, abdominal strength.

Introduction

Urinary incontinence is a significant health problem worldwide. It has a considerable social and economic impact on individuals and society. Urinary incontinence — the loss of bladder control — is a common and often embarrassing problem. The severity ranges from occasionally leaking urine when cough or sneeze to having an urge to urinate that's so sudden and strong¹.

According to J Urology analyzed data on 17,850 adults 20 years old or older who participated in the 2001 to 2008 cycles of the National Health and Nutrition Examination Survey proves that prevalence of urinary incontinence in the combined surveys was 51.1% in women and 13.9% in men.² In young women, the prevalence of incontinence is

usually low but around menopause, with a steady rise there-after into later life. Stress and mixed incontinence is higher than urge incontinence.³

In men, the prevalence of incontinence is much lower than in women, about 3% to 11% overall, with urge incontinence accounting for 40% to 80% of all male patients. Stress incontinence accounts for less than 10% of cases and is associated with prostate surgery, trauma, or neurological injury³.

Urinary incontinence has become one of the main health problem faced by women after delivery. Stress incontinence is one of the common type of urinary incontinence seen in delivered women caused by muscle weakness^{3,4}.

Pelvic floor exercises shows a wide range of improvement in regaining the muscle strength but core stability and gluteal contraction also plays an important role in urinary incontinence which plays an important role in maintaining spinal stability, proper posture thereby improving postural problems, reducing weight gain after delivery, preventing back pain and making people physically more active⁴.

Stress urinary incontinence is highly prevalent, affecting millions of women worldwide. It is difficult to pinpoint the number of women affected by stress urinary incontinence, because often they do not report it^{1,2,4}. However, studies show that 20.8% of women over the age of 15 have experienced stress urinary incontinence worldwide². The reported prevalence of stress urinary incontinence in India is about 12%³. Most of the women who are suffering from stress urinary incontinence withdraw from social life and try to hide the problem from families, friends^{4,5}.

Women who have undergone normal vaginal delivery reported stress urinary incontinence more, than those who delivered through cesarean section. Operative vaginal deliveries, mainly forceps delivery can cause stress incontinence symptoms in the postpartum period⁶. A descriptive study was conducted in Calcutta to determine the incidence of postpartum stress urinary incontinence and its correlation with mode of delivery in 250 primipara women⁷. Among them 222 responded to the questionnaire for stress urinary incontinence (SUI). The incidence of stress urinary incontinence was proved to be 23.42%⁸. The overall prevalence of urinary incontinence between the ages of 20 to 80 years was 53.2%. The incidence was significantly higher after vaginal delivery about 27.1% and more so after forceps delivery (35.5%) in comparison with that after cesarean section (14.3%)⁵. In middle aged women lack of core stability and core strength is very common because of obesity, pregnancy etc. leading to increased chance for urinary incontinence⁴.

Urinary incontinence is more common in women because of childbirth stretching the pelvis and its muscles and/or because of a different anatomy than men, with a shorter urethra that allows easier passage of urine⁷. And the prevalence of incontinence increases with age – 17 per cent ages 40 to 59, 23 per cent ages 60 to 79 and 32 per cent after age 80^{4,5}.

Stress incontinence occurs when urine leaks with

increased intra-abdominal pressure, such as when you cough, sneeze or laugh or do heavy lifting. It is caused by decreased strength of the urinary sphincter and pelvic floor muscles⁵.

Among the different types of urinary incontinence, stress urinary incontinence predominates in most surveys. This condition affects women of all age groups and probably related to pregnancy and labour⁸. A descriptive study was conducted in community setting to assess the prevalence of stress urinary incontinence in premenopausal nulliparae, primiparae and grand multiparae and to examine possible obstetric risk factors. Three hundred consecutive nulliparae and grand multiparae, 20 to 43 years of age, were interviewed during the third postpartum day about the symptoms of stress urinary incontinence. Prevalence was significantly higher in grand multiparae (21%). It was lower in nulliparae (5%). Grand multiparity was found to be associated with an increased risk of developing persistent stress urinary incontinence during reproductive ages. Study concluded that frequent vaginal birth adds more risk to have SUI^{10,11}.

Methodology

30 female subjects were selected based on the inclusion criteria for the experiment. The written consent letter was taken from them and the description of the study was explained in detail. The participants were randomly grouped into group A and B. Group A includes 15 females and underwent kegels training and group B with 15 females and received kegels combined with Pallof press exercise. Group A received exercise of 3 sets per day daily for 8 weeks. Group B was given kegels and Pallof press exercise daily for a period of 8 weeks. Start by lying on back. Contract pelvic floor muscles for 3 to 5 seconds. Relax for 3 to 5 seconds. Repeat the contract/relax cycle 10 times. Do 3 set exercises of 10 repetitions, daily 3 times. Group B used red resistance band since the medium resistance ideal for all population. Start with kegels exercise's same as group A followed by Pallof press set up with a band firmly affixed to an immovable object. Stand in line with the band apparatus and turn body perpendicular. Center the band on chest using both hands. Push the band straight out in front, keep body in a straight-line with no rotation. Hold it in front for 3 seconds, return the band in complete control to chest. Continue the exercise 3 sets of 10 repetitions in both sides. RUIS and IIQ 7 were taken on the first day and after the 8th week.



Figure : 1 kegels exercise



Figure : 3 Pallof press



Figure :2 Starting position of Pallof press

Results

The intervention of kegels exercise and pallof press exercise were found to be individually effective in controlling urinary incontinence(RUIS) and improving quality of life of women (IIQ-7).

But in comparison of post test scores of outcome measures evidenced that the reduction in the urinary incontinence frequency and improvement in quality of life scores were significantly more among the women s treated with combined kegels and pallof press exercise than with women s treated with kegels alone .

It may be concluded that combined pallof press and kegels exercise is more effective in treating stress urinary incontinence and improving quality of life in the long run.

Table-1: Range, mean and SD of outcome measures of subjects with stress urinary incontinence in kegels group.

Sno	Outcome measures	Kegels Group				Wilcoxon test	p-value
		Pre test		Post test			
		Range	Mean ±SD	Range	Mean ±SD		
1	RUIS	5-7	6.06±0.79	4-6	4.66±0.72	U=64 Z=-3.73	0.05
2	IIQ-7	5-8	6.26±0.88	4-6	4.8±0.67	Z=-4.23	0.05

Note; S-significant(p<0.05), NS-Not significant(p>0.05).

The above **table-1** shows the pre and post test outcome measures in this study. In pre test, RUIS was ranging within 5-7 with mean and SD of 6.06±0.79. But in post test, it was found to be decreased to the range 4-6 with mean and SD of 4.66±0.67. The non-parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be significant (p<0.05).

Similarly, in pre test, IIQ-7 were ranging within 5-8 with mean and SD of 6.26±0.88 But in post test, it was found to be increased to the range 4-6 with mean and SD of 4.8±0.67. The non-parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be significant (p<0.05).

It shows there is a significant improvement on stress urinary incontinence and quality of life among subjects

treated with kegels exercise.

Table-2: Range, mean and SD of outcome measures of subjects with stress continence in Kegel and pallof group.

Sno	Outcome measures	Kegel + Pallof				Wilcoxon test	p-value
		Pre test		Post test			
		Range	Mean \pm SD	Range	Mean \pm SD		
1	RUIS	5-7	6.13 \pm 0.74	4-6	4.73 \pm 0.70	U=64 Z=-3.73	0.05
2	IIQ-7	5-8	6.86 \pm 0.91	4-6	4.66 \pm 0.61	Z=-4.23	0.05

Note; S-significant ($p < 0.05$), NS-Not significant ($p > 0.05$).

The above table-2 shows the pre and post test outcome measures stress incontinence and quality of life. In pre test, RUIS was ranging within 5-7 with mean and SD of 6.13 \pm 0.74. But in post test, it was found to be decreased to the range 4-6 with mean and SD of 4.73 \pm 0.70. The non-parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be significant ($p < 0.05$).

Similarly, in pre test, IIQ-7 were ranging within 5-8 with mean and SD of 6.86 \pm 0.91. But in post test, it was found to be increased to the range 4-6 with mean and SD of 4.66 \pm 0.16. The non-parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be significant ($p < 0.05$).

Its evident that there is a significant improvement on stress urinary incontinence and quality of life among subjects treated with Kegels and pallof exercise.

Discussion

The main objective of the study was to find out the effect of combined pallof press and kegel training for urinary incontinence in multigravida women and its effects on quality of life.

The study was carried out at various physiotherapy clinics and houses in and around Bangalore and the mean age was taken 35.67 \pm 2.91 (group A-kegels) and 34.8 \pm 3.14 (group B-kegels and pallof press)

There is a crucial link between urinary incontinence and quality of life. Previous studies shows that prevalence of urinary incontinence and other pelvic floor disorders like pelvic organ prolapse will increase as the global population ages. PFE are advised as a first line of treatment for women with SUI. These exercises are

designed to strengthen weak perineal and pelvic floor muscles, but their success highly depends on patients' motivation level and compliance with the exercises. Contraction of the abdominal muscles may provide an efficient mechanism by which contraction of the pelvic floor muscles is initiated, particularly for patients who have difficulty in learning how to contract those muscles. However, the use of Abdominal muscle training to rehabilitate the pelvic floor muscles may be useful in treating SUI. The abdominal muscles act indirectly to activate the pelvic floor muscles and maintain their coordination, support, endurance, and strength.

The benefits of pelvic floor exercises can be maintained for up to 5 years even with a reduction in frequency of exercise to as little as one session per week. However, the PF group only showed some increase in LPP after 12 weeks of treatment that did not quite reach statistical significance. Although they continued to perform pelvic floor muscle training after 12 weeks, the effect was not further enhanced at 24 weeks. These findings thus raise concerns about the efficacy of pelvic floor muscle training.

At this point, the need for abdominal strengthening arises to help or to support the pelvic floor in proper and effective functioning so that the incontinence can be reduced or controlled in more better way than with kegels alone. Thus this study strongly suggest to combine abdominal strengthening with pallof press exercise which is easy, less time consuming and more effective in controlling urinary incontinence along with kegels.

Conclusion

The study concluded that combined use of kegels and pallof press is more effective in controlling the frequency of stress urinary incontinence in women and improving the quality of life than providing kegels alone for urinary incontinence. Kegels alone is effective in pelvic floor strengthening but in the long run there is a need for abdominal strength along with pelvic floor strengthening that can be helpful in preventing associated health issues. Clinicians should be aware of the complications after vaginal or cesarean delivery and advise them to perform both kegels and pallof press daily.

Future recommendations:

Further research can be done by increasing the number of sample size and age of women with urinary incontinence, include both the genders and study can be done so that the treatment can be beneficial to both categories. Study can be done with Pallof press in different positions.

Conflict of Interest: Nil

Funding: Self

Ethical Clearance: was taken from the Oxford College Of Physiotherapy committee.

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Role of Early Physiotherapy to Enhance Functional Ability in a Patient with Bipolar Latissimus Dorsi Myocutaneous Flap Transfer at the Elbow: A Case Report

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Abstract

Background – Elbow flexion is often lacking in patients with neuro-vascular injuries post trauma to the arm. Option for functional reconstruction is often limited in such patients due to delayed presentation and unavailability of suitable nerves and blood vessels. Many a times the only available option is regional (Latissimus dorsi) or Free (gracilis) functional muscle transfer. Physiotherapy in the form of exercises and electrical stimulation, muscle re-education form an important part of post-operative protocol which helps in regaining the functional ability after bipolar latissimus dorsi transfer.

Case Description – A 17 year old male met with a road traffic accident which led to injury to his right arm because of which his radial, ulnar, median and musculocutaneous nerve got injured. Patient was unable to flex the elbow because of this injury. Surgeons performed bipolar latissimus dorsi myocutaneous flap transfer at the elbow and after the surgery patient was referred for the postoperative rehabilitation.

Method – A case of post-bipolar latissimus dorsi transfer with reduced strength and range of motion has been presented.

Intervention – Pulsed short wave diathermy at the axilla for 15 minutes. Electrical stimulation over the transferred latissimus dorsi, lumbricals, flexor carpi radialis, flexor carpi ulnaris, flexor digitorum profundus and superficialis for 10 minutes each. Tapping was done over the transferred latissimus dorsi muscle with range of motion exercises. The subject was treated 1 hour per day, 3 days a week for 3 months.

Outcome Measures – Right shoulder/elbow/wrist muscular strength measured by manual muscle test, Right shoulder/elbow/wrist active and passive range of motion, Functional ability measured by Disabilities of arm, shoulder and hand scale.

Results – Physiotherapy can effectively improve the range and strength of the elbow muscles thus improving the functional capacity.

Conclusion – Elbow and arm function post operatively can significantly improve through various physiotherapeutic interventions.

Keywords – Elbow flexion, Latissimus dorsi

Introduction

The function of the elbow joint is to provide stability and mobility in elbow function¹. Elbow flexion is often lacking in patients with neuro - vascular injuries post severe trauma to the arm. Loss of elbow flexion because of this can result in reduced ability to position hand in

space as the arm might hang limply from the shoulder. It affects activities of daily living like wearing clothes, feeding, bathing, brushing, cooking, etc. In short all the functional activities get affected because of this injury.

Earlier surgeons did this surgery only when the hand functions were preserved but times have changed; now they opt for surgical intervention in order to provide stability to the arm. In order to regain the flexion at elbow, surgeons perform bipolar or unipolar latissimus dorsi, triceps transfer, sternocleidomastoid transfer, pectoralis transfer, etc. However, bipolar latissimus dorsi transfer is considered to be an effective procedure for restoring elbow flexion². Post – surgery the arm is immobilized in cast for about four to six weeks. Since the muscle tendon has been transferred the strength and contractility of the muscle reduces and to regain the post-operative status of the transferred muscle patient requires rigorous post-operative rehabilitation.

Rehabilitation is considered to be critical to achieve successful outcomes in these cases. Rehabilitation requires activating the transferred muscles and learning new motor control strategies¹. Recommended treatment includes early mobilization by active and passive range of motion exercises, electrical stimulation, functional training using audio-visual feedback^{2,3}. One such case has been presented here.

Case Description

17 year old male met with a road traffic accident in the year 2017. This led to head injury and injury to his right arm. NCCT (Non-contrast head computed tomography) showed fracture of the frontal bone which was managed conservatively. X-ray showed fracture

at the distal end of radius of the right side which was managed by K- wire fixation. He underwent debridement (removal of major part of the biceps muscle) and repair of the brachial artery with the interposition reverse long saphenous vein graft with skin grafting.

Postoperatively, the patient developed blow out from brachial artery repair site which was then ligated. He was unable to perform any active movement with the right hand. Even seven months post-surgery, he could not perform any functional activity with his right arm and so NCV (Nerve conduction velocity) was done. His radial, median, ulnar and musculocutaneous nerves were not recordable in the NCV and so he was referred to the plastic surgeon. In order to regain elbow flexion for the right arm; bipolar latissimus dorsi was done by the plastic surgeon. His arm was immobilized in the cast for about four weeks and then he was referred for physiotherapy.

On observation, shoulder girdle was elevated with the help of an aeroplane splint, elbow was slightly flexed because of the scar from the surgery and the right wrist was held in the neutral position. On sensory examination, superficial sensation was reduced around the scar at the elbow.

On motor examination,

Pre- Surgical Status

Table1. RANGE OF MOTION (R.O.M) before surgery

Joint	Motion	Arom	Prom
Shoulder	Flexion	0 – 140°	0 – 180°
	Extension	0 – 40°	0 – 50°
	Abduction	0 – 135°	0 – 180°
	Internal Rotation	0 – 50°	0 – 70°
	External Rotation	0 – 55°	0 – 90°
Elbow	Flexion	-	0 – 150°
	Extension	-	150° – 0
Wrist	Flexion	-	0
	Extension	-	0 – 60°

- The patient couldn't actively flex or extend the elbow and wrist. Absent range at the elbow resulted in reduced active range at the shoulder.

Table2. Manual Muscle Testing (M.m.t) Before Surgery

Joint	Muscles	Strength			
		INDEX	MIDDLE	RING	LITTLE
Shoulder	Flexors	3-			
	Extensors	3-			
	Abductors	3-			
	Internal Rotators	3-			
	External Rotators	3-			
Elbow	Flexors	0			
	Extensors	3			
Wrist	Flexors	1			
	Extensors	0			
1 st CARPOMETACARPAL	FLEXORS	1			
	ADDUCTORS	1			
	EXTENSORS	0			
	ABDUCTORS	0			
METACARPOPHALANGEAL	FLEXORS	0	1	1	1
	EXTENSORS	0	0	0	0
	ABDUCTORS	0	0	0	0
	ADDUCTORS	0	0	0	0
PROXIMAL INTERPHALANGEAL	FLEXORS	0	1	1	1
DISTAL INTERPHALANGEAL	FLEXORS	0	1	1	1

Post-Surgical Status

Table 3. R.O.M after surgery

Joint	Motion	Arom	Prom
Shoulder	Flexion	0 – 90°	0 – 95°
	Extension	0 – 35°	0 – 40°
	Abduction	0 – 81°	0 – 90°
	Internal Rotation	0 – 50°	0 – 55°
	External Rotation	0 – 25°	0 – 30°
Elbow	Flexion	-	40° – 110°
	Extension	-	110°– 40°
Wrist	Flexion	-	0
	Extension	-	0 – 60°

* Post-surgery the patient couldn't actively flex the elbow. Nerve injury led to no active movement at the wrist and fingers.

Table4. M.M.T after surgery

Joint	Muscles	Strength			
Shoulder	Flexors	(3+)			
	Extensors	(3+)			
	Abductors	(3+)			
	Internal Rotators	(3)			
	External Rotators	(3)			
Elbow	Flexors	1			
	Extensors	3			
Wrist	Flexors	1			
	Extensors	0			
1 st Carpometacarpal	Adductors	1			
	Flexors	1			
		Index	Middle	Ring	Little
Metacarpophalangeal	Flexors	0	1	1	1
	Extensors	0	0	0	0
	Abductors	0	0	0	0
	Adductors	0	0	0	0
Proximal Interphalangeal	Flexors	0	1	1+	1+
Distal Interphalangeal	Flexors	0	1	1+	1+

*The grades within the bracket mean within available range. Metacarpophalangeal (MCP) and the Interphalangeal (IP) joints of the thumb did not depict any kind of strength.

Functional Scale– DASH (Disabilities of the arm, shoulder and hand) SCORE was used to grade the functional ability.

Disability score – 58.62 (before treatment)

Surgical Intervention

Bipolar latissimus dorsi transfer- Latissimus origin is approached through longitudinal incision posterior to the mid- axillary line. The latissimus dorsi is mobilized. Its origin and insertions are completely divided and muscle is completely islanded keeping neurovascular pedicle (Thoracodorsal artery, its venae comittantes and the nerve) intact. Latissimus is then tunneled under the axilla to exit the delto-pectoral incision. The latissimus tendon is brought out deep and proximal to pectoralis major. A new origin is provided by attaching muscle to coracoid process. Elbow is approached through S-shaped anterior incision, once adequate muscle tension is adjusted latissimus tendon and biceps brachii tendon is sewn together at the radial tuberosity while holding the forearm in maximum supination and 100 degree of flexion¹. Post-surgery the arm is immobilized in the cast and then is referred to the physiotherapy department.



Figure1. Post Bipolar Latissimus dorsi myocutaneous transfer at the elbow

Physiotherapy Intervention

First Two Weeks

Pulse Short wave diathermy was given at the axilla of the right arm to promote healing of surgical wound⁴. (Parameters- 20 Hz for 15 minutes)

Passive movements (10 repetitions and 2 sets with a rest period of 5 seconds in between each set) and scar mobilization was done at the right elbow for improving the range of motion^{5,6}.

Since the manual muscle testing depicted grade 1 strength for the elbow flexors we started with Electrical stimulation followed by tapping along with passive movement over the transferred latissimus dorsi muscle belly on the anterior aspect of the arm for muscle re-education^{5,6}.

Since, the muscle strength for wrist and finger flexors was also grade 1; electrical stimulation was also given for lumbricals, Flexor digitorum superficialis, flexor digitorum profundus, flexor carpi radialis and ulnaris⁵. (Interrupted direct current, Triangular stimulation, Parameters – 30 contractions and 2 sets).

Range of motion exercises at the shoulder, elbow and wrist were continued to prevent any secondary complications (10 repetitions and 2 sets with a rest period of 5 seconds in between each set). The improvement in the ranges within 2 weeks has been mentioned in table 6.

Two Weeks to Four Weeks

Progression from passive to active assisted and active range of motion exercises in gravity eliminated plane was initiated. Patient was made to do multiple angle isometrics in the gravity eliminated plane (10 repetitions at every angle). The patient was asked to apply an equal an opposing force while flexing the elbow as the therapist applies force in the opposite direction at different angles like 30⁰, 45⁰, 90⁰, etc. PNF Technique (Hold relax technique) was done in the gravity eliminated plane to improve the extension lag at the elbow^{1,7}.

Wound in the axilla healed within 3 weeks and so in order to improve the ranges at the shoulder stretching and strengthening exercises were started. Patient was made to even perform shoulder isometric exercises (10 repetitions and 2 sets with rest period of 5 seconds between each set).

After Four Weeks

Slowly progression was made to active movements which were done against the gravity. Initially, the patient required assistance (active assisted movement) while flexing the elbow against gravity but later was capable

to perform flexion though not completely. He was even made to do isometric movements in the available range. Electrical stimulation was continued simultaneously for the transferred latissimus dorsi, wrist flexors and the lumbricals.



Figure 2. Patient actively flexing the elbow post-rehabilitation

Outcome

The range of motion after 2 weeks and after 3 months has been mentioned below.

Table 5. Comparison of range of motion between 2 weeks and 3 months of physiotherapy

Joint	Motion	2 Weeks		3 Months	
		Arom	Prom	Arom	Prom
Shoulder	Flexion	0 – 100°	0 – 102°	0 – 150°	0 – 160°
	Extension	0 – 40°	0 – 45°	0 – 44°	0 – 50°
	Abduction	0 – 87°	0 – 92°	0 – 145°	0 – 150°
	Internal Rotation	0 – 50°	0 – 57°	0 – 65°	0 – 70°
	External Rotation	0 – 30°	0 – 34°	0 – 60°	0 – 70°
Elbow	Flexion	-	30°– 115°	0 – 125°	0 – 130°
	Extension	-	115°– 30°	125° – 0°	130° – 0
Wrist	Flexion	-	0	-	0
	Extension	-	0 – 65°	-	0 – 80°

*The patient couldn't actively flex or extend the wrist.

Table 6. Manual Muscle Testing after 3 months of physiotherapy

Joint	Muscles	Strength			
		Index	Middle	Ring	Little
Shoulder	Flexors	(4)			
	Extensors	(4)			
	Abductors	(4)			
	Internal Rotators	(3+)			
	External Rotators	(3+)			
	Elbow	Flexors	(2+)		
	Extensors	4			
Wrist	Flexors	1			
1 st Carpometacarpal	Flexors	2-			
	Adductors	2+			
	Abductors	0			
	Extensors	0			
			Index	Middle	Ring
Metacarpophalangeal	Flexors	0	1	1	1
	Extensors	0	0	0	0
	Abductors	0	0	0	0
	Adductors	0	0	0	0
Proximal Interphalangeal	Flexors	0	3-	3	3
Distal Interphalangeal	Flexors	0	3	3	3

Functional Scale: Dash Scale

Disability score – 10.35 (after treatment)

The score reduced from **58.62** to **10.35** within 3 months.

Discussion

Elbow flexion improvement in patients with traumatic neuro-vascular injuries provides an important gain in the injured limb function. This case study was aimed to find out the effectiveness of physiotherapy in a

patient with transferred latissimus dorsi over the elbow. The patient underwent 3 months of early physiotherapy post-surgery. Electrical stimulation, passive exercises and strengthening exercises after the surgical intervention were extremely important or else gain in the strength would have been minimal. Passive exercises helped in preventing any secondary complications. Also since the newly transferred muscle had to be re-educated passive movements was an important part of the rehabilitation process.

Electrical stimulation played an important role in improving the strength of the muscles which could not contract by themselves. Further isometric exercises and strengthening exercises helped in improving the strength. The outcomes were measured by using DASH Scale which showed improvement in the patient. The patient is still continuing with the physiotherapy and we expect improvement.

Conclusion

Early physiotherapy after the bipolar latissimus dorsi transfer to the elbow plays an effective role in improving both the range of motion and the strength of the elbow. Patient regains the ability to perform the functional activities. It was a self-designed protocol based on the physical assessment.

Ethical Clearance – Not required as this is a case report.

Source of Funding – Self.

Conflict of Interest- Nil

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Immediate Effect of Muscle Energy Technique on Quadratus Lumborum Muscle in Patients with Non-Specific Low Back Pain

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Abstract

[Purpose] The aim of this study was to evaluate the immediate effect of Muscle Energy Technique on Quadratus Lumborum Muscle on pain level and active Lumbar Range of motion in patients with acute and sub acute nonspecific Low back pain. [Subjects and Method] Sixty patients with nonspecific low back pain and limited lumbar ROM were selected. The subjects were randomly assigned to an experimental group(n=30), which received treatment consisting of Muscle Energy Technique to Quadratus Lumborum muscle and hot pack, while that of control group received only hot pack to lower back. Pain levels using NPRS and Lumbar ROM using Modified Schober's test were measured before and immediately after the interventions in both groups. [Results] Both the groups showed significant improvement in outcome measures. However, the Experimental group showed better results on comparing with control group. [Conclusion] The combination of Muscle Energy Technique to Quadratus Lumborum muscle along with hot pack treatment was found to be effective in reducing pain and improving lumbar ROM after a single intervention session.

Keywords: Muscle Energy Technique, Quadratus Lumborum muscle, Non specific Low back pain.

Abbreviations : MET - Muscle Energy Technique; ROM - Range Of Motion; NPRS - Numeric Pain Rating Scale

Introduction

Low back pain is the most common health problem that affects work performance and quality of life. It is defined as pain, stiffness, muscle tension, or localized stiffness above the inferior gluteal folds and below the costal margin, with or without leg pain (sciatica). The prevalence of low back pain in India (2016) was found to be 42.4%¹. The majority (60.9%) of population with low back pain experienced moderate disability. Non specific low back pain is characterized by the absence of structural change, that is there is nothing disc space reduction, nerve root compression, bone or joint injury, marked scoliosis or lordosis that may lead to back pain.² Despite absence of structural change in nonspecific LBP, it can limit daily activities and inability to work. It is usually categorized in 3 subtypes: acute (<6 weeks), sub-acute (6 to 12 weeks) and chronic (>12 weeks) low back pain. The back muscles along with the abdominal, the glutea and the leg muscles play important role in the etiology of low back pain.

MET is defined as "treatment procedure that involves voluntary contraction of patient muscle in a precisely controlled direction, at varying level of intensity against a distinctly executed counterforce applied by the therapist."³ According to the studies conducted by Noelle M Selkow (2009)⁴ and Franke H Fryer G, (2015)⁵, MET may be useful to decrease nonspecific low back pain. Norris (2000) describes the divided roles in which quadratus is involved:- The muscle act functionally different in its medial and lateral portions, with the medial portion being more active as a stabiliser of the lumbar spine, and the lateral more active as a mobiliser. Janda (1983)⁶ observes that, when the patient is sidebending, when the lumbar spine appears straight, with compensatory motion occurring only from the thoracolumbar region upwards, tightness of quadratus lumborum may be suspected.

Quadratus lumborum is a common source of lower back pain. Because it connects the pelvis to the spine and bilateral contraction produces extension, unilateral

contraction produces extension and sidebending to the same side⁷. In dysfunction there is often a degree of spasm or tightness in the muscles which stabilise the region, notably: psoas and erector spinae of the thoracolumbar region, as well as quadratus lumborum and rectus abdominis. Quadratus fibres merge with the diaphragm (as do those of psoas), which makes involvement in respiratory dysfunction a possibility since it plays a role in exhalation, both via this merging and by its attachment to the 12th rib. Tightness of quadratus, or the presence of trigger points, can result in pain in the lower ribs and along the iliac crest if the lateral fibres are affected. Tightness of the medial fibres, or the presence of trigger points, can produce pain in the sacroiliac joint and the buttock. Thus, the purpose of study is to see the difference in pain scale and lumbar ROM immediately post Muscle Energy Technique intervention.

Method

60 Subjects were selected for the comparative study conducted at Bhausahab Sardesai Talegaon Rural hospital, based on the following inclusion criteria- Both male and female between the age group of 20–45 years⁸, with NPRS score of 4-7⁹. of having acute and sub acute low back pain localized paraspinally with Quadratus lumborum tightness present.^{10,7} Exclusion criteria consists Radiating pain, paresthesia, numbness into buttocks or lower extremity, patients having low back pain of more than 12 weeks of duration (chronic), Spondylolisthesis, Spondylosis, Lumbar disc herniation, Previous Spinal surgeries, Structural deformity, Systemic disease or inflammatory condition of spine, Hip joint pathology or fractures.

After the approval of Institutional Ethical Committee, written informed consent was taken from all the 60 subjects and were divided in two groups by chit method of random sampling. Subjects within experimental group were treated with hot pack for 20 minutes¹¹ on low back in prone position and MET to Quadratus Lumborum as follows - (figure-1) The practitioner stands behind the side-lying patient, at waist level. The patient has the uppermost arm extended over the head to firmly grasp the top end of the table and, on an inhalation, abducts the uppermost leg

until the practitioner palpates strong quadratus activity (elevation of around 30° usually). The patient holds the leg isometrically in this manner, allowing gravity to provide resistance for 10-second, the patient allows the leg to hang slightly behind him over the back of the table. The practitioner straddles this and, cradling the pelvis with both hands (fingers interlocked over crest of pelvis), leans back to take out all slack and to ease the pelvis away from the lower ribs during an exhalation. The stretch should be held for between 10 and 30 seconds. Contraction followed by stretch is repeated with raised leg in front of, behind the trunk in order to activate different fibers and was given bilaterally. The control group subjects were treated with only 20 minutes hot pack on low back in prone.

Outcome was measured before intervention and immediately post treatment by Modified Schobers test for all Lumbar spine ranges and NPRS scale for pain intensity.

Results

Descriptive statistics was done in the form of mean and standard deviation. Interferential statistics evaluated changes in the NPRS using Mann-Whitney test between the groups and Wilcoxon matched pairs test was used to measure changes within groups, while changes in Lumbar range were evaluated using Paired t test and Unpaired t test in both control and experimental group. Data analysis was done using InStat (Version 3.05, created September 2000). Significance was accepted with $p < 0.05$

Study showed extremely significant difference in NPRS of experimental group with mean difference of 4.23 ± 1.0 and p value = 0.0001, while significant difference in pain scale of control group with mean difference of 2 ± 0.7 and p value = 0.0001, with $U = 44.0$ (Table 1)

Comparison of mean difference of lumbar ranges by Modified Schobers test between experimental and control group showed that there was significant improvement in lumbar flexion, side flexion and rotation of experimental group than in control group. (Table 2)

Table 1. Comparison of pre and post means of NPRS

NPRS	Pre-Mean	Post- Mean	Mean Difference	p Value	Significance
EXPERIMENTAL GROUP	5.7 ± 1.02	1.46 ± 1.04	4.23 ± 1.0	0.0001	Extremely Significant
CONTROL GROUP	5.3 ± 0.91	3.3 ± 0.9	2 ± 0.7	0.0001	Extremely Significant

Table 2. Comparison of Lumbar ROM pre and post treatment using Paired T test

Range of motion	Experimental Group		p Value	Paired T test	Control Group		p Value	Paired T test
	Pre-mean	Post- mean			Pre-mean	Post- mean		
Flexion	3.01 ± 0.75	4.83 ± 0.49	0.0001	17.41	3.56 ± 0.9	4.12 ± 0.85	0.0001	8.43
Extension	1.63 ± 0.81	3.12 ± 0.70	0.0001	11.54	2.12 ± 0.76	2.47 ± 0.63	0.0001	4.78
Right side flexion	15.9 ± 4.80	19.3 ± 4.55	0.0001	12.71	16.56 ± 2.55	16.9 ± 2.61	0.0002	4.247
Left side flexion	15.7 ± 4.5	19.5 ± 4.5	0.0001	11.13	17.0 ± 2.67	17.43 ± 2.7	0.0001	4.46
Right rotation	7.13 ± 1.16	8.99 ± 1.06	0.0001	13.66	7.2 ± 0.87	7.6 ± 1.02	0.0001	5.48
Left rotation	7.06 ± 1.33	9.16 ± 1.55	0.0001	13	7.4 ± 0.95	7.70 ± 0.80	0.0014	3.52



Figure 1: The practitioner stands behind the side-lying patient, at waist level with the patient’s uppermost arm extended over the head to firmly grasp the top end of the table. The patient holds isometric hip abduction during inhalation and later allowing the leg to hang slightly behind him over the back of the table. The practitioner cradle the pelvis with both hands (fingers interlocked over crest of pelvis), leans back to take out all slack and to ease the pelvis away from the lower ribs during an exhalation.

