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CONTENTS

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Efficacy of Yogatherapyon Lung Functions and Lung Volumes in Children-A Experimental Study

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Abstract

Background: The lungs go through 4 distinct histological phases of development and in late fetal development respiratory motions and amniotic fluid are thought to have a role in lung maturation.[1,2] Development of this system is not completed until the last weeks of fetal development, just before birth. Therefore premature babies have difficulties associated with insufficient surfactant (end month 6 alveolar cells type 2 appear and begin to secrete surfactant) [3-6]. Considerable structural changes in the chest wall may change infant and childhood predisposition to respiratory failure, lung injury, and ventilation-associated lung injury. Yoga respiration consists of very slow, deep breaths with sustained breath hold after each inspiration and expiration.Thus,previous studies considered Yoga as a method of breathing and chest expansion exercises. **Objectives**: To assess the effect of yogasana on lung volume, function and breath holding capacity on children. **Materials and Methods:** Experimental study was conducted 2 groups were formed .Group A was designated for yoga asanas**(**UttitaKumarsana, ArdhaMatsyandrasana , Parvatasana, Yoga Mudra, Dhanurasana and Bhujangasana) Group B was asked to continue regular playing activities for 30 Min 3 times a week for 12 sessions. **Result Analysis:** Chest expansion, FVC,FEV1,FEV25-75% and breath holding capacity has shown increased in both group whereas more in children performing yogaasanas. **Conclusion:** The study concludes that looking at increasing burden of studies & expectation it is necessary to keep children ready to combat with physical mental fitness Yoga session should be incorporated as routine from school itself.

***Key Words**: Yoga Asanas, FVC,FEV1, Chest expansion*

Background

The orientation of the ribs is horizontal in the infant; by 10 years of age, the orientation is downward. Ossification of the rib cage, calcification of the costal cartilage, and development of muscular mass develops progressively until adulthood. Lung Volumes: Functional residual capacity (FRC) is determined by the static balance between the outward recoil of the chest wall and the inward recoil of the lung. In infants, the outward recoil is quite small, and the inward recoil is only slightly less than that in adults.[7]

Yoga, originated in India thousands years ago, it is a method of learning that aims to attain the unity of mind, body, and spirit through three main Yoga structures: **Exercise, Breathing, and Meditation**[9].

It is separated into Six Branches.

1. Bhakti Yoga is the path of heart and devotion.

2. Raja Yoga is the path of Yoga that focuses on meditation and contemplation.

3. Jnana Yoga is the path of Yoga that deals with wisdom and knowledge or the Yoga of the mind.

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4. Karma Yoga is the path of service; it refers to the energy of action.

5. Tantra Yoga is the path of ritual, it also known as sorcery, witchcraft, magic spell or some mysterious formula.

6. Hatha Yoga is the most popular branch of Yoga. In general, when people mention about Yoga, they refer to Hatha Yoga. It is the physical training part combining postural exercise ("asana"), relaxation, and voluntary control of breathing ("pranayama"). Yoga practice consists of the five-principle including proper relaxation, proper exercise, proper breathing, proper diet, and positive thinking and meditation. Yoga literally means 'union' or 'to join' i.e. union with divine consciousness.

Breathing and chest wall expansion exercise, the treatment technique for chest physical therapy, have been used to treat various forms of respiratory dysfunction, both acute and chronic abnormalities resulting from medical or surgical conditions, and for health promotion[1]. Exercise training has been shown to improve respiratory capacity, airway resistance, exercise tolerance, and to reduce work of breathing.[2] Previously, it was reported that Yoga training (asans and pranayams) for 6 months improved lung function, respiratory muscle strength, skeletal muscle strength, and endurance in 12-15 years old Indian[10]. However, different Yoga training (three weeks duration) produced different results on the cardiopulmonary function in young Indian[11]. This experiment tested the hypothesis that short-term Yoga training improved chest wall expansion and lung volumes in young children. The Yoga Sutrasdescribes the components and process of yoga as "eight limbs". Through these practices, the goal of yoga ultimately was to discipline the mind and body for spiritual goals.

- Moral principles (yama)
- Observances (niyama)
- Posture (asana)
- Breath control (pranayama)
- Withdrawal of the senses (pratyahara)
- Concentration (dharana)
- Meditation (dhyana)
- Pure contemplation (Samadhi)

Proposed Mechanism of Biological Effect

As a mind body practice, the biological mechanism of yoga probably has multiple components. As a physical activity, part of the effect is similar to other types of exercise. Generally, yoga is considered a low- to moderate-intensity exercise. Exercise is known to improve health through improving cardiovascular fitness, muscle strength, and respiratory adaptations, modifying metabolism and immune function. Yoga's emphasis on relaxation in static and dynamic exercises distinguishes it from conventional exercise. By systematically contracting and relaxing muscles in coordinate sequences, changing breathing patterns, and cultivating mental attentiveness and awareness during practice, yoga attempts to synchronize the body and mind.In particular, yoga changes the sympatho-vagal balance, producing physiological effects systemically. Six positions of Hatha Yoga (UttitaKummersana, ArdhaMatsyendrasana, Parvatasana, Yoga Mudra, Dhanurasana and Bhujangasana) were assigned in this study because of their dominant effects on chest wall function.Spirometry can be reproducibly done from the age of 5 years but these values should be interpreted with individual considering age, sex, height and nutritional status[26]. Subdivision of lung volumes show changes in different lung diseases that help us to understand the nature of the defect[11].

Materials & Methodology

Study has been conducted on 40 school going children studying in VIthstandardbetween 11 to 15 age. School permission as well as parents consent was taken for both boys and girls those who are willing to participate. On screening those who have chest expansion <4 cms were included. Child with respiratory disease,trauma and recent illness,infections were excluded from study**.**

Procedure

40 subjects were selected for the study as per the inclusion & exclusion criteria after the approval from ethical committee of the institution. An informed consent was taken from the parents. Every step of the procedure was explained to them.Pre-assessment was carried out for BMI,Chest Expansion Measurement, Breath Holding

time with stop watch and spirometry was performed for FVC,FEV1,FEV25-75%.40 subjects were divided in two groups using chit method.

Group A was allocated for Yoga therapy UttitaKumarsana, ArdhaMatsyandrasana , Parvatasana, Yoga Mudra, Dhanurasana and Bhujangasana for 30 Min yoga-aasana session 3 times/Week 12 sessions for 4 weeks. Group B were asked to carry out Regular playing activities like walking, running, playing outdoor games for minimum 30 min. every day for 4 weeks .Post-assessment was done,data was obtained and result was analyzed.

Result & Data Analysis

TABLE 1:- Statistical Analysis for Chest Wall Expansion at Upper level in Group A& B

Groups	Treatment	CWE	Difference	SD	SE	Paired t test	unpaired t test
GROUP A	PRE	3.175	1.325	0.4667	0.1043	t = -12.698 p = 0.000	t = 9.077 p= 0.000
	POST	4.5					
GROUP B	PRE	2.95	0.2	0.2991	0.06689	t = -2.990 p = 0.008	
	POST	3.15					

TABLE 2:- Statistical Analysis for Chest Wall Expansion at Middle level in Group A& B

Groups	Treatment	CWE	Difference	SD	SE	Paired t test	Unpaired t test
GROUP A	PRE	3	1.425	0.5684	0.1271	t = -13.077 p = 0.000	t = 10.443 p= 0.000
	POST	4.425					
GROUP B	PRE	2.925	0.05	0.1539	0.03441	t = -1.453 p = 0.163	
	POST	2.975					

TABLE 3:- Statistical Analysis for Chest Wall Expansion at Lower level in Group A& B

Groups	Treatment	CWE	Difference	SD	SE	Paired t test	Unpaired t test
GROUP A	PRE	2.7	1.625	0.7048	0.1576	t = -10.311 p = 0.000	t = 9.072 p= 0.000
	POST	4.325					
GROUP B	PRE	2.675	0.1	0.2616	0.05849	t = -1.710 p = 0.104	
	POST	2.775					

TABLE 4:- Statistical Analysis for Breath Holding time in Group A &B

Groups	Treatment	BHT	Difference	SD	SE	Paired t test	Unpaired t test
GROUP A	PRE	23.5	16.45	9.254	2.069	t= -7.950 p = 0.000	t = 6.723 p= 0.000
	POST	39.95					
GROUP B	PRE	21.35	2.35	1.531	0.3424	t = -6.863 p = 0.000	
	POST	23.7					