Discussion

The study was undertaken to assess the immediate effectiveness of Muscle Energy Technique on Quadratus Lumborum muscle in patients with acute and sub acute nonspecific low back pain. For the purpose of this study, 60 patients were selected and divided into two groups. Experimental group was given 20 min hot pack to low back and MET for Quadratus Lumborum, while the control group was given 20 min hot pack. The changes observed in this study are noteworthy, within the group comparison showed that there was significant reduction in low back pain in both the groups. According to Table 1 the post treatment reduction in pain scale was significant with p value = 0.0001 of experimental group. It should be noted that the control group produced good outcome, but addition of the MET improved the outcomes substantially.

The reduction in pain due to MET can be explained on the basis of neurophysiology, as described by Chaitow that Post-isometric relaxation refers to: the subsequent reduction in the tone of agonist muscle after isometric contraction, it occurs due to Golgi tendon organ stretch receptors located in the tendon of the agonist muscle. These stretch receptors react to overstretching of muscle by inhibiting further muscle contraction. The fact that increasing the length of shortened muscles relieve tenderness and pain, supports a muscular origin of the pain. According to the study conducted by Harald Brodin, Stockholm, describes the effect of using MET in a group of low back pain sufferers. 41 patients (24 female, 17 male) who had suffered pain in and around lumbar segments, with reduced mobility for a duration of at least 2 months, were randomly assigned to two groups, one receiving no treatment and the other receiving MET of lumbar spine 3 times a week, both groups recorded their pain level at rest and also during activity. Results showed that the group receiving MET treatment showed pain reduction statistically greater than in non treated group, as well an increase in mobility of lumbar spine. Low back pain reduction due to hot pack is explained on the basis of physiological changes which are, application of thermotherapy and hot water lead to significant increase in soft tissue flexibility, improvement in blood circulation through muscles, easier and better contraction of smooth muscles, also improvement in the motor function of muscles. Besides, hot pack triggers decline in pain especially low back pain by inhibiting the pain signal and exerting pressure on back muscles. The study conducted by Morteza Dehghan, Journal of Clinical and Diagnostic Research. examined the efficiency of thermotherapy, cryotherapy alongside a routine pharmacological treatment, on pain relief in acute low back back patients. Clinical trial study was conducted on 87 patients randomly assigned to three

group of 29 each. First (thermotherapy) group underwent hot water bag and naproxen, Second (cryotherapy) group was treated with ice and naproxen, and the third group was only treated with naproxen, all for one week. The data were analysed by SPSS software using paired t-test, ANOVA, and chi-square. Results indicated that the application of thermotherapy compared to cryotherapy and control group reported significant less pain (<0.05)

In this study, the experimental group showed significant improvement in lumbar ranges as compared to control group, due to mechanism that muscle contraction against equal counterforce triggers the Golgi tendon organ. The afferent nerve impulse from the Golgi tendon organ enters the dorsal root of the spinal cord and meets with an inhibitory motor neurone, which stops the discharge of the efferent motor neurones impulse and therefore prevents further contraction, the muscle tone decreases, which in turn results in the agonist relaxing and lengthening, so there is increase in the ROM.

A study conducted by Ronald Schenk, Amy MacDiarmid, The Journal of Manual and Manipulative Therapy 10, examined whether the application of a muscle energy technique (MET) to the lumbar spine could significantly influence lumbar range of motion in an asymptomatic population. 26 volunteer subjects, with limited range of motion in lumbar extension, were divided in control group and treatment group. Treatment group subjects underwent eight sessions of MET, twice a week for 4 weeks. An independent group t test was done to analyze the data, and mean changes were compared for both groups. Statistical significance was found at the $p < 0.05$ level indicating that the MET group significantly improved in lumbar range of motion.

Thus from the above result and Statistical data analysis, research hypothesis is significantly proven.

Conclusion

It can be concluded that Muscle energy technique of Quadratus Lumborum along with hot pack is beneficial in immediately reducing non specific low back pain and improving lumbar spine mobility as compared to hot pack alone.

Conflict of Interest: NIL

Source of Funding : Self

Ethical Clearance: Taken from Institutional Ethical committee

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Assessment of Body Coordination, Strength and Agility Using Bruininks- Oseretsky Test of Motor Proficiency (BOT-2) in Overweight and Obese Children Aged 7-12 Years

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Abstract

Background - Childhood obesity is a major health problem in many developing countries, including India. As a result, overweight and obese children achieve fewer opportunities to develop proficient motor skills. Early assessment should be done to evaluate children having poor coordination problem and early intervention should be given to avoid risk of any neuromotor disturbances later. This study is done to find out the level of motor proficiency in terms of Body coordination, strength and agility in overweight and obese school going children aged 7-12 years using BOT-2 test.

Method: A cross sectional analytical study was conducted using BOT-2 long form. Purposive sampling of 54 overweight and obese children (32 males and 22 females) aged 7-12 years who met the inclusion criteria were taken for the study and assessed under 2 motor area composite of BOT -2. The study was conducted after the ethical clearance obtained by the institutional ethical committee. Each task was explained verbally and demonstrated to each student, to ensure proper understanding of the task.

Results: 54 children were assessed (59.2% males and 40.8% females) and standard score of the BOT -2 test was calculated which signifies the level of proficiency. For Body coordination component mean standard score of 45.07 and for strength and agility component it was 37.79.

Conclusion: This study concludes that according to Descriptive Category of BOT -2 test in Body coordination 33%, in Strength and agility 74% of overweight and obese children aged 7-12 years has motor deficits.

Key Words: Obesity, Body Coordination, Strength and agility, BOT-2.

Introduction

Prevalence of Childhood obesity has increased at an alarming rate. An approximately 42 million school children aged less than 5 years are overweight and close to 35 million of these are living in developing countries. 10% of children around the globe aged between 5 to 17 years are overweight out of which 70% grow up to become obese adults. ¹

Bruininks-oseretsky Test of motor proficiency, Second Edition (BOT-2) is an individually administered test that uses engaging, goal- directed activities to measure a wide array of motor skills in individuals of age 4-21. The BOT-2 uses a subset and composite

structure that highlights motor performance in the broad functional areas of stability, mobility, strength, coordination and object manipulation. Four motor area composites of BOT- 2 are as follows: 1. Fine Manual Control, which encompasses motor skills involving control and coordination of the distal musculature of the hands and fingers. 2. Manual Coordination, which encompasses motor skills involving control and coordination of the arms and hands, especially for object manipulation. 3. Body Coordination, which encompasses control and coordination of the large musculature used in maintaining posture and balance. 4. Strength and Agility, which encompasses aspects of fitness and coordination involved in casual play, competitive sports,

and other physical activity.² In the present study only 2 motor area composites were considered i.e. Body Coordination, Strength and agility, which had 4 subtests namely bilateral coordination, balance, running speed and agility, strength.

Motor development is the gradual process by which child gains balance and coordination of the large muscle of legs, trunk and small muscle of the hand. A motor skill is a learned series of movement that combines to produce a smooth, efficient action.³ Balance is an ability to maintain the line of gravity of a body within the base of support with minimal postural sway. An increase in sway isn't essentially an indicator of dysfunctional balance such a lot as it is an indicator of reduced sensorimotor control.⁴ Maintaining balance requires coordination of input from multiple sensory systems including the vestibular, somatosensory, and visual systems.⁵

Vestibular system has sense organs that regulate equilibrium; directional information because it relates to head position (internal gravitational, linear, and angular acceleration) Somatosensory system, senses proprioception and kinesthesia of joints; information from skin and joints (pressure and vibrating senses); spatial position and movement relative to the support surface; movement and position of different body parts relative to each other. Visual system refers to the verticality of body and head motion; spatial location relative to objects.⁶

Bilateral coordination refers to the flexibility to coordinate each side of the body at a constant time in an exceedingly controlled and arranged manner, for example; stabilizing paper with one hand while writing/cutting with the other. It is the ability to use both sides of the body in an integrated and skillful manner.⁷ Good bilateral coordination/integration is an indicator that both sides of the brain are communicating effectively and sharing information. Inadequate bilateral coordination can adversely affect overall motor coordination as well as cognitive development, therefore negatively moving educational performance.⁸

Motor competence can be defined as a person's movement coordination quality when performing different motor skills, ranging on a continuum from gross to fine motor skills⁸. Majority of available studies on motor skill competence in overweight and obese children focuses exclusively on gross motor skills, like balance and gait. Marshall and Steele (2004) found

body composition to be negatively related to locomotor skill proficiency (running, jumping) but did not reveal differences in the motor skill level of relatively stationary object control tasks (e.g. striking, throwing, catching etc.) Till date, there is less research in the literature which has evaluated the relation between motor competence and BMI in Indian obese children. The purpose of the present study was to find the association between both gross and fine motor skills and BMI in children (overweight, obese) using BOT – 2.⁹

Material and Methodology

In this study, 148 children were screened for BMI from 4 different schools out of which 54 were included in the study who fulfilled the inclusion criteria of age between 7-12 years with BMI of 23 and above. Then they were assessed under 2 motor area of BOT – 2 like body coordination, Strength and agility. It took approximately 10 minutes to prepare the testing area and 20 – 25 minutes to administer the form. Item raw scores were determined for each item and for multiple trials when allowed. Each item raw score reflects one of the variety of possibilities such as the number of correct responses for a given item (e.g., number of sit-ups correctly completed) or the number of seconds an activity is sustained (e.g., seconds able to stand on one leg on a line – eyes open). Each item raw score was converted to a point score using information provided on the Record Form. For each subtest, the point scores were summed, creating total point scores.

Once total point scores were determined, each subsequent step involved looking up information in the tables provided in the manual. First, each subtest total point score was converted to a scale score. Second, the sum of the scale scores for each subtest within a Motor Area composite was converted to a standard score. Finally, the Motor Area composite standard scores were summed and this sum was converted to a Total Motor Composite standard score. For all of the scale and standard scores, confidence intervals (95%) was determined and used when interpreting a child's performance. Then the data collected was analyzed using Epi info 7 software.



Photograph 1 – Assessing touching nose with

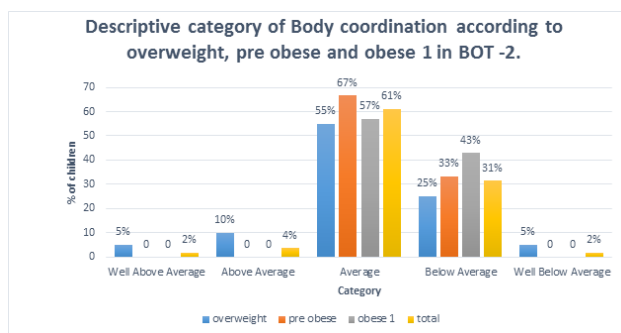


Photograph 2 – Assessing standing on index finger for bilateral coordination. One leg on balance beam for balance.



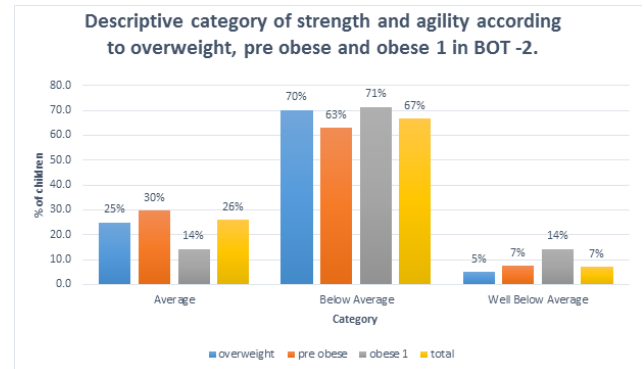
Photograph 3 – Assessing V-up for strength.

Data Analysis



Graph 1 - Descriptive category of Body coordination according to overweight, pre obese and obese 1 in BOT -2.

Interpretation – Graph 1 represents that out of 54 children 2% falls under well below average category, 31% falls under below average, 61% under average category, and 4% under above average and 2% under well above average category in body coordination motor area composite of BOT 2.



Graph 2 - Descriptive category of strength and agility according to overweight, pre obese and obese 1 in BOT -2.

Interpretation – Graph 2 represents that out of 54 children 7% falls under well below average category, 67% falls under below average, 26% under average category in strength and agility motor area composite of BOT 2.

Results

Graph 1- represents that in body coordination maximum children i.e. 61.1% falls under average category, 31% under below average, 2% under well below average, 4% under above average and 2% under well above average category. Only in overweight category 5% were well below average, 25% were below average, 55% were average, 10% were above average and 5% were well above average. In pre obese category 33% were below average, 67% were average. In obese 1 category 43% were below average, 57% were average.

Graph 2- shows that in strength and agility 67% falls under below average category, 7% under well below average, 26% under average and 0% under above average and well above average category. Then only in overweight category children 5% were well below average, 25% were below average, 55% were average, 10% were above average and 5% were well above average. In pre obese 7% were well below average, 63% were below average, 30% were average. In obese 1 category 14% were well below average, 71% were below average, 14% were average.

Discussion

The aim of the study was to assess motor proficiency in terms of Body coordination, Strength and agility using Bruininks- oseretsky test of motor proficiency [BOT-2] in overweight and obese children aged 7-12 years” In this study 148 children were screened for BMI from 4 different schools out of which 54 were included in the study from which 37.30% were overweight with the BMI (23-24.9), 50% were pre-obese with BMI (25-29.9) and 12.96% were obese 1 with BMI (30-40).

The ULC subtest relies heavily on hand–eye coordination of a child. Traditionally, most children would participate in catching and throwing activities from a young age that would help develop hand–eye coordination. Therefore, it’s not shocking to visualize youngsters falling below expected proficiency levels for the Upper limb coordination (ULC) subtest, given the reduction in physical activity and motor skill competence in recent years. Previous analysis has shown that cultural variations influence the motor skill proficiency of kids (Bardid et al., 2015). However, it is also important to mention that there is some evidence that video gaming can lead to improvement in manual dexterity and hand–eye coordination in laparoscopic surgery training in surgeons (Adams et al., 2012; Badurdeen et al., 2010; Rosser et al., 2007). Touch screen devices require several actions such as swiping, dragging and dropping, pushing or tapping which all require fine motor skill to perform.¹⁰

It was found that maximum of obese 1 were in below average according to the descriptive category. Strength and agility included activities like stepping sideways over a balance beam, one-legged side hop, standing long jump, pushups etc. It seems obvious that having more fat mass does not help a child in motor activities that involve changes in center of mass. The idea that carrying too much weight may have such an effect was termed the morphological constraint hypothesis coined by Chivers et al.¹¹ The morphological constraint hypothesis states that children who are overweight or obese have to move within high biomechanical constraints and are therefore more challenged in tasks that involve changes in center of mass.¹²

A study on gait control in obese and normal-weight children investigated the effect of vision in children in their early teens. The obese children were more dependent on vision than the normal weight children. The authors concluded that the obese children not only suffer from

the mechanical problem of moving excess of mass but also seem to have a different linkage between perception and action, which leads to a poorer motor performance. D’Hondt et al.¹³ hypothesized that the reason for this is that sensory information is processed differently in obese children when controlling locomotion. The effect of body mass on motor planning and skills was also studied in experiments examining obstacle crossing through 3D kinematics and kinetics. The results showed that the obese children had more difficulty in motor planning and motor skills, as their strategy left them less stable after crossing the obstacles. The difficulty that obese children experience in planning and controlling their additional weight seems obvious to Gill et al.¹⁴

Also excessive body weight affects body geometry and increases the mass of different body segments, which makes non-stationary activities more demanding. Lower actual and perceived motor competence might limit obese children’s participation in recreational activities and sports, which are typically enjoyed by their motor proficient peers. Stodden et al. proposed that the development of motor skill competence is a primary underlying mechanism that promotes the engagement in physical activity, which in turn encourages motor skill competence. The reciprocal influence between physical activity and motor skill competence increases as children enter in middle and late childhood. Lopes et al. showed that the strength of the negative association between motor competence and BMI, increases up to the age of 11. Hence children might have showed lower motor deficits in strength and agility motor area composite especially in push-ups subtest.

Conclusion

This study concluded that in Body coordination 33%, In Strength and agility 74% of overweight and obese children aged 7-12 years has motor deficits.

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To Compare the Skilled based Physical Fitness Such as Agility, Power and Speed between the Young College Male Basketball and Football Players

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Abstract

Background: Football and basketball players need good fitness, flexibility, power, strength, agility, endurance and vertical jumping ability to achieve sporting targets. Physical fitness is important for top class performance in sports and also for injury prevention.

Objective: To compare the skilled based physical fitness such as Agility, Power and Speed between the Young college male Basketball and Football players.

Method: 60 players (only males), playing football and basketball since 1 year, age between 17-25 years from different colleges in Surat and Bardoli were included for the study. From these 30 players were football players and 30 players were basketball players. All players had filled up the informed consent form and the self-administered questionnaire. The physical fitness tests were carried out such as Illinois Agility Test (IAT), 20 meter sprint, and Vertical Jump Height (VJH) for all 60 players. The comparison was done between the football and the basketball players for each of the physical fitness tests.

Results: All statistical analysis was performed using SPSS version 16. The independent t-test was used for comparing means between two groups. Results were considered to be significant at $p < 0.05$ and confidence interval was set at 95 %. Significant differences was found between players for IAT and VJH with $p = 0.000$ ($p < 0.05$). There was no significant difference found between players for 20 Meter Sprint Test with $p = 0.590$.

Conclusion: Agility was better in football players than basketball players. VJH was more in basketball players than football players. There was no difference found in 20 meter sprint test between basketball and football players.

Key Words: Physical fitness, Basketball, Football, Vertical Jump Height, Agility, Speed, Power.

Introduction

The performance in most of sports is thought to be determined by such factors as physical fitness, physique,

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body composition, psychological traits and technique. "Physical fitness" is general term used to describe the ability to perform physical work ⁽¹⁾. The most frequently cited components fall into two groups: one related to health and the other related to skills that pertain more to athletic ability ⁽²⁾. Physical fitness, as one aspect of total fitness, is a means for development of individual personality as a whole. It is a well-known fact that players, of one game differ from the players of other games in their body measurement, physical fitness levels and personality traits ⁽³⁾.

Basketball is one of the sports characterized by

many of the basic and variable skills⁽⁴⁾. It has developed to involve common techniques of shooting, passing, dribbling, including player's positioning as well as offensive and defensive structures⁽⁵⁾. A basketball player needs good fitness, flexibility, power, strength, agility, endurance and vertical jumping ability to achieve sporting targets⁽⁵⁾. Many authors have suggested that power, agility, and speed are important characteristics for elite basketball players⁽⁶⁾.

One of the most popular sports, played in every nation at varying levels of competence is Football. This is a multifactorial event which requires simultaneous attention on body size, body composition, strength, power, quickness, reaction time, speed, agility and endurance for better performance⁽⁷⁾.

Agility is skill-related component of physical fitness that relates to the ability to rapidly change the position of the entire body in space with the speed and accuracy⁽¹⁾. Speed is skill-related component of physical fitness that relates to the ability to perform a movement within a short period of time⁽¹⁾. Power is skill-related component of physical fitness that relates to the rate at which one can perform work⁽¹⁾.

Thus, the aim of this study is to compare the skilled based physical fitness such as Agility, Power and Speed between the young college male Basketball and Football players. Physical fitness is important for top class performance in sports and also for injury prevention. College level and University level players are the future talents, who can become top level players. Basketball and football players require good agility, power and speed. The finding of this study will help Sports Physiotherapist, Coaches, Fitness Trainers and Players themselves to appropriately train and improve performance by introducing modifications in practice sessions.

Methodology

A cross sectional study conducted by collecting data from Sir K.P. College of Commerce- Surat, Sardar Vallabhbhai National Institute of Technology (SVNIT)-Surat, The Patidar Gin Science College- Bardoli. 30 Basketball and 30 Football players were selected on the bases of inclusion and exclusion criteria. All players voluntarily agreed and signed informed consent form to extend full co-operation and be available for data collection as and when required.

Inclusion criteria included males between the age group 17 – 25 years playing basketball at collage level, players participated at competitive level for minimum 2 years and physical activity practice volume was approximately 16 hours per week. Individual with any, musculoskeletal and neurological impairment, pathological condition of spine, hip, knee, and pelvis, any traumatic condition in past 6 months, cardiovascular disease, uncontrolled metabolic disorder, undergone any surgical procedure, poor balance, functional strength and flexibility, impaired ROM and Muscle power were excluded from study.

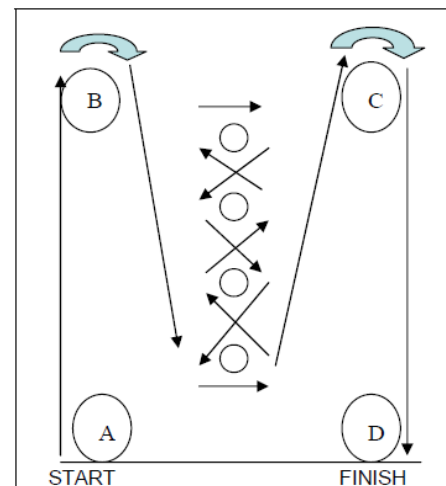
The purpose and requirement and schedule of the testing procedure were explained. Players participating in the study were required to fill a self – administrated questionnaire.

Preliminary measurements and demographic data, in which subject's age, gender, height and weight were taken. The procedure allowed the measurement of agility, speed and power by Illinois agility test, 20 meter sprint test and Vertical jump height. Each test were explained and demonstrated. Before testing, players were given practice trials to become familiar with the testing procedures. The procedure allowed the players to do 5 minutes warm up. Then procedure was carried out.

Illinois Agility Test:

This test was selected based upon established criteria and its reported validity and reproducibility of the test⁽⁸⁾⁽⁹⁾. Materials used were eight cones, stopwatch and measuring tape.

Direction of Illinois Agility test:



Cones were placed on the flat nonslip Ground. Test

was set up with four cones forming the agility area (10 meters long x 5 meters wide). Cone at point A, marking the start. Cone at B & C to mark the turning spots. Cone at point D to mark the finish. Four cones were placed in the centre of the testing area 3.3 meters apart. Players was positioned with both feet behind Cone A. Players were instructed to signal the researcher by raising his right hand when he/she was ready. On the “go” command, player sprinted forward 10m and then had run towards cone B and had turn cone B, then they had run between the cones which were keep at the distance of 3.3m in a zigzag pattern as shown in figure, then the player had run towards the cone C and had turn cone C and finished the test by running the distance of 10m towards the cone D. Test was completed when the player had cross the finish line and when no cones were knocked over ⁽¹⁰⁾. Time shown in the stopwatch was recorded in seconds.

20 Meter Sprint:

This test was used to determine the player’s maximum sprint speed & the ability to accelerate from stationary position. Equipment used were cones, stopwatch, whistle and measuring tape. 20 meter track have been measured and marked using cones. Researcher had stay at finish line with stopwatch. For this test, players have to position himself at starting line and have been instructed to give signal to researcher by raising his right hand when he was ready. At the sound of the whistle players sprinted with all-out effort. As player cross the finish line the time was recorded ⁽⁸⁾. Time shown in the stopwatch will be recorded in second.

Vertical Jump Height:

Vertical jump height is measured by the Stand and Reach test ⁽¹⁰⁾⁽¹¹⁾. Materials used were measuring tape and chalk for marking on wall. Players have positioned so that they were standing with equal weight on bilateral lower extremities, which were approximately shoulder-width apart. The players stands, side on with the dominant shoulder facing the wall, with a piece of chalk in the hand closest to wall, and had instructed to reach as high as possible and make a mark on wall; this is called the standing reach height and have been recorded as a zero starting position. The player had then asked to bend (flex) the knees approximately 120 degrees and swing the arms prior to the jump. The player was not allowed a run up or a shuffle step prior to the jump. The player was asked to jump and place a second chalk mark as high as possible on the wall, called as a jumping height

⁽¹²⁾⁽¹³⁾. This test is selected because it has high validity (0.80) and reliability (0.93) coefficients ⁽¹⁴⁾ and because it allows arm movement and a squat motion before the jump, such as those performed in sports like basketball. The player’s vertical jump score was measured as the distance between the two chalk marks; means the standing reach height and the jumping height. The difference between two chalk marks was measured in centimeters.

Statistical Analysis

All statistical analysis was performed using SPSS version 16. The independent t-test was used for comparing means between two groups. Results were considered to be significant at $p < 0.05$ and confidence interval was set at 95 %.

Demographic Data

Table: 1 Demographic Data of the Basketball players (Mean±SD)

	Mean±SD
Age (year)	20.58±0.98
Height (m)	5.93±0.27
Weight (kg)	71.52±14.23

Table: 1 represents Demographic data of Basketball players which included age(year), height(m) and weight(kg) among 30 Basketball players.

Table: 2 Demographic Data of the Football players (Mean±SD)

	Mean±SD
Age (year)	20.45±1.2
Height (m)	5.86±0.32
Weight (kg)	72.06±12.65

Table: 2 represents Demographic data of Football players which included age(year), height(m) and weight(kg) among 30 Football players.

Descriptive Data

Table: 3 Group Statistics

	Players	N	Mean	Std. Deviation
IAT	Basketball	30	20.23	.79
	Football	30	16.02	.61
20 Meter Sprint Test	Basketball	30	3.59	.27
	Football	30	3.55	.23
VJH	Basketball	30	53.17	5.06
	Football	30	44.93	3.66

(IAT- Illinois Agility Test, VJH- Vertical Jump Height)

Table: 3 represents mean and SD of Basketball players and Football players for IAT, 20 Meter Sprint Test and VJH. For basketball and football players the mean of IAT were 20.23 and 16.02 respectively. The result showed that basketball players took more time than football players to complete the agility test.

The mean of 20 meter sprint test for Basketball players and Football players were 3.59 and 3.55 respectively. There was no much difference found in 20 meter sprint test.

The mean of VJH for Basketball players and Football players were 53.17 and 44.93 respectively. The result showed that basketball players had more VJH than football players.

So, this table represented that agility was good in football players and VJH was good in basketball players.

Table: 4 Independent Samples Test

	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
IAT	23.23	58	.000	4.21	.18
20 Meter Sprint Test	.542	58	.590	.03	.06
VJH	7.23	58	.000	8.23	1.14

Table: 4 represents mean difference of IAT, 20 Meter Sprint Test and VJH between Basketball and Football players. For IAT t-value was 23.23 and associated significance value was $p=0.000$. For 20 meter sprint test t-value was 0.542 and associated significance value was $p=0.590$. For VJH t-value was 7.23 and associated significance value was $p=0.000$. The result showed that there was significant differences found between players for IAT and VJH with $p=0.000$ ($p<0.05$). There was no significant difference found between players for 20 Meter Sprint Test with $p=0.590$.

Discussion

The present study was conducted to compare the skilled based physical fitness such as Agility, Power and Speed between the young college male Basketball and Football players age between 17- 25 years. The sample size was 60. The outcome measures used were Illinois Agility Test, 20 meter sprint and Vertical Jump Height

to determine Agility, Speed and Power respectively. Results of this study showed that the significant differences was found between players for IAT and VJH with $p=0.000$. There was no significant difference found between players for 20 Meter Sprint Test with $p=0.590$.

Indu Mazumdar., et al., (2012) ⁽¹⁵⁾, conducted the study on the relationship of selected physical fitness variables to the playing ability in Basketball at different levels. In present study, physical fitness of player's measured by using IAT, 20 meter sprint test and VJH for the comparison between basketball players and football players. The result showed significant different in IAT and VJH with $p<0.05$.

Miller, M.G., et al., (2006) ⁽¹⁶⁾, conducted the study on the effects of a 6- week Plyometric training program on agility. Similarly, Raya, M.A., et al, (2013) ⁽¹⁰⁾, conducted the study on comparison of three agility tests with male service members: Edgren Side Step Test,

T-Test, and Illinois Agility Test. The results suggest that these tests are valid measures of agility that uniquely assess movement in different planes, thus providing a comprehensive assessment of high-level mobility. This was the one reason to select the IAT in our study for the comparison because it is the test reliable to improve the performance of players. The present study concluded that IAT was good in football players than basketball players. So, we can use the IAT for the training purpose.

Utku Alemdaroglu (2012)⁽¹⁷⁾, conducted study on The Relationship Between Muscle Strength, Anaerobic Performance, Agility, Sprint Ability and Vertical Jump Performance in Professional Basketball Players. This study measured many component of the Physical fitness. In present study, agility, speed and power were selected for the study purpose because these are the necessary components to improve the performance of basketball and football players.

Markovic, G., et al., (2004)⁽¹⁸⁾, conducted the study on reliability and factorial validity of squat and countermovement jump test. Based on the results of this study, it can be concluded that CMJ and SJ, are the most reliable and valid field tests for the estimation of explosive power of the lower limbs in physically active men. This was the one reason to select the VJH in our study for the comparison.

Warren Young., et al., (2008)⁽¹⁹⁾, determined relationship between split times within sprints test in 65 elite Australian Rules footballers. There was a high correlation ($r = 0.94$) between 10 m and 20 meter sprint, indicated that these measures assessed very similar speed quality. Furthermore, 20 meter sprint is a part of the SPARQ rating system for basketball. So, to evaluate a speed of a Basketball and Football player 20 meter sprint is more appropriate.

Agility, Speed and Power are very important for basketball and football players. So, present study was conducted to compare skilled based physical fitness such as agility, speed and power between the young college male basketball and football players.

Conclusion

Agility was better in football players than basketball players. VJH was more in basketball players than football players. There was no difference found in 20 meter sprint test between basketball and football players.

Conflict of Interest: There is no conflict of interest.

Source of Funding: Self-funded

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The Effect of Mobilization of an Asymptomatic Cervical Spine on Shoulder Pain, Shoulder Range of Motion and Shoulder disability in Patients with Shoulder Pain

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Abstract

Introduction: Shoulder pain is a common complaint for individuals of all ages and activity levels with a prevalence ranging from 7% to 34%. Along with involvement of shoulder joint, dysfunction at the cervico-thoracic spine and the adjacent ribs (also called the shoulder girdle) is considered to predict the recurrence and poor outcome of shoulder complaints. When shoulder joint is highly irritable, manual therapy cannot be given to it directly. Changes in the axio-scapular muscle activity during low-load functional tasks have been shown in individuals with chronic neck pain, which play an indirect role in shoulder biomechanics. Therefore, cervical spine mobilization techniques could be used during therapy to affect the more peripheral symptoms.

Materials and method: 60 patients with shoulder pain were randomly divided into 2 groups of 30 patients each. Group A received lateral and postero-anterior Maitland's mobilization of the C5, C6 and C7 spinous processes along with Short Wave Diathermy (SWD) to the shoulder while Group B received SWD to the shoulder alone for 5 days. Passive range of motion of the shoulder using a universal goniometer, Pain on VAS and a Shoulder Pain and Disability Index scale were assessed pre and post treatment.

Conclusion: Mobilization of the asymptomatic cervical spine lead to a significant reduction of pain, significant increase in the overall shoulder ROM and a reduction in the functional disability after 5 days of treatment in individuals with shoulder pain. It has a lasting effect on improvement in functional disability. When two groups were compared (SWD + mobilization v/s SWD alone), no one group was statistically better than the other.

Key Words: Cervical mobilization, Shoulder pain, asymptomatic cervical spine

Introduction

Shoulder pain is a common complaint for individuals of all ages and activity levels⁽¹⁾, with a prevalence ranging from 7% to 34%. It is observed that shoulder pain, is potentially referred from a variety of musculoskeletal sources including the shoulder complex, cervical spine and elbow. Non-musculoskeletal sources would include the lungs, heart, diaphragm, gallbladder and spleen⁽²⁾.

Many painful conditions which affect the shoulder could be divided into extrinsic and intrinsic causes. Extrinsic conditions include disorders of the cervical spine, thoracic outlet and the posture. Intrinsic factors would include Acute and Chronic calcific tendinitis, bicipital tenosynovitis, Arthritis, Adhesive capsulitis⁽³⁾ Shoulder impingement syndrome (SIS) and Rotator cuff tendinitis⁽⁴⁾.

It is observed that mobility in the cervical and upper thoracic spine reduces with age in individuals with shoulder complaints. Thus, functional disorders of the cervical and upper thoracic spine as well as the adjoining ribs are not extrinsic causes of shoulder complaints, but are considered as intrinsic causes of shoulder pain⁽⁵⁾. Therefore, dysfunction at the cervico-thoracic spine and the adjacent ribs is considered to predict the recurrence

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and poor outcome of shoulder complaints ⁽⁶⁾

Up to 40% of the patients with shoulder pain present with dysfunction at the **cervico-thoracic** spine and ribs, which is one of the reasons for dysfunction of the shoulder ⁽⁷⁾.

It is known fact that cervical radiculopathy can lead to shoulder pain ^(8,9) as the structures of the cervical spine- the facet joints and cervical dorsal rami, refer pain and initiate muscle spasm in the shoulder region ⁽²⁾. Restricted shoulder movement can be due to the cervico somatic pain referring to the shoulder region and the initiating spasm in shoulder musculature ⁽⁴⁾.

Manual therapy can be given to reduce pain during movement, restore the ROM and function of shoulder ⁽⁴⁾. Studies have shown improvement in the outcome measures in patients with shoulder pain following manual therapy to the cervico-thoracic spine ⁽⁷⁾.

Axio-scapular muscle function affects loading of the cervical spine, as they optimize the scapular position and transfer load from the upper limbs to the cervical spine. Changes in their activity during low-load functional tasks is seen in individuals with chronic neck pain, which play an indirect role in shoulder biomechanics. Therefore, cervical spine mobilization could be used during therapy to affect the more peripheral symptoms ⁽⁴⁾.

Assessment and treatment at the central level; that is cervical spine, helps in reducing pain and improving ROM of the peripheral joint. Thus, manual therapy can be used when joint-based techniques cannot be applied to the highly irritable joint ⁽⁴⁾

It has been proven that a single session of cervical mobilization has reduced pain on the distal joints which is 5 minutes or even less ⁽¹⁰⁾. Substantial data is available on the immediate effect of cervical mobilization on pain but there is lack of data on its long-term effect. Thus in this study we will treat the asymptomatic cervical spine and study its immediate and long-term effect on shoulder pain and other variables.

Material and Method

In an experimental study 60 patients with shoulder pain were purposively sampled and randomly divided in 2 groups of 30 each. It included males and females above 18 years of age with insidious onset of unilateral shoulder pain of less than 4 weeks duration, no complaints

of neck spasm and pain in the past 6 months with normal ROM of the cervical spine and not taking physiotherapy treatment. Patients with parasthesia or neurological deficit in upper limb, any surgery or dislocation of the painful shoulder, taken cortisone injection for the current shoulder pain and patient doing neck and shoulder exercises were excluded from the study.

Group A received lateral and postero-anterior Maitland's mobilization of the C5, C6 and C7 spinous processes along with Short Wave Diathermy (SWD) to the shoulder while Group B received SWD to the shoulder alone. Outcome measures like Passive range of motion (PROM) of the shoulder using a universal goniometer, Pain on VAS and a Shoulder Pain and Disability Index scale were assessed pre-treatment, 5 days and 8 days after treatment.

Group A: Received SWD (contra-planar method) to shoulder in supine position for 15 minutes followed by Maitland mobilization to the cervical spine. Patient was sitting in front of the table, hands crossed and head bent over the hands (no rotation of cervical spine). The lateral aspect of the spinous processes of C5, C6, and C7 was marked on the ipsilateral side of the painful shoulder. Therapist's thumb on the lateral aspect of the spinous process of C5, lateral glide was applied towards the non-painful side with a dosage of 5 oscillations in 30 seconds (1 set). After this, postero-anterior mobilization was given on the spinous process of the same vertebra. 5 oscillations in 30 seconds (1 set) were given at C5, C6, C7 spinous process, with a Grade III Maitland's mobilization ⁽¹¹⁾.

Group B: Patients received SWD (contra-planar) to shoulder in supine position for 15 minutes

Both the Groups received treatment for 5 consecutive days and then discontinued. After 8th day home exercise program was shown- pendular exercises, Wand exercises, Finger ladder and Towel exercises, Free exercises and isometrics for shoulder.

Findings

Group A: Cervical spine mobilization and SWD for shoulder

TABLE 1: Comparison of mean VAS Scores in Group A using Paired t-Test

	MEAN		P- VALUE	
Pre – Post 5 th day	6.11	3.77	0.002	Significant
Pre – Post 8 th day	6.11	3.14	<0.01	Significant
Post 5 th – Post 8 th day	3.77	3.14	1.16	Not significant

TABLE 2: Comparison of mean Shoulder ROM in Group A using Paired t-Test

	Mean Flexion		P value	Mean Extension		P value	Mean Abduction		P value	Mean Adduction		P value	Mean MR		P value	Mean LR		P value
Pre – Post 5 th day	137	147.65	<0.01	37.75	41.6	0.45*	132.1	142.5	<0.01	34.95	36.15	0.02	56.05	60.75	0.00	65	70.75	<0.01
Pre – Post 8 th day	137	153.15	0.00	37.75	42.25	0.01	132.1	150	<0.01	34.95	36.15	0.02	56.05	62.45	0.01	65	74	0.00
Post 5 th – Post 8 th day	147.65	153.15	0.05	41.6	42.25	0.01	142.5	150	0.02	36.15	36.15	1*	60.75	62.45	0.19*	70.75	74	0.10*

TABLE 3: Comparison of mean SPADY Scores in Group A using Paired t-Test

	MEAN		P- VALUE	
Pre – Post 5 th day	45.55	38.1	0.02	Significant
Pre – Post 8 th day	45.55	28.45	<0.01	Significant
Post 5 th – Post 8 th day	38.1	28.45	0.00	Significant

TABLE 4: Comparison of mean VAS Scores in Group B using Paired t-Test

	MEAN		P- VALUE	
Pre – Post 5 th day	6.1	5.09	0.01	Significant
Pre – Post 8 th day	6.1	4.23	<0.01	Significant
Post 5 th – Post 8 th day	5.09	4.23	0.01	Significant

TABLE 5: Comparison of mean SPADY Scores in Group B using Paired t-Test

	MEAN		P- VALUE	
Pre – Post 5 th day	45.55	34.75	<0.01	Significant
Pre – Post 8 th day	45.55	29	<0.01	Significant
Post 5 th – Post 8 th day	34.75	29	0.00	Significant

TABLE 6: Comparison of mean ROM in Group B using Paired t-Test

	Mean Flexion		P value	Mean Extension		P value	Mean Abduction		P value	Mean Adduction		P value	Mean MR		P value	Mean LR		P value
Pre – Post 5 th day	136.75	144	0.00	41.25	39.25	0.19	126.05	132.35	0.17	31.2	34.25	0.00	59.4	61.4	0.22	60.5	68	0.00
Pre – Post 8 th day	136.75	146.25	0.00	41.25	40	0.40	126.05	137.5	0.00	31.2	37.45	<0.01	59.4	61.9	0.05	60.5	67	0.01
Post 5 th – Post 8 th day	144	146.25	0.29*	39.25	40	0.37*	132.25	137.5	0.20*	34.25	37.45	0.00	61.4	61.9	0.68*	68	67	0.49*

Group B: SWD for the shoulder**Discussion**

The results of the present study showed that there was a reduction in pain and shoulder disability as seen on the VAS and SPADY score in both the groups, post 5th and post 8th day of treatment when compared to pre-treatment (Table 1, 3, 4, and 5).

There are various reasons for the reduction in pain. Firstly, the heating effect of SWD stimulates the cutaneous thermo-receptors, to block the transmission of pain as it enters the spinal cord via the 'pain-gate' mechanism. Also, when heat acts as a 'counter-irritant' which closes the 'pain-gate' and reduces pain⁽¹²⁾

Secondly, when the articular mobilization is given, Type I articular receptors are stimulated and they have an inhibitory influence on Type IV nociceptive receptors leading to a reduction in the intensity of pain⁽¹³⁾. Thus, when lateral cervical glide mobilizations were given at C5/6 level, it affected peripheral pain⁽¹⁴⁾. It activates descending inhibitory pathways from the dorsal periaqueductal gray area of the midbrain (dPAG) and produces a concurrent hypo-analgesic and sympatho-excitatory effect⁽¹⁵⁾.

In Group A (SWD + Mobilization group) there was a significant reduction in pain on the post 5th (P=0.00) and post 8th day of treatment (P=0) compared to the pre-treatment (Table 1). That is pain consistently reduced, though pain on 5th and 8th day was not statistically different (P=0.16). The treatment was given for five consecutive days after which it was discontinued, still

showed to be effective as pain did not return to baseline rather reduced.

In Group B (SWD only), a remarkable reduction in pain was observed post 5th day (P=0.01), post 8th day (P=0) of treatment when compared to pre-treatment. Also, when pain on 5th day and 8th day was compared there was further reduction in pain (P=0.01) (Table 4). This is because SWD increased the pain threshold in response to the action of heat directly upon the free nerve endings or the nerve trunk to which it supplies. It reduces pain by vasodilation and the removal of chemical mediators of pain (bradykinin, serotonin and prostaglandins) from the affected tissue⁽¹⁵⁾ thus the effect being lasting. Muscle spasm also reduces post application of SWD, relaxing muscles and reducing pain⁽¹⁴⁾.

When Group A and Group B were compared for pain, a significant difference was observed between pre-post 5th day (P=0.04) but no significant difference was observed when pre-post 8th day (P=0.06) and post 5th-8th day (P=0.67) of treatment was compared. This shows adding cervical mobilization reduces pain better than application of SWD alone. Though there is no difference in 2 groups after 5 days, pain continues to reduce till 8th day and does not return to pretreatment values even when cervical mobilization is stopped after 5 days. This suggests a lasting effect, which is due to the release of endorphins and enkephalins as a part of descending pain suppressing pathway.

The results also showed that there was increase in overall Shoulder ROM in both the groups (Table 2, 6). In group A, a remarkable difference was observed in all the ranges post 5th and 8th day but on 5th to 8th day comparison only flexion (P=0.05) and abduction (P=0.02) improved significantly (Table 2).

The increment in the shoulder ranges in Group A could be due to an improvement in the collagen extensibility, physiologic and accessory joint movements⁽¹⁷⁾. It has also been observed that oscillatory manual therapy techniques; helps tissue remodelling, interconnects the new collagen fibres, improves the extensibility, lengthens the tissue as well as increases the articular mobility⁽¹³⁾.

A study conducted by Lynda McClatchie et al found a significant reduction in the shoulder abduction painful arc after mobilizing the asymptomatic cervical spine, in individuals with shoulder dysfunction which has a neurological basis by positively affecting a nerve root impingement⁽¹⁵⁾.

Results of Group B (table 6), found an increase in all the ranges. A significant difference was observed between the pre-post 5th day flexion, lateral rotation and horizontal adduction and pre-post 8th day flexion, abduction, medial rotation, lateral rotation and horizontal adduction ROM. The improvement in the ROM in this group could be because of the viscoelastic property of the connective tissues(glycosaminoglycan) which varies with temperature that is after being treated with SWD. The collagen fibers becomes more plastic than elastic. When group A and B were compared for ROM , the groups were not statistically different.

Results of the present study found a significant improvement in the functional capacity in Group A (table 3) as well as Group B (table 5) on the pre-post 5th, pre-post 8th day as well as post 5th- 8th days of treatment. There was a reduction in pain and an improvement in the ranges of the shoulder. SPADY scale has pain and disability as its components; as there was reduction in the pain scores, we could assume that the functional activities that were restricted due to pain, improved.

Results of the present study found no significant difference in the SPADY scores between Group A and Group B on pre-post 5th day (p=0.34), pre-post 8th day (p=0.87) as well as the post 5th and 8th days(p=0.22) of treatments. Though the increase in SPADY score was more in Group A than Group B, it was not statistically

significant.

Conclusion

Mobilization of the asymptomatic cervical spine causes significant reduction of pain, increase in the shoulder ROM and a reduction in the functional disability after 5 days of treatment in individuals with shoulder pain. It has a lasting effect on pain and functional disability. When two groups were compared (SWD + mobilization v/s SWD alone), no one group was statistically better than the other.

Conflict of Interest – None

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Ethical Clearance – Obtained from Institutional ethical Committee

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Age and Gender- Related Test Performance in Community Dwelling Elderly Population: Six-Minute Step Test and Four Square Step Test

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Abstract

Background and purpose: Aging is associated with a decrease in the efficiency of several functions, among which are posture control and functional capacity, even in the absence of diseases. There is little data available in literature describing variation in test performance for older adults who are functioning independently. The available data are less and often difficult for clinicians to use as a basis of comparison in documentation because they are not presented in terms of age and gender groupings. The purpose of this study is to investigate aging related changes in balance and functional capacity performance in community dwelling elderly people.

Method: Total 60 subjects were included and divided into 3 groups according to age groups. Group 1 (60-69), Group 2 (70-79), Group 3 (80-89) in each group 20 subjects with 10 males and 10 females. The informed consent was taken. Six Minute Step Test (6MST) and Four Square Step Test (FSST) were performed on them. The number of steps taken by the subjects in 6 minutes were recorded in 6MST and the time taken by the subjects to complete the FSST were recorded using stopwatch. The data obtained was analyzed using independent t- test and one way ANOVA.

Result: 6MST and FSST scores were significantly different in all 3 age groups. The results showed that there is a progressive decrease in the 6MST and progressive increase in the time taken to complete FSST with increasing age. However, there was no significant difference between males and females performance in 6MST and FSST.

Conclusion: From the results it can be concluded that there is a progressive decrease in the test performance (6MST & FSST) with age in community dwelling elderly people.

Keywords: *Six Minute Step Test, Four Square Step Test, Community dwelling elderly.*

Introduction

Aging is associated with a decrease in the efficiency of several functions, among which are posture control and gait, even in the absence of diseases. With advancing age changes related to normal aging and those associated with diseases and their treatment can affect the systems that regulate balance and posture.¹ Balance impairment in older adults increases the risk for falls. Loss of confidence, or fear of falling often result in decreased physical activity leading to further decline in their postural stability and quality of life.² In recent years there has been an increasing international awareness of health issues relating to aging populations.³ There has

been a sharp increase in the number of older persons worldwide.^{4,5} According to the demographic profile of elderly, India carries 15% of world population. The fastest growing age group by percentage is between 65 – 75 years of age.

For a person with a balance and mobility deficit, restoring function or preventing further dysfunction are priorities for health care providers. To perform this rehabilitation service effectively, one must be able to identify the impairment, to provide appropriate treatment, and to evaluate outcomes using assessment tools with known measurement properties.⁶

Physical capacity is ability to perform activities of daily living and leisure, determined by the capacities of the physiological and neurological system.⁷ However aging results in an important decrease of muscle power and exercise capacity.⁸ Therefore, elderly often function at the limit of their capacity in order to fulfill the activities of daily living.⁹ Determination of the remaining physical capacity can be important in clinical decision-making.

The most accurate way of assessing physical and discriminating the cause of exercise intolerance is maximal cardiopulmonary exercise testing with measurements of exhaled gases.^{10,11} However, the complexity of the equipment, the high operating costs and the need for trained technicians, making its use limited in clinical practice.¹² Six minute step test is considered a good alternative for assessing exercise capacity^{13,14} since it requires only a small room and is portable. It is also a low cost test with better monitoring.

The general principles of the 6 minute step test (6MST) are based on the recommendations of the American Thoracic Society (ATS) March 2002 for the 6 Minute Walk Test (6MWT). The 6 minute step test (6MST) is performed on a 20cm high, which is 90cm wide and 30cm in long with no handles.¹⁵ The test starts from a standing position and the patients are instructed to step up and down the step at their own pace for 6 minutes.¹⁶ The legs should climb the step in an alternate manner without the support of their arms, which remained stationary at their sides. The patient performed the tests at a freely chosen cadence.¹⁶ Step up and step down is considered as 1 complete step.

The Four Square Step required the subjects to rapidly change direction while stepping forward, backward, and sideway, over a low obstacle, while time to complete the test is measured. The square was formed by using four canes of 90 cms each resting flat on the floor. The score was recorded as the time taken to complete the sequence.⁶

However, there is little data available in literature describing variation in test performance for older adults who are functioning independently. The available data are less and often difficult for clinicians to use as a basis of comparison in documentation because they are not presented in terms of age and gender groupings. Thus the aim of the study was to investigate aging related changes in balance and functional performance and to determine criterion values depending on age in

community dwelling elderly people.

Method

A sample of convenience of 60 subjects were included in the study and they were divided into 3 groups based on their age. Group 1: age group of 60-69 years, Group 2: age group of 70-79 years, Group 3: age group of 80-89 years. The source was an urban population in Delhi.

Statistics were performed using SPSS Software Version 21. Demographic details of sample were analyzed using mean and standard deviation. An independent t-test was used to analyze the difference between the performance of males and females on Six Minute Step Test and Four Square Step test in each group. (Group 1, 2 &3). One way analysis of Variance (ANOVA) was used to find out the difference among scores of Six Minute Step Test and Four Square Step test for subjects in all the 3 age groups. The significance level of $p \leq 0.05$ was fixed.

Results

The sample consisted of a total of 60 subjects. Group 1 (60-69 years) consisted of 20 subjects (10 males and 10 females) with a mean age of 63.95 ± 2.50 years, Group 2 (70-79 years) consisted of 20 subjects (10 males and 10 females) with a mean age of 73.35 ± 2.36 years, Group 3 (80-89 years) consisted of 20 subjects (10 males and 10 females) with a mean age of 83.35 ± 2.25 years. All 3 groups were matched in terms of height and weight.

Analysis of data obtained from Six Minute Step Test shows significant difference between Group 1 (Mean = 101.65, S.D. = 17.07) and Group 2 (Mean = 88.70, S.D.= 18.28), between Group 2 (Mean = 88.70, S.D.= 18.28) and Group 3 (Mean = 68.40, S.D.=11.90), between Group 3 (Mean = 68.40, S.D.=11.90) and Group 1 (Mean = 101.65, S.D. = 17.07) [F- value = 21.96, p value= .000]. Similar findings were observed on analysis of Four Square Step Test, which showed significant deterioration between Group 1 (Mean = 16.30, S.D.= 3.56) and Group 2 (Mean = 18.13, S.D.= 1.75), between Group 2 (Mean = 18.13, S.D.= 1.75) and Group 3 (Mean = 20.04, S.D.= 2.74), between Group 1 (Mean = 16.30, S.D.=3.56) and Group 3 (Mean = 20.04, S.D.= 2.74) [F- value = 8.97, p value =.000]. No statistical significant difference was found between male and female in both the tests.

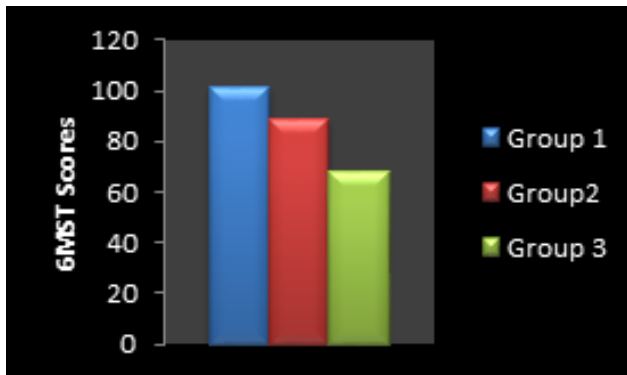


Figure 1: Comparison of 6MST Scores among Group 1, 2 and 3

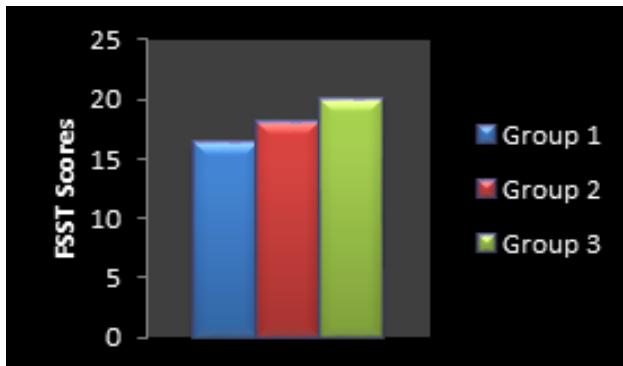


Figure 2: Comparison of FSST Scores among Group 1, 2 and 3

Discussion

The results obtained reveal that balance and physical capacity decrease across the age as the age increases. Group 1 (aged 69-69 years), Group 2 (aged 70-79 years) and Group 3 (aged 80-89 years) shows significantly poorer scores on Six Minute Step Test (p -value = 0.00, F value = 21.96), and Four Square Step Test (p -value = 0.00, F value = 8.97) with increase in age. Thus, Six Minute Step Test and Four Square Step Test showed a trend towards age related declines.

Our study confirmed previous findings of Steffen¹⁷ et al and Mollinger¹⁸ et al on functional capacity for each of three age cohorts (60-69, 70-79 and 80-89 years). Performance on the Six Minute Step Test depends on muscular strength, postural balance, general health, nutritional status, orthopaedic and cognitive function. Cardiopulmonary fitness and skeletal muscle mass progressively decline in aged population and both factors contribute to weakness and functional disability in elderly. As compared to western population, the nutritional status, muscle strength and general health are comparatively lower in Indian population.¹⁹ This could be the possible reason for lower values of Six Minute

Step Test in our study. The differences among studies that evaluate functional capacity are due to the diversity among populations possibly as a result of the different conditions of life such as type of occupational activity, access to health care services, inequality in income distribution and educational level.^{20,21} The differences observed in the functional performance of older adults from different localities may be also due to uncontrolled factors and to the lack of standardization among studies conducted in different locations. Barbosa et al²² point out that factors such as selection or exclusion criteria, number of subjects, differences in body composition, social and economic conditions can influence the functional capacity behaviour of elderly individuals in different locations.

Our findings of Four Square Step Test scores showed poorer scores with increasing age. There was a progressive increase in the time taken to complete FSST with age which indicates poor performance in elderly subjects. Due to age related changes, elderly are weaker, slower and less powerful and hence, there is a reduction in performances requiring the regulating and coordinating functions of the nervous system, i.e. balance, reaction time, agility and coordination.¹⁹ This might be the reason for increase in FSST time.

Result obtained in our study showed that functional capacity (Six Minute Step Test) and balance (Four Square Step Test) in all the age groups there is no significant difference in male and female performance. Thus, indicating gender was not a factor affecting performance on these tests. Similar results were obtained by Steffen¹⁷ et al and Mollinger¹⁸ et al who also reported that gender is not a factor in determining performance on functional capacity and balance test. However, Chen et al also found no age and gender effect on success in stepping over obstacles to be non-significant.²⁰ Although studies have shown association between balance and sex²¹, in this study, these associations were not observed. A study with elderly individuals showed significant association between sex and balance deficit, being observed in 46.1% of subjects. The study also showed that females were 3.7 times more likely to have balance deficits when compared to males²¹. Literature reveals better performance of males in the balance test.^{22,23}

Maciel and Guerra²¹ found in their study that elderly over the age of 75 years were 6.2 times more likely to have balance deficits when compared to younger individuals (between 60 and 75 years). In the English Longitudinal

Study of Ageing conducted with individuals aged from 50 years, it was observed that elderly individuals aged 80 years or more were 6.99 times more likely to have balance deficits compared to those aged 65-69 years.²⁴

Balance deficits are caused by sensory and motor changes due to aging, which can suppress steps of posture control and generate instability.²⁵ In the nervous system, disturbances in the function of specific muscles (muscular strength), as those in the ankle area responsible for postural control, could cause loss of balance, considering that muscle atrophy and bone deformities can change the base of support of the foot.²¹ Furthermore, weight gain, common in the elderly, may also influence the loss of dynamic balance as it contributes to the collapse of the plantar arch, whose function is related to shock absorption and distribution of load over the entire foot.²⁶ Thus, the results of this study show differences and similarities with other studies conducted with elderly populations.

Rather than selecting participants who were healthy (free from any pathologies), older people were selected who functioned independently without assistive devices in the community. It was anticipated that the range of performance on the tests by such participants would show substantial variation. Hence, while interpreting the findings, the characteristics of the subjects were kept in mind.

Conclusion

The data obtained from the study showed a trend towards age related decline on performance of Six Minute Step Test and Four Square Step Test. Thus, the hypothesis that there will be significant difference in age related test performance in community-Dwelling Elderly population: Six- Minute Step Test and Four Square Step Test holds true.

Thus, concluding that there is significant decrease in performance on physical capacity and balance of elderly population with increase in age.

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Funding: Self

Ethical Clearance: Yes

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To Evaluate Scapulohumeral Rhythm in Scapular Dyskinesia in Software Professionals with Neck Pain

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Abstract

Neck Pain a musculoskeletal condition which is increasing commonly throughout the World having considerable impact on individuals that affects their social, physical and psychological aspects. Neck Pain is more prevalent in office workers than in general community. Computers have become an epitome of modern life, being used in every aspect of life. Work related Neck pain is leading cause of disability and absenteeism. Evaluation, treatment planning for Neck Pain rehabilitation often fails to include an objective assessment of scapular motion. Methodology: A cross-sectional study, 120 subjects with Neck Pain. Convenient sampling method was done. Subjects were screened for Scapular Dyskinesia using Lateral Scapular Slide Test (LSST) those fulfilling the inclusion criteria, further Scapular Upward Rotation (SUR) assessed by Digital Inclinometer at 0°, 45°, 90°, 120° of Gleno-Humeral abduction and assessed for Scapulohumeral rhythm (SH rhythm). NDI questionnaire was asked to fill. Results: The results showed statistically significant correlation between all the variables. SUR is more in dominance hand and SH rhythm is more in non-dominance hand and is altered in all the angles and none were closely related to the clinically accepted ratio. SH rhythm is more in starting angles of humeral elevation and is less when reaching to full range.

Keywords: *Scapulohumeral rhythm, Scapular Upward Rotation, Lateral Scapular Slide Test, Neck Disability Index.*

Introduction

In 21st century, many people are leading a mechanical life. Job related Musculoskeletal disorders usually happen over a period of time, resulting from repeated workload exposures. The Neck, low back and upper limbs are commonly vulnerable to Musculoskeletal disorders.^[1] Advent of technology has made everything just a click away. There are lots of people who are working for prolonged time in front of the computers during working hours. Neck pain is the most common and widely prevalent repercussion of desk job.

Neck pain major contributor to disability worldwide with about 70% of population. 5-10% adults having a disabling neck pain problem. According to Global Burden of Disease study says that Neck pain the 4th leading cause, ranking behind back pain, depression, arthralgias.^[2]

Work related Musculoskeletal Disorders are important health problems in Industrialised Countries.^[3] Considering rapid growth of computer use at all levels of society, problem does not appear to diminish working

with office machines for 5 hours or more in day, which has found to be associated with a significant increase risk for neck pain.

Few evidences concluded that prolonged sitting is a potential risk factor for neck pain. Office work is associated with prolonged sitting, particularly with poor workstation ergonomics, working postures, repetitive work which may cause prolonged static contraction of muscles which increase pressure on muscles and soft tissues, which leads to fatigue, pain, increase risk of musculoskeletal injury in spine and finally cause altered and abnormal Scapular posture which leads to Neck pain.

Scapular Dyskinesia defined as “SICK scapula^[4] S- Scapular malposition, I- Inferior medial winging scapula, C- Coracoid tenderness, K- dyskinesia of scapular movement ; which results in Scapular Dyskinesia which is an alteration in normal position or motion of scapula during coupled Scapulohumeral movements”. Upward rotation is the predominant scapulothoracic motion. Co-ordinated Scapulothoracic and Glenohumeral

movements during arm elevation, known as SH rhythm^[5] provides range of motion while allowing for proper length tension relationships between various axio-scapular and Glenohumeral muscles. SH rhythm alters in dyskinesia, generally the ratio of scapula and humerus is 1:2 i.e, when arm abducted to 180°, 60° occurs by rotation of scapula and 120° by rotation of humerus at shoulder joint. Controversy exists about overall ratio of movement between Glenohumeral and Scapulothoracic articulations, as well as changes in the ratio throughout the arc of motion during arm elevation.^[6] The ratio of 2:1 is however more complex than originally described by Inman^[7] and is affected by velocity of motion, plane of elevation, external load.

Scapular protraction defined as increased distance between inferior angle of scapula and spinous process of corresponding vertebra.^[8] Inferior angle contributes to loss of power, limited flexion, abduction of upper extremity. It is usually due to weak Serratus anterior, trapezius, rhomboid muscles. Altered stability of scapula may create or sustain symptomatic mechanical dysfunction in cervical spine and induce neck pain or influence recurrence of neck pain.^[9] Scapula and neck shares common muscle attachment. Overtime the muscles and other soft tissues tighten up due to excessive load required to hold the head in position. The anterior neck muscles become weak from being stretched. This chronic overload and tightening of soft tissues and less overlapping of actin, myosin fibrils (Sliding filament) and deposition of lactic acid may eventually result in decreased oxygen and blood flow, ultimately causes pain. Abnormal position of neck eventually cause joint pain, muscle weakness. Due to which one feels that just holding up head is difficult, person maintains a slouched posture. So, because of this if any alteration in scapulothoracic muscle function can perpetuate strain in neck muscle and sensitize cervical spine structure.

Individuals with neck pain display altered postural behaviour when performing prolonged usage of computer abnormal scapular posture and associated changes in axio-scapular muscle activity may contribute to painful neck disorders affecting mechanical stresses on pain sensitive cervicobrachial structures.^[10]

Methodology

A Cross sectional study of 120 target sample was identified based on selection criteria using convenient sampling method. Software Professionals- 23-35 years,

both genders, with neck pain, work experience more than 1 year, working hours more than 6 hrs, NPRS of 4 and above. Subjects indulged in recent surgery of Neck, Shoulder, Back and Neurological dysfunction; pathology preventing Scapular position testing; Road Traffic Accidents; Disc pathologies; Chest deformities were excluded from the study.

Test Procedure:

Subjects were selected based on selection criteria, procedure was explained to the subjects. 120 subjects having Neck Pain with mean age: 29.9±3.25, Working hours: 9.41±1.08, Work experience: 7.53±2.88 selected by convenient sampling method. Physical Evaluation is done, examined for dyskinetic patterns of Scapula on both sides. Scapular protraction measurements were taken in three positions: (A) Sitting/Standing with arms resting on the side (0°), (B) Hands on the waist, thumbs facing posteriorly (45° abduction), (C) 90° abduction and maximal internal rotation.

LSST done with measuring tape from inferior angle of scapula to corresponding spinous process measured bilaterally both in dominance, non-dominance hand and mean of three trials were taken. LSST positive subjects taken for further assessment.



Fig 1. Placement of measuring tape from inferior angle of scapula to corresponding spinous vertebrae.

SUR using protocol developed by Johnson et al, is used. Digital Inclinometer is placed over root of Scapular spine and posterolateral acromion.^[11] Assessed for SUR in 0°, 45°, 90°, 120° abduction readings taken bilaterally and mean of three trials were taken.