TABLE 5:- Statistical Analysis for Lung Volume (FVC) in Group A & B

Groups	Treatment	Lung volume-FVC	Difference	SD	SE	Paired t test	Unpaired t test
GROUP A	PRE	76.5	13.05	9.162	2.049	t = -6.370 p = 0.000	t = 6.213 p= 0.000
	POST	89.55					
GROUP B	PRE	86.7	0.25	0.9665	0.2161	t = -1.157 p = 0.262	
	POST	86.95					
Groups	Treatment	Lung Volume-FEV1	Difference	SD	SE	Paired t test	Unpaired t test
GROUP A	PRE	86.8	14.4	13.52	3.023	t = -4.780 p = 0.000	t = 4.698 p= 0.000
	POST	101.2					
GROUP B	PRE	99.75	0.2	1.105	0.2471	t =-0.809 p = 0.428	t = 4.698 p= 0.000
	POST	99.95					
Groups	Treatment	Lung volume-FEF25-75%	Difference	SD	SE	Paired t test	Unpaired t test
GROUP A	PRE	87.55	17.5	12.47	2.789	t = -6.276 p = 0.000	t = 6.348 p= 0.000
	POST	105.1					
GROUP B	PRE	89.15	-0.25	0.9105	0.2036	t = 1.228 p = 0.234	t = 6.348 p= 0.000
	POST	88.9					

Discussion

Yoga has its ancient roots in India, where it is both a spiritual and physical practice integrating mind and body. The difference between Yoga and other exercise is the predominant focus on sensations in the body (Halvorson, 2002). Like other forms of exercise, the present data indicate that four-week Yoga training improves respiratory capacity especially chest wall expansion and lung volumes. Respiratory function depends on many factors including nervous system, respiratory muscle, and lung dimension. Yoga training also improves muscle strength and flexibility (Raub, 2002) and increased respiratory sensation (Villien et al., 2005), maximum expiratory pressure and flow rate (Joshi et al., 1992; Stanescu et al., 1981; Yadav and Das, 2001).[8,9] It is likely that the improvement of respiratory function and increased chest wall expansion in the present study were resulted from the increased respiratory muscle strength.

All the asanas practiced in this study especially bhujangasana&dhanurasana have their effect on improving chest wall expansion mainly at upper level. It stretches the anterior structures and strengthens the posterior structures of the upper chest & thus widens and opens the chest area thereby improving respiration at the upper level thus regular practice of these asanas results in improved chest wall expansion at upper level.

Asanas like ardhamatsyendrasana, parvatasana& yoga mudrasana have their effect on improving chest wall expansion at mainly middle level. With ardhamatsyendrasana, the spinal muscles of the back & abdomen are twisted laterally, especially the upper back, shoulder region is twistedthe chest is opened up; with regular practice of parvatasana lung capacity also increases thus improving chest wall expansion at the middle level.[15,16]

Dhanurasana, yoga mudrasana have their effect on improving chest wall expansion at mainly lower level. It widens and opens the chest area, while performing dhanurasana the spine is extended up to the umbilicus as well as the lower limbs are flexed & extended from hip thereby improving respiration at the lower level, stretches the chest as a whole thus regular practice of theseasanas results in improved chest wall expansion at lower level. The increased chest wall dimension indicates the possible increased ventilation-perfusion ratio and improved gas exchange capacity. Blood flow to this part is usually high in excess of ventilation.

Improvements in BHT could be attributed to the control of the neural respiratory centers during the various asanas. While performingyoga participants were instructed to consciously be in control of their breathing, which may indicate that the autonomic breathing stimulus was overridden resulting in increased breath holding time (Makwana et al. 1988). It was not clear if the improvement occurred at the level of neural reception or at higher centers in the brainstem. Improvements in Breath Holding Time point to a decreased responsiveness of the respiratory centers to CO2 levels along with an increased endurance of respiratory muscles with later signs of fatigue (Joshi and Joshi 1998).By consistently performing a variety of *asanas,* muscles of the thoracic cavity are constantly being recruited. This recruitment may lead to greater musculature and thereby result in improved FVC (Joshi et al.1992).

Performing Yoga stretching and balancing movement can lead to improvements of muscle strength and flexibility of all these muscles (Halvorson, 2002), by performing the asanas in this study the abdominal muscles get strengthened, it also helps in compression of the muscles of the chest which improves the lung's recoiling capacity which in turn improves forced expiration in 1st second. Abdominal breathing uses the diaphragm primarily, and is congruent with the shape of the lungs and the capacities of the breathing muscles. It performs respiration with the least effort and is associated with mental stability and calmness. In contrast, chest breathing utilizes primarily intercostal muscle plus accessory breathing muscles: trapizius, scalenes, pectoral, and sternomastoid (Chaitow and Bradley, 2002; Frownfelter, 1978; Levenson, 1992)[11,12]. Yogaasanas,train the muscles of the thoracic cavity and constantly get recruited. This recruitment may lead to greater musculature; also the asanas are maintained before releasing thus maintaining the stretch and thereby result in improved forced expiration at 25-75%.

Six positions of Hatha-Yoga used in this study has been reported to predominantly effect on prime mover and accessory respiratory muscle such as external and internal intercostal muscle, pectoral, latisimusdorsi,

erector spinae, rectus abdominis, serratus anterior and diaphragm[10]. A type of Yoga, the *Asanas,* involves a variety of effects including: relaxation, stretching, and balancing of muscles; mobilization of joints; improvement of posture; action on pressure points; improvement of breathing; calming of the nervous system; and promotion of homeostasis in cardiovascular, digestive, endocrine and other systems.The*Asanas*relaxes muscles through holding them in gently stretched positions (Monro, 1997)[9].

Study published states that Yoga practice can decreased reaction time, indicating improvement of neuromuscular system (Bhavanani et al., 2003)[11]. Although the chemoreceptor reflex adaptation and blood gases has been widely studied (Forster and Pan, 1995; Pianosi and Khoo, 1995), the possible role of nervous system on improved lung function in Yoga exercise especially in a short-term training period needs further experiments.[17,18].In summary, the present study suggests that short-term Yoga exercise improves respiratory breathing capacity by increasing chest wall expansion and forced expiratory lung volumes. These data provide more scientific evidence to support the beneficial effect of Yoga practice on respiration and muscle strength.

Conclusion

This study concludes that short term yoga exercises significantly improves chest wall expansion, lung volumes (FVC, FEV1, FEF25-75%) and breath holding time in children of 10-12 yrs which helps to improve cardiovascular endurance in children .

Conflict of Interest: None

Source of Funding: Self

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Comparison between the Effects of Gait Training on Floor and Treadmill Through Partial Body Weight Support System in Cerebral Palsy

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Abstract

Gait is one of the most important motor skill require for optimal functioning of every human being. Gait impairment is common in cerebral palsy leading to reduce motor ability and impaired balance. The body weight support system is a therapeutic intervention technique that provides task specific gait training which helps cerebral palsy children by facilitating walking constraints. Research on gait training using PBWSS has been done in the past but none of them highlighted the importance of walking surface.Aim and Objectives: To compare the effect of PBWSS on gait function in floor versus treadmill set up.Methodology: Subjects are selected with due fulfilment of selection criteria, 30 spasticcerebral palsy children divided into two groups. Group A(n=15) was given conventional therapy for 45 minutes/day and gait training with PBWSS for 15 minutes/day on treadmill for 6 days in a week for 4 weeks and group B was given conventional therapy for 45 minutes/day and gait training with PBWSS for 15 minutes/day on floor for 6 days in week for 4 weeks. Cadence, stride length and GMFCS were taken as outcome measure.Results: All subjects were in the mean range of 6.33±0.81 in group A and 6.73±0.88 in group B. Both group showed positive difference in values of cadence, stride length and GMFM. However, ground is more significant than treadmill.Conclusion: The study concluded that a spastic CP child who has undergone intensive gait training with PBWSS on floor has better beneficiary effect than PBWSS with treadmill training.

Key words: *cerebral palsy, partial body weight support system, gait training.*

Introduction

Cerebral palsy is defined as a group of disorders the development of movement and posture, causing activity limitation that are attributed to non progressive disturbances that occurred in the developing fatal or an infant brain. [1]The motor disorder (like gait deficit, balance deficit, spasticity, in coordination, involuntary motor control, reduced endurance and energy deficiency) of CP are often accompanied by disturbances in sensation, perception, cognition, communication and behaviour.[1] The worldwide prevalence of cerebral palsy is 1.5 to 4 per 1000 live births and in India 3 per 1000 live birth

The common motor dysfunction of children with CP is the delay of motor development.[2] Children with cerebral palsy either remain wheelchair dependent or reach a low walking level characterized by slow speed and disturbed motor control that leads to numerous disabilities.[2]

Gait is one of the most important as it is a motor skill that requires an optimal pattern of motor coordination and involves complex control mechanisms. The gait impairment is one of the major concerns for parents and caregivers. It can be due to spasticity reduced motor control ability and impaired balance. As the child grows with no simultaneous lengthening of skeletal muscles, muscular tightness and muscle contractures, they eventually develop bony torsion which leads to decline in gait function over time.