SH rhythm was calculated by subtracting scapular rotation from shoulder elevation to determine Glenohumeral(GH) joint contribution to shoulder elevation.^[12]



(Eq.1.) $GH \text{ motion} = (\text{Total Shoulder motion}) - (\text{Scapular Upward Rotation})$

(Eq.2.) $\text{Scapulo Humeral Rhythm} = (\text{GH elevation}) / (\text{SUR})$

Findings

Table-1: Distribution of subjects with Neck pain according to Gender

S. No.	Gender	No. of subjects	Percentage
1.	Male	72	60%
2.	Female	48	40%

Table-1 shows gender distribution of 120 subjects with neck pain, out of which 72(60%) were males and 48(40%) were females.

Table- 2: Mean ± S.D of baseline characteristics and Outcome measures

S. No.	Variables	Mean	S.D
1.	Age (years)	29.9	±3.25
2.	Working hours	9.41	±1.08
3.	Working experience (years)	7.53	±2.88
	Outcome measures		
1.	NPRS	6.16	±0.73
2.	NDI	14.2	±4.45

Table 2: represents outcomes of baseline characteristics and outcome measures of 120 subjects in which Mean and SD was obtained among Software Professionals with Neck Pain.

Table-3: Correlation of Pain over Scapular Upward Rotation in Dominance and Non dominance at 0°, 45°, 90°, 120°

Sl.No	Variables	r- value	P- value
	Dominance		
1.	Pain over 0°	-0.0695	> .00001
2.	Pain over 45°	-0.0994	> .00001
3.	Pain over 90°	0.0013	>.00001
4.	Pain over 120°	-0.0689	>.00001
	Non dominance		
1.	Pain over 0°	-0.0049	> .00001
2.	Pain over 45°	-0.1417	> .00001
3.	Pain over 90°	-0.0486	>.00001
4.	Pain over 120°	-0.1287	>.00001

Table 3: Pain over the Scapular Upward Rotation in non- dominant hand showed statistically non-significant in all positions (>.00001). Pearson’s correlation coefficient was used to find out the relationship between Pain and SUR in subjects with Neck pain.

Table-4: Humeral elevation, Mean SUR measures and ScapuloHumeral rhythm

Table- 4: represents the Scapulohumeral rhythm alteration in both dominance and non dominance hands

Sl. No.	Humeral elevation	Mean SUR (± S.D)	SH rhythm
	Dominance		
1.	0° - 45°	5.38(± 1.27)	7.36:1
2.	0° - 90°	22.96(± 2.22)	2.93:1
3.	0° - 120°	38.99(± 5.09)	2.08:1
	Non dominance		
1.	0° - 45°	5.02(± 1.05)	7.96:1
2.	0° - 90°	22.5(± 2.48)	3:1
3.	0° - 120°	37.9(± 4.88)	2.16:1

Discussion

The present study was conducted on 120 subjects having Neck pain with altered scapular position with mean Age(29.9±3.25years), Working hours(9.41±1.08 hours), Work experience (7.53±2.88years) were selected by convenient sampling method. The present study assessed the scapular position in Software professionals with neck pain in three different positions to evaluate Scapular Dyskinesia , SUR and determined the SH rhythm. Measuring tape and Base line digital inclinometer were used to assess the scapular position.

Results of the study showed that there is significant difference of scapular position in Software professionals in all three positions that is at rest(0°), hands on hip(45°) and 90° of glenohumeral abduction with internal rotation and is non significant in SUR,which infers that the scapular kinematics is altered in all three positions in computer professionals who works in abnormal posture for long hours which cause neck pain.

Soft tissues work harder to hold up the head. Overtime due to over stretching, muscles and soft tissues tighten up due to excessive workload required to hold head in position. Anterior neck muscles become weak from being in shortened position due to less overlapping of Actin and Myosin fibrils.This chronic overload and tightening of soft tissues may eventually result in decreased blood flow and oxygen to the soft tissues which causes pain.

The altered scapular position occurred due to working posture of Software professionals, as they used to work for long hours in poor postures which include, forward head posture, and protracted shoulder. Poor working posture will further lead to imbalance of scapular muscle activity especially excessive loading of scapular muscles which causes neck pain in Software professionals who works in poor posture. This is supported by a systematic review done by Green B.N et al, who observed that neck pain is associated with prolonged computer use in poor working posture.

Increased upper trapezius muscle length in scapular downward rotation and increased levator scapulae muscle stiffness may contribute increased compressive load and shear force on cervical spine during active neck movement. Repetitive, excessive stress in neck structures has potential to cause cumulative micro trauma to tissue in cervical region which will lead to neck pain, limited neck range of motion. It has been found that prolonged exposure to stress can impair proprioception related muscle function, which can further damage muscle spindles.

Our results showed a significant difference that is more than 1.5cm indicating change in scapular position in computer professionals with neck pain this is similar to observation made by Alexopoulos E.C, Tanagra D et al who observed that altered scapular alignment is proposed to be related to neck dysfunction and pain. Ludewig P.M found that extensive computer use amongst office workers has lead to an increase in work related neck pain. Aberrant activity within the three portions of the trapezius muscles and associated changes in scapular posture have been identified as potential contributing factor.

To further support the study Morten Wrested, Therese N Hanvold etal did a systematic review on computer work, musculoskeletal disorders of neck and upper extremity, review examines the evidence for an

association between computer work, neck and upper extremity disorders they observed that the work related load of the neck muscles especially trapezius in computer work is influenced by computer workstation layout and individual working techniques which includes altered neck which will lead to altered scapular position.

The SH rhythm ratios were observed bilaterally which is ranging from 7.96:1 to 2.08:1. Although the results relative to SH rhythm across entire range of motion are in fairly close agreement with 2:1 ratio suggested by Inman et.al, this ratio is an average that does not represent the substantial variability observed throughout the range. Exceptionally high ratio is obtained at during 45° of humeral elevation. SH rhythm ratio obtained in this study, none were equal to clinically accepted 2:1 ratio. It may be due muscle weakness and joint laxity.

As health care and focus on patient outcomes continue to evolve understanding of scapular kinematics changes, as Physiotherapists we must be prepared to add new measures to our clinical repertoires.

Limitations:

- Gender equality not taken into account and Muscle activity, Muscle strength, ligament laxity are not considered.

Conclusion

The present study concluded that there is an alteration of scapular position in Software Professionals with neck pain. SUR is more in dominance hand, SH rhythm is more in non-dominance hand. SH rhythm is altered in all angles and were not closely related to clinically accepted ratio. SH rhythm is more in starting angles of humeral elevation and is less when reaching to end range. Digital Inclinometer can be used by clinicians in documenting not only variable nature of Scapulohumeral rhythm, but increasingly more variant Scapulohumeral rhythm patterns in pathological conditions which will be helpful in further rehabilitation, scapular kinematics and adds as outcome measures to our clinicians.

Future Recommendations:

1. Muscle strength and joint laxity can be taken into consideration in future work in order to determine their respective impacts on Scapulohumeral rhythm.

Conflict of Interest: There is no conflict of interest.

Funding: Self

Ethical Clearance Committee : The oxford college of physiotherapy.

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Prevalence of Recreational Interest in Geriatric Population

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Abstract

Background: Recreational therapy “means a treatment services designed to restore, remediate and rehabilitate a person’s level of functioning and independence in life activities, to promote health and wellness. As well as reduce or eliminate the activity limitations and restrictions to participation in life situations caused by an illness or disabling condition. Recreational therapy especially in senior citizens is important because senior citizens can suffer from loneliness, depression and anxiety which can lead to loss of physical functioning and can contribute to early death. **Objectives:** Objectives of the study were to determine the prevalence of Recreational interest in geriatric population **Material and Method:** In this observational study, 100 subjects were assessed using Recreational Activity Interest Questionnaire and Recreational Activity Interest Scale. **Results:** Statistical analysis of Recreational Activity Interest Questionnaire and Recreational Activity Interest Scale were found to be extremely significant. **Conclusion:** The study concluded that majority of population were aware of recreational activities and those who were not aware of recreational activities should be made aware of the same.

Keyword: Recreational therapy, Geriatric population, Recreational interest, Independence.

Introduction

The ageing of population is an obvious consequence of the process of demographic transition¹. In recent years, there has been an increase of aging in the society. India is country with world’s second largest population where there is equal number of geriatric population as young population.

The aging of the population can lead to an increase in the number of individuals which are at risk for chronic diseases.²

Sometimes when we are working with senior’s citizens we observe some senior citizens who are unable to express themselves or aphasia³ (partial or total loss of the ability to articulate ideas).

Recreational therapy especially in senior citizens is important because senior citizens can suffer from

loneliness, depression and anxiety which can lead to loss of physical functioning and can contribute to early death.⁴

What is recreational therapy?

Recreational therapy “means a treatment services designed to restore, remediate and rehabilitate a person’s level of functioning and independence in life activities, to promote health and wellness. As well as reduce or eliminate the activity limitations and restrictions to participation in life situations caused by an illness or disabling condition” .^{5,6}

An advantage of Recreational Therapy is that it will not interfere with medication such non-pharmacological intervention.

Aged people are more likely to accept the medication treatment for their chronic conditions. The dynamic and diverse nature of Recreational Therapy can be more flexibly adjusted to suit the different physical and mental needs of older adults.^{1,7}

Activity, both mental and physical, is a basic human need. Unfortunately, senior citizens have a very low rate of activity participation because they often lack the

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physical and abilities to initiate engagement.⁸

Recreational programs promote quality of life by providing an appropriate level of stimulation using meaningful activities.⁹

Other research offers some support for use of pet therapy, exercise, and bright light therapy.

There is less evidence which supports the use of effect of recreational therapy in geriatric population. Therapeutic recreation interventions show great promise as management strategies for dementia-related behaviors.¹⁰, The purpose of this study is to through light on the prevalence of recreational interest in geriatric population

Aim and Objectives

Aim: To study and find out the prevalence of recreational interest in geriatric population.

Objectives: To determine the prevalence of Recreational interest in geriatric population.

Materials and Methodology

An ethical clearance was taken from institutional ethical committee of KIMSDU Karad prior to initiation of the study. An observational study was conducted at physiotherapy department of Krishna College of physiotherapy. Total 100 were taken by the simple random sampling method and as per inclusion, exclusion criteria for study. Inclusion criteria was-60-70 age years, both males and females, exclusion criteria was-Prolong Bed ridden patients. Patient with Higher psychological condition.

Cardiac patients (pacemaker, valve replacement.) etc. Written informed consent was taken and whole study was explained to individuals. Subjects were aware with the recreational therapy, recreational activity. for 6 week. The interpretation of study was done on the basis of data collection sheet and outcome measure.

Outcome Measures

- Recreational Activity Interest Questionnaire
- Recreational Activity Interest Scale

Procedure:

Each of them will be screened as per inclusion and exclusion criteria.

Written consent will be taken from the subjects.

Using random sampling method, total 100 subjects will be taken.

Recreational activity scale will be filled up by each individual to find out the recreational interest.

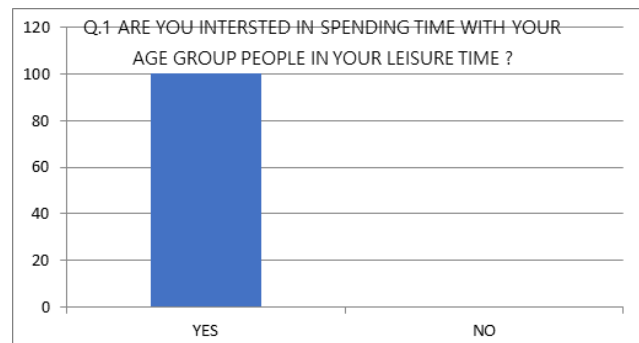
Each individual will also ask to fill up the data collection sheet.

The results will then be obtained by appropriate biostatistical analysis.

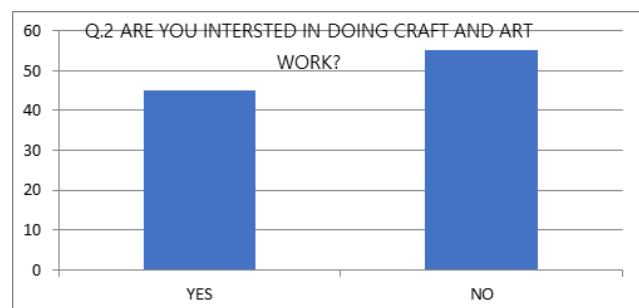
Findings

Statistical analysis was done manually and by using the statistics software INSTAT so as to verify the results derived. The statistical analysis was done by 't' test.

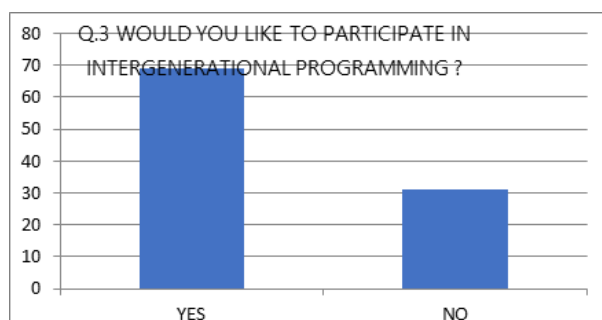
Recreational Activity Interest Questionnaire



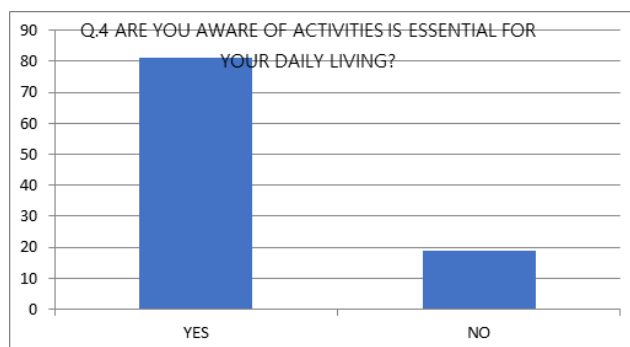
Graph 1. The graph shows that out of 100 population, all 100 are interested in this activity.



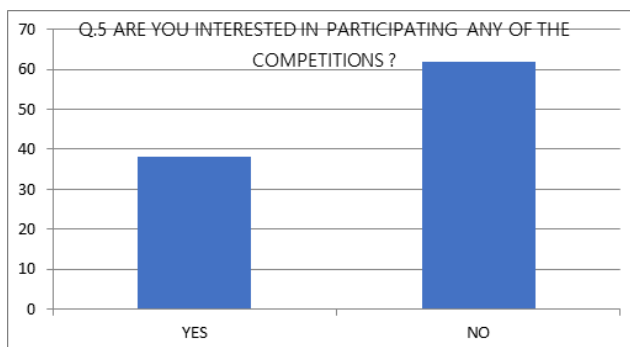
Graph 2. The graph shows that out of 100 population, 45 are interested and 55 are not interested for this activity.



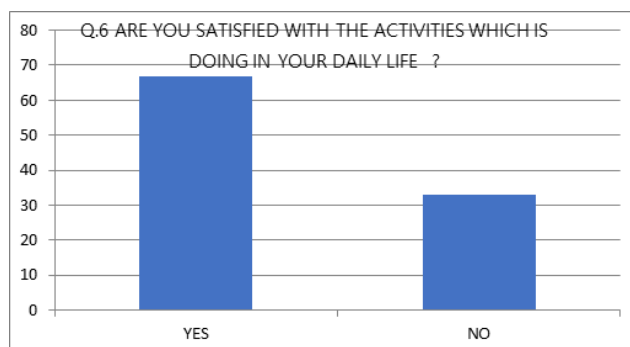
Graph 3: The graph shows that out of 100 population, 45 are interested and 55 are not interested for this activity.



Graph 4: The graph shows that out of 100 population, 81 are interested and 19 are not interested for this activity.



Graph 5: The graph shows that out of 100 population, 38 are interested and 62 are not interested for this activity.



Graph 6: The graph shows that out of 100 population, 67 are interested and 33 not interested for this activity.

Results

Statistical analysis of collected data was done accordingly so result shows that some individuals are interested in recreational activities, and some know about recreational activities while some don't know much about recreational activities and thus they are not aware of it.

Discussion

This project was done in 3 months with sample size 100.

This study 'Prevalence of recreational interest in Geriatric Population' was conducted to find out the prevalence of recreational interest in geriatric population. Previous literatures show that recreational activities for senior citizens play a key role in the well being of older adults and helps in enhancing the quality of their life. But we had to find that what percent of geriatric population is aware of this.

The main objective of this study was to find the prevalence of recreational interest in Geriatric Population. This study was conducted among geriatric population in and around Karad Considering inclusion and exclusion criteria they were requested to participate in the study. Their consent was taken and also their demographic information was taken. For participation in this research, the subject must be a geriatric who is above 60 years. The subjects was assessed by using "Recreation activity interest scale" and "Recreational activity interest questionnaire"

Statistical analysis of collected data was done accordingly so result shows that some individuals are interested in recreational activities, and some know about recreational activities while some don't know much about recreational activities and thus they are not aware of it.

Conclusion

This study shows that majority of Geriatric population is aware of recreational activities and those who are not aware of recreational activities should be made aware of the same.

Conflict of Interest: No conflict of interests.

Source of Funding: This study was funded by Krishna Institute of Medical Sciences Deemed To be

University, Karad, Maharashtra, India.

Ethical Clearance: The study was approved by the institutional ethical committee of KIMSDU.

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Improving Upper Limb Function in a Person with Stroke Using Proprioceptive Neuromuscular Facilitation Approach: A Case Study

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Abstract

A sixty-six-year-old male presented with right upper limb weakness of three years duration. Radiological studies identified an acute infarct with haemorrhagic component and absence of flow in the left middle cerebral artery. This case report discusses his presentation and effect of proprioceptive neuromuscular facilitation (PNF) approach in stroke to improve upper limb function

Keywords: Stroke, proprioceptive neuromuscular facilitation, upper limb

Introduction

The World Health Organisation (WHO) defines stroke as rapidly developing clinical signs of focal (or global) disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than of vascular origin.¹ It is one of the leading causes of death and disability in India. The estimated adjusted prevalence rate of stroke range, 84-262/100,000 in rural and 334-424/100,000 in urban areas.² Some people recover completely from strokes, but more than 2/3rd of survivors will have some type of disability.

Rehabilitation is a common route taken by individuals who have survived a stroke in order to regain function and independence, which can take place in acute, sub-acute, inpatient and outpatient setups. There are several different approaches to physiotherapy treatment after stroke. Proprioceptive Neuromuscular Facilitation (PNF) is a neurophysiological approach in which impulses from the periphery are facilitated to the central nervous system through the stimulation of sensory receptors present in muscles and around the joints by stretch, resistance, traction, approximation and

audio-visual command to the patient.

PNF provides the therapist with an efficient means for evaluating and treating neuromuscular and structural dysfunctions.³⁻⁷ The goal of the PNF techniques is to promote functional movement through facilitation, inhibition, strengthening, and relaxation of muscle groups by using concentric, eccentric, and static muscle contraction.⁸⁻⁹ Thus, the purpose of this case study is to provide clinicians with a perspective on physical therapy management of patients that present with a stroke using PNF approach to improve the function of upper limb.

Case Report

A 66-year-old male who was a known case of hypertension and diabetic mellitus experienced a sudden onset of weakness in his right upper limb and deviation of his mouth towards the right side on 12th July 2016. He was taken to the local hospital, where MRI of brain was done which was diagnosed as acute infarct with haemorrhagic component at left basal ganglia, internal capsule and corona radiata causing mass effect and also absence of flow in the left middle cerebral artery. Medical management was started immediately for pain, hyperlipidaemia, congestive heart failure, hypertension, as well as medications for spasticity, and anxiety. Physiotherapy treatment was started in 2017.

Following the subjective history, it was hypothesized that the patient would present with right hemiparesis,

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impaired range of motion, balance and muscle spasticity secondary to a middle cerebral artery(MCA) embolic cerebrovascular accident (CVA). In addition, the Fugl Meyer Scale was used to objectively assess stroke specific disability and the Barthel Index was used to measure functional ability. He was a good candidate for a case report due to limited publication on the interventions that were implemented, including specific PNF techniques for upper limb interventions.

A standardized physiotherapy (PT) examination was performed with tests and measures as described by the Bickerstaff's Neurological Examination in Clinical Practice.¹⁰ These included muscle performance, neuromotor development and sensory integration, range of motion, and reflex integrity. Voluntary Muscle control was graded using Brunnstrom stages of motor recovery as described by O'Sullivan.¹¹

Reflex integrity and muscular tone is commonly impaired following a CVA, and the patient presented exaggeration in these categories on initial examination. The patient's reflex integrity was measured using reflex hammer, while his muscular tone was assessed using the Modified Ashworth Scale(MAS). Tham L. K. et al. have demonstrated the validity and reliability of using deep tendon reflexes as an assessment of neurological or neuromuscular disorders through motion analysis.¹²

The patient's symptoms from his MCA stroke included impaired muscle performance which led to impairments of range of motion, muscle spasticity and exaggerated reflexes. The patient's muscular weakness led to impairments of motor function; his left upper and lower extremity presented with hemi-paresis. The patient's functional assessment score on the Fugl- Meyer Scale was 34 out of 78 at the first week indicating severe physical disability and Barthel index 10/20 indicating moderate disability. The patient's functional mobility deficits were secondary to a central nervous system insult, which made him a good candidate for PNF-based interventions.

Interventions, outcome measures, and changes in impairments, functional limitations, and disabilities were documented on a daily basis. The patient was scheduled for physiotherapy daily for 1-hour sessions on weekdays during his rehabilitation. The patient attended the session for 6 weeks. The basic principle of motor learning is to repeatedly practice a particular task in order to relearn. In a study carried out by Chaturvedi et al in which PNF

intervention was given to upper extremity for two weeks to the patients of acute stroke, there was significant improvement in the upper extremity function.¹³ In the PNF approach, there are two pairs of diagonal patterns for the upper and lower extremities: diagonal 1 (D1) and diagonal 2 (D2). Each of these patterns can be performed in either flexion or extension. Hence, the terminology used is D1Flexion(D1F) or D1Extension(D1E) and D2Flexion(D2F) or D2Extension(D2E) of the upper or lower extremities. The upper limb was exercised in the D1F and D1E patterns, first passively then in an active assisted manner and then active manner. A PNF D1 thrust pattern was practiced (reverse thrust was contraindicated as the limb is moving into a flexion synergy pattern) and along with it hold and relax technique was used simultaneously. The hold and relax technique was performed in a position of comfort and below an amount that caused pain. Strong isometric contraction from the restricting muscles (antagonists) was resisted and then voluntary relaxation, and passive movement in to the newly gained selection of the agonist pattern.



Fig 1.(a). D1 EXTENSION



Fig 1.(b).D1 FLEXION

On first week the patient's Barthel Index score was 10/20 that is a low score. By sixth week his Barthel Index score was increased by 15/20 which showed a

moderate disability. In a previous study which compared the muscle tone and stiffness on the affected side and the non-affected side of the upper extremity (UE) in stroke patients at Brunnstrom stage III or above for the UE, and at MAS grade 2 or lower and it was found that the flexor carpi radialis of the affected side showed significantly lower muscle tension and stiffness than that on the non-affected side. Additionally, it was also found that the non-affected side of the extensor digitorum and flexor carpi ulnaris showed slightly less muscle tone and stiffness than those on the affected side.

In the present case, it was noticed that the patient's spasticity in first week according to Modified Ashworth Scale was 1+ i.e. slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (less than half) of the ROM. In sixth week it was seen that according to Modified Ashworth Scale it was improved to 1 i.e. slight increase in muscle tone, manifested by a catch and release or by minimal resistance at the end of the range of motion when the affected part/s is/are moved in flexion or extension. The physical performance according to Fugl Meyer Test in first week was 34/78 which when tested on sixth week was seen to be 40/78 which considered as a slight improvement in the physical performance. See Fig 2. for progression of Barthel index and Fugl Meyer test from first week to sixth week.

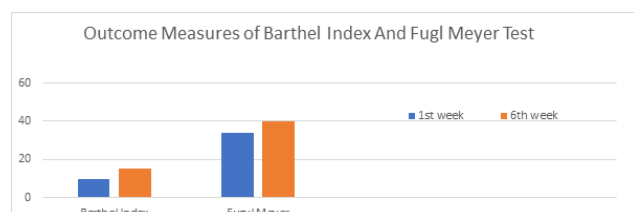


Fig 2. Progression of Barthel Index and Fugl Meyer Test

Discussion

The patient made a good progress in six weeks outpatient rehabilitation. There was a good improvement seen in the upper limb, grip strength being the only weakness. More importantly, the patient was pleased to see the progress that was made. Factors that may have positively influenced the patient's outcome include PNF based rehabilitation, patient motivation and consistent emotional support from family. The scientific literature on CVA provided beneficial information regarding the pathological condition and expected clinical signs and symptoms, providing background information that enhanced the physiotherapist's understanding of the

patient's conditions. This information also provided a basis upon which hypotheses could be formed regarding the underlying causes of the patient's problems, emphasizing the need for a plan of care that maximized the patient's functional independence.

A study done by Morreale et al. in ischemic stroke patients of early versus late stage found that patients who received early PNF treatment showed better improvement than patients who received late PNF treatment after 12 months.¹⁴ A study conducted by Kraft et al. based on techniques to improve arm and hand function using PNF and EMG stimulation concluded that chronic stroke patients would achieve arm function by combining both stimulation and PNF.¹⁵ The studies regarding the PNF intervention in stroke are both conflicting and supportive, but they not been tried in acute stroke. Our results show that PNF is efficient in improving functional outcome after stroke. Continuous application of the PNF intervention could decrease abnormally increased muscle tone and stiffness while increasing the muscle activity of the UE muscles.

Patients with strokes might benefit from longer rehabilitation, allowing for a greater breadth of treatments and progression in their programs, as well as maintaining an intensive therapy schedule. Moreover, the breakdown of PNF-based interventions into intervention sequencing and outcomes would be helpful to further explore the effectiveness of PNF-based therapy in rehabilitation of strokes.

Conclusion

Residual upper limb disability is a common occurrence in patients with chronic stroke. PNF treatments can be useful in motor function, reducing musculoskeletal and neurological complication and most, importantly increasing levels of functional independence in subjects with residual upper limb disability.

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Perception of Physiotherapists about the Effectiveness of Therapeutic Ultrasound

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Abstract

Objective: To determine the perception of physiotherapists about the effectiveness of therapeutic ultrasound as a treatment modality. **Study design:** descriptive cross-sectional study. **Period** 6 months after the approval of synopsis from June 2017 to November 2017. **Material & Method:** A self-administered questionnaire was distributed among the physiotherapists working in the clinical practice, 25-60 years of age of both genders. Questionnaire employing of both open and closed ended questions. Questions were asked regarding the usage, their knowledge of appropriate dosages and their perception of its effectiveness for various conditions. Perception was evaluated using Visual analogue Scale. **Results:** One hundred and twenty questionnaires were completed and returned a response rate of 87.5%. Physiotherapists perceived ultrasound to be effective in acute tendinitis, acute bursitis and chronic muscle strain. Respondents believe that therapeutic ultrasound become more effective when used in conjunction with other techniques at appropriate dosages, However, the placebo qualities of ultrasound were not perceived to be effective by most of the physiotherapists. **Conclusion:** Therapeutic ultrasound is perceived to be most commonly used electro physical agent among the physiotherapists. The findings suggest that ultrasound was thought to be as an effective treatment tool when applied appropriately. The results of this study will be useful for the clinicians however, further experimental studies investigating ultrasound efficacy are indicated.

Keywords: therapeutic ultrasound, efficacy, usage, perception

Introduction

Electro physical agents are one of the components of physiotherapy modalities.¹ Some examples of electro physical agents are Transcutaneous Electrical Nerve Stimulator (TENS), Therapeutic Ultrasound (US), Interferential Therapy (IFT), Laser therapy, Short Wave Diathermy (SWD) etc. Therapeutic ultrasound remains as a part of clinical practice since 1950's and have identified as the most commonly used electro physical agent by practicing musculoskeletal Physiotherapists.^{1,2} Although ultrasound is commonly used clinical modality, there are limited numbers of published scientific studies investigating the efficacy of US in improving clinical outcomes. By knowing the perception of Physiotherapists about the effectiveness of therapeutic ultrasound it will be helpful to identify the areas where the US can be used more efficiently and the beliefs of Physiotherapists about the efficacy of ultrasound in treating the musculoskeletal problems. Previous studies were conducted in UK.

Singapore, South Australia and USA² but no data available for the Pakistan. Therefore, the aim of this study was to determine the usage and perception of Physiotherapists practicing in musculoskeletal field about the effectiveness of therapeutic ultrasound as a treatment modality in Sindh, Pakistan.

Material and Method

A sample of 120 Physiotherapists were selected for this descriptive cross-sectional study. Data were collected by non-probability convenient sampling. The questionnaire was developed by the Lucy S. Chipchase, School of Health Sciences (Physiotherapy), University of South Australia in 2003 by the analysis of focus group discussion that ensured the face and content validity of the questionnaire.^{2,3,4} Questionnaire consists of two sections: Section 1 consisting of 13 items addressed demographic details such as age, gender, experience, field of work, education, ownership of ultrasound and

patient load. The data was collected via closed ended categorical questions. Section 2 consist of five items, investigated the subjects' usage of ultrasound, their knowledge of appropriate dosages and their perception of its effectiveness for various conditions. Information in this section was recorded on Visual Analogue Scale⁵. Consent forms were sent to the Physiotherapists before the administration of questionnaire explaining the purpose of study and assuring confidentiality. After the return of consents, questionnaires were self-administered to those participants who meet the inclusion criteria. Focus group data were analyzed in terms of trends and common ideas.

Results from the questionnaires were entered into Statistical Package for Social Sciences (SPSS) for windows version 20 (IBM Corp, 2012). Demographics variables were measured on categorical and ratio scale. Ordinal data (in the form of Visual Analogue Scale) for frequency ultrasound use were described in percentages. Responses were coded into numerical format. Summary statistics were provided in the form of percentages for each question, means and standard deviation where appropriate. Results are displayed in graphs and tables.

This study was conducted after getting ethical approval from Institutional Review Board of Jinnah Postgraduate Medical Center, Karachi, Pakistan.

Inclusion Criteria:

- Physiotherapists having special interest in the field of Musculoskeletal.
- Age: 25-60 years
- Both private and public practitioners.

Exclusion Criteria:

- Subjects not currently practicing physiotherapy.
- Interstate and intern physiotherapists.

Results

One hundred and twenty questionnaires were completed and returned a response rate of 87.5%. Twenty-four of these were excluded due to incomplete data. Of the respondents 77 were females and 43 were males. The age of the respondents ranged from 25 to 60 years, with a mean of 27.4±8.16 years. Most of the respondents 117(97.5%) had completed their undergraduate education training in the province of

Sindh, Pakistan.

Respondents were asked about their work place. Of these, most (89.2%) were metropolitan, 8.3% were provisional population and only 2.5% were rural population. A list of different fields was given, respondents were requested to select their current field of work. Of the most, 59 (49.2%) defined their current field of working as General practice. Of the total respondents included in the study, 56 (46.1%) were currently working in the private hospitals, 38 (31.7%) working in Public hospitals, 12(10.0%) were working in the public organization, only 4(3.3%) were private practicing population. Of the total, only 22.5% of respondents had attended continuing education in electrophysical agents over the last five years. When participants were asked about the ownership of US machine, 92.5% respondents possessed at least one ultrasound machine at their workplace.

Participants were asked to identify the most frequently used modalities, only 21(17.5%) of the respondents use electrotherapy modalities in their clinical practice. Out of 21 responses, 7 physiotherapists use continuous ultrasound (5.8%) ranking this modality as their first choice, 5(4.2%) of the respondent use TENS as their second choice, 3.3% physiotherapists use hot packs and 2.5% use pulsed ultrasound (figure 1).

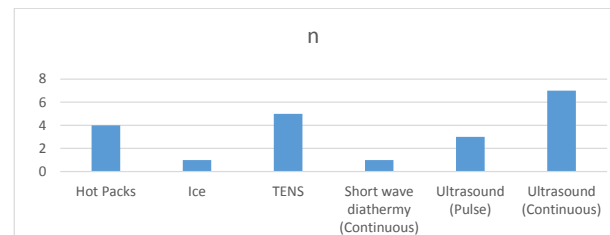


Figure 1. Usage of different electro physical agent modalities.

The frequency of ultrasound usage was calculated in relation to the number of patients treated. Most physiotherapists 37.5% (n=45) use ultrasound for less than 5 times per week and only 7.5% therapists use ultrasound more frequently to treat the patients. Respondents were permitted to select the two main factors influencing their choice to use ultrasound. Most respondents choose ultrasound because of its tissue healing and thermal properties, with 109 physiotherapists (90.8%) rank tissue healing as their primary choice for ultrasound usage (Table 1). The knowledge of physiotherapists about the ultrasound was assessed by requesting them to indicate the most appropriate dosage (mode, frequency and intensity) for

both acute and chronic conditions. For an acute ankle sprain, 60.8% of respondents choose pulsed mode of ultrasound to be more effective with frequency of 3MHz. 78.3% physiotherapists perceived continuous mode with frequency of 1.5MHz to be more effective in chronic condition

Table 1. Factors influencing physiotherapists’ decision to use ultrasound (n=120)

Factor	n (%)
Tissue healing	109 (90.8)
Thermal properties	81 (67.5)
Placebo	17 (14.1)
Gives opportunity to talk to the patients	1 (0.8)
Patients ask for it	9 (7.5)
To diagnose certain conditions (e.g. stress fractures)	5 (4.1)
You own a machine	1 (0.8)
It’s portable and easy to apply	7 (5.8)
To fill in treatment time	1 (0.8)
Other-please specify	6 (5)

Participants were asked to complete a visual analogue scale indicating their perception about the effectiveness of ultrasound for variety of clinical conditions. Responses showed that therapeutic ultrasound perceived to be more effective in acute tendonitis, acute bursitis and chronic muscle strain (Table 2).

When participants were requested to select two therapies they considered most useful when applied together with ultrasound. Most respondents (96.7%) reported that ultrasound was most effective when used in combination with other techniques. Exercise and passive mobilization were thought to be most effective in conjunction with ultrasound (Figure 2).

Table 2. Physiotherapists’ perception of ultrasound’s effectiveness for various conditions (VAS score/100)

Conditions	Mean	Standard deviation
Acute ankle sprain	61.0	21.5
Chronic knee OA	33.0	9.5
Chronic muscle strain	70.0	18.6
Chronic scar tissue	62.1	21.9
Cervical spondylosis	65.1	19.6
Acute tendinitis	73.3	18.5
Chronic lumbar disc herniation	63.0	19.3
Acute bursitis	70.3	20.5
Placebo	62.0	25.4

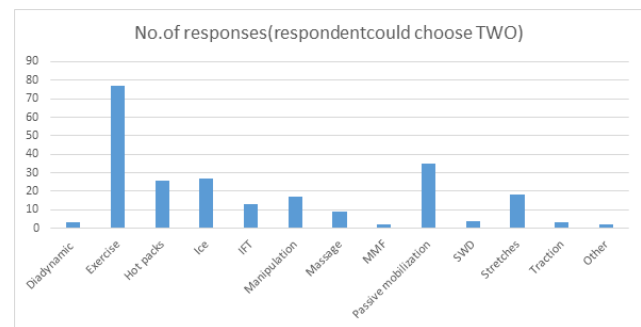


Figure 2. Techniques perceived to be effective when combined with ultrasound.

Discussion

In this survey based cross-sectional study the perception about the efficacy of therapeutic ultrasound was evaluated among the physiotherapists who aged between 25-60 years. In our study the response rate was (87.5%) higher than the previous study². This study shows that therapeutic ultrasound was most commonly used electrophysical agent among the physiotherapists of Pakistan these findings were comparable to the findings in UK, USA, Australia and Singapore.^{2,6,7,8,9} High frequency of use of ultrasound was also reported by Kitchen and Partridge in England.¹⁰

The population surveyed in the present study consisted majority private practitioners, this indicate the high usage of US in the private hospitals, this is similar to the findings reported by Ter Haar in UK.^{7,8,11} In present study, most of the respondents (92.5%) were possessed ultrasound machine at their clinics in terms of the ownership than any other form of electrophysical modality, however Lindsey et al (1990) reported that physiotherapists at Australia were more interested in having TENS units.⁷ Pope et al (1995) reported that physiotherapists in England were more frequently use Ultrasound, Pulsed-Shortwave Diathermy (PSWD) , Interferential current, TENS and flow torn¹² however the current study reported frequent use of continuous ultrasound, TENS, hot packs and PSWD. This indicate that use of short wave, interferential current, and flow torn has decreased over the decades. One explanation for these findings is that participants may not have been aware that many newer machines are capable of delivering a variety of currents. Alternatively, participants may not have been familiar with the latest technology. Although with the great availability of the therapeutic ultrasound, the present study demonstrates that less number of (37.5%) physiotherapists use ultrasound more frequently in terms of the patients treated per week. These findings differ from the previous study in UK.⁸ The usage of ultrasound is dependent upon the physiotherapists' knowledge about the appropriate dosages.

The results of the present study suggest that most of the physiotherapists (60.8%) prefer pulsed ultrasound to produce better effects in acute ankle sprain, These findings contradict from findings of Van den Bekerom et al (2012) who reported that ultrasound is not as effective in treating the acute ankle sprain¹³ Physiotherapists in this study report that continuous ultrasound is most effective for chronic knee osteoarthritis, this is comparable to the findings of previous studies.^{14,15} However MH Huang (2005) reported that pulsed US is more effective than continuous US in treating chronic knee osteoarthritis.¹⁶ The differences between the findings is because of the difference in the knowledge of the physiotherapists. The population surveyed in this study believe that ultrasound is effective in treating many of the musculoskeletal problems and soft tissue injuries such as chronic scar tissues, chronic muscle tear, acute tendinitis and bursitis who similar findings were reported by Rita A Wong et al (2007) and Physical therapists in Dutch primary health

care.^{17,18}

In present study the respondents state that ultrasound is not much effective or have little effects when given as placebo, because it produces only the psychological effects. Therefore, most therapists suggest that active ultrasound is more effective than placebo ultrasound. This is similar to the findings of VJ Robertson and Kerry G Baker (2001)¹⁹. However LS. Chipchase (2003) reported that Physiotherapists in Australia thought ultrasound is more effective in producing placebo effect.²

Physiotherapists in this study believe that the efficacy of ultrasound is enhanced when is used with other techniques. Most of the physiotherapists (64.1%) suggest that ultrasound when combined with exercise and passive mobilization is more effective in pain management, and similar findings were obtained in previous studies.^{2,20,21} Hot packs and ice therapy were also used in conjunction with ultrasound but to lesser quantity however there usage was higher among the Australian Physiotherapists.²² JW Busse and M. Bhandari reported that most physiotherapists (68%) believe ultrasound is effective in fracture healing cases²³ however these findings were not consistent with the findings of present study. When analyzing the outcomes of this study it was observed that most physiotherapists (90.8%) use ultrasound because of its tissue healing properties and 67.5% of the respondents use because of thermal properties of ultrasound as thermal effects lead to increase in blood flow and metabolic activity which will enhance the regeneration and elasticity of tissues^{24,25}. These findings are comparable to the study conducted in Brisbane, Australia.² Hence, US is perceived to be most effective when used in conjunction with other physiotherapy treatment.

Conclusion

This study concludes that therapeutic ultrasound is most frequently used modality among all the electrophysical agents. Physiotherapists perceive ultrasound to be effective in both acute and chronic musculoskeletal problems and soft tissues injuries. However, the perception of therapeutic ultrasound effectiveness is also considered high for acute tendinitis, acute bursitis and chronic muscle strain. Physiotherapists' perception regarding the ultrasound efficacy is influenced by its tissue healing and thermal properties. Ultrasound is perceived to be most effective when applied in conjunction with other physiotherapy

techniques specifically exercise and passive mobilization.

Ethical Clearance: Taken from Institutional Review Board of Jinnah Postgraduate Medical Center, Karachi, Pakistan.

Source of Funding: Self-Funded.

Conflict of Interest: Nil

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Comparison of Immediate Effect of Hold-Relax Proprioceptive Neuromuscular Facilitation and Foam Roller Exercise on Tight Hamstring Muscle in School Going Children” – An Experimental Study

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Abstract

Context: Hamstring tightness occurs in early childhood and tends to increase with age. Hold-relax PNF technique and foam roller exercise technique are used to improve flexibility of hamstring muscle.

Aim: Comparison of immediate effect of hold-relax proprioceptive neuromuscular facilitation and foam roller exercise on tight hamstring muscle in school going children.

Settings and Design: The interventional study was carried out in various primary schools of Aburoad.

Method and Material: 60 subjects were included on the basis of inclusion and exclusion criteria and divided into 2 groups with 30 participants in each group. One group received hold-relax PNF and other group received foam roller exercise.

Statistical analysis: Data was analyzed by using SPSS version 20. Wilcoxon signed-rank test was used for the pre treatment and post treatment comparison within both the groups and Mann-Whitney U test was used for the inter group comparison.

Results: Statistically is significant ($p < 0.05$) the result showed high significant difference within and between the two groups. There was more effect of hold-relax PNF technique compared to foam roller exercise.

Conclusion: The above study concluded that both the technique showed marked improvement but hold-relax PNF more effective in school going children with hamstring tightness.

Keywords: Hold-relax PNF technique, Foam roller exercise, Hamstring tightness, school going children.

Introduction

Muscular flexibility is an important aspect of normal human function. Limited flexibility has been shown to predispose a person to several musculoskeletal overuse injuries and significantly affect a person's level of

function. Muscular tightness is frequently postulated as an intrinsic risk factor for the development of a muscle injury. Lack of flexibility has been suggested as a predisposing factor to hamstring strains.¹

Flexibility is a vital component of fitness required for most desirable musculoskeletal functioning and maximizing the performance of physical activities. Flexibility dysfunction is a widespread problem faced by common as well as sportspersons, especially in case of hamstring group of muscles. Hamstring tightness is not only a causative factor for reduced range of motion but it can also lead to various other musculoskeletal

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problems. Length-tension relationship of muscle as well as shock absorbing ability of the limb is affected by tightness of muscle. Reduced flexibility generates a vicious circle of range reduction and resulting increase in postural problems. Tight muscles also compress the blood vessels and lead to reduced optimal performance.²

Hamstring tightness occurs in early childhood and it tends to increase with age. hamstring is an example of those muscle group that have a tendency to get shorten.³ Hamstring muscle has a tendency to undergo shortening by the age of 5-6 years, as child start to do any activity or sedentary lifestyle.⁴ The progressive decline in flexibility with age has been attribute to change in elasticity and decreased level of physical activities. Hamstring extensibility is a physical fitness component widely recognized as an important marker of health and quality of life.³

Goniometer

To measure a ROM of a particular joint, the therapist should have thorough knowledge on the ROM of an individual joint. Selection of goniometer is a important factor while measuring ROM of joint. The universal goniometer is desinged by Mr.Moore. This is the commonest variety having stationary arm, movable arm and body.⁵

Active Knee Extension Test

For the AKET participants were positioned supine on a plinth so that the leg not being tested was flat on the plinth with the knee extended. A strap was placed over the mid-thigh of this leg to eliminate any elevation of the limb. An additional strap was positioned over the front of the participant's pelvis and around the plinth to maintain the pelvis in a neutral position during hamstring measurements. Subject then flexed his hip to 90 degree and subject was instructed to grasp behind the knee with both the hands to stabilize the hip. subject then actively extends the knee as far as possible.⁶

Need of the Study

Hamstring muscle tightness is present in all age group population and it increases with age. there are many ways of reducing hamstring tightness but very few techniques given an immediate result.

Proprioceptive neuromuscular facilitation techniques are more advanced form for facilitation as well as elongation of muscle groups and foam rolling is

a techniques to release myofascial adhesions that restrict the muscle from lengthening and allowing full joint muscle.

Both these techniques have been applied on adult. However, there was a paucity to find out its effect on school going children with hamstring tightness. So, our need of study was to find out that which technique gives the best result in short time to improve hamstring flexibility in school going children.

Aim of the Study

The aim of the study is to compare the Immediate effect of hold-relax proprioceptive neuromuscular facilitation and foam roller exercise on tight hamstring muscle in school going children.

Objective of the Study

- To find out the immediate effect of hold-relax proprioceptive neuromuscular facilitation on tight hamstring muscle in school going children.
- To find out the immediate effect of foam roller exercise on tight hamstring muscle in school going children.
- To compare between two techniques the immediate effect of hold-relax proprioceptive neuromuscular facilitation and foam roller exercise on tight hamstring muscle in school going children.

Hypothesis

Null Hypothesis

- There is no significant difference between the immediate effect of hold-relax proprioceptive neuromuscular facilitation and foam roller exercises on tight hamstring muscle in school going children.

Alternate Hypothesis

- There is significant difference between the immediate effect of hold-relax proprioceptive neuromuscular facilitation and foam roller exercises on tight hamstring muscle in school going children.

Material and Methodology

Study Settings: Shri U.S.B. College Of Physiotherapy, Abu Road

Source of Data: Various primary schools in Abu

Road.

Method of Data Collection :

Study Population: School going children with hamstring tightness.

Sample Size: 60 Students

Sampling Method: Purposive sampling

Study Design: An experimental study

MATERIAL

- Plinth
- Goniometer
- Foam mattress
- Inch tape
- Weighing machine
- Foam roller
- Stop watch
- Consent form
- Assessment form
- Pen and paper
- Treatment table



Figure 1: Foam Roller

Criteria for Selection

Inclusion Criteria :

- AGE : 5-12 years children
- GENDER : Both (male and female)
- Normal child

➤ Hamstring tightness (Minimum degree \leq 160 degrees)

Exclusion Criteria :

- Regular sports player
- Hamstring tightness
- Past pathology
- Post fracture of lower limb
- History of spinal cord injury
- History of low back pain
- Subject not willing to participate
- Subject using lower limb prosthesis or orthotic device

Measurement Procedure

After the approval of the study from the ethical committee, 60 subjects from various schools of Abu road, who fulfilled the inclusion and exclusion criteria where taken for the study purpose. Written informed consent was signed by the class teacher of each subject before proceeding for the study procedure. Before starting the study a brief assessment was taken. Class teachers and subjects were explained about the test and procedure to be conducted. Total 60 subjects with tight hamstrings were selected.

Before data collection procedure begun, each subject received a verbal explanation and a demonstration of the movement to be performed and practice trials were performed by them. For subjects to fit in inclusion criteria AKE test was performed whose minimum degree was taken as 160 degrees.

Application of PNF Technique

Position of the Subject: Sitting on a treatment table with the knee of the treated leg extended and uninvolved foot on the ground.

Procedure:

Participants performed 8 minutes of the hold-relax PNF technique. While keeping the knee and foot pointed toward the ceiling to avoid hip rotation, participants first leaned their trunk down toward the table (trunk + hip flexion) until their hamstrings were stretched to the point

of discomfort. They sustained the stretching position for 5 seconds. They were then instructed to push their heel into the table (to contract the hamstrings) for 5 seconds using maximum



Figure 2: Application of PNF

Effort before leaning their trunk further toward the table and holding the new position for 5 seconds. A 10-second break was permitted every three repetitions. We devised these procedures in the interest of investigating a protocol that could be easily self-administered (ie, easy to track time).⁷

Application of Foam Rolling

Procedure:

Participants performed 8 minutes of foam rolling over the entire length of the hamstring, from the ischial tuberosity to the posterior knee. Once again, we chose an 8-minute period for consistency in the duration of the intervention. The participants rolled out their hamstrings at a rate of three to four times per minute, with 10 seconds of rest after each minute. The researcher ensured that the participants were rolling at the appropriate pace by observing a stopwatch and also provided feedback if participants were off pace.⁷



Figure 3 : Application of Foam Roller

Result

All statistical analysis was done by SPSS statistics version 20.0. Pre treatment and post treatment data was analyzed by Wilcoxon sum rank test and inter group comparison was calculated by Mann-Whitney U test. Level of significance was set at 0.00 levels.

Table 1: Gender distribution

Gender	Frequency
Male	32
Female	28
Total	60

Interpretation: The above table 1 shows gender distribution.

Table 2: Inter-group comparison of mean and SD of Group A, Group B and difference.

	Mean	Sd
Group A	11.87	1.85
Group B	5.47	1.38
Difference	6.4	0.47

Interpretation: The above table 2 shows the mean of Group A, Group B and difference and SD of Group A, Group B and difference.

Wilcoxon sign rank test was used for pre treatment and post treatment comparison for

Group A and Group B.

Mann Whitney U test was used for between group comparison of Group A and Group B

Table 3: Intragroup comparison of pre & post treatment of Hold-relax proprioceptive neuromuscular facilitation treatment in Group A.

	Z	P
GROUP A	-4.817 ^b	0.00

Interpretation: The above Table 3 shows the

result of Wilcoxon sign rank test which shows there was significant different between the pre and post of Hold-relax proprioceptive neuromuscular facilitation in Group A.

Table 4: Intragroup comparison of pre & post treatment of Foam rolling exercise in Group B.

	Z	P
GROUP B	-4.600 ^b	0.00

Interpretation: The above Table 4 shows the result of Wilcoxon sign rank test which shows there was significant different between the pre and post Foam rolling exercise in Group B.

Table 5: Inter group comparison of post treatment on both groups.

Intergroup	Z	Sig.	Mann-whitney U
(Group A-B)	-4.314	0.00	158.500

Interpretation: The above table 5 shows the result of Mannwhitney U test which shows there was significant different between both groups.

Discussion

The intent of the study was to comparison of immediate effect of hold- relax proprioceptive neuromuscular facilitation and foam roller exercise on tight hamstring muscle in school going children. In the present study, the values of pre- treatment and post treatment Hold-Relax Proprioceptive Neuromuscular Facilitation and Foam Roller Exercise where analyzed, it was statistically proven that there is significant improvement in Hold-Relax Proprioceptive Neuromuscular Facilitation and when comparison was done between the groups, from both the techniques Hold-Relax Proprioceptive Neuromuscular Facilitation was proved more significant.

Laura Deguzman et al, (2018) conducted a study to find out The Immediate Effects of Self-administered Dynamic Warm-up, Proprioceptive Neuromuscular Facilitation, and Foam Rolling on Hamstring Tightness and concluded that The PNF intervention elicited a

greater improvement in knee extension angle compared to the foam rolling intervention but not when compared to the dynamic warm-up intervention.⁷

Ramachandran Sivagnanam et al, (2018) conducted a study to find out comparative effect of PNF stretching technique on hamstring flexibility and concluded that both PNF hold relax and PNF contract relax antagonist contract stretching is effective in improving hamstring flexibility.⁸

Wicke J et al, (2014) conducted a study to find out A comparison of self-administered proprioceptive neuromuscular facilitation to static stretching on range of motion and flexibility and it concluded that Results from this study showed that this form of PNF stretching significantly improves hip ROM and HBSF.⁹

Clinical Implications

The results suggest that from both the techniques i.e. Hold-Relax Proprioceptive Neuromuscular Facilitation and Foam Roller Exercises it is proved that Hold-Relax Proprioceptive Neuromuscular Facilitation are more effective than Foam Roller Exercise for the tight hamstring in school going children. So, Hold-Relax Proprioceptive Neuromuscular Facilitation can be more beneficial for this group of participants

Limitations

1. Subjects with 5-12 years of age where considered for study thus results cannot be generalized to all age group.
2. Only immediate effect was studied and long term effects were not studied that would have help to find maintenance of the improved outcome measures.
3. Only AKE ROM was measured.
4. Study on done only on normal subjects.

Further Recommendations

1. Treatment can be given for longer duration with follow up.
2. Further studies can be done with larger sample size.
3. This study can be done by taking different outcome measure.
4. Further study on other techniques in combination

with Hold-Relax Proprioceptive Neuromuscular Facilitation and Foam Roller exercise.

5. Study can be done on only male or female participants.

Conclusion

Between the Hold-Relax Proprioceptive Neuromuscular Facilitation and Foam Roller exercise, there is more significant increase in AKE angle by Hold-Relax Proprioceptive Neuromuscular Facilitation compare to Foam Roller Exercises.

Hence, it can be concluded that from both the form of treatment option for the treatment on tight hamstring muscle in school going children, Hold-Relax Proprioceptive Neuromuscular Facilitation and Foam Roller exercise. Hold-Relax Proprioceptive Neuromuscular Facilitation proved to be more effective and convenient.

Conflict of Interest: Nil.

Source of Fund: No fund was needed.

Ethical Clearance: From Shri USB College of Physiotherapy, Abu road.

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Effect of Accu Tens with Accu Band on Nausea, Vomiting, Retching and Quality of Life in Early Pregnancy

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Abstract

Background: Nausea and vomiting are basic human preventive reflexes against the absorption of toxins, as well as responses to correct stimuli. They are often used together, although each phenomenon should be assessed separately.¹ Nausea and vomiting in pregnancy (NVP) is repeatedly experienced in early pregnancy, most frequently between 6 and 12 weeks. It's important to find out Accu tens and bands and related techniques have potential for nonpharmacologic relief of nausea and vomiting in pregnancy

Methodology: Subjects were randomized into two groups. 124 subjects of above 18 years old subjects were recruited in each group. Accu (TENS) Transcutaneous Electrical Nerve Stimulation with accu band at P6 point or Neiguan acupuncture point of dominant hand was administered to experimental group while control group was subjected to placebo (TENS) Transcutaneous Electrical Nerve Stimulation with Accu band on dorsum of wrist joint. Both the groups received interventions for 5 days in a week for 3 weeks. The outcome of study assessed by Rhodex index, Nausea Vomiting of Pregnancy Quality of Life (NVPQOL) questionnaire, which was assessed before treatment and after treatment session regimen.

Result: Rhodex index scores shows that there is comparison between group A and group B mean value of group A and group B 18.61 and 12.29 respectively. The t-value were 6.66 and $p < 0.0001$. NVPQOL scores shows that there is comparison between group A and group B mean value of group A and group B 115.23 and 80.58 respectively. The t-value were 7.25 and $p < 0.0001$.

Conclusion: The results obtained from this study showed that the Accu TENS with Accu band can be easy to perform, least expensive, feasible and most efficient management strategy for reducing nausea, vomiting and retching, weight gain and enhancing the quality of life of individuals with early pregnancy.

Keywords: Vomiting, Nausea, Quality of life, acupuncture.

Introduction

Nausea and vomiting are basic human preventive reflexes against the absorption of toxins, as well as responses to correct stimuli. They are often used together, although each phenomenon should be assessed separately.¹ Nausea and vomiting in pregnancy (NVP) is repeatedly experienced in early pregnancy, most frequently between 6 and 12 weeks. NVP can continue till 20 weeks, and continue after this time for up to 20 % of women.²

The reported incidence of HG among Indian female population was found to be approximately 0.5% to 20%, while; it was noted higher in multiple pregnancies. In

general nausea and vomiting of pregnancy (NVP) occurs between the 4th and 6th week of pregnancy, with peak observed in between week 8 and 12.^{3,4} A more severe form of nausea, vomiting of pregnancy, in form of HG, will also occur in 0.5 to 3 percent of pregnancies and may lead to hospitalisation.^{5,6}

NVP has a significant impact on quality of life for pregnant women and their families.¹¹ It leads to discomfort, disability and suffering and results in absence from daily and social activities.⁷ Furthermore, almost 50 % of women reported that NVP negatively affected the relationship with their partner and their partner's daily life.¹¹ Therefore, this affliction warrants attention and optimal treatment regimen.⁸

In current years, the use of complementary and alternative therapies has become famous in many countries.¹⁸ these include herbal remedies (ginger, chamomile, peppermint, raspberry leaf), homeopathic remedies (Nux vomica, Pulsatilla), acupressure, accustimulation bands, acupuncture^{9, 10, 11} and moxibustion^{12, 13}. Pregnant women may recognize these as “natural” and therefore safe.²⁰

Ginger is the only nonpharmacologic intervention recommended by the American College of Obstetrics and Gynaecology.¹⁴ Ginger is trusted to help in improving NVP by stimulating gastrointestinal tract motility and stimulating the flow of saliva, bile, and gastric secretions. One component of ginger has been shown to have homogeneous activity as the 5-HT₃ antagonist, ondansetron. Additionally, its extract has been found to hamper the growth of some strains of *H. Pylori*.¹⁵

The beginning therapy for NVP and HG should include dietary changes. Influenced women should avoid heavy meals and instead eat several light meals throughout the day that are bland and high in fibers containing foods that may further improve gastric emptying. Eating protein more than carbohydrates and taking in more liquids than solids may also help nausea by enhancing the gastric dysrhythmias related with NVP²⁶. Small volumes of salty liquids such as electrolytes-replacement sport beverages are desirable, and if the smell of hot foods is noxious, cold foods should be prepared.¹⁶

Although there are various remedial options available for HG and NVR management, still the unanimous agreement proclaiming the optimal treatment strategy is lacking. Accu TENS and related techniques have potential for nonpharmacologic relief of nausea and vomiting throughout pregnancy.¹⁷

However, due to symptoms of nausea and vomiting during pregnancy may occur throughout the day and generally last for weeks, alternative forms of acupuncture may be better suited for treatment of this illness.

Methodology

The purpose of the study is to find out the effect of effect of accu tens with accu band on nausea, vomiting and retching in early pregnancy.

A 60 patients with age group 18 to 35 years who met the inclusion criteria were selected for the study

using simple random sampling technique from various maternity hospitals. they were explained about the study, procedure and consent of the patient were taken. This study were passed through ethical committee before starting the study. The inclusion criteria were Morning sickness since 6 to 12 weeks of gestation, Nausea and vomiting for a minimum of 3 days. Estimated gestational age of between 6 and 12 weeks and Patients were required to be at least 18 years old and have a Mobile telephone. The Exclusion criteria were Subject who suffered from conditions other than pregnancy associated with symptoms of nausea and vomiting, Thyroid disease, Liver disease, Acquired immune deficiency syndrome, Diabetes, Gall bladder disease, Peptic ulcer disease, Malignancy treated with chemotherapy, antibiotic therapy, antidepressant medication, alcoholism, or drug addiction, Subject with a cardiac pacemaker was excluded, Those who were treated with acupuncture previously and No concomitant therapies for nausea and vomiting during trial.

Procedure

Subjects were randomized into two groups. 124 subjects of above 18 years old subjects were recruited in each group. Accu (TENS) Transcutaneous Electrical Nerve Stimulation with accu band at P6 point or Neiguan acupuncture point of dominant hand was administered to experimental group while control group was subjected to placebo (TENS) Transcutaneous Electrical Nerve Stimulation with Accu band on dorsum of wrist joint. Both the groups received interventions for 5 days in a week for 3 weeks. The outcome of interest included severity of nausea, vomiting and retching via Rhodex index, weight gain via body mass index (BMI), quality of life via Nausea Vomiting of Pregnancy Quality of Life (NVPQOL) questionnaire, which was assessed before treatment and after treatment session regimen.

Experimental group:

Subjects were administered to Accu (TENS) Transcutaneous Electrical Nerve Stimulation at a frequency 10-15 Hz for 30 minutes a day at P6 of dominant hand. P6 was located (on the anterior surface of the forearm, 5 cm proximal to the distal wrist crease, between the tendons of the flexor carpiradialis and the Palmaris longus).

The reference electrode was applied at thenar muscles at P6 so as to stimulate the median nerve by applying pressure at a site on the underside of the wrist

on dominant hand. Accu-band was continuously applied on the same stimulated P6 points and pressing the button for 5 minutes every 2 hours in the subject's dominant side while she awake for 5 days. The subjects were provided with Accu (TENS) Transcutaneous Electrical Nerve Stimulation and Accu band 5 days in a week for 3 weeks.

Control group:

Subjects was applied placebo (TENS) Transcutaneous Electrical Nerve Stimulation at P6 or Neiguan acupuncture point for 30 minutes a day. Accu band was applied on the dorsum of wrist joint and pressure for 5 minutes every 2 hours in the subject's dominant side while she awake for 5 days. The subjects

were treated with placebo Transcutaneous Electrical Nerve Stimulation (TENS) and accu band on dorsum of wrist, 5 days a week for 3 weeks.

Statistical Analysis

Statistical analysis of the nausea, vomiting and retching in early pregnancy via Rhodes index score, quality of life of the pregnant women via The statistical tests used for the analysis of the results were as follow:

I. Univariate descriptive test including mean, standard deviation , and confidence interval

II. Bivariate test using Paired t-test and Independent t-test

Parameters	Post Treatment (Control)	Post Treatment (Experimental)	95% CI	DF	t-value	Std Error of Diff	p-Value
Mean	18.6100	12.2900	4.4410 to 8.1990	105	6.66	0.94	<0.0001
SD	6.2800	3.0700					
SEM	0.8709	0.4140					
N	52	55					

Table1 depict that there was significant improvement in the pre treatment and post treatment Rhodes index scores in both control group and experimental group. However, experimental group was found to be more significant at $P = <0.05$.

Parameters	Post Treatment (Control)	Post Treatment (Experimental)	95% CI	DF	t-value	Std Error of Diff	p-Value
Mean	115.2300	80.5800	25.1865 to 44.1135	105	7.25	4.77	<0.0001
SD	27.4600	21.7200					
SEM	3.8080	2.9287					
N	52	55					

Table 2 depict that there was significant improvement in the pre treatment and post treatment NVPQOL scores in both control group and experimental group. However, experimental group was found to be more significant at $P = <0.05$.

Discussion

The result obtained from this controlled trial are novel as to date there have been no data comparing the effects of Accu TENS with Accu band versus placebo Accu TENS with placebo Accu band on Nausea, vomiting and retching, weight gain and quality of life of the early pregnant women.

This study confirms that after three weeks of treatment, the experimental group who received Accu TENS with Accu band showed significant improvement in Nausea, vomiting and retching via Rhodes index score, weight gain via BMI and quality of life via NVPQOL scale score as compared to control group who received placebo Accu TENS with Accu band.

The result of present study supports the hypothesis of Todd Rosen et al. who studied the effect of Accu TENS with Accu band on effect of nausea, vomiting and retching in early pregnancy¹⁸. The primary outcome measure was self-recorded symptoms according to the Rhodes Index of Nausea, Vomiting, and Retching (Rhodes Index). Secondary outcome measures were medication use, weight gain, and presence of urinary ketones. Baseline characteristics were similar in both groups. They concluded that the Nerve stimulation therapy is effective in reducing nausea and vomiting and promoting weight gain in symptomatic women in the first trimester of pregnancy.¹⁹

These study support the hypothesis aimed effectiveness of acupressure in reducing nausea and vomiting of pregnancy. 60 women completed the study. There were no differences between groups in attrition, parity, fetal number, maternal age, gestational age at entry, or pre-treatment nausea and emesis scores. Analysis of variance indicated that both groups improved significantly over time, but that nausea improved significantly more in the treatment group than in the sham control group ($F_{1,58} = 10.4, P = .0021$). There were no differences in the severity or frequency of emesis between the groups. There was a significant positive correlation ($r = 0.261, P = .044$) between maternal age and severity of nausea. They indicated

that acupressure at the PC-6 anatomical site is effective in reducing symptoms of nausea but not frequency of vomiting in pregnant women²⁰.

The superiority of the experimental group over the control group can be explained by means of theory which is postulated that acupressure causes low frequency electrical stimulation of the skin sensory receptors which may activate A β and A fibers. These fibers synapse within the dorsal horn and may, in turn, cause release of endorphins from the hypothalamus. Increased levels of β -endorphin concentration have been reported in human cerebrospinal fluid after acupuncture stimulation and β -endorphins may have antiemetic effects mediated by its action on μ receptors.²¹ Electro-acupuncture (repeated sensory stimulation) has been thought to modulate serotonin, substance P, and endogenous opiates along various pathways in the central nervous system. Some effects may be manifested through the serotonin- and substance P-mediated components of the emetic reflex, as well as through the opiate μ receptor via its antiemetic actions^{22,23}.

For further discussion to summarize, Accu TENS with Accu band is an effective treatment protocol with respect to nausea, vomiting and retching, weight gain and quality of life in early pregnancy.