The use of Body weight support system is a therapeutic intervention technique that provides task

specific gait training it helps in reduction of gravitational force that would further reduce the load that should be overcome by the individual by facilitating walking constraints. Body weight support system consists of a mounting frame and a harness to support a percentage of individual's weight as he/she walks.[3] By this intervention patient's effort will be reduced to a great deal and we can promote a gait pattern which is nearly close to typical gait[3,9]. By doing this, child will be able to perform more repetitions and establish normal and efficient movement patterns.

Ambulatory difficulty is one of the most commonly seen disabilities in children suffering from cerebral palsy. Their inability to maintain a proper trunk control causes great variations when their gait patterns are taken into consideration. Children will be treated by incorporating partial body weight support system while they are given gait training. Fear of fall is eliminated by using PBWSS so children can focus more on gait training and trunk control. On ground, children walk according to their own wish and speed whereas on a treadmill, speed parameters can be control. There are very few studies comparing the two yet no study includes children suffering from spastic cerebral palsy. In order to bridge this gap, the researcher wants to carry out the study.

Materials and Methods

Spastic cerebral palsy children between age 5 to 8 years and with GMFCS level 2 and 3 were taken. Surgical treatment before six months, botulinumtoxins before six months and fixed contractures in lower limb were excluded. Subjects were selected based on criteria, after obtaining the written consent letter from the parents of the children with CP. The children were randomly grouped into two groups. Group A (n=15) was given conventional therapy for 45 minutes/day and gait training with PBWSS for 15 minutes/day on treadmill for 6 days in a week for 4 weeks and group B was given conventional therapy for 45 minutes/day and gait training with PBWSS for 15 minutes/day on floor for 6 days in week for 4 weeks. Cadence, stride length and GMFCS were taken as outcome measure. All the participants received following conventional therapy: stretching, weight bearing exercise, strengthening exercise, mat exercise, and balance training [10]

Figure 1: Gait training over treadmill through PBWSS

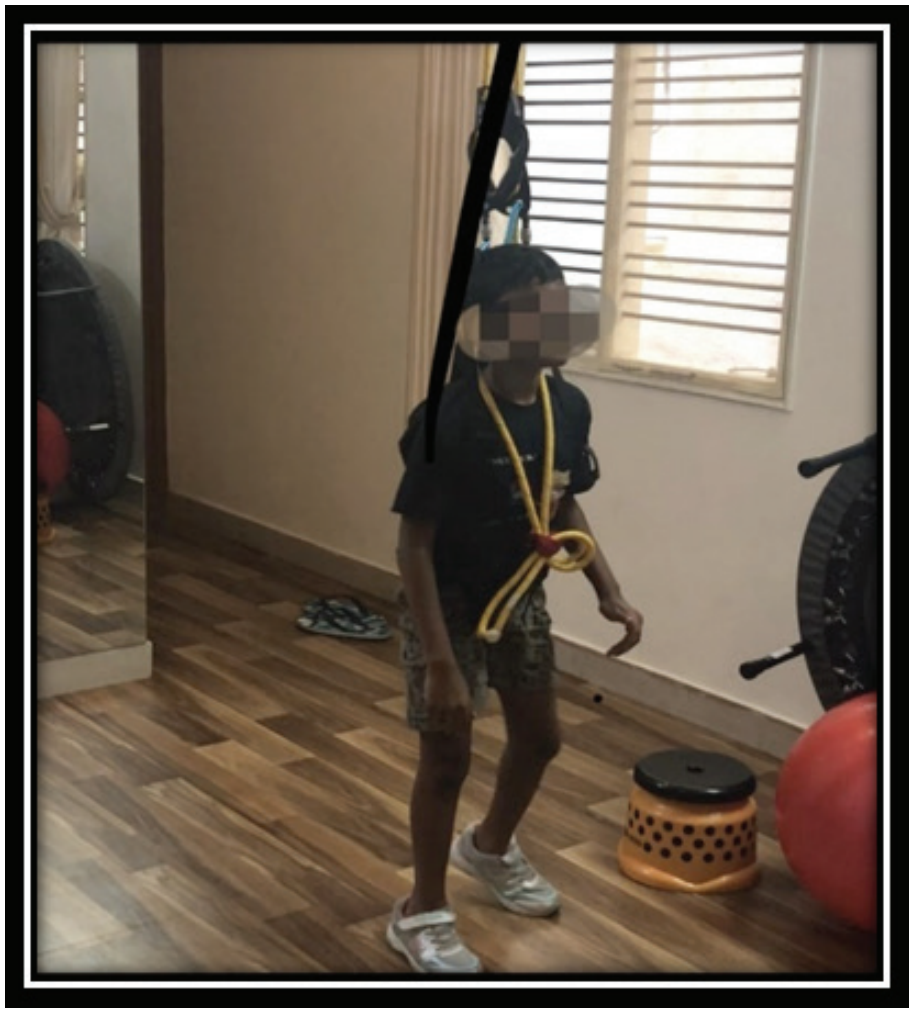

Figure 2: Gait training on ground through PBWSS

Findings

All the data were expressed as a mean ± standard deviation (SD). A student's version statistical package for social science(SPSS) version 20.0 software for windows was for the statistical analysis. The level of significance was at $p<0.05$ for all statistical tests.

Table-1: Mean and SD of outcome measures of GMFM in between the groups

Sr.no	Outcome measures	Post test	
		Group- A	Group- B
		Mean ±SD	Mean ±SD
1	GMFM	59.83±3.54	58.69±3.94
Between group comparison Mann –Whitney U test		GMFM: U = 98.5, p<0.55 (Not significant)	

In the above table the post values of GMFM are compared between the 2 groups. The mean and SD of group A was 59.83±3.54 and group B was 59.83±3.54. U value of the same is 98.5, p<0.55. This shows that there was no significant difference between the two groups.

Table-2 : Mean and SD of outcome measures of cadence and stride length in between the groups

Sr.no	Outcome measures	Post test	
		Group- A	Group- B
		Mean ±SD	Mean ±SD
1	Cadence	23.33±2.43	26.26±2.63
2	Stride length	46.32±1.49	47.97±1.47
Between group comparison Unpaired t- test		Cadence: t =-3.16 , p<0.003 (significant) Stride length: t= -3.04, p<0.005	

In the above table the post values of cadence are compared between the 2 groups. The mean and SD of group A was 23.33±2.43 and group B was 26.26±2.63. T value of the same is -3.16, p<0.003. This shows that there was significant difference between the two groups.

The post values of stride length are compared between the 2 groups. The mean and SD of group A was 46.32±1.49 and group B was 47.97±1.47. T value of the same is -3.04, p<0.005. This shows that there was no significant difference between the two groups.

Discussion

The purpose of this study was to find out and to compare the effect of partial body weight support system on gait function (cadence and stride length) and motor function in ground setting over treadmill setting.

For group A(treadmill): After 4 weeks of therapy, cadence (p<0.05), stride length (p<0.05), GMFM (p<0.05) were statistically significant. Treadmill training has variety of benefits. First of all, treadmill can be used in confined space which proves a boon for small setups. [5] Secondly, child can repeat more number of gait cycles with complete and symmetrical steps because belt is in motion and the child has to walk as long as the belt is moving. [5] Moreover speed of locomotion can be controlled which constantly gives us a feedback for the intensity of training. With moving belt, child will improve balance to maintain upright posture. [5, 6] There is significant correlation between balance and gait. [6] Balance improves cadence, step length and stride length. Treadmill training improves the functions other than gait like standing, rising, transfer and balance. [6]

For group B(over ground): after the 4 weeks of therapy, cadence(p<0.05), stride length (p<0.05) and GMFM(p<0.05) were found to be statistically significant. When the child is given on ground training, time period for double limb support is increasing and that of single limb support is decreasing which has a positive impact on the child's transfer abilities and weight shifting. [7] Further more, it also improves strength of hip and knee flexor-extensor. [8] So child will be more confident to take step.

In between the group: gait training improves strength especially hip and knee flexion-extension; there is significant difference found in cadence and stride length. There is statistically more significant difference found in ground setting compared to treadmill setting. Over ground gait training showed positive impact on

stride length, cadence, decreased double limb support, increased single limb support. [7]And ground training also improves the kinematics of pelvic position, hip and knee and ankles which is required for normal gait pattern. Floor walking involves a mandatory aspect of using lower limb strength more when compared to treadmill walking where lesser effort is required to walk because the belt is moving automatically. These improvements can be explained by various theories like neuroplasticity and motor learning. [5] Treadmill belt is in continuous motion with pre determined speed, so child is just raising and keeping down the limbs on belt and there is no active muscle activation for propulsion. [5] Child moves his hips, knees and ankles with more range of motion as he has to clear the moving surface on treadmill, which is not required in normal gait pattern. One more disadvantage of using treadmill is it may limit the transfer of skill to over ground walking, since the strategies required for treadmill walking are not necessarily the same for over ground walking, which is type of surface that we normally walk.

Conclusion

This study was conducted to find out and to compare the effect of partial body weight support system on gait function (cadence and stride length) and motor function in ground setting over treadmill setting. As per the gait outcome measures (cadence and stride length) and GMFM scores, there is significant improvement found in both groups. However, there is significant difference observed (in gait parameters) on ground than treadmill and no significant difference found (GMFM) in between the groups.

Future Recommendation:

Further study can be done on backward gait training on treadmill vs over ground and with gait analyser so that other parameter of gait can be measured.

Conflicts of Interest: No conflict of interests

Ethical Clearance: Ethical clearance certificate was taken from Oxford College of Physiotherapy

Funding: Self

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Effect of Therapeutic Exercise Protocol in Asymptomatic Individuals with Hyper-Lordosis of Lumbar Spine – An Interventional Study

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Abstract

Objective- The objective of the study was to study the effect of therapeutic exercise protocol in asymptomatic individuals with hyper-lordosis of lumbar spine.

Methods- Ethical clearance was obtained from institutional ethical committee. Subjects fulfilling the inclusion and exclusion criteria were included. Informed consent form was taken from each of the subject prior to the treatment. The motive and procedure of the study was thoroughly explained to the subjects participating. Instructions were given to the subjects about the exercise protocol. The sessions of these exercise protocol were conducted for 35 minutes/4 days/week. Pre and post test was assessed for lumbar lordotis angle and abdominal muscle strength using flexible ruler and pressure biofeedback respectively and the outcome measures were analysed after 1 month.

Result- Statistical analysis for lumbar lordosis angle ($p=<0.0001$) and abdominal muscle strength ($p=<0.0001$) revealed extremely significant difference post intervention. Lumbar lordosis angle in the study population reduced by 2.11 degrees. It also showed that the abdominal muscle strength improved by 5 seconds hold with 40mmHg pressure.

Conclusion- The study results concluded that this exercise protocol was significantly effective in reducing hyper-lordosis of lumbar spine as well as improved abdominal muscle strength.

Keywords- *hyper-lordosis, lumbar lordosis, therapeutic exercises, abdominal muscle strength, flexicurve ruler, pressure biofeedback*

Introduction

Lumbar lordosis is the ventral curvature of the spine formed by wedging of the lumbar vertebrae and intervertebral discs.(1)

Normal lumbar lordosis angle ranges from 30º to 45º (9)

In sagittal plane, lumbar lordosis is a key feature for maintaining balance. (10)

The balance of the muscles around the pelvis is an important factor in maintenance the lumbar lordosis. Because of relationship between the sacrum and the pelvis through the spine, any change in the biomechanics of sacro-pelvic region leads to changes in spinal curvatures, especially the lumbar lordosis.(3)

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Various anomalies are caused in the lumbar and pelvic regions when body balance is affected by any increase or decrease in lumbar curvature.[4]

Figure 1: Lumbar Spine

With normal lumbar lordosis, energy expenditure and stress on the supporting structures is minimised when balance is maintained between the lumbar spine and abdominal musculature.

Normally, the abdominal muscles rotate the pelvis posteriorly and, the erector spinae muscles tilt the pelvis anteriorly. Correct activation of muscle or groups of muscles results in normal compressive and tensile forces occurring at the lumbar spine. There are minimal stresses placed upon the intervertebral disc and the zygapophyseal joints with lumbar spine in neutral position. Hence chances of low back pain are minimal. [5]

Line of gravity lies slightly posterior which causes extension of lumbar spine. Anterior longitudinal ligament and iliolumbar ligaments as well as, the anterior fibres of the annulus fibrosus of the intervertebral disc and zygapophyseal joint capsules provide passive opposing forces which are necessary to counteract extension of lumbar spine. Active opposing forces are also provided by abdominal muscles which is necessary to counteract extension at the lumbar spine. [6]

Lumbar curvature carries the upper body weight and transfers it directly to the pelvis, which is of great significance. The structures in the lumbar region are one of the factors that affect the lumbar-pelvic balance, as well as the performance of lumbar lordosis and pelvic tilt [11]. Also, weakness of abdominal, dorsal, and lumbar muscles has been considered as the most common factors increasing the lumbar curvature. [10]

Types of Lumbar Lordosis:

HYPO-LORDOSIS:

When the lordotic angle of lumbar spine is less than 30º it is termed as hypo-lordosis. [9]

In hypo-lordosis there is over-compression of the intervertebral discs anteriorly with posterior displacement of the nucleus pulposus.

The zygapophyseal joints are in a close-packed position with lumbar spine extension, therefore with a hypolordotic lumbar spine, the zygapophyseal joints are distracted as a result of its anatomical orientation and also due to the decreased load on the zygapophyseal joints posteriorly. [5]

There will be stretching of the lumbar spine extensors and the posterior lumbar spine ligaments whereas shortening of the abdominal muscles and the anterior longitudinal ligament in hypo-lordotic lumbar spine. [6]

Hyper-Lordosis:

When the lordotic angle of lumbar spine is more than 45º it is termed as hyper-lordosis. [9]

In hyper-lordosis there is compression of the posterior vertebral bodies and the posterior zygapophyseal joints since they are in a close-packed position, which increases intervertebral disc pressure and narrowing of intervertebral foramina. There is excessive stretching of the anterior longitudinal ligament and abdominal muscles while shortening of lumbar spine extensors, posterior longitudinal ligament, interspinous ligaments and ligamentum flavum.[5]

With a hyper-lordotic lumbar spine posture there is impaction of the zygapophyseal joints. The resultant alteration in the spinal biomechanics results in decreased range of motion of the lumbar spine. The inflammation from the dysfunction phase of the degenerated intervertebral disc along with the decreased range of motion results in the hypersensitivity of proprioceptors and nociceptors in the intervertebral disc, ligaments, joint capsules, zygapophyseal joints and nerves. This hypersensitivity initiates a reflexogenic response thereby inducing muscle spasm.[7]

Following are some causes for hyper-lordosis:

- Bad posture
- Obesity
- Lack of exercises
- Sedentary lifestyle
- Shifting of line of gravity during pregnancy
- Use of footwear with high heels

Hyper-Lordosis Because of Bad Posture:

Lumbar posture in females is thought to compensate for the bipedal obstetric load during pregnancy and is based on a longer series of dorsally wedged vertebrae in the lumbar spine.[8]

Changes in postural patterns have been indicated as a risk factor for developing pain in the lumbar region, since abnormal posture causes tension in the ligaments and muscles, which indirectly affects the lumbar curvature, thus triggering pain.[9]

Hyper-lordosis can be corrected with exercises. Exercises should be such that hip flexors and back extensors will be lengthened and abdominal muscles and hip extensors will be strengthened.

Therapeutic Exercises:

Therapeutic exercise is the systematic, planned performance of bodily movements, postures, or physical activities intended to provide a patient/client with the means to-

- Remediate or prevent impairments.
- Improve, restore, or enhance physical function.
- Prevent or reduce health-related risk factors.
- Optimize overall health status, fitness, or sense of well-being [12]

In treatment of lumbar pain, therapeutic exercises are considered for strengthening lumbar muscles and increasing lumbar flexibility and maintain lumbar lordosis. [13][14]

Therapeutic exercises which specifically include lumbar stabilisation exercises have shown beneficial results in treatment of chronic back pain. [15]

These exercises mainly focus on increasing dynamic stability and lumbar muscle strength.[16][17]

So, this study tried to analyse the changes in lumbar lordosis angle following the implementation of exercise protocol which focused towards correcting its biomechanics.

Materials and Methodolgy

Type of study- Experimental study. Sample size- 46

Study duration- 6 Months Place of study- Karad

Inclusion Criteria-

- Age group 20 to 25 years.
- Lumbar lordotic angle more than 45°(hyper-lordosis) derived using Youdas et al trigonometric method.

Exclusion Criteria-

- Subjects with any congenital spinal deformities.
- Subjects with a history or current status of spinal fracture.
- Subjects who had surgical procedures related to spine.
- Pregnant females.
- Subjects who are physically disabled.

Outcome Measures:

Flexible Ruler:

The measurement of lumbar curvature (lumbar lordosis angle) was done using flexible ruler.

- The method that was used for characterizing the curvature of the low back was referred to by Youdas et al as the trigonometric method.
- Based on the trigonometric method, measurements of curvature was derived by using the

formula, $\theta = 4\arctan(2h/L)$, where d is the depth of the curve at its midpoint and l is the length of the line connecting the end points of the curve.