Conclusion

The result obtained from this clinical trial showed that Accu TENS with Accu band showed better and faster improvement than control group in all the outcome measures.

The results obtained from this study showed that the Accu TENS with Accu band can be easy to perform, least expensive, feasible and most efficient management strategy for reducing nausea, vomiting and retching, weight gain and enhancing the quality of life of individuals with early pregnancy.

Conflict of Interest: There is no conflict of interest between the authors

Source of Funding: Nil

Ethical Clearance: This research study is given clearance under Ethical committee headed by Principal, Maharashtra Institute of Physiotherapy, Latur.

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Effect of Dynamo-Static Splint on Post Operative Knee Stiffness

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Abstract

Aim: To Study the effect of Dynamo-Static Splint on Post-operative knee stiffness

Objectives: The Objectives of the study are as follows: (1) To find the effect of Dynamo-Static Splinting on Pain (2) To find the effect of Dynamo-Static Splinting on Knee Range of Motion

Methods: This study was conducted for the duration of 6 months. 20 subjects of age 20 to 60 years were screened out of which 10 subjects were selected for the study depending on the inclusive and exclusive criteria. Condylar Fracture of Femur and Tibial Plateau Fractures referred to Physiotherapy Department Between 4 to 5 weeks. These subjects were then divided into 2 groups Pre-treatment assessment and Post-treatment assessment were recorded.

Results: Statistically significant differences in the VAS at rest and activity, Pre and Post range of motion were seen between the two groups. Post treatment Range of motion It indicated that it was significant ($p < 0.0001$) and ($p = 0.0460$) in the interventional group subjects. VAS at rest. It indicated that it was significant ($p < 0.0001$) and ($p = 0.0203$) in the interventional group subjects. Intra group analysis of these values within the group was done using Wilcoxon test and the Inter group analysis between the groups was done by Mann-Whitney test.

Conclusion: The present study provided evidence to support the use of dynamo static splint for post-operative knee joint stiffness. In addition, results supported splinting exercises were significantly effective in reducing the quality of pain and improving range of motion in post-operative knee stiffness.

Key words: *Dynamo-Static, Post-operative, Splint, Knee Stiffness, Knee.*

Introduction

Anatomy

The knee is the largest and most complex joint of body. The knee is also known as the tibiofemoral joint. This is a synovial hinge joint formed between three bones: femur, tibia, and patella.^[1]

The knee joint consists of two articulations: one between the femur and tibia (tibiofemoral joint), and one between the femur and patella (patellofemoral joint).^[1]

Fracture

A fracture is a break in the Continuity of the bone.^{[3][4]}

Causes of Fracture

A bone will fracture when a force is applied to it that is stronger than the bone itself. A key factor in a bone's susceptibility to fracturing is age. Fractures commonly happen because of accidents, falls, or sports injuries.^{[3][4]}

Other causes are low bone density and osteoporosis, which cause weakening of the bones.^[4]

Overuse can cause stress fractures, which are very small cracks in the bone.^{[3][4]}

Types of Fracture

There are four main types of Fracture^[4]

- Simple

- Compound
- Complete
- Incomplete

Classification of Fractures Around Knee Joint^[4]

- ❖ Condylar fracture of Femur
- ❖ Fracture of Patella
- ❖ Tibial Plateau Fracture

Complication of Fractures^[4]

Early Complication

- ✓ Vascular Injury
- ✓ Wound infection
- ✓ Fracture blisters
- ✓ Damage to surrounding tissue
- ✓ Compartment syndrome

Late Complication

- ✓ Delayed Union
- ✓ Non-Union
- ✓ Malunion
- ✓ Joint stiffness
- ✓ Myositis ossificans

Causes of Knee Stiffness

- ❖ Causes of A Stiff Knee^{[3][4]}
 - Fluid Accumulation
 - Altered Biomechanics
 - Pain
- ❖ Stiff Knee Following an Injury^{[3][4]}
 - Sprain
 - Fracture
 - Ligament Injury

❖ Stiffness Due to Medical Condition^{[3][4]}

- Rheumatoid Arthritis
- Osteoarthritis
- Bursitis
- Gout

Method

- Type of Study: Experimental study
- Design of Study: Pre and Post Study
- Sampling Method: Simple random sampling with random elocution
- Study Duration: 6 months
- Place of study: Krishna Hospital ,Physiotherapy Department
- Sample size: 10

The Cochran formula for sample size is

$$n = Z^2 pq/e^2$$

Criterion of the study

Inclusive

- Subjects with Condylar Fracture of Femur and Tibial Plateau Fractures referred to Physiotherapy Department Between 4 to 5 weeks

Exclusive

- Open Wound Near the Knee Joint.
- Soft tissue injury.
- Loss of sensation.
- Compound Fracture
- Post-operative period less than 4 to 5 weeks
- Knee Arthroplasty
- Ligament Injury

PROCEDURE

An approval for the study was obtained from the Protocol committee and institutional Ethical Committee

of KIMSDU. : This study was conducted for the duration of 6 months. 20 subjects of age 20 to 60 years were screened out of which 10 subjects were selected fulfilling the inclusion and exclusion criteria i.e. Patients Referred to Physiotherapy department having condylar femoral fracture and tibial plateau fracture between 4 to 5 weeks and were given explanation about the project and the treatment what subject received and what benefits and its effects were, The subjects were asked

to sign a consent form, then were divided in 2 Groups. **Group A** was given Dynamo-Static Splinting & protocol exercises with traditional physiotherapy and **Group B** was given just traditional physiotherapy. Range of Motion was assessed every day after the treatment and before the treatment for a week. Pre-Treatment and Post Treatment Assessments was done for the comparative study between these 2 groups Responses were recorded and were used for analysis & derive the conclusion.

Table No 1 : Exercise Protocol

Group A Treatment Protocol	Group B Treatment Protocol
Traditional Physiotherapy Programme <ul style="list-style-type: none"> • Paraffin Wax Bath 15 minutes application by Direct Method • Mobilization (initial Stage Grade I and II) -Anterior Glide -Posterior Glide • Static Exercises Static Quadriceps, Static Hamstrings, SLR • Strengthening Exercises (Weight cuffs, Active Resisted, Resistance band exercises-Initial Stage As improvement was seen started with Squats, Leg press, Ankle Pumps, Static Cycle, Quadriceps Table, Stair Climbing) • Dynamo-Static Splint which was locked at achieved ROM, Splinting Protocol and Splinting Exercises was given 	Traditional Physiotherapy Programme <ul style="list-style-type: none"> • Paraffin Wax Bath 15 minutes application by Direct Method • Mobilization (initial Stage Grade I and II) -Anterior Glide -Posterior Glide • Static Exercises Static Quadriceps, Static Hamstrings, SLR • Strengthening Exercises (Weight cuffs, Active Resisted, Resistance band exercises-Initial Stage As improves start with Squats, Leg press, Ankle Pumps, Static Cycle, Quadriceps Table, Stair Climbing)

Results

Table No 2 : Comparison of pre-pre and post-post VAS at rest in between groups

	Pre interventional	Post interventional
Group A	4.4±0.5477	3.4±0.5477
Group B	4.6±0.5477	3.8±1.483
P value	0.8125	0.6213
Interference	Not Significant	Not Significant

Table No 3: Comparison of Pre and Post VAS at rest within the groups

	VAS at rest			
	Pre interventional	Post interventional	P value	Interference
Group A	4.4±0.5477	3.4±0.5477	0.0203	Significant
Group B	4.6±0.5477	3.8±1.483	0.2907	Not Significant

Table No 4: Comparison of pre-pre and post-post VAS on activity between groups

	Pre interventional	Post interventional
Group A	7.6±0.5477	6±0.7071
Group B	7.4±0.8944	6.4±1.517
P value	0.7040	0.4766
Interference	Not Significant	Not Significant

Table No 5: Comparison of Pre and Post VAS on activity within the group

	VAS on activity			
	Pre interventional	Post interventional	P value	Interference
Group A	7.6±0.5477	6±0.7071	0.0039	Very Significant
Group B	7.4±0.8944	6.4±1.517	0.2398	Not Significant

Table No 6 Comparison of Pre and Post ROM within the group

	Range of Motion Day 1 and Day 7			
	Pre test	Post test	P value	Interference
Group A	28±3.742	34.2±4.712	0.0460	Significant
Group B	36±4.234	48.8±10.640	0.0754	Quite not significant

Discussion

The current study is aimed to find the effect of dynamo-static splint on post-operative knee stiffness. 10 subjects were selected based on the inclusion and exclusion criteria and were allotted in 2 groups. Objectives of this study were to find whether there is any effect of dynamo-static splint on post-operative knee stiffness. because in general, Immobilization stiffness at the knee is the problem often encountered after post-operative knee stiffness. Numerous conditions such as knee fractures total knee replacements, and knee ligament reconstruction, to name a few, frequently leave the patient with less than normal range of motion. When joint mobility is lost, functional impairment results ranging from an athlete's poor running performance to the elderly's inability to walk to the bathroom or to feed them.

Prevalence of post-operative knee stiffness was taken into consideration, according to previous studies conducted, concluded that out of the series of 1000 the primary stiffness postoperatively was 1.3%.^[2] Comparing it to another study similarly after one more study presented The prevalence of stiffness was 5.3%.^[2] So considering the population a total of 20 sample were screened and depending on the inclusive and exclusive criteria of the study 10 sample were included in the study.

According to previous studies of McClure PW, Blackburn LG, Dusold C. The use of splints in the treatment of joint stiffness: Biologic rationale and an algorithm for making clinical decisions. The study presented. The primary rationale for using splints is to apply relatively long periods of tensile stress to shortened connective tissues to induce tissue lengthening through biologic remodelling. The process of remodelling is contrasted with more temporary mechanical phenomena that occur in biologic tissues. The proposed algorithm guided the use of splints based on measurements of pain and ROM. It described three variables of splint use that was to be adjusted: frequency, duration, and intensity. The relative importance of each of these variables was discussed. Deciding which patients were appropriate for end-range splinting and deciding when to discontinue splint use were also discussed.^[7]

Considering the literature on the basis using the biological evidence we used dynamo static splint as a treatment for post-operative cases of knee where the patient was locked up in the end range of the ROM and

was dynamically able to move at the static end range. Results showed a significant mark. The statistical analysis were as followed Wilcoxon matched pair test for pre and post comparison for VAS at rest was significant for group A that is the pain intensity was reduced in group A by the use of dynamo static splint and VAS at rest for group B was not considered significant P value for group A was 0.0203 and 0.2907 in group B.

Man- Whitney test for pre-pre and post-post comparison for VAS on activity was not significant in both the groups that is there was no significant difference in the inter group comparison of pre-pre and post-post values p value for pre was 0.8125 and 0.6213 for post.

Wilcoxon matched pair test for pre and post comparison for VAS on activity was very significant for group A that is the pain intensity was reduced in group A by the use of dynamo static splint and VAS on activity for group B was not considered significant P value for group A was 0.0039 and 0.2398 in group B.

Man- Whitney test for pre-pre and post-post comparison for VAS at rest was not significant in both the groups that is there was no significant difference in the inter group comparison of pre pre and post-post values p value for pre was 0.7040 and 0.4766 for post. The comparison between pre and post test revealed that pain intensity was reduced in both at rest and on activity in group A by using dynamo static splint and exercises for four weeks and was not significant in group B.

Wilcoxon matched pair test for pre and post comparison for ROM was considered significant for group A that is range of motion increased in group A by the use of dynamo static splint and ROM for group B was not considered quite significant P value for group A was 0.0460 and 0.0754 in group B. The comparison between pre and post test revealed that ROM increased in group A by using dynamo static splint and exercises for 4 weeks.

Therefore, the results of statistical analysis proved that the use of dynamo static splint was useful in maintaining range of motion and also reduced pain intensity.

Conclusion

The present study provided evidence to support the use of dynamo static splint for post-operative knee joint stiffness. In addition, results supported splinting

exercises were significantly effective in reducing the quality of pain and improving range of motion in post-operative knee stiffness.

Conflict of Interest: The author declares that there are no conflicts of interest concerning the content of the present study.

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Ethical Clearance: The study was approved by Institutional Ethics Committee, KIMSUDU.

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Fall Prevention by Otago Exercise Program based on Health Belief Model in Community-Dwelling Older Persons

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Abstract

Health belief model (HBM) has been widely used to communicate with older persons in order to change their behaviors. This group of people have a higher risk of fall due to poor postural balance and inappropriate fall-related behaviors. Home-exercise programs like Otago exercise program (OEP) can ameliorate postural balance, but most of the older persons do not well comply with the program. This mixed methods research study was aimed to investigate effects of a 12-week HBM-based OEP (HBM-OEP) on postural balance (Berg balance scale, BBS) and quadriceps torque in 72 healthy community-dwelling older persons (control group, n = 36 and HBM-OEP group, n = 36). Levels of fall-related HBM domains (knowledge, perception, and behaviors) were also recorded at baseline and 12-week post-intervention. Results showed that the BBS increased from 51.3 ± 0.4 to 53.2 ± 0.3 ($p < 0.05$). The quadriceps torque between baseline and post-intervention were not significantly different (181.7 ± 12.2 vs 188.2 ± 9.9 Nm). In contrast, the quadriceps torque in the HBM-OEP group significantly increased from 176.8 ± 10.6 to 220.0 ± 9.2 Nm ($p < 0.05$). Both quadriceps torque and BBS were positively correlated with the levels of knowledge, perception, and behavior scores. In conclusion, the 12-week HBM-based OEP was effective to improve postural balance and the levels fall-related health beliefs.

Keywords: health belief model, Otago exercise program, older persons, postural balance, fall prevention

Introduction

Based on data from the United Nations, the elderly population is exponentially increasing to > 15% of the world population prospects by year 2050. Approximate 30% of the older persons experience accidental fall every year². Predisposing factors of fall in the older persons include arthritis, balance disturbance, fall-related behaviors, and lower limb muscle weakness³⁻⁵. The lower limb muscle strength can be represented by the quadriceps torque⁶. Exercise interventions designed to promote the lower limb muscle strength and postural balance are effective to prevent fall in older people⁷.

The OEP encompasses essential aspects of fall preventive exercises including postural balance retraining and muscle strengthening⁸. It incorporates flexibility and endurance exercises as home exercise program for community-dwelling elderly persons^{7, 9}. However, a systematic review showed that only 37% of participants complied with the OEP activities⁹. Therefore, a theoretical psychosocial framework that facilitates the older person's knowledge, perception, and behavior might promote program compliance.

The HBM, a theoretical framework modifying health-related behaviors, has been developed in the early 1950s by social psychologists^{10, 11}. The HBM consists of health person's beliefs (risk susceptibility, risk severity, benefits to action, and barriers to action), self-efficacy, and cues to action¹². Nowadays, it has been widely used in health promotion and behavioral modification programs in older persons¹³⁻¹⁵. The purposes of this present study were to examine effects of HBM-OEP on postural balance and quadriceps muscle strength and to investigate levels of knowledge, perception,

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and behavior related to fall prevention in community-dwelling older persons.

Materials and Method

Theoretical framework and research design

This research used a mixed method of descriptive study and pre-and-post test quasi-experimental design. The theoretical model of the HBM-OEP was adapted from Hochbaum and Hazavehei^{11, 16}. Fall-related perception included perceived susceptibility (belief concerning the chance of fall), perceived severity (belief in the seriousness of fall), perceived benefits (belief in the efficacy of the OEP), and perceived barriers (belief concerning physical burden of falling). External cues to action were weekly fall-preventing education and peer's experience sharing. Health action included the OEP, fall-preventing behavior, and environmental management. Initially, 835 elderly individuals were recruited from the areas of primary care hospitals in Udonthani province, Thailand. Inclusion criteria were age ≥ 65 years old, Barthel index (activities of daily living $\geq 17/20$)¹⁷, Oxford knee score $\geq 40/48$, no underlying diseases (diabetes mellitus, hypertension, depression, dementia, incontinence, and sleeping problems), ≥ 20 functional dentition, normal eye health, Thai writing and speaking, and informed consent. Exclusion criteria were impaired cognitive or physical functions and received other exercise programs within previous 6 months. The participants in the exercise group received the HBM-OEP home program (HBM domains of knowledge, perception, and behavior and tailored OEP) as previously described⁸. The control participants received routine care. All procedures have been approved by the Ethical Review Committee for Human Research, Faculty of Public Health, Mahasarakham University (PH065/2559) and registered to the Thai Clinical Trials Registry (TCTR20190624004).

Demographic, knowledge, and behavior data collections

Two sets of questionnaires were used in this study: 1) demographic and personal characteristics data, and 2) fall-related knowledge, perception, and behavior questionnaires approved for content validity by 3 experts in Nursing, Public Health, and Physiotherapy (index of conjugate ≥ 0.5). Only the items with coefficient of reliability (Cronbach's α) ≥ 0.7 were acceptable.

Leg strength measurements

Quadriceps isometric muscle strength was recorded by a back-leg dynamometer model T.K.K 5002 (Takei Scientific Instruments, Niigata, Japan) in kilograms of force. Leg length was measured from a lateral joint line of the knee to lateral malleolus. The length of the chain was adjusted to fit the height of the participants by asking them to stand on the base of the dynamometer with 90° knee flexion. Three trials were performed after familiarization trials with rest periods of 30 seconds. The maximal strength was used for quadriceps torque calculation (Newton x meter, Nm).

Statistical analysis

Continuous data are expressed as mean \pm SEM. Normality of sample data was tested by Kolmogorov-Smirnov test. Means of two dependent and independent groups were compared by paired t-test and unpaired t-test, respectively. Nominal data were compared by χ^2 test. The level of statistical significance was $p < 0.05$. All data were analyzed by using SPSS software (version 18, SPSS, Inc., Chicago, IL, USA).

Results

Baseline assessments

Seventy-two participants (control, $n = 36$ and OEP, $n = 36$) were interviewed and evaluated for education, underlying diseases, medication, frequency of exercise and other demographic data as shown in Table 1.

HBM-OEP improved postural balance and quadriceps muscle strength

At baseline, BBS between control and HBM-OEP groups were not significantly different. After interventions, BBS in control group was not changed (Fig. 1). In contrast, BBS in the HBM-OEP group significantly increased from 51.3 ± 0.4 to 53.2 ± 0.3 post-intervention ($p < 0.05$). After 12 weeks, the quadriceps torque in the control group was not changed (181.4 ± 12.2 vs 188.2 ± 9.9 Nm). Meanwhile the HBM-OEP group had significantly higher quadriceps torque compared to baseline (176.8 ± 10.6 vs 220.0 ± 9.2 Nm) (Fig. 2).

HBM-OEP enhanced the levels of fall-related knowledge, perception, and behavior

At baseline, the levels of fall-related knowledge in control and HBM-OEP groups were not significantly different (Table 2). In the control group, the baseline and post-intervention levels of fall-related knowledge

were not statistically different ($\chi^2 = 0.06$, $p = 0.97$). In the HBM-OEP group, the post-intervention levels of fall-related knowledge ($\chi^2 = 35.26$, $p < 0.05$) were significantly higher than baseline. Likewise, the levels of post-intervention perception and behavior scores also significantly increased compared to baseline ($p < 0.05$) (Table 3).

Quadriceps muscle strength and postural balance were correlated with the levels of fall-related knowledge, perception, and behavior

Pearson's correlation coefficients showed that both quadriceps muscle strength and postural balance levels were significantly correlated with the levels of fall-related knowledge, perception, and behavior (Fig. 3).

Table 1 Basic characteristics of subjects at baseline

Variable	Control	HBM-OEP	p-Value
Age (years)	70.3±6.2	68.4±5.2	0.16
Gender			
Male	21	17	0.35
Female	15	19	
Education			
No school	1	-	0.33
Primary school	33	30	
Middle/vocational school	2	5	
Bachelor degree	-	1	
Height (cm)	158.8±9.7	155.3±7.8	0.09
Weight (Kg)	58.9±8.4	59.0±9.5	0.99
BMI (Kg/m ²)	23.2±3.1	24.4±3.3	0.13
Underlying disease			
None	24	17	0.12
Diabetes mellitus	8	5	
Hypertension	2	5	
Osteoarthritis of knee	1	2	
Cataract	1	2	
Others	-	5	
Medication			
None	25	19	0.25
Anti-hypertensive drug	3	8	
Anti-insomnia drug	-	1	
Others	8	8	
Exercise			
None			0.20
1-2 session/week	4	9	
≥ 3 session/week	20	20	
	12	7	

Ratio data were analyzed by unpaired t-test. Nominal data were analyzed by χ^2 test.

Table 2 Comparison of the levels of fall-related knowledge in the elderly participants between baselines of control and HBM-OEP groups; and between baseline and post-intervention (12-week)

Group	Point of measure	Category	Number (%)	χ^2	p-Value
Control		High	2(5.6)		
	Baseline	Moderate	22(61.1)		
		Low	12(33.3)		
		High	2(5.6)	0.06	0.97 ^b
	12-week	Moderate	22(61.1)		
		Low	12(33.3)		
HBM-OEP		High	2(5.6)	0.06	0.97 ^a
	Baseline	Moderate	22(61.1)		
		Low	12(33.3)		
		High	25(69.4)	35.26	0.00 ^b
	12-week	Moderate	11(30.6)		
		Low	0(0.0)		

^aComparison between between baselines of control and HBM-OEP groups; ^bComparison between baseline and post-intervention in the same group.

Table 3 Comparison of the levels of perception and behavior

Variable	Control		HBM-OEP	
	Baseline	12-week	Baseline	12-week
Perception				
Perceived susceptibility	29.6±0.4	29.8±0.4	30.5±0.3	41.4±0.3*
Perceived severity	10.1±0.2	10.3±0.2	10.1±0.2	14.1±0.2*
Perceived benefit	21.3±0.2	21.2±0.2	21.4±0.2	28.5±0.2*
Perceived barrier	18.8±0.3	19.2±0.2	18.6±0.3	28.1±0.2*
Total perception scores	79.8±0.7	80.5±0.6	80.6±0.6	112.1±0.5*
Behavior	40.0±0.4	40.0±0.3	39.4±0.4	53.4±0.3*

Levels of perception and behavior were measured at baseline and post-intervention. Data are presented as means±SEM. * $p < 0.05$ versus respective baseline.

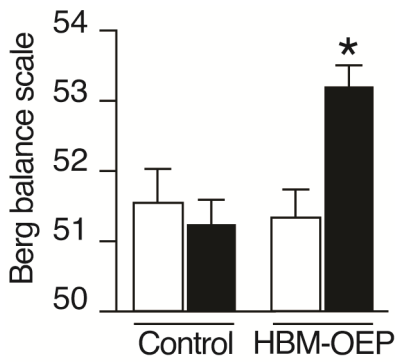


Figure 1 Berg balance scale values were measured in both control and HBM-OEP at baseline (white bar) and post-intervention (12 weeks, black bar). Data are presented as means±SEM. *p < 0.05 versus respective baseline.

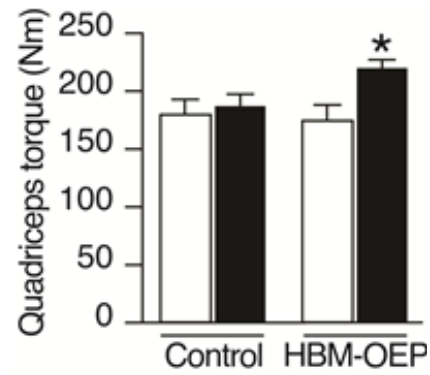


Figure 2 Quadriceps torques were determined in both control and HBM-OEP at baseline (white bar) and post-intervention (black bar) with the back-leg dynamometer. Data are presented as means±SEM. *p < 0.05 versus respective baseline.

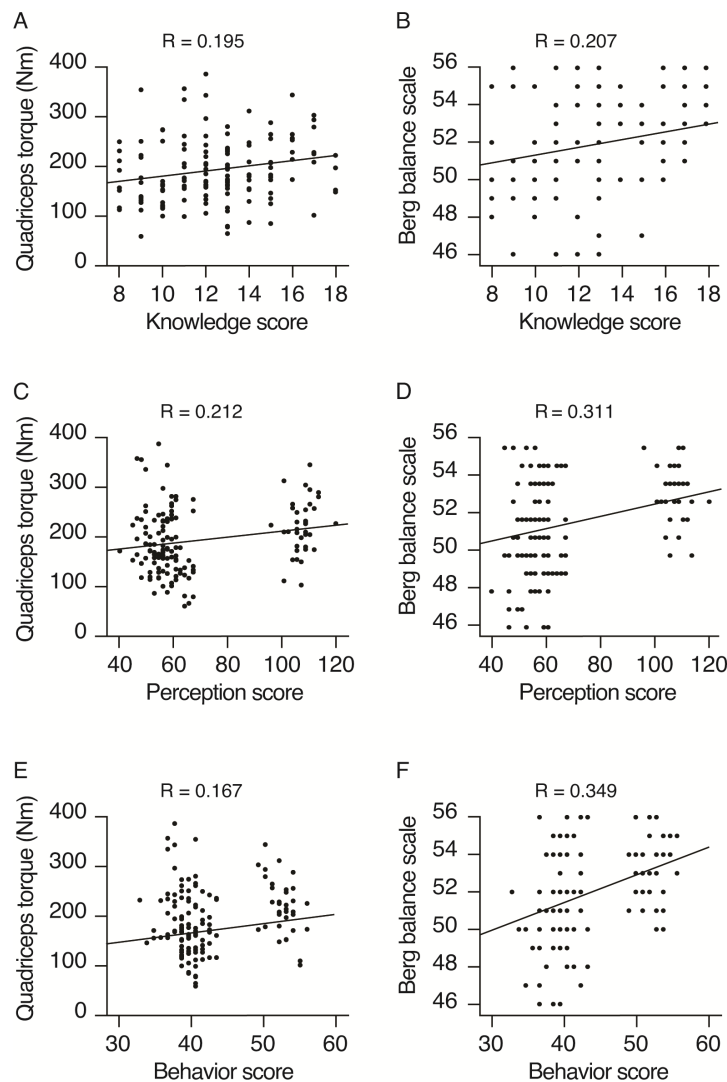


Figure 3 Correlation between fall-related knowledge, perception, and behavior scores and quadriceps torque and Berg balance scale. Knowledge (1 point/item of 18 items and subsequently ranked into 3 levels as follows (Low = 0-10, Moderate = 11-14, and High = 15-18 points). Perception (Likert's scale: Agree, 3; Undecided, 2; and Disagree, 1 point; maximum scores were 45, 15, 30, 30, and 120 for susceptibility, severity, benefit, barrier subdomains, and total perception, respectively). Behavior (Likert's scale: Always, 3 points; Sometimes, 2 points; and Never, 1 point; maximum scores was 60). The data were obtained from both control and HBM-OEP groups.

Discussion

This present study demonstrates that the HBM-OEP improves postural balance in the older population. These improvements are correlated with their increased levels of the fall-related knowledge, perception, and behavior. Our conclusion is predicated upon the following findings: (1) HBM-OEP increases BBS scores, indicating postural balance improvement, (2) HBM-OEP enhances quadriceps torque, an important factor for postural balance, and (3) HBM-OEP improves the fall-related knowledge, perception, and behavior levels, which are correlated with BBS scores and quadriceps torque.

The fall risk factors can be classified into physical and psychosocial factors, which are subject to different ways of handling. The physical factors like underlying diseases (diabetes mellitus, hypertension, and cataract) are mitigated mainly by pharmacological and surgical approaches, whereas the age-related musculoskeletal problems are usually prevented by exercises.

The World Health Organization defines the older persons as ones with age ≥ 65 years²⁷. It has been further classified into three subgroups: youngest-old (65 to 74 years), middle-old (75 to 84 years), and oldest-old (≥ 85 years)^{28, 29}. In the present study, age of the participants was in the youngest-old group, explaining why their musculoskeletal system improved after the 12-week HBM-OEP. This is in line with a recent report of better postural balance by 24-week OEP in older fallers with knee osteoarthritis¹⁸. Similarly, the 12-week OEP was found to improve lower limb strength (knee flexors, dorsiflexors, and plantar flexors)¹⁹. However, this present study was first to demonstrate a positive effect of the OEP on the knee extensors. This might be partially due to the effect of the HBM on psychosocial factors.

The psychosocial factors such as knowledge, perception, and behavior are managed by health behavior theoretical models such as social cognitive theory, protection motivation theory, and HBM²⁰. In this present study, the HBM has been employed since it can address personal views and beliefs on health problems²¹. According to the HBM theory, a change in belief takes place before a change in behavior. Previous studies showed that the HBM improved behaviors to treatment procedures in psychiatric, hypertensive, heart disease, and asthma patients^{14, 22-24}. Here we showed that the older population also complied to the exercise program as shown by their improvements in postural balance and

quadriceps strength.

In conclusion, the HBM-OEP can ameliorate postural balance and quadriceps strength in the older population. These effects are associated with the augmented levels of the fall-related knowledge, perception, and behavior.

Conflict of Interest: The authors declare that they have no conflict of interest.

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Informed consent: Informed consent was obtained from all individual participants included in the study.

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Comparative Study of Instrument Assisted Soft Tissue Mobilisation Vs Ischemic Compression in Myofascial Trigger Points on Upper Trapezius Muscle in Professional Badminton Players

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Abstract

Study design: Pre-post experimental study design. **Background:** The presence of trigger points over trapezius muscle is one of the major reasons of injuries in badminton players. Trigger points affect the flexibility of muscles which if untreated leads to dysfunctions. This alters the biomechanics of badminton gameplay. **Objective:** Hence, present study was undertaken to find out and compare the effects of Instrument Assisted Soft Tissue Mobilization and ischemic compression in trapezius trigger points in badminton players. **Procedure:** In this study, 30 participants were recruited based on inclusion and exclusion criteria. They were divided in 2 groups of 15 each. Each intervention was administered to them for a period of 2 weeks, 2 sessions per week in respective groups. Pre and post assessment was taken using following outcome measures-NPRS, pain pressure threshold and cervical range of motion. **Results:** There was significant increase in the pain pressure threshold of the players and the cervical range of motion in the IASTM group. There was decrease in the NPRS findings in the IASTM group. **Conclusion:** The results suggested that IASTM showed better results than ischemic compression in relieving trapezius trigger points.

Keywords: trapezius, trigger points, Instrument Assisted Soft Tissue Mobilization (IASTM), ischemic compression.

Introduction

Tightness of muscle and reduction of range of motion are common in team sports like cricket, football etc. This increases the incidence of muscular injuries in sports. It has been demonstrated that reduced joint range of motion in upper and lower extremities decreases movement efficiency. Therefore, maintaining and regaining normal Range of Motion (ROM) is of utmost importance for injury prevention and performance improvement¹.

The prevalence of myofascial trigger points in overhead athletes with posterior shoulder tightness is unknown and this investigation may be beneficial, particularly to clinicians as they examine biomechanical dysfunctions and (or) musculoskeletal pain of patients. Myofascial trigger points (MTrPs) are common, often causing pain, lack of mobility, and other physical conditions that can impair daily function².

The trapezius is a large muscle originating from the neck and inserting in the thorax on the dorsal side of the neck and trunk. It consists of three parts: descending (superior), ascending (inferior), and middle. The muscle attaches to the medial third of superior nuchal line; external occipital protuberance, nuchal ligament, and spinous processes of C7 - T12 vertebrae. The insertion of the muscle is on the outer part of the clavicle bone and different parts of scapula. It is supplied by Spinal root of

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accessory nerve (CN XI) (motor) and cervical nerves (C3 and C4) (pain and proprioception)³.

Badminton is an individual sport which doesn't involve human contact and requires high level of power, agility and speed from movements in varied positions. It is a racquet sport which is played between two or four people, with a game which demands actions of short duration and high intensity. Badminton is a complex sport in which performance is assessed considering many factors. It is characterized by high-intensity, intermittent actions. Shoulder pain and stiffness was the most common injury sustained by amateur badminton players. Badminton involves lower risk in comparison to other racquet sports. In injuries associated to badminton, research says that 11-31% of injuries are located in the upper limbs. The majority i.e.74% of injuries in badminton are overuse injuries and the upper extremities account for 19-32%. This dysfunction results in abnormal scapular biomechanics that occur as a result of create imbalance between the agonist and antagonist muscles and predispose the shoulder to injuries^{4,5,6}.