Pressure Biofeedback Unit:

Measurement of abdominal muscle strength was done by using Chattanooga Pressure Stabilizer™ with subjects in crook lying position and pressure biofeedback unit (PBU) was placed under the lumbar spine at L3 level, right below the umbilicus and it was inflated to 40 mmHg.

The individual was instructed to "Take a breath in and as you exhale, gently draw your navel in towards your spine". Individual was asked to maintain abdominal contraction for as long as they can while maintaining a pressure of 40mmHg on the Pressure gauge. The time duration of the hold was measured.

Procedure-

Subjects fulfilling the inclusion and exclusion criteria were included. Informed consent form were taken from each of the subject prior to the treatment. The motive and procedure of the study were thoroughly explained to the subjects participating. Instructions were given to the subjects about the exercises.

Lumbar lordosis angle and abdominal muscle strength were measured before and after the exercises by using Flexible ruler and pressure biofeedback respectively.

The therapeutic exercises were performed for 40 minutes with proper rest intervals.

The sessions of these exercises were conducted four times in a week for four weeks.

Statistical Analyses

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

Age Distribution :

Table No. 1: LUMBAR LORDOSIS ANGLE-

Minimum	Maximum	Mean	Standard deviation
20	24	22.2	0.66

Table no. 2 : ABDOMINAL MUSCLE STRENGTH:

	Pre-test		Post-test		p value	t value
Lumbar Lordosis Angle	Mean	SD	Mean	SD		
	46.71	1.29	44.6	1.08	<0.0001	15.91

Table no. 3

	Pre-test		Post-test		p value	t value
Abdominal Muscle Strength	Mean	SD	Mean	SD		
	8.58	1.22	12.3	2.09	<0.0001	9.84

Result

Statistical analysis for lumbar lordosis angle (p=<0.0001) and abdominal muscle strength (p=<0.0001) revealed extremely significant difference post intervention. Lumbar lordosis angle in the study population reduced by 2.11 degrees. It also showed that the abdominal muscle strength improved by 5 seconds hold with 40mmHg pressure.

Discussion

This study "Effect of therapeutic exercise protocol in asymptomatic individuals with hyper-lordosis of lumbar spine." was conducted to analyse the effect of therapeutic exercise protocol which focused on normalising lumbar lordosis in asymptomatic hyper-lordotic individuals. Hyper-lordosis is considered as a predisposing factor for low back pain. Weakness of abdominal muscles and hip extensors leads to increase in lumbar lordosis angle as well excessive anterior pelvis tilt. Bad posture, obesity, use of footwear with high heels and sedentary lifestyle cause alterations in lumbar curvature and surrounding musculature. So it is necessary to maintain normal biomechanics of lumbar spine so as to reduce the chances of low back pain.

So this study was conducted to find out best therapeutic exercise protocol which focus mainly on normalising lumbar lordosis angle and strengthening of abdominals muscles.

The objective of this study was to analyse the effect of therapeutic exercise protocol which included posterior tilting of the pelvis along with strengthening of abdominal muscles on hyper-lordosis of lumbar spine. This study was conducted with 46 subjects. Subjects included were within the age group of 20 to 25 years and lumbar lordosis angle measuring more than 45^0 with flexicurve ruler derived using Youdas et al trigonometric method. Subjects with any congenital spinal deformities, any history or current status of spinal fracture, subjects who had surgical procedures related to spine, pregnant females and physically disabled were excluded from this study.

Prior informed consent was taken. They were explained with the necessary information before handing them with the forms. The forms used consisted 2 sections firstly demographic data and information about the subject and outcome measure, secondly the consent form. Subjects with lumbar lordosis angle greater than 45 degrees were taken for this study. The outcome measures used in the study were flexicurve ruler and pressure biofeedback apparatus. Pre assessment was done with flexicurve ruler and pressure biofeedback apparatus and values were taken. Subjects were informed about the therapeutic exercises to be performed. A session of 35 to 45 minutes was conducted four times a week for four weeks. Post assessment was done and values were noted. Values were measured to study the effect of therapeutic exercises.

The age group included in this study was 20-25 years. The mean of the age group was 22 years and standard deviation was 0.66.

Pre-test mean of lumbar lordosis angle was 46.71 and standard deviation was 1.29. Whereas, post-test mean was 44.6 and standard deviation was 1.08. p value was <0.0001 and t value was 15.91. Inference was extremely significant.

Pre-test mean of abdominal muscle strength was 8.58 and standard deviation was 1.22. Whereas, post-test mean was 12.30 and standard deviation was 2.09. p value was <0.0001 and t value was 9.84. Inference was extremely significant.

This study showed that lumbar lordosis angle in the study population reduced by 2.11 degrees. It also showed that the abdominal muscle strength improved by 5 seconds hold with 40mmHg pressure. This study showed that the therapeutic exercise protocol which focused on normalising lordosis of lumbar spine as well as strengthening of abdominal muscles are equally effective.

Conclusion

It was found that therapeutic exercise protocol focusing on posterior pelvic tilt was effective in normalising lumbar lordosis angle and improving abdominal muscle strength. Hence it is concluded that this exercise protocol shows effectiveness in reducing hyper-lordosis of lumbar spine in asymptomatic individuals.

Lumbar lordosis angle in the study population reduced by 2.11 degrees. It also showed that the

abdominal muscle strength improved by 5 seconds hold with 40mmHg pressure.

Therefore, it is concluded that this exercise protocol with posterior pelvic tilt is effective in reducing hyper-lordosis of lumbar spine as well as improving abdominal muscle strength in asymptomatic individuals.

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Conflict of Intrest: The author declares that there is no conflict of interest concerning the content of the present study.

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A Comparative Study of Impact of Education on Occupational Performance and Quality of Life in Professional Science Courses

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Abstract

Background: Education has become one of the clearest indicators of life outcomes such as employment, income and social status, and is a strong predictor of attitudes and well-being. The top most among professional oriented courses are Medicine and Engineering. Medical Education is perceived as being stressful, and a high level of stress is caused by strenuous medical programs, which may have physical and psychological effects on the well-being of medical students. Engineering students take half-yearly examinations, as compared to the annual examinations taken by medical students which leads to a higher prevalence of stress among engineering students.The aim is to compare and study the Impact of Education on Occupational Performance and Quality of Life in Medical students and Other Science Professional Course (Engineering).

Method:135 individuals (70= medical field & 65= engineering field) were screened from different colleges of Nagpur city. A convenient sample of 100 students (male & female) from different colleges were divided into 2 groups of 50 each - Group A: Medical stream and Group B: Engineering stream. The subjects were asked to fill up the OPHI-II and WHOQOL-BREF questionnaire.

Results: On the OPHI-II scale, the engineering students have better occupational identity and occupational settings as compared to the medical students whereas the occupational competence showed no significant difference in both the fields. On the WHO Quality of life-BREF scale, the physical health and psychological domains shows no significant difference in both the fields; whereas the social relationship and environment domains show significant difference in both the fields.

Conclusion*:* There is an impact of education on the Occupational Performance and on Quality of Life in students of both the fields. On the OPHI-II scale, engineering students have better occupational identity and occupational settings in comparison to the medical students. On the WHOQOL-BREF scale, engineering students have better quality of life in social relationships and environmental domain in comparison to the medical students.

Key words: *OPHI-II, Occupational Performance, Quality of Life, Education stream*

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Introduction

Education has become a one of the clearest indicators of life outcomes such as employment, income and social status, and is a strong predictor of attitudes and well-being. Education enhances a person's social identity. The top most among professional oriented courses are

Medicine and Engineering.

Medical Education is perceived as being stressful, and a high level of stress is caused by strenuous medical programs, which may have physical and psychological effects on the well-being of medical students.Medical students are overloaded with a tremendous amount of information. They have a limited amount of time to memorize all the information studied. The overload of information creates a feeling of disappointment because of the inability to handle all the information at once and succeed during the examination period. Over 55,000 students graduate as doctors every year.[1] Many medical students struggle with their own capacity to meet the demands of medical curriculum. The students have to face life-threatening situations and also attend the clinical postings and handle patients from third year itself which is assumed to affect the occupational performance and quality of life of the students.

Engineering is the application of scientific knowledge and mathematical methods to practical purposes of the design, analysis, or operation of structures, machines, or systems.[2]Engineering students take half-yearly examinations, as compared to the annual examinations taken by medical students. The higher frequency of examinations lead to a higher prevalence of stress among engineering students. All India Council for Technical Education reports, 60% of 1 million engineers graduate every year.[1] The final year students face various stressors like getting good campus placements, train well for job market, enhance communication skills and up-to-date knowledge about new technology, more burdens of mini- & mega-projects that have to be submitted in the final year which eventually affect the occupational performance and quality of life of the students.

Occupational Performance is the ability to perceive, desire, recall, plan and carry out role, routines, tasks and sub-task for the purpose of self-maintenance, productivity, leisure and rest in response to demands of the internal and/or external environment. Occupational Performance Roles are patterns of occupational behaviour composed of configurations of self-maintenance, productivity, leisure and rest occupation. There are various standardised scales for the evaluation of occupational performance, out of which Occupational Performance History Interview (OPHI-II) Version 2.1 is the latest scale.[3][4]

The Occupational Performance History Interview (OPHI-II) Version 2.1[3][4] is based on Model of Human Occupation. It is a semi-structured interview which is organized into the following thematic areas:

- Occupational Roles
- Daily Routine
- Occupational Settings (Environment)
- Activity/Occupational Choices
- Critical Life Events

The second part of the OPHI-II is composed of the three rating scales. They are:

- **Occupational Identity Scale**- measures the degree to which a person has internalized a positive occupational identity.
- **Occupational Competence** Scale - measures the degree to which a person is able to sustain a pattern of occupational behaviour that is productive and satisfying.
- **Occupational Settings (Environment)** Scale - measures the impact of the environment on the client's occupational life.

WHO defines Quality of Life as individuals' perception of their position in life in the context of the cultural and value systems in which they live and in relation to the goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, level of independence, social relationships, personal beliefs and their relationship to salient features of their environment.[5]

There are various standardised scales to assess the quality of life, some of which are disease specific, health related, etc. Whilst the WHOQOL-100 allows a detailed assessment of individual facets relating to quality of life, it may be too lengthy for some uses, therefore WHOQOL-BREF has been developed to look at domain level profiles which assess quality of life. The structure of the WHOQOL-BREF focus on a four domains solution: Physical, Psychological, Social Relationships, Environment. [5]

Stress is a complex, dynamic process of interaction between a person and his/her life. Although it is a stimulus and response, it is a process in which we perceive and cope up with threats and challenges around us.

Methodology

Design:

Type of Study:A Comparative Study

Inclusion Criteria:

1. Both Male and Female
2. Age Group [21-27yrs]
3. Medical and engineering students of 3rd and Final year, Trainees and students pursuing PG course

Exclusion Criteria:

1. Students from other professional stream
2. Participants who are under treatment or were taking medications of any Psychiatric illness.
3. Students unwilling to participate in the study

Materials:

Process:

For collection of normative data 135 individuals (70= medical field & 65= engineering field) were screened from different colleges of Nagpur city. A sample of 100 individuals (50 each from both science professional fields) were included in the study. With the ethical consent, complete details of the purpose of the study was explained to the individual. The subject was selected only if they fulfilled the inclusion criteria needed for this study. The subjects were asked to fill up the OPHI-II and WHOQOL-BREF questionnaire.

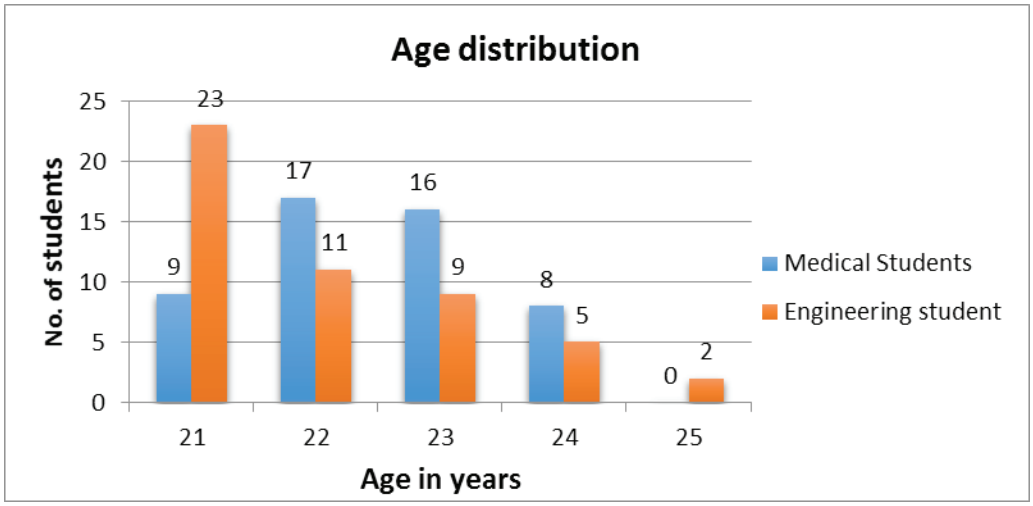
A convenient sample of 100 students (male & female) from different colleges were divided into 2 groups of 50 each-

Group A: Medical stream

Group B: Engineering stream

Results and Discussion

This study was conducted in Occupational Therapy School and Centre, GMCH, Nagpur with a random sample of 100 normal individuals from different colleges of Nagpur city.



Graph no.1: Age distribution of medical and engineering students

In Graph 1, among the engineering students, 46%, 22%, 18%, 10% and 4% were of 21,22,23,24 and 25 years of age respectively; whereas among the medical students, 18%, 34%, 32% and 16% were of 21, 22, 23, and 24 years of age.

Table No.1: Comparison of Occupational Performance History Interview scores

OPHI-II Sub scales	Medical student		Engineering student		t-value	p-value
	Mean	SD	Mean	SD		
Occupational Identity	58.1	10.79	64.74	14.0	2.6553	0.0093,HS
Occupational Competence	59.2	12.59	64.24	15.08	1.6629	0.0995,NS
Occupational Settings	58.96	13.70	72.24	18.73	4.0444	0.0001,HS

Table no.1 describes the **comparison** of all the three components [Occupational Identity, Occupational Competence and Occupational Settings (Environment) scales] of the **Occupational performance history interview-II** of medical and engineering student.

The engineering students have better **occupational identity** in which the t-value is 2.6553 and p-value is 0.0093 as compared to the medical students. The reasons can be apart from personal problems, the medical students have huge syllabus and annual examination, long clinic and college hours, difficulty in understanding subjects, no proper lunch breaks, lack of sleep due to night shifts and latenight studies which affects their attention span, memory, judgement. Clinical presentations and maintaining 80% attendance are the other stressors which add to the poor performance of these students. In engineering, the examination pattern is half yearly, the students have timly assignment submissions, proper college timings with lunch breaks and enough time for preparing for their exams. The study by*Vidya D. C., Swetha N., Thirunaaukarasu D., Gladius Jennifer H., Karthikeyan E, concluded that* the prevalence of perceived stress among medical students was 76.8% as compared to 75% of engineering students.[6] This study is in accordance with the study by Pratibha M. Vaidya and K.P. Mulgaonkar, published in The Indian Journal of Occupational Therapy: Vol. XXXIX: No. 1 (April 2007-July 2007); which concluded that there is considerable amount of stress and anxiety in medical students.[7]

The engineering students also have a better occupational settings in which the t-value is 4.0444 and p-value is 0.0001 as compared to the medical students. The reasons being that medical students have to work in compromised hospital environments and for long hours, getting exposed to various infectious diseases, lack of time management leads to less interaction with the family, friends and social gatherings, no time for their leisure hobbies. The study by Michal Avrech Bar, and Tal Jarus, published in International Journal of Environmental Research and Public Health. 2015 Jun: 12(6): 6045-6065; concluded that Occupational performance affects mental health and life satisfaction. The research also indicates that social support has a direct effect on physical health and life satisfaction and an indirect effect on mental health.[8]The results also supports many theoretical models that state that the environment affects participation and occupational performance of a human being. [9]

Table No. 2: Comparison of WHO Quality of life- BREF of medical and engineering students.

Domain	Medical student		Engineering student		t-value	p-value
	Mean	SD	Mean	SD		
Physical health	66.64	11.56	63.0	14.40	1.3933	0.1667,NS
Psychological	68.64	12.41	66.08	10.61	1.1081	0.2705,NS
Social Relationship	63.44	13.35	70.86	15.41	2.5725	0.0116,S
Environment	67.38	13.49	72.96	12.33	2.1579	0.0334,S

Table no. 2summarizes the mean scores of WHO-QOL BREF of medical and engineering students. The physical health and psychological domains show no significant difference in both the fields with t-value 1.3933 and 1.1081 and with p-value 0.1667 and 0.2705, respectively; whereas the social relationship and environment domains show significant difference in both the fields with t-value 2.5725 and 2.1579 and with p-value 0.0116 and 0.0334, respectively with engineering students having better social relationships and environmental settings. The reasons can be because of various co-curricular activities, cultural/tech fests happening in engineering colleges which give students a chance to showcase their talents and hobbies and also interact with various students from different geographical regions. They all have well structured and organised buildings for their lectures and practicals with latest technologies which adds to their better quality of life. Whereas, in medical students, the lack of sleep, hectic schedules, long clinical postings, etc all makes it difficult to maintain social relationships. A qualitative study by Marcus Henning, Christian Krageloh, et al., showed that the medical students face numerous challenges during their medical journey which affects their quality of life during these years. [(10)]

This in accordance with the article by Mario Ivo Serinolli and Marcia Cristina ZagoNovaretti[(11)] justifies that the effects of socio demographic factors, physical traits, and religious beliefs on the quality of life of medical students may facilitate improvements in physical, psychological, and social support for medical students at a critical stage in their training, thereby providing tools for student better adjustment to medical school.