Trigger point are found in the tight bands of the muscle and are localised, painful and can be quite easily identified. The spots can produce symptoms like referred pain, referred tenderness, motor dysfunction and autonomic phenomenon^{7,8}.

(IASTM) is developed recently for MTrPs. This is a type of enhanced Chinese medicine technique named Gua Sha. IASTM instruments are made of steel with the goal of releasing and reforming soft tissue restrictions. It helps the healing process by creating a micro trauma, breaking down collagen cross linkages, increasing blood flow and cellular regeneration⁹.

Apart from stretching, instrument assisted soft tissue mobilization (IASTM) is widely used recently in sports physiotherapy for increasing joint mobility. It is as effective as a non-invasive technique and hence has gained popularity in recent times. IASTM tool helps the physiotherapists to diagnose and treat any soft tissue dysfunctions. There is a study done by Laudner et al. (2014) suggested that application of IASTM to posterior shoulder provides improvement in range of motion in baseball players¹⁰. It has been found out that the effects of IASTM-treated soft tissue structures have shown increased fibroblast recruitment and activation in injured tendon and improved biomechanical, histological and vascular properties in the healing ligament. Case reports

and pilot studies using IASTM have also demonstrated promising outcomes for diagnoses such as patellar tendinopathy, chronic ankle pain, plantar fasciitis, post-natal calf pain, knee pain, carpal tunnel syndrome, cumulative trauma disorders, and lateral epicondylitis/epicondylitis¹¹.

Ischemic compression is another manual therapy technique which is commonly used as a way of relieving TrPs. It involves applying direct sustained finger pressure to the TrP with an adequate force over stipulated time duration, to reduce the blood supply and relieve the tension within the affected muscle. The pressure is gradually applied, maintained, increased and the gradually released¹². Travell and Simons⁷ originally recommended 'ischaemic compression' for trigger points (TrPs) with thumb pressure firm enough to cause the skin to blanch¹³.

Method

Ethical clearance was obtained from the Institutional Ethical Committee. 30 participants meeting the inclusion and exclusion criteria and who were willing to participate in the study were included.

Inclusion Criteria-

- Professional badminton players.
- 18-30 years of age
- Both genders included
- Playing for at least 1 year
- Positive jump sign

Exclusion Criteria-

- Open wounds in upper back area
- Skin infections
- Cervical and upper limb Fractures
- Hypersensitive skin

The subjects were then assessed for the outcome measures using NPRS, Pain pressure threshold using pressure algometer and Cervical lateral flexion and rotation range of motion pre-intervention. After this procedure, Instrument Assisted Soft Tissue Mobilization and Ischemic Compression was administered to Group A and Group B respectively for a period of 2 weeks;

4 sessions per week post which patients were assessed again for the said outcomes.

After permission from the ethical committee, the permission to screen the participants was taken from the respective authority. Badminton academies of the surrounding areas were approached for the same. An informed consent was taken from each participant and an explanation of the study was be given.

Participants those who were willing to participate in the study were screened according to the inclusion and exclusion criteria. Players fulfilling the inclusion criteria were included in the study.

The patients were be divided into Group A(IASTM group) and Group B(ischemic compression group)by lottery method. They were assessed on basis of positive jump sign on palpation and the most painful trigger point was located. Each session lasted for 15 minutes. Each group was given 2 weeks of treatment, 2 sessions per week (4 sessions). There was a gap of 3 days before the consequent session.

Participants were assessed with respect to pre treatment and post treatment in the following outcome measures:

1. Numerical Pain Rating Scale (NPRS)
2. Cervical range of motion for rotation and lateral flexion on dominant side.
3. Pressure Algometer.

Procedure in group A:

Patients were assessed on the basis of positive jump sign on the upper trapezius muscle for location of trigger points. The procedure of IASTM was explained to the patient. The areas of treatment will be adequately exposed. Range of motion for neck, NPRS score and pain tolerance score on pressure algometer will be recorded pre treatment on 1st session and post treatment on 4th session. Moisturizer will be applied to reduce friction before each session. IASTM will be given for maximum 8-10 strokes or till the appearance of local erythema. Ice pack will be given to participants after treatment to guard against muscle soreness.

Procedure for group B:

Patients will be assessed on the basis of positive jump sign on the upper trapezius muscle for location

of trigger points. Procedure for ischemic compression will be explained to them. The area of treatment will be adequately exposed. Range of motion for neck, NPRS score and pain tolerance score on pressure algometer will be recorded pre treatment on 1st session and post treatment on 4th session. Ischemic compression technique will be given for 90 sec over the trigger point.

Post treatment recordings of the outcomes will be taken at the end of 4 sessions. After completion of the treatment, post intervention readings will be taken and analysed strongly.



Fig 1: Application of IASTM



Fig 2: Application of ischemic compression

Results

A total of 30 subjects were recruited for the study. They were evaluated before and after at 2 weeks. The demographic characteristics of the participants were presented in Table 1. There is a positive significant difference in mean difference of cervical range of motions, the pre and post assessment of these ranges

show an increase of range of motion ($p < 0.001$). In the present study, the intragroup analysis of mean NPRS and pain pressure threshold values in the subjects which revealed significant improvement at 2 weeks ($p < 0.001$) and also revealed significant decrease in the mean difference of NPRS and pain pressure threshold scores between the pre and post assessment of the subjects.

Table 1: Gender and Age distribution of subjects in study group

GENDER			AGE	
Gender	No. of Patients	Percentage (%)	Group	Average age
Male	26	86.66	A	21
Female	4	13.33	B	20.86
Total	30	100		

Table 2: Comparison of pre and post assessment Cervical Range of Motions (ROM), NPRS and pain pressure threshold in group A.

	NPRS	Pain pressure threshold	Cervical Range of Motion	
			Rotation	Lateral Flexion
Pre	5.66	2.74	61.93	46.93
Post	3	3.56	69.53	53.13
p value	<0.001			

Table 3: Comparison of pre and post assessment Cervical Range of Motions (ROM), NPRS and pain pressure threshold in group B.

	NPRS	Pain pressure threshold	Cervical Range of Motion	
			Rotation	Lateral Flexion
Pre	5.13	2.14	67.06	48
Post	3.46	2.57	72.26	52.4
p value	<0.001			

Discussion

In the present study we have evaluated the effects of newly developed IASTM technique versus ischemic compression on the myofascial trigger points on upper trapezius muscle in badminton players. The finding of the present study is IASTM produced better results with respect to pain, pain pressure threshold and mobility of the cervical spine. The difference between the pre intervention and post intervention readings was strongly

statistically significant.

Clinicians have reported that IASTM is a type of soft tissue mobilization technique to relieve myofascial adhesions, borders, tightness, fibrous nodules, crystalline deposits, and scar tissue more effectively and can reach the tissues deeper in the body where the hands are not capable of reaching that effectively¹⁴. Cyriax proposed the theory of deep friction massage and cross fibre massage upon which the theory of IASTM is based on¹⁵. IASTM

brings about a local minor trauma to soft tissue, which causes haemorrhagic changes in the capillaries and other thin vessels, which stimulates the body's inflammation process and starts the body's healing process and reparative system¹⁶. This inflammatory process restarts the healing process by increasing the supply of blood, nutrients, and fibroblasts to the area, thus enhancing collagen formation, deposition, and maturation¹⁰. Two more factors have to be considered:

1. Increase in the length of sarcomere.
2. Increase in the blood flow to trigger points⁹.

The above changes take place due to the dragging procedure of the IASTM and the creation of micro trauma. This leads to localised vasodilation and start the healing of the soft tissue.

While applying ischemic compression technique, sustained thumb pressure is given over the trigger point over a period of one minute to 90 seconds. The pressure over the trigger point is gradually increased as the pain tolerance. This causes increase in blood flow to the trigger points. The healing process thus starts with the increase in flow of nutrients to the treated area. The increase in local blood flow could cause the observed increase in dialysate glucose after trigger point release because changes in dialysate glucose can be directly related to changes in local blood flow. Simons hypothesized that there is localized ischemia in the zone around the trigger point which results in the shortage of glucose and oxygen for proper function. Supporting the above mentioned hypothesis, the current data states that in on relaxation of the trigger point nodule, there is increased flow of nutrients through blood, which allows for the increased perfusion of substrate and supply of oxygen to muscle to match with energy demands of cell required to regain normal function⁹.

IASTM involves the use of a tool which is used to diagnose and treat myofascial restrictions. The scraping over the skin which occurs as a result post IASTM intervention might have greater local vascular changes as compared to ischemic compression. This caused greater amount of healing in the underlying soft tissues. On the other hand, IASTM being a newer form of treatment could have increased the curiosity level of the participants regarding its effects and method of application. IASTM is applied in a linear fashion over the affected area. This could have caused greater tissue stretch hence greater improvement in mobility of the

cervical spine. Zeynab et al reported a case study to find out the effects of IASTM technique on upper trapezius trigger points. He reported increase in the pain pressure threshold and decrease in disability (NDI) in his case study⁹.

On the contrary, ischemic compression technique being a comparatively conventional technique was familiar to participants. The method of application of ischemic compression doesn't involve any kind of tissue stretch and is a very localised treatment. Hence the local vascular changes could be lesser as compared to IASTM.

Hugh Gemmell et al did a study on Immediate effect of ischaemic compression and trigger point pressure release on neck pain and upper trapezius trigger points and found no statistically significant results though their results were clinically significant²⁵. The study compared to manually applied techniques unlike in our study.

The above mentioned factors can be associated with the results of the study.

Conclusion

In the current study, application of IASTM once in 3 days for 2 weeks to trigger points in upper trapezius muscle produced significant increase in both lateral flexion and rotation of cervical spine. Also, it improved the pain pressure threshold of players which was measured with pressure algometer. Also, it decreased the pain measured by NPRS. These findings were more statistically and clinically significant when compared with ischemic compression technique. Our study concludes that IASTM is more effective in treating badminton players with upper trapezius trigger points than ischemic compression technique.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Taken from Institutional Sub-Ethics Committee of Dr. D. Y. Patil College of Physiotherapy, Pune.

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Proprioceptive and Functional Outcome of the Knee in Arthroscopic Anterior Cruciate Ligament Reconstruction of a Preserved Remnant Tissue

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Abstract

Background: Injury to the ACL (Anterior Cruciate Ligament) not only causes mechanical instability but also leads to functional deficit in the form of diminished proprioception of the knee joint. This study analyzes and reviews our understanding of the sensory element of ACL deficiency, with specific reference to proprioception as an important component of functional knee stability.

Method: 100 patients who underwent ACL reconstruction surgery and completed Simple and Effective Rehabilitation Protocol (SERP) with minimum duration of 2 years from surgery to follow up, were all assessed for proprioception, stability and functional outcome of the reconstructed knee. They were assessed by the knee joint position sense, single leg hop test for both the normal and reconstructed knee and KOOS questionnaire respectively.

Result: Chi square table value for 1 degree freedom at 0.05 was 3.84, hence the calculated Chi square values of proprioception knee in supine lying, proprioception knee in standing and single leg hop are less than table value of the accepted hypothesis which concludes that, there is no significant difference between the scores of selected outcome variables among reconstructed knee and normal knee subjects. The calculated paired 't' and 't' table value with respect to the functional outcome of knee in operated and normal subjects was 6.53 and 2.66 respectively at 0.005 level.

Conclusion: There was no significant difference of Proprioception between the scores of selected outcome variables among reconstructed knee and normal knee in supine lying, standing and single leg hop. But it shows that there is significant difference of 2.66 at 0.005 level between reconstructed knee and normal knee groups with respect to the functional outcome of knee after two years of follow-up in ACL reconstructed knees.

Keywords: ACL, remnant tissue, Reconstruction, Joint position sense, Stability, Functional outcome.

Introduction

Anterior cruciate ligament (ACL) is considered as the proprioceptive sensory organ as well as primary

stabilizer of the knee. Due to the proprioceptive ability that helps in initiating the protective and stabilizing muscular reflexes¹. Any trauma to the ACL can result in compromising the joint afferent sensations resulting in proprioceptive deficits. Therefore, the potential goal of the ACL reconstruction is to restore better proprioception. It is known that the ACL injured knee frequently has a ligament remnant tissue (mostly at the tibial footprint) in which mechanoreceptors and free neural ends are found^{2,3}.

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Theoretically, there is a strong possibility that the preservation of the ACL remnant tissue may restore proprioception, stability and functional outcome of the graft after ACL reconstruction⁴. In the recent past, the surgical technique that preserves this remnant tissue in arthroscopic ACL reconstruction is known to have shown better preservation of the proprioceptive function^{2,5}.

The purpose of this study is to evaluate the proprioceptive ability and the functional outcome of the patient who have undergone the remnant tissue preservation arthroscopic ACL reconstruction surgical technique in patients with ACL tears. The research hypothesis was that there was no significant difference between the scores of selected outcome variables among reconstructed knee and normal knee subjects.

Material and Method

The present cross-sectional study was approved by Ethical Committee and Institutional Review Board (RC/16/154). Hundred consecutive patients who underwent the preserved remnant tissue technique ACL reconstruction in our institution and who completed the SERP rehabilitation were included in the study. Minimum duration from surgery to assessment was 2 years. Both men and women within the age group of 18 – 60 years who underwent surgery and completed SERP protocol of minimum duration from surgery to assessment of 2 years with unilateral ACL reconstruction were included in the study⁶. Patients with re-injury of ACL, revision surgery and those who did not participate or complete the SERP rehabilitation protocol were excluded from the study. The patients were called to the Orthopedic OPD department and evaluated in department of Physical Medicine and Rehabilitation of our institution.

Initially, the patients were given KOOS questionnaire for completion. A translated version in the language of their choice was made available for patients who had difficulty in comprehending the questions^{7,8}. Joint position sense was assessed by replicating knee joint angle and was measured with universal goniometer, average of 3 response angles from two different positions; supine and standing with full knee extension was done. Initially, for trial, the patients were asked to bend the knee to 30 degrees of flexion (test angle) with eyes open. Further, for assessment they were asked to close the eyes and bend the knee to test angle. This joint position was measured with goniometer⁹. Same procedure was followed to the normal limb and compared. Stability

of the knee was assessed by Single hop test which is reliable and a valid tool to measure the knee¹⁰. A 6 meter distance was measured, a base line was marked where the patients were asked to stand. The subjects were told to hop as far as possible, take off and land on the same foot¹¹. The hop distances were measured from toe to toe of same foot. The tests were performed for both legs 3 times each. The patients were given one trial of single leg hop before the readings were taken.

The data were analyzed by SPSS 20.0 through the following statistical analysis. Descriptive statistics Chi square test was used to find the difference between the scores proprioceptive ability in various position and further inferential statistics Unpaired t-test was performed to find the functional outcome scores of KOOS questionnaire among reconstructed knee subjects.

Findings

Table 1 shows the Chi square value of knee joint sense in supine lying was 0.0074 and Chi square value of knee joint sense in standing position was 0.0055. Table 2 shows the Chi square value of Knee joint stability was 0.0057. Chi square table value for 1 degree freedom at 0.05 was 3.84, hence the calculated Chi square values of proprioception knee in supine, proprioception knee in standing and single leg hop are less than table value then, the hypothesis is accepted and it was concluded that, there is no significant difference between the scores of selected outcome variables among reconstructed knee and normal knee subjects. Table 3 shows the comparative mean value, mean difference, standard deviation and unpaired 't' values of functional outcome of knee between reconstructed knee and normal knee subjects.

In reconstructed knee and normal knee group subjects for functional outcome of knee the calculated paired 't' value is 6.53 and 't' table value was 2.66 at 0.005 level. Since the calculated 't' value is more than 't' table value, it shows that there was significant difference between reconstructed knee and normal knee group in functional outcome of knee in the follow up two years duration.

Table 1: Chi square value of joint sense of knee in supine lying, standing.

Sl. No.	Variable	Chi square value
1.	Joint sense Knee in supine lying	0.0074
2.	Joint sense Knee in standing	0.0055

Table 2: Chi square value of knee joint stability by single leg hop.

Sl. No.	Variable	Chi square value
1.	Single leg hop	0.0057

Table 3: Comparative mean value, mean difference, standard deviation and unpaired ‘t’ values of functional outcome of knee between reconstructed knee and normal knee subjects.

n = 100

Sl.No	Groups	Functional outcome of knee		Standard deviation	Unpaired “t” test
		Mean	Mean difference		
1	Reconstructed knee	2.29	1.62	0.57	6.53*
2	Normal knee	0.67			

*0.005 level of significance

Discussion

Any trauma to the ACL can result in compromising the joint afferent sensations which in turn may cause proprioceptive deficits. Therefore, the potential goal of the ACL reconstruction is to restore proprioception as close to the native knee as possible¹². There is a strong possibility that the preservation of the ACL remnant tissue maybe able to restore proprioceptive function of the graft after ACL reconstruction. In the recent past, the surgical technique that preserves this remnant tissue in arthroscopic ACL reconstruction is known to have shown better preservation of the proprioceptive function¹³.

Our understanding of recovery of knee function in ACL-deficient knees is still evolving. Although most of the focus today is on anatomic placement, the number and position of various bundles during reconstruction. Enough evidence is coming to light which establishes that proprioception of the knee suffers after an ACL tear. Proprioception is emerging as an important factor to determine post-operative results of ACL reconstruction¹⁴.

Various studies have demonstrated the presence of mechanoreceptors in remnant ACL stumps; based on this there have been proposals of preserving these ACL remnants during reconstruction to ensure a better functional outcome¹⁵. We believe that proprioception is an important aspect of knee stability, and that it is lost after ACL injury, and all attempts must be made to restore as much proprioception as possible by modifying surgical methods and rehabilitation protocols. Remnant preserving surgery may be one of the options that needs to be explored in more detail, and could potentially be a solution to some of the poor functional outcomes in mechanically well-done ACL reconstructions^{3,16}.

Takahashi, T et al persevered the ACL remnant tissue in ACL reconstruction which enhanced cell proliferation, revascularization, and regeneration of proprioceptive organs in the reconstructed ACL and reduced anterior translation. However, remnant preservation did not improve the structural properties of the graft¹⁷.

Proprioception contributes to the development of motor control and plays a major role in the reflex

protection of joints against potentially harmful forces, as reduced proprioception is one of the factors contributing to re-injury of the knee. Therefore, proprioception appears not only important for regaining full function after ACL reconstruction but also for the prevention of future ACL injury in a reconstructed knee.

Evaluation of the functional outcomes did not reveal any significant differences in terms of mechanical stability between the two groups. However, a significant difference was detected in functional outcome and proprioception in the two groups with group one (>20% remnant) showing better results. According to Lee BI et al, thus postulated that if more of the tibial stump was kept intact, better would be the preservation of proprioceptive function and the functional outcome for the patient¹⁸.

A detailed analysis of proprioception in normal and ACL-deficient knees was also done by Pap et al. Proprioception was assessed using detection of knee movements in 20 patients with unilateral ACL deficient knees and 15 age-matched control subjects. The authors also found diminished proprioception in knees with ACL tears as compared to the uninjured knees of patients and the control group¹⁹.

According to Zhanget al, ACL remnant tissue harvested within 3 months after injury yields higher healing potential, suggesting that early surgical intervention may achieve better clinical results²⁰. Muneta Tet al remnant-preserving ACL reconstruction has higher potential for early healing, superior functional recovery, earlier return to sports, and lower occurrence of re-injury, although the scientific evidence to support the potential is not yet sufficient²¹.

Kim et al suggested that the remnant – preserving technique could be an effective alternative to traditional techniques. This technique provided comparable mechanical stability and improved proprioception and vascular recovery as compared to remnant shaving techniques²².

Song et al, had concluded that the mean Coleman Methodology Score showed moderate methodologic quality for the included studies. This systematic review showed significant postoperative improvements in patients undergoing remnant-preserving ACLR in all of the studies. The currently available evidence is not sufficiently strong to support the superiority of remnant-preserving ACLR²³. The authors concluded that ACL

remnants of adolescent patients had more CD34+ cells, and those cells had a higher potential for proliferation and multiline age differentiation in vitro. During remnant-preserving or remnant-transplanted ACL reconstruction, surgeons should consider the patient's age when predicting the healing potential²⁴.

Lee et al concluded that apart from improving proprioception, certain remnant tissues provided mechanical stability to the knee as well^{16,20}. Sekiya et al., investigated the significance of the single-legged hop test to the ACL reconstructed knee as it specifically relates to knee muscle strength recovery and residual anterior laxity. Positive correlations were found between the hop index and muscle strength index at all levels of residual anterior laxity ($P < 0.05$), but these correlation coefficients were relatively low⁸. On the other hand, the remnant tissue preservation has been expected to enhance the recovery of proprioceptive sensation²⁵⁻²⁷.

In this study there was improvement in proprioception, stability and functional outcome of the knee in arthroscopic ACL reconstructed knees with preserved remnant tissue.

Conclusion

In this study of arthroscopic ACL reconstruction with preserved remnant tissue, proprioception of knee in lying, standing and single leg hop were less than table value of the accepted hypothesis which concludes that, there was no significant difference between the scores of selected outcome variables among reconstructed and normal knee. But it shows that there was significant difference between reconstructed knee and normal knee group in functional outcome of knee at the time of two years of follow up.

Conflict of Interest – Nil

Source of Funding- Self

Ethical Clearance: Ethical clearance was obtained from the Institutional Review Board at Pondicherry Institute of Medical Sciences, Puducherry. IRB No. RC/16/154

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Cross-Sectional Study to Identify Iliotibial Band Syndrome Causes among Treadmill Runners and Its Impact on Functional Activities

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Abstract

Running causes overuse injuries and ITBS (Iliotibial band syndrome) is one of the most common injury. Risk factors of ITBS includes ITB tightness, abductor weakness and biomechanical differences. People using treadmill without ruling out faulty biomechanics leads to ITBS. Objectives: i) To find the causative factor for ITBS among treadmill runners. ii) To find out the impact of ITBS in functional activities among treadmill runners. Methodology: 120 samples fulfilling the selection criteria were included. Age, lateral knee pain, speed of running, number of days running per week, since how many months, for how many minutes were collected. Participants with lateral knee pain were assessed using NCT (Noble compression test). Subjects were assessed with hip abductor strength test, NPT (Navicular position test), TT test (tibial torsion test) and Q angle measurement. Common cause for ITBS among treadmill runners was evaluated. Participants were screened for their functional activity using the LEFS (lower extremity functional scale) and scored accordingly. Result: Mean age calculated is 27.88 ± 3.91 yrs, running since 12.08 ± 5.82 months, for 23.58 ± 4.91 minutes, 4.06 ± 0.8 days a weeks, with a speed of 6.75 ± 0.57 m/sec. 40.83% of the subjects had ITBS due to hip abductor weakness, 15.83% of the subjects had a FF (flat feet) and int.TT while 14.17 % had int.TT. Increased Q angle and ext.TT was found in 9.17%. 5 % had hip abductor weakness and increased Q angle whereas 2.5% of the subjects had all the four components present. The mean score obtained by all the subjects with ITBS in the LEFS scale is 63.12 ± 5.33 . Conclusion: Study concludes that hip abductor weakness alone is the major cause of ITBS among treadmill runners. FF and int.TT being second most important cause. Mean score of ITBS in LEFS scale is 63.12 ± 5.33

Keywords: ITBS, Tibial Torsion, Flat Feet, Hip abductor weakness, Q angle, LEFS scale

Introduction

The Iliotibial band (ITB) or tract is a lateral thickening considered as a continuation of the tendinous portion of the tensor fascia lata (TFL). Proximally ITB splits into superficial and deep layers, enclosing TFL and anchoring this muscle to the iliac crest. At the level of greater trochanter, fibres from the gluteus maximus and TFL merge with ITT posteriorly and anteriorly respectively. ITB continues down passing over the lateral femoral epicondyle and attaches to Gerdy's tubercle of the anterolateral aspect of the tibia.^{1,2,3}

ITBS is an overuse injury very common in runners and cyclist. The incidence is reported to be as high as 12% of all running related injuries. It is a non traumatic overuse injury caused due to repeatative flexion and

extension of knee which results in repeatative friction of ITB over the lateral femoral epicondyle, with biomechanical studies demonstrating a maximal zone of impingement at approximately 30 degrees of knee flexion. This impingement zone occurs at or slightly less than 30 degrees of knee flexion.^{3,5,6,7}

In ITBS population prevalence of women is estimated to be between 16% - 50% and for men between 50% - 81%.⁸

Patients with ITBS often presents with faulty biomechanics and /or anatomical factors. There are numerous anatomical factors that may contribute to ITBS including knee, forefoot, and rear foot alignments, Q-angle, ITB tightness and muscle imbalance.

Many ITBS patient shows changes in lower

extremity kinematics, for instance greater peak hip abduction, greater peak knee internal rotation and femoral external rotation. Along with these contribution of poor muscle performance, such as hip abductors can further exacerbate faulty biomechanics.^{6,10}

There are lots of benefits of treadmill running and it's a great alternative for runners when unfavorable weather or safety issues makes it impossible to run outside but one need to make sure that they are running properly on the treadmill and assessed properly by a physiotherapist prior to their training process for any faulty biomechanics so as to avoid injuries. Thus the study emphasizes on finding out the most common cause of ITBS which is one of the common running injury.

Materials and Method

120 subjects signed an informed consent form approved by the institutional review board. Subjects i.e treadmill runners (non-athletes) were taken from gyms in and around Bangalore. The consented participants were given a proforma where individual records like age, gender, duration and speed of treadmill running and whether they had lateral knee pain, type and onset of pain following the running regime were recorded. Participants with Grade I (pain comes on after running, but does not restrict distance or speed) and Grade II (pain comes on during running, but does not restrict distance or speed) were included.⁸ Participants with the lateral knee pain were then assessed using Noble Compression Test to confirm Iliotibial band syndrome (ITBS).^{4,6}

The subjects with ITBS were assessed bilaterally and were compared with: 1) Hip abductor strength test(MMT), 2)Q-angle measurement, 3) tibial torsion measurement and 4) navicular drop test.



Fig 1: Tibial torsion test



Fig 2: Q-angle measurement



Fig 4: Navicular position test

The most common underlying cause for ITBS among the treadmill runners were evaluated.

Participants were then screened for their functional activities using the Lower Functional Scale (LEFS) and scored accordingly. LEFS scale has a total score of 80. The scale consists of 20 items, each with a maximum score of 4 where 0 indicates extreme difficulty and 4 indicates no difficulty.

Findings

The data were carefully collected and calculated. Statistics such as mean and standard deviation were calculated for all the variables considered for the study. The data were analysed through SPSS version 20.0.

120 samples with ITBS were collected for the study, out of which 55.83% were female and 44.17% were male. ITBS 63.34% of subjects were between 20-30 yrs of age whereas 36.6% of subjects were between 30-40

yrs of age

Age of the treadmill runners with ITBS is found to be 27.88 ± 3.91 yrs running since 12.08 ± 5.82 months for a duration of 23.58 ± 4.91 minutes runs 4.06 ± 0.8 days a weeks with a speed of 6.75 ± 0.57 m/sec.

Table 1: Causes of ITBS

Sl.No.	Causes	No. of subjects	Percentage
1.	Hip abd weakness	49	40.83%
2.	Flat feet + int TT	19	15.83%
3.	Int tibial torsion	17	14.17%
4.	Increased Q angle+ Ext TT	11	9.17%
5.	Int tibial torsion + Hip abd weakness	7	5.83%
6.	Increased Q angle+ Weak hip abd	6	5.00%
7.	Increased Q angle+ Int TT+ Flat feet	4	3.33%
8.	Int tibial torsion + Flat feet+ Hip abd weakness	4	3.33%
9.	Increased Q angle+ Int TT+ Flat feet+ Hip abd weakness	2	2.5%

Table 1 indicates hip abductor weakness being the most common cause for ITBS among treadmill runners and flat feet along with internal tibial torsion being the second most cause.

Table-2: LEFS score among the treadmill runners with ITBS

S.no	LEFS score	No. of subjects	Percentage
1	50-55	8	6.67
2	55-60	21	17.5
3	60-65	29	24.17
4	65-70	62	51.67

Table 2 indicates 76.34 % of subjets scored between 60-70 in LEFS whereas 24.17% scored between 50-60. Mean and SD of LEFS score is 64.17 ± 5.33 .

Discussion

The main objective of the study was to find out the causes of ITBS among treadmill runners and its impact on their functional activities. The study was carried out at various gyms in Bangalore and the mean age take is 27.88 ± 3.91 years, running since 12.08 ± 5.82 months, for 23.58 ± 4.91 minutes for 4.06 ± 0.8 days/week with a speed of 6.75 ± 0.5 m/s

Knowledge of the causes of ITBS are essential for providing the treadmill runners with appropriate advice

before they start treadmill running in order to prevent ITBS. It is due to excessive friction between the ITB and the lateral femoral condyle. Posterior edge of the band impinges against the lateral epicondyle just after the foot strike in the running cycle. The friction occurs at or slightly below 30 degrees of knee flexion. This provides an irritation beneath the posterior fibres of ITB.⁸

Among 120 samples with ITBS 40.83% of the subjects had only hip abductor weakness having normal Q angle, tibial torsion angle and foot arch. The similar

result was being found by Michael Fredericson et al, where he found that long distance runners with ITBS has weaker hip abduction strength in the affected leg compared with the unaffected long distance runners.³

Jull and Janda categorised muscles based on their primary functions, as “phasic” or “postural”, and is indicated that in response to dysfunction, the phasic muscles tends to be weakned and the postural muscles tend to develop higher tone and ultimately shorten. Here the G. Medius for hip abductionis is a phasic muscle and TFL/ITB the synergist muscle is a postural muscles. Hence when hip abductor is weakned, ITB is substituted and becomes overactive to be the primary muscle responsible for that movement. Thus when ITB is tight. The posterior edge of the band impinges against the lateral femoral condyle during running and thus causes ITBS.

15.83% of the subjects with ITBS had a flat feet and internal tibial torsion while 14.17 % had internal tibial torsion only.

Similar results were reported by Brian Noehren et al said that biomechanical factors associated with ITBS, he found that development of ITBS appears to be related to increased peak hip adduction and knee internal rotation. These combined motion may increase ITB strain causing it to compress against the lateral femoral condyle.

Ankle pronation including pes planus or decreased lateral arch creates and increased internal rotational movement to the leg or the tibia, with distal attachments of ITB at the lateral femoral condyle and at the Gerdy’s tubercle, the ITB is slightly strained with increased tibial internal rotation thus increasing tension on the ITB. This motion acts to stretch the ITB, which will increase friction of ITB when pulled more tightly over the lateral femoral condyle during running.⁴

Increased Q angle and external tibial torsion was found in 9.17% of the subjects with ITBS. Azhar M Merican et al in his study said that that increasing ITB tension had statistically significant effect on knee kinematics including translation of the patella plus external rotation in flexion would increase Q angle. 3.33% of subjects had increased Q angle, flat feet and internal tibial torsion. Since both factors i.e increased Q angle and internal tibial torsion is present, the cause here is not genu valgum but increased Q-angle may be due to wider pelvis, femoral anteversion or quadriceps weakness. Hip abductor weakness as well as increased

Q angle are present among 5% of the subjects whereas 2.5% of the subjects had all the four components present i.e increased Q angle, hip abductor weakness, flat feet and internal tibial torsion

The second objective of the study was to find out the impact of ITBS on the functional activities. It has been evaluated by using LEFS scale, which has a total score of 80. The scale consists of 20 items, each with a maximum score of 4 where 0 indicates extreme difficulty and 4 indicates no difficulty.

It has been found that the mean score obtained by all the subjects with ITBS is 63.12 ± 5.33 . 75.84% of all the subjects scored between 60-70 whereas 24.26% were between 50-60. Most of the subjects had moderate difficulty in activities like squatting, lifting heavy objects like bag of groceries from floor, walking a mile, going up or down stairs(10 stairs), sitting for 1 hr, running on an uneven ground, making a sharp turn while running fast and hopping, and thus they scored 2 in each items. While they had a little difficulty in activities like putting on shoes, getting in and out of the car, running on even ground and thus scoring 3 in each items. Since only grade I (pain does not occur during running or normal activity but pains 3 hours after the sport specified training) and grade II (minimal pain present towards the end of the training or running, performance is not effected) have been taken so most of them did not score 0 or 1 which means extreme and quite a bit difficulty respectively.