Conclusion

It can be concluded that –

1. There is an impact of education on the Occupational Performance and on Quality of Life in students of both the fields.

2. On the OPHI-II scale, engineering students have better occupational identity and occupational settings in comparison to the medical students. The occupational competence were equal among both the fields.

3. On the WHOQOL-BREF scale, engineering students have better quality of life in social relationships and environmental domain in comparison to the medical students.

Limitation:

1. Small sample size.

2. The study was restricted to a specific geographical area (Nagpur city).

3. The study was conducted on a limited age group.

Future scope:

1. A pre- and post-intervention study using various coping strategies to improve occupational performance and quality of life will be more effective.

2. Suggestions to the academic council to modify the current curriculum of the courses.

Conflict of Interest: NA

Source of Funding: NA

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

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Early Physiotherapy Intervention of a Patient with Acute Intermittent Porphyria-A Single Case Study

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Abstract

Background: The Porphyrias are metabolic disorders, each resulting from the deficiency of a specific enzyme in the heme biosynthetic pathway. Acute intermittent porphyria (AIP) is an autosomal dominant inborn error characterized by decreased activity of porphobilinogen (PBG) deaminase leading to increased levels of haem precursors, namely amino levulinic acid (ALA) and PBG. The major manifestations of theacute hepatic porphyrias are neurologic- neuropathic abdominal pain, peripheral motor neuropathy, and mental disturbanceswith attacks often precipitated by steroid, hormones, certain drugs, and nutrition influences.

Purpose: Intensive care measures and a multidisciplinary therapeutic approach are essentialbut thereis less documented evidence are available.If this aspect is incorporated early in the rehabilitation programme, then the functional recovery in such will be better.so the aim of the study is to find how Early Physiotherapy intervention using Comprehensive need based Approach to improve the functional status of porphyria patient.

Key Points of Case: A 17 years old male patient wasdiagnosed with acute intermittent Porphyria. Having the history of abdominal pain since last 3 months with family history of AIP which was diagnosed very late. A detailed Physical and Neurological examination of this patient was taken. Along with medical treatment, early physiotherapy intervention using comprehensive need base approach was being given to the patient. The Barthel Index was taken to assess the functional status of the patient and Berg Balance Scale was taken to assess balance on admission and subsequent follow-ups. Post-intervention follow-ups were taken at 6 weeks and 12 weeks period.

Conclusion: A clinically significant improvement was found on Barthel Index and Berg Balance Scale. Early Physiotherapy intervention using a Comprehensive need based Approach is highly recommended to improve the functional status of a patient with porphyria

Keywords: *Acute intermittent porphyria, Barthel Index, Berge Balance Scale, Early physiotherapy intervention.*

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Introduction

The porphyria is arare inherited group of metabolicdisorders, occurs due to the deficiency of a specific enzyme in the heme biosynthetic pathway. These enzyme deficiencies are inherited as autosomal dominant or recessive traits.[1]

Its prevalence is 2-3 cases per 100000 persons per year. Though it is not much reported in India, but the Prevalence rate is high inthe communities of western Rajasthan like Kumar and Maheshwari.2, [3]

There are mainly two types of porphyria hepaticor *erythropoietic* classified on the basis of primary site of overproduction and accumulation of the porphyrin precursoror porphyrin, in the heme biosynthesis and may have overlapping features also. [1]

Acute intermittent porphyria is the second most common form of porphyria characterized by a deficiency of the porphobilinogen deaminaseenzymewith autosomaldominant traits.[4, 5]

The main Manifestations of AIP are neurovisceral symptoms such as pain in abdomen (85-95%) which is severe and poorly localized, vomiting (50%), constipation (50%), peripheral neuropathy (42-68%), seizures (10-16%), delirium, coma and depression. Autonomic disturbances may manifest as urinary retention, paralytic ileus, restlessness, tremor, excessive sweating, tachycardia, and labile.Complications like bradycardia and sudden death have also been reported.[6, 7]

An attack of acute intermittent porphyria may be precipitated by one of the "four Ms": medication, menstruation, malnutrition, mala-Dies.Some drugs are absolutely contraindicated during acute porphyria so patients are recommended to wear an 'alert bracelet' or other identification at all times.So, in case of emergencies the identification of patient becomes easy for health care professionals.[8]

Diagnosis of AIP is confirmed by detection of porphyrin or porphyrin precursors in freshly voided urine.Classic burgundy red discoloration of long stored urine is also a clue.Quantitative measurements of PBG and ALA in urine or erythrocyte HMBS enzyme test are more reliable confirmatory tests. [9]

Haemin therapy is the only licensed therapy for symptomatic patients with acute porphyria. Removal of precipitating factors, treatment of underlying infection, a carbohydrate diet. I.V. dextrose in high doses (300-500 g/day) blocks induction of the enzyme and prevents accumulation of precursors. Heme acts by depressing the ALA synthetase enzyme. The symptoms improve readily on heme therapy generally within 24 hours. [10]

Various Physiotherapy approaches to rehabilitation have been developed to enhance motor recovery and to achieve functional independence in patients. The theoretical background and treatment strategies of the various approaches are very different. Thus, need based comprehensive approaches could be used to enhance the functional independence in the patient.

To facilitate early and better prognosis of AIP; medical management should be continued along with early interventions using need-based approaches of physiotherapy.

Case description:

History and examinations:A 17-year-old male patient with the family history of AIP complaints of abdominal pain since last 3 months for which he was hospitalized for 4-5 days. The patient experienced 1-2 episodes of the same every month. So, he was again hospitalized where all investigations were done. USG, Endoscopy, Blood and urine tests were done. On the basis of investigations, he was diagnosed with AIP, and was treated symptomatically. Later patient experienced abdominal pain and had an episode of convulsion for which he was taken to Emergency department and treated.

Investigatory findings:

Positive: PBG (Porphobilinogen)&- 5-ALA (Amino levulinic Acid)

MRI: Focal Bilateral symmetrical non-enhancing abnormal signal intensity lesions involving Bilateralcapsulo-ganglionic regions , Bilateral temporal & frontal lobes with leuko-malacic cystic change involving external capsule, internal capsule & sub-cortical white matter of temporal lobes on both sides.

On examination: Respiratory Rate was 20/min and regular, Heart Rate was 100/min and Blood Pressor-100/70 mmHg, Cold hands & feet with frequent episodes of perspiration.

- Level of consciousness: vegetative state.
- Pathological reflex: Tonic Labyrinthine Reflex

- Supine dominant.

· Postural deviation: Right scoliosis at thoraco-lumbar region.

· Generalized wasting of whole body.

· Tone in the muscles appeared fluctuating with deep tendon reflexes brisk and Babinski's sign - positive.

· Ankle Clonus present and Choreo–athetoid type of involuntary movement was present.

· Muscle twitching present at multiple muscle groups of body.

Description of outcomes: The Barthel Index was taken to assess the functional status of the patient. The Barthal Index hasan excellent reliability, validity, and sensitivity.[11]and Berg Balance Scale was taken to assess balance. It has high (r=0.95) intrarater and inter-rater reliability.[12, 13]on admission and subsequent follow-ups. Post-intervention follow-ups were taken at 6 weeks and 12 weeks period.

Description of Intervention:

Physiotherapy interventionwas given to this patient by using differentcomprehensive need based approaches–

Ø Conductive education approach- Family & parental education &counseling regarding relapes and medication.

Ø Neuro developmental therapy–Proper positioning -To prevent abnormal posture, abnormal reflex patterns, contractures & deformity, bedsores and promote development of correct joint alignment, synergy & comfort.

Ø For prevention of secondary complications like Respiratory complications – Patient is given postural drainage followed by suctioning and good Breathing exercises,for Deep vain thrombosis prevention-passive movements of lower limb. For prevention of Bedsores &other skin eruptions – advice for maintaining good hygiene and frequent change of positioning and use of water bed.for prevention of Contractures & deformities –full range passive movements and use Night splint was adviced.

Ø Rood's Approach-Improve arousal through sensory stimulation.Multisensory stimulation was used through auditory,olfactory , gustatory ,visual , tactile , kinesthetic & vestibular stimulations.

Ø Early transition to sitting postures was given as soon as patient was medically stable.

Ø Motor Relearning programme of car and shepherd- Patient is given Task – oriented activities to achieve functional activities

Ø Dietary advices given infirm of high carbohydrate.

Ø Advices on discharge –To do exercises regularly in correct manner, Proper positioning, eye care, oral care , catheter care ,trecheostomy care and maintain proper hygiene.

Table -1 Summary of values on BI AND BBS

	Barthal Index	Bearg Balance Scale
ON ADMISSION	0	0
AT 6 WEEK	70	35
AT 12 WEEK	100	56

Discussion

Primary aim of the study was to see how Early Physiotherapy intervention using Comprehensive needbased Approacheshelp in improving functional status of porphyria patient. Adetailed Physical and Neurological examination of a 17 years old male was taken The Barthel Index and BBSwas taken on

admission and subsequent follow-ups. Post-intervention follow-ups were taken at 6 weeks and 12 weeks period. A clinically significant improvement was found on Barthel Index and BBS

The possible recovery might be because of hemin therapy because Albumin-bound heme rapidly enters hepatocytes, increasing amount of functional cytochromes also increase amount of functional tryptophan pyrrolase and to replete the heme pool that regulates activity of ALA Synthesis. [14]Another study provides strong evidence that prophylactic heme therapy, through a multi-disciplinary approach, decreases the incidence of acute attacks, decreases health care costs and leads to better patient satisfaction and quality of life.[15]

Different therapeutic approaches have been used to enhance the functional recovery of patients

1) Rood's Approach-Improvement in arousal level could be due to the use of Rood's approach.

Based on available literature, Facilitation or inhibition of proprioceptors, exteroceptors, and vestibular stimulation excited the cortical level and give motor recovery. Autonomic nervous system stimulation, another component of Rood's approach can also stimulate the motor activity of vital organs as well as the skeletal muscles.[16]

2) Bobath Approach- Postural correction in patient was might be because of using Bobath approach in form of proper positioning during sitting, standing and lying as Intervention strategies and techniques for Bobath consist of therapeutic handling, facilitation, and activation of key points of control. Which was taken care during every exercise. Therapeutic handling is used in order to influence the quality of the patients' movements and incorporates both facilitation and inhibition.[17,18]

3) Motor relearning Approach -The motor relearning approach promotes the regaining of normal motor Skills through task-oriented practice with appropriate feedback and the active participation of the patients.This therapy increases the functional use of the neurologically weaker extremity through massed practice of functional activity with task performance.[19-21]

4) Conductive education is built on the assumption that the damage to the central nervous system which causes motor dysfunction can be overcome by using specialized learning strategies and that the nervous system can generate new neural connections. Education is designed to teach individuals how to complete daily tasks such as reading, eating or speaking in practical situations. The situations, be it at home in an educational setting, present opportunities for a patient to learn in real-world environments.[22]

Conclusion

A clinically significant improvement was found on Barthel Index and Berg Balance Scale. Early Physiotherapy intervention using a Comprehensive need based Approach is highly recommended to improve the functional status of a patient with porphyria

Ethical Clearance –Taken from institutional advisory board.

Consent: Written informed consent was taken from the patient.

Conflict of Interest: Nil

Source of Funding: Self

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Star Excursion Balance Test as an Exercise to Improve Static and Dynamic Balance in Community-Dwelling Persons with Unilateral Osteoarthritis of Knee

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Abstract

Knee joint stability is important for postural stability.Abnormal weight distribution is common in individuals with unilateral osteoarthritis of knee (OA knee) as compensatory mechanism for pain and joint malalignments. Various forms of conventional physiotherapy interventions have been used to prevent further degenerative process. Star excursion balance test (SEBT) has been invented to assess dynamic postural stability. This present study was aimed to investigate effects of SEBT as a postural control exercise training tool(SEBTx) in persons with unilateral OA knee. Fourteen participants were randomly assigned to control group (n = 7) and SEBTx group (n = 7). The control group received weekly routine physiotherapy interventions (joint mobilization, ultrasound therapy, transcutaneous electrical nerve stimulation, and taping). In addition to the routine interventions, the SEBTxgroup was instructed to perform SEBTxfor 30 min/session, 3 sessions/ week, for 4 weeks. Primary outcome (weight distributionon posturography in 8 directions – anterior, Rt. anterolateral, Rt.lateral, Rt. posterolateral, posterior, Lt. posterolateral, Lt. lateral, Lt. anterolateral)was measured at baseline and4 weeks post-intervention. Secondary outcomes numeric pain rating scale (NPRS) and Timed Up and Go test (TUG) were used to assess pain and dynamic balance, respectively. Results showed thatweight distribution inSEBTx group significantly improved in the Lt. posterolateral and posterior directions post-intervention. Moreover, NPRS in SEBTx group significantly reduced from 47.9±7.4 to 33.3±6.0. Lastly, TUG significantly reduced from 13.5±0.9 to 11.5±0.7 s in SEBTx group. In conclusion, the SEBTx should be applied to improve postural balance in individuals with unilateral (OA knee).

Keywords:*osteoarthritis of knee, star excursion balance test, dynamic postural control, Timed Up and Go, knee pain*

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Introduction

Knee joint stability is important for postural stability of the entire body.[1]Therefore, accumulative abnormal biomechanical knee joint loading essentially leads to afferent somatosensory dysfunction in osteoarthritis of knee (OA knee), resulting in postural sway.[2, 3]Postural

sway inOA kneeis attributed to lack of accurate proprioceptive feedback.[3]When knee proprioception is altered, proprioceptive input is compensated by foot and ankle mechanoreceptors.[4, 5]Moreover, an inter-limb weight-bearing asymmetry is also observed as off-loading mechanism on affected knee.[6] Thisincreases risk of further damage, particularly on the unaffected side.[7]For this reason, treatments of postural sway would be useful to persons with knee OA.[8]

Balance training exercise was reported to improve OA knee patients' abilities in controlling posture. In this way, strengthening exercises and dynamic balance training can improve ability to balance in OA knee patients.[9, 10]Previous studies showed that dynamic balance training showed improvement in postural sway in diabetic nephropathy patients.[11]Star excursion balance test (SEBT) has been commonly used for assessing dynamic postural stability.[12]The test consists of a person balancing on one leg and repeatedly performing single-leg squat movements to use the non-stance leg to reach maximally along one of eight diagonal lines, each at 45º intervals from each other.[13] Participants are instructed to touch all 8 lines 6 times before measurements were made. Interestingly, a study showed that these repetitive movements result in sensorimotor learning from vestibular, visual, and somatosensory feedbacks.[14] Therefore, this present study was aimed to investigate effects of SEBT as a postural control exercise training tool (SEBTx) on static and dynamic postural balance and pain level in persons with unilateral OA knee.

Materials and Methods

Human subjects

Fourteenparticipants with unilateral OA knee from neighborhood community were allocated to control group (n = 7) and SEBTx group (n = 7) after being assessed for eligibility. Inclusion criteria were OA knee according to the American College of Rheumatology (ACR) clinical classification criteria for OA knee, ability to write and speak Thai, and informed consent. Exclusion criteria were cognitive impairmentand uncontrolled cardiovascular diseases.

Baseline Assessments

The community-dwelling subjects were evaluated for years of knee pain, number of falls in 1 year, and other demographic data. The data of the completed subjects are shown in Table 1. The subjects were re-confirmed for the OA knee with the ACR clinical classification criteria.

Intervention and exercise procedures

Both control and experimental groups received weekly routine physiotherapy interventions (joint mobilization, ultrasound therapy, transcutaneous electrical nerve stimulation, and taping when appropriate). In addition to the routine interventions, the SEBTx group was instructed to perform SEBTx.[12] Directional mapping of SEBTxand other details were described.[15] The SEBTx was performed for 30 min/session, 3 sessions/week, for 4 weeks.

Outcome Measurements

Primary outcome – weightdistribution used as a proxy of static postural sway machine was measured with biofeedback posturography (Fig. 1). The machine consisted of load cell transducerscollecting frequency of weight distribution for 10 s in 8 directions. A processor (node micro-controller unit, NodeMCU) received signals from the transducer-connected hx711 amplifier. The data were displayed on the Raspberry Pi. The monitor showed frequency of weight distribution in each direction proportionally to body weight. Secondary outcomes – 100-point numeric pain rating scale (NPRS) and Timed Up and Go test (TUG) were used to assess pain and dynamic balance, respectively.[16]

Statistical Analysis

If not specified otherwise, the data are expressed as mean±SEM. Normality of sample data was tested by Kolmogorov-Smirnov test. Means of two dependent groups were compared