Conclusion

The study concluded that the hip abductor weakness is the most common cause associated with ITBS among treadmill runners whereas flat feet and internal tibial torsion being the second most common cause.

The LEFS scale has found that there were 24.26% of subjects scoring between 50-60 having moderate difficulty in activities which has got an impact on activities of daily living in subjects with ITBS.

Conflict of Interest: Manuscript title: “Cross-sectional study to identify ITB causes among treadmill runners and its impact on functional activities “

I certify that there is NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers’ bureaus; membership, employment, consultancies, stock ownership, or other

equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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Funding: Self

Review Board on Ethics for Research

Review Category: Exemption from Review

Expedited Review: Full Review

We hereby declare that the project titled, "Cross-sectional study to identify ITBS causes among treadmill runners and its impact on functional activities" Carried out by Dr. Sukanya Baruah of II year M.P.T. has been brought forward for scrutiny to the board members.

Involvement of Special groups: No

Type of Study: Cross-sectional study

AV Needs: Yes

After analyzing the objectives, subjects involved and the methodology of the study, the following conclusions were drawn. The study does not cause any mental or physical harm to the subjects involved and there are no risks involved in the study. The performance of the study procedure will not cause any injury to the subjects. The board has evaluated and confirmed that the experimenter is trained and qualified in measuring outcome. The informed consent form ensures that the experimenter explains the procedure of the study to the subjects, their voluntary participations is confirmed and the identification of subjects is maintained confidential.

More over the finding of the study will benefit similar subjects, the profession and the society. Hence the review board has no objections on the conduct of the study.

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Effect of Chalk Dust Exposure on PEFR and CAT in School Teachers

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Abstract

In teachers, occupational exposure to chalk dust is very common. Classrooms contain of fine particulate matter that source from chalk dust.

To further evaluate and study the symptoms of respiratory illness in school teachers, the present study was conducted in order to evaluate individual's degree of obstruction using the PEFR, and its impact on their overall health, using COPD assessment test.

This comparative study was conducted in 40 School teachers and 40 normal healthy individuals. The data for this study was collected using mini Bell's PEFR device and the COPD Assessment test (CAT). An analysis of the data showed that the mean CAT score of group A (teachers) was significantly higher ($p=0.001$) than group B (normal individuals). The mean PEFR for group B was higher than group A, although the difference was not statistically significant.

Hence, the study concluded that respiratory symptoms significantly impacted the health of school teachers. They also showed signs of airway obstruction as compared to normal individuals.

Keywords: chalk dust exposure, PEFR, CAT, teachers.

Introduction

Any infectious disease of upper or lower respiratory tract is termed as respiratory tract infection. Laryngitis, common cold, pharyngitis, acute rhinitis are few upper respiratory tract infection. Some examples of lower respiratory tract infections are acute bronchitis, bronchiolitis, pneumonia etc. ⁽¹⁾. The main causes of respiratory tract infections were found to be allergens, smoking, bacterial viruses, direct contact with an infected person etc ⁽³⁾. Whereas it was found that respiratory tract infections (RTI) can also be caused due to indoor air pollution in households using biomass fuels ⁽⁴⁾.

Acute respiratory tract infections cause 3.9 million deaths every year, throughout the world, as per World Health Organization. ⁽⁵⁾ Studies have shown that RIT's prevails in about 33.5% of people in India ⁽¹⁵⁾. In a study done on teachers in India, the prevalence of various respiratory symptoms was found to be 28.35% ⁽¹⁶⁾.

In teachers, occupational exposure to chalk dust is very common. Classrooms contain of fine particulate matter that source from chalk dust. Limestone or gypsum are usually the main constituents of chalks. Kaolinite, carboxy methyl, poly vinyl alcohol, starch etc are also present in small quantities; colored chalks contain some metals ⁽⁶⁾. Studies have stated that there was increased prevalence of respiratory symptoms in natural chalk factory workers ⁽⁷⁾. A study conducted in Spain showed that frequent use of the duster or chalk in class was associated with an increased risk of respiratory symptoms ⁽⁸⁾. A study done on school teachers showed that the deposition of chalk dust in lung has caused interstitial pneumonia with multiple bullae ⁽⁹⁾.

Another risk factor for respiratory impairment can be poor ventilation of the classrooms ⁽¹⁰⁾. It is seen that there is a regular exposure to pollen grains of the teachers in the school play gardens. Pollen grains are aeroallergens and are important cause of pollinosis. Inhalation of

airborne pollen directly targets the respiratory system and in turn causes allergic rhinitis, allergic alveolitis, asthma etc.⁽¹¹⁾.

The severity of obstructive airway disease is assessed using various Lung function tests. They evaluate the effects of various therapeutic regimens and provide a better understanding of disordered pulmonary physiology. One such accepted index of pulmonary function is PEFR and is widely used in respiratory medicine⁽¹²⁾.

Measurement of PEFR is simple, non-invasive, rapid and economical method to access the strength and speed of expiration in L/min, through a forced expiration from total lung capacity⁽¹²⁾.

Although spirometry is required for diagnosis of COPD it does not measure patient's perspective with respect to symptoms, function or overall health condition.

The COPD assessment test represents a move towards individualized treatment for COPD patients. CAT has been found to have a high validity not only in COPD but also in general population⁽¹³⁾. As part of the BREATHE study, CAT has been tested in general population in the Middle East⁽¹⁴⁾.

A study done on school teachers in India, who were exposed to chalk dust on daily basis stated that teachers are at an increased risk of developing occupationally related pulmonary function impairments⁽⁶⁾. To further evaluate and study the symptoms of respiratory illness in school teachers, we conducted the present study to evaluate the effect of chalk dust allergy using PEFR and CAT score in school teachers.

Methodology

- Research approach: Comparative/ Analytical study.
- Sampling: convenient sampling.
- Sample size: 80 Group A- 40 School teachers. Group B- apparently healthy individuals who were non-teachers.
- Duration of study: 6 months.
- Study setting: Various schools of Mumbai.

Inclusion criteria:

- Group A:

1. Teachers using chalk and blackboard as their primary teaching aid for an average of 15 hours in a week for at least 1 year.

2. Subjects ranged from 20 to 60 years.

3. Subjects having no history of respiratory disorders in past 2-3 months.

- Group B:

1. Individuals who are not in the teaching profession.

2. Individuals who are not exposed to chalk dust.

3. Subjects ranged from 20 to 60 years.

4. Subjects who do not have history of respiratory disorders in past 2-3 months.

Exclusion criteria:

- Group A:

1. Smokers

2. Subjects having history of respiratory disorder in past 2-3 months.

3. Subjects currently suffering from any respiratory disorders.

4. Subjects currently on medication- spacers, bronchodilators etc.

- Group B:

1. Smokers.

2. Subjects having history of respiratory illness.

3. Subjects currently on medications- spacers, bronchodilators etc.

Materials and Method

An ethical clearance was obtained from the institution before initiating the study. Prior consent was taken from all the subjects of this study, and their confidentiality was ensured. This comparative study was carried out in various schools of Mumbai. A total of 40 school teachers and 40 apparently healthy individuals who were non-teachers between the age group of 20 to 60 years were included in the study.

Material used:

- 1) Peak expiratory flow meter.
- 2) Mouthpieces

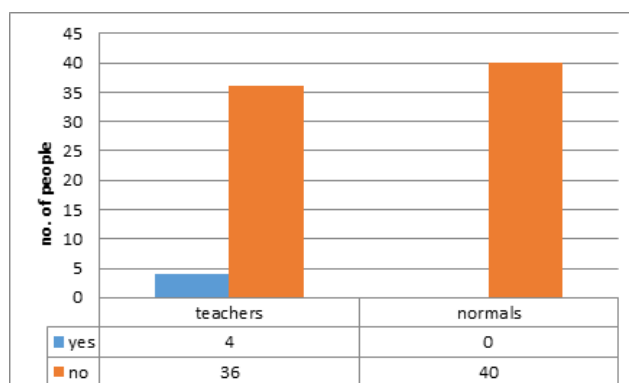
• **Method:**

Detailed history was obtained from each participant and brief examination was performed. PEFR was measured using mini bell PEFR device in sitting position. Three readings were taken and the best of three reading was considered. CAT was given to the subjects and based on the answers the CAT score was evaluated. Data was analyzed using unpaired t test for comparison between the study group and controls. The information obtained was presented in the form of Tables and graphs.



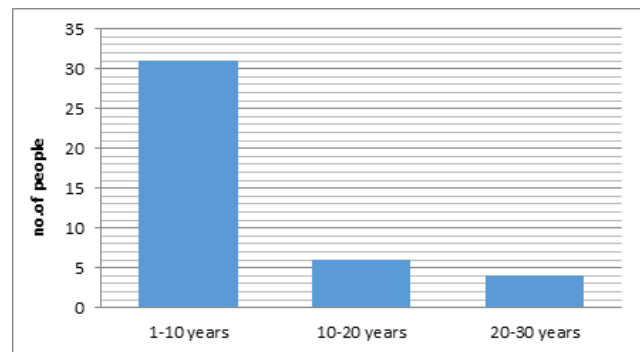
Figure 1: Assessment of PEFR

Results and Findings



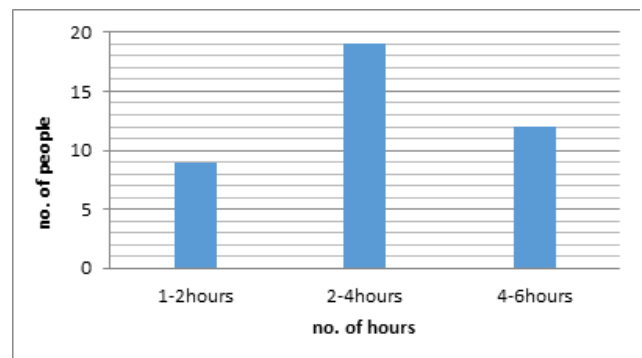
Graph 1: Distribution based on previous respiratory illness

Inference: 4 subjects from group A had history of respiratory illness.



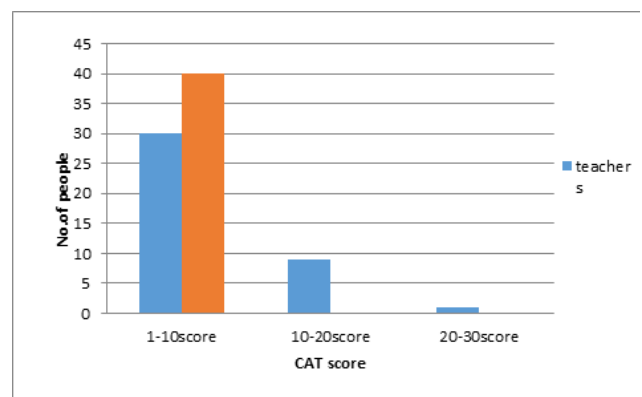
Graph 2: Distribution of the work experience of group A

Inference: graph 2 shows the maximum teachers (31) had teaching experience between 1 -10 years.



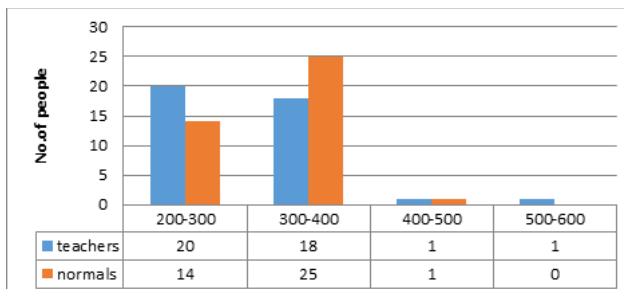
Graph 3: Distribution based on number of hours exposed to chalk dust by group A on daily basis

Inference: graph 3 depicts that the number of hours group A is exposed to chalk dust on daily basis is 2-4 hours with mean being 3.52 ± 1.28



Graph 4: Comparison of COPD Assessment Test score between Group A and Group B.

Inference: The mean CAT score of group A was 7.65 ± 5.24 and that of group B was 2.2 ± 1.43 . The p value (0.0001) denotes high statistical significance.



Graph 5: Comparison of Peak Expiratory Flow Rate between Group A and Group B.

Inference: The mean PEFR of group A was 340 ± 68.12 and that of group B was 345 ± 46.40 . The p value (0.3673) was statistically not significant.

Discussion

We conducted a study to evaluate the effects of chalk dust on PEFR and CAT in school teachers. A school was selected randomly to conduct the study. The study included a total of 80 subjects in the age group 20-60 years.

According to demographic details, the mean age of group A was found to be 37.2 ± 7.75 and that of group B was found to be 40 ± 8.74 . The mean BMI of group A was 25.26 ± 4.31 and the mean BMI of group B was 25.44 ± 2.80 .

Out of the 80 subjects, 2 were male, 1 in each group and the rest 78 were females.

The CAT is formulated such that the overall score ranges from 0-40⁽¹³⁾. The CAT scoring is classified into levels of impact. 5- Upper limit of normal in healthy non-smokers, <10 low, 10-20 medium, >20 high, >30 very high.

In our study out of 40 subjects from group A, 30 were in normal to low level impact category, 9 were in the medium level and 1 was in high level of impact category. Whereas, in the controls all of the 40 subjects were in the normal to low level impact category as shown in graph 4.

The CAT score comparison was done by applying the unpaired t test. It was noted that the CAT score of the teachers who were exposed to chalk dust was significantly higher as compared to controls. (P value 0.0001)

Ohtsuka et al stated in his study done on the teachers that, the school teachers who were suffering from

interstitial pneumonia and multiple bullae, had chalk dust in their lungs⁽⁹⁾. The main constituents of chalks are commonly found to be limestone and gypsum⁽⁶⁾.

Chalk dust also contains calcium sulfate or calcium carbonate which has acute health effects such as irritation to the eyes, respiratory tract, mucous membranes etc.

A previous study also states that fine particles of chalk may cause oxidative damages in alveolar macrophages and cause cytotoxicity⁽²⁴⁾.

The measurement of PEFR is done according to the 3 zone classification of American lung association. Once the highest of three values is noted, it is classified into green, yellow or red zone. Peak flow in green depicts a good control over asthma, yellow zone indicates that the respiratory airways are narrowing and red zone indicates severe airway narrowing⁽²⁵⁾.

In the present study the PEFR of group A was subjectively lower than compared to group B. The mean PEFR for group A was 340 ± 68.12 . The mean PEFR for group B was 345 ± 46.40 . However, there was no statistical significant difference in PEFR of group A as compared to group B (P value 0.3673).

Our findings were not in accordance with the study done on teachers by kamini D. Nikam, Munira A Hirkani⁽⁶⁾. Their study showed a significant lower PEFR in teachers as compared to controls.

The difference between the results of the two studies could be attributed to the following factors:

- less working hours of the teachers
- Conduction of study on a small sample size.
- The aerobic fitness of the subjects was not evaluated to check if the subjects are practicing daily aerobic exercises which may have given them a good lung capacity.
- Probable use of dustless chalks by some teachers.

It was observed that group B also had lower than normal PEFR. It may be due to the daily air pollution that they are exposed to. It could be indoor or outdoor air pollution. In a previous study done by E.Suguna it is stated that, one half of the world's population is exposed to solid fuel smoke produced by open fires. Solid fuel smoke has been associated with respiratory

tract infections⁽⁵⁾.

Other reasons for low PEFR in group B could be, having a less active lifestyle, no fitness regime etc.

In the present study it was also observed that teachers exposed to chalk dust daily for 5 or more hours either had a low PEFR or a high CAT score. The mean hours of exposure to chalk dust was 3.52 ± 1.28 .

12 subjects in group A had exposure to chalk dust daily for 5 hours or more. The mean PEFR of these 12 subjects was found to be 366 ± 98.47 . And the mean of their CAT was 8.27 ± 5.711

Conclusion

Thus we can conclude that the CAT was significantly higher in group A as compared to group B (p value 0.0001) indicating the affection of the respiratory airways.

PEFR of group A was subjectively lower than compared to group B. However, there was no statistical significant difference in PEFR of group A as compared to group B (P value 0.3673).

Conflict of Interest: The authors report no conflict of interest with respect to the present study.

Source of Funding: No funding was required for the present study.

Ethical Clearance: The study was approved by Institutional Ethical Committee of D.Y.Patil, School of Physiotherapy.

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Effectiveness of Reaction Time Training & Physical Exercises on Rt & Quality of Life of Epileptics- A Case Series

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Abstract

Aim: To study Effectiveness of Reaction time training & physical exercises on RT & quality of life of Epileptics- a case series.

Objectives: Finding the effect of RT training & physical exercises on Reaction time (RT) & quality of life (QOL) in Complex partial seizures (CPS)

Methodology: 4 subjects (OPD patients, OT dept KEMH) age 20-40 yrs, of Refractory CPS with or without secondary generalization with atleast three years of period of onset were included in a 4 week study. The Outcome was measured on RT machine, WHO BREF QOL questionnaire, Mini Mental status examination (MMSE) & neurological evaluation. Pre & post intervention changes were assessed with RT machine & WHO BREF QOL questionnaire. The Occupational therapy intervention consisted of 30-45 mins of training on 1) RT simulated machine & activities & 2) physical activities twice a week with home programme.

Results: The (paired) t value of post intervention RT is 4.0691 (significant at $p=0.05$). The (paired) t values of differences in individual domain scores for physical domain =23.0638 (significant at $p=0.001$), psychological =5.6949 (significant at $p=0.02$) & social =3.4762 ((significant at $p=0.05$). The study suggests a definite avenue for OT intervention in patients with epilepsy.

Conclusion: RT & QOL can be improved using RT training & Physical exercises. However a study has to be done on larger sample size with a longer follow up to confirm the efficacy of the study.

Key words: Occupational therapy, RT, QOL, CPs

Introduction

Epilepsy is the second most common disorder of CNS, affecting 1% of global human population. According to international league classification, its classified as Generalized, partial (simple/complex) & unclassified. CPS are characterized by focal seizure activity accompanied by transient impairment of the patient's ability to maintain normal contact with the environment. The patient is unable to respond to visual or verbal commands. The seizure frequently begins with an aura. The start of the ictal phase is often a behavioral arrest or a motionless stare, which marks the onset of the period of amnesia. The origin of CPS is mostly temporal or frontal. They may be produced by gliosis, haematomas, vascular malformations, tumours. Or functional impairment in inhibitory neurotransmitter GABA¹²

Seizures / epileptic form discharges & AEDs have deleterious effects on cognition & RT. RT is the time elapsed between the presentation of a sensory stimulus & the subsequent behavioral response. Seizures / epileptic form discharges also reduces speed of motor performance; physical health (easy fatiguability), psychosocial & psychological components of an individual & thus affecting QOL.¹

Impairment in RT can be due to cognitive impairment⁶ or reduced motor performance or AEDs while Physical impairment is due to over protective attitude with regards to safety or can be due to AEDs.

Most of the AEDs take care of epilepsy but not of QOL which is affected due to seizures. Occupational therapy intervention for RT training & physical exercises can be used for improving RT & QOL. RT training

improves alertness & attention & thus finally reduces the time required by an individual to respond. Exercises helps to improve health related QOL of epileptic patients & reduces susceptibility to seizures., Occupational therapy intervention for physical training helps to improve physical health, self esteem, social reintegration & thus improving overall QOL of an individual.

Objectives : Finding the effect of RT training & physical exercises on Reaction time (RT) & Quality of life (QOL) in Complex partial seizures (CPS).

Methodology: Four (20-40yrs) subjects with CPS were part of the study. Informed consent was obtained from all the subjects

• **Inclusion criteria**

1. Subjects (OPD patients, OT Dept, KEMH) of Refractory CPS with or without secondary generalization.

3. Atleast three years of period of onset, but not

greater than 30 years.

4. All subjects on medication with seizure frequency one episode in 2-3 months.

• **Exclusion criteria:**

1. Other neurological (CVA, brain tumours, TBI, TIA, MS, Cognitive impairment etc)/ Psychiatric (depression, Conversion, Narcolepsy, catatonic schizophrenia etc) disorder.

2. Neonatal, childhood onset & other seizure types.

• Study design: case series

Outcome measures: Primary outcome: RTM & WHO QOL (administered at the beginning & at the end of 4 weeks of study).

1. Rt machine (RTM)*



Fig 1 (RTM , Anand agencies, Pune, model-2)

2.

The standardized apparatus used in the study has two sides: subject & examiner side.

On the examiners side we have the following switches:

- Mains on-off
- Chronoscope
- Reset key
- Fore period key

- 4 keys with markings for 4 different lights
- Start key

On the subjects side :

- 4 different coloured lights
- A joystick

In our study we made use of the apparatus as SRT apparatus. Connect the apparatus & Put the mains on , reset the the time, adjust the foreperiod – 3 sec.Check if the apparatus is connected poperly . When the key

marked with white light is pressed buzzer sound (ready signal) will be heard following which the light will glow after the adjusted foreperiod. As soon as the subject hears the buzzer sound, he has to get ready to move the joystick in pre decided direction (eg right). Immediately after the light glows the subject moves the joystick. The light is put off on the movement of the joystick. The time to react to the light is recorded on the chronoscope.

Controls employed: Premature reactions were discarded. Every patient was explained the procedure & was given 3 practice trials. 5 test trials were given & the average RT was found out.

3. WHO QOL BREF : It's a QOL questionnaire consisting of 26 questions, basically into 4

Domains of life (physical, psychological, social & environmental). Each question is rated on 1 to 5 scale (1-very poor/ very dissatisfied & 5- very good/ very satisfied). Raw scores are converted into scale of 0-100 on the basis of guidelines given by WHO.

4. Mini Mental Status examination: MMSE or 'Folstein test' is a brief 30 point questionnaire test that is used to screen cognitive impairment. It was introduced by Folstein et al (1975). It consists of questions on Orientation (max score 10), Registration (max score 3), Attention & calculation (max score 5), Recall (max score 3), Language tests (max score 8) & Construction (max score 1). Total score - 30, > than 25 impairment, > than 20 definite impairment.

5. Neurological evaluations: Demographics of patient, Type & focus of epilepsy, Duration & Frequency of episodes, Medical history, Investigations, Medications & Dosages, Higher functions, Cranial nerves & Motor examination.

Protocol of treatment:

45 mins of occupational therapy intervention twice a week for 4 weeks was given. Most of the activities given were combination of various components of RT (speed of visuo-motor performance, visuo-spatial attention, internal selection of a movement, motor preparedness, perception). Activities used in the protocol were constant & selected according to the educational background of the subjects. RT simulator* used in the protocol is purely used as simulated activity for visual RT. Pre & post assessments were done using primary outcome measures. Fatigue was avoided during the activities by

giving rest period of 2-3 mins in between the physical activities. Patients were advised to have AEDs before exercises. No. of repetitions & complexity of activities was increased weekly.

WEEK 1

RT simulator



Fig 2: Reaction time simulator

- RT simulator (93 impulse/min for 5 mins) - fig 2
- Ruler test 30 trials¹³ (fig 3).
- Cards game simple 10 times¹³
- Jumping over the line: 5 lines at distance of 15 inches between each (10 times)
- Throwing a ball into the basket (5 trials)
- Stationary cycling 5 mins

Week 2:

- RT simulator (107 impulse/min for 5 mins)
- Ruler test¹³ 30 trials
- Cards game complex 10 times¹³.
- Jumping over the line : 5 lines at uneven distances
- Throwing a ball into the basket (10 trials)
- Stationary cycling 10 mins

WEEK 3:

- RT simulator (125 impulse/min for 5 mins)
- Ruler test¹³ 30 trials

- Cards – pictorial ¹³ 10 times .
- Obstacle course (10 times)
- Throwing a ball into the basket (15 trials)
- Stationary cycling 15mins

WEEK 4:

- RT simulator (150impulse/min for 5mins)
- Ruler test ¹³ 30 trials
- Cards game ¹³ bilateral hand 10 times .
- Obstacle course complex (10 times)

- Throwing a ball into the basket (20 trials)
- Stationary cycling 20mins

HOME PROGRAMME:

- Deep breathing exercises (10 times), brisk walking (6 mins)
- Ball throwing & catching (10 times)
- Ruler test ¹³ (30 trials)
- Explained to avoid fatigue/ exhaustion/ dehydration
- Regular medications.

Data Analysis & Graphical Analysis:

1. Subject data: (Table 1)

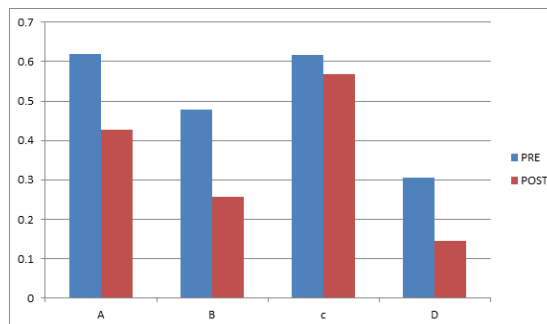
Table 1, showing subject data & Epilepsy history.

subject	Age/sex	Epileptic foci	Duration of seizures	Frequency of seizures(max)	Type	occupation
A	30y/f	Rt Temporal	9yrs	1episode/2mnths	CPS	housewife
B	31y/m	Rt fronto temporal	10yrs	1episode/3mnths	CPS	Clerical work
C	24y/f	Rt Temporal	10yrs	2episodes/3mnths	CPS with sec generalisation	housewife
D	35y/m	Rt temporal	7yrs	1episode/2mnth	CPS with sec generalisation	peon

2. RTM scores:

The t (using Student’s paired t test) value of difference in RT is stastically significant at p=0.05. (shown graphically).

The t values (using Student’s paired t test) of differences in individual domain scores is stastically significant for physical domain at p=0.001, psychological at p=0.02 & social at p=0.05 while the t value for environmental domain is stastically not significant at p0.05 (but it is significant at p=0.10).



Graphical Analysis

Graph 1; On X- axis - Subjects, Y- axis-- RT in seconds

3 QOL scores

The t values (using Student's paired t test) of differences in individual domain scores is statically significant for physical domain at $p=0.001$, psychological at $p=0.02$ & social at $p=0.05$ while the t value for environmental domain is statically not significant at $p0.05$ (but it is significant at $p=0.10$).

Table(2), Pre & post scores of 4 domains of WHO-Qol BREF Questionnaire & calculation of t - values.

Domains	A		B		C		D		SD	SE	Using paired t test, t value DF=3
	PRE (x1)	POST (x2)	PRE (x1)	POST (x2)	PRE (x1)	POST (x2)	PRE (x1)	POST (x2)			
Physical	44	88	56	94	38	75	38	81	3.512	1.756	23.0638
Psychological	44	75	56	94	31	50	56	75	9.3944	4.6972	5.6949
Social	50	69	56	75	44	50	44	50	6.9524	3.4762	3.5959
Environmental	44	56	44	56	50	50	44	50	5.7447	2.8724	2.61106

Results

using Student's paired t test , shows that there is significant improvement in

- SRT (post intervention difference in RT is statically significant at $p=0.05$)

- QOL- The t values (using Student's paired t test) of differences in individual domain scores is statically significant for physical domain at $p=0.001$, psychological at $p=0.02$ & social at $p=0.05$ while the t value for environmental domain is statically not significant at $p0.05$ (but it is significant at $p=0.10$).

However no epileptic attacks were induced during the intervention & throughout the protocol.

Discussion

CPS are the second most common type of seizures after GTC affecting human population. The most common focus of origin of CPS is temporal followed by frontal lobe. It is one of the commonest causes of disability. Chronic or increased frequency of CPS & AEDs may lead to cognitive impairments, reduced RT, reduced speed of visuo-motor performance, easy fatiguability & thus affecting QOL of an individual^{1,4}

The present study was conducted to improve QOL & RT of an individual with CPS by improving

RT & physical health through Occupational therapy intervention. RT training practice with activities involving , motor preparedness, visuo-spatial attention, speed of visuo-motor performance, internal selection of a movement & perception, helps to improve interneuronal & intersynaptic connections by increasing neuronal firing & flow of oxygenated blood to the areas of Frontal, Parietal, Temporal lobes, Basal ganglia & Thalamus. Activities involving the components of RT increases neuronal activity in the areas of contralateral frontal cortex {sensory, motor, pre motor, cingulate areas (which are responsible for visuo-spatial attention for correct movement selection) & supplementary motor cortex (responsible for internal selection of movement)}, contralateral parietal association cortex (anterior region-responsible for use of visual information available in preparatory stimulus & posterior region- selects a correct movement on basis of spatial attention to response stimulus) as shown by PET & fMRI studies.

The activities included in our protocol involved all the components of RT (i.e motor preparedness, visuo-spatial attention, internal selection of a movement, speed of visuo-motor performance & perception etc). We found that repetition of these activities with increasing number of trials for a 4 week period improved RT . Ando et al' described that minimum of 3 weeks of RT training improves RT & effects lasts upto 3 weeks. Activity of stationary bicycle was selected with the goal

of improving RT as well as physical health. Studies have shown that exercises on stationary bicycle improves arousal & alertness, thus improving RT (Davranche et al). Graph (I) shows pre & post intervention RT values. The interpretation of t value shows that Occupational Therapy intervention for RT training leads to significant improvement in RT. The post intervention difference in RT for subject C shows the least improvement followed by D, as compared to A & B. This can be attributed to secondary generalisation & higher seizure frequency seen in C & D as compared to A & B.

Occupational therapy intervention for Physical Exercises contribute to both physical & mental well being of an individual thus leading to effective heart functioning. Sirven⁵(1999) has reviewed that neurohormones such as beta endorphins are released after prolonged exercises which plays an important role in general physiological stress reactions. They help to enhance feeling of well being finally leading to a better QOL.

Adjunctive Occupational therapy intervention for physical training also improves aerobic capacity of an individual, reduces fear of participation & enhances self esteem. The activities used in our protocol (DBE, brisk walking, stationary bicycle), for a 4 week period, helped to break the vicious cycle of detraining which is set in CPS patients.

Table 3—shows pre & post intervention values for physical, psychological, social & environmental domains. The paired t value obtained for mean difference of scores of domains shows that there is significant improvement in physical, psychological & social domains of QOL. The improvement in Physical & Psychological domains was more in A & B as compared to C & D. This can be attributed to secondary generalisation & higher seizure frequency seen in C & D as compared to A & B⁴ or it may also be attributed to the difference in kind of physical work / lifestyle followed by the subjects. The lower levels of Improvement in social domain in all subjects as compared to physical & psychological can be attributed to short term protocol & pre-existing fear / apprehension of having seizure episodes in a social situation & thus avoiding such situations. The results suggests that Occupational Therapy intervention for physical training leads to better QOL. Results obtained in case series supports the studies done by ‘Riccardo Mario Arida et al³ & ‘K.O Nakken et al⁷ which showed that exercises improve aerobic capacity & arousal of an individual & thus improving QOL.

Studies done by ‘Riccardo mario arida et al (2010)³, Symonds (1970), Paulson (1963) & Vidart et al (1967) showed that exercises improves attention & thus leading to a seizure suppressing effect. During the entire course of intervention, no episodes of seizures were noticed thus suggesting that Occupational therapy intervention for RT training & physical training improves arousal, alertness & attention, thus producing a seizure suppressing effect.

Conclusion

RT & QOL can be improved using occupational therapy intervention for RT training & Physical exercises. However a study has to be done on larger sample size with a longer follow up to confirm the efficacy. Study with a larger sample size & with longer follow up would validate the effects of intervention on seizure suppression & drug dosages. A futuristic study with Video EEG monitoring can help in selecting the best activities for improved results in RT & also to record the inter-ictal discharges during the intervention.

Conflict of Interest- Nil

Source of Funding - Self

Ethical Clearance - Institution of Ethics Committee (IEC) 1&2, KEM hospital, Mumbai

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14. *RTM & RTS has been manufactured by Anand agencies, Pune (India).

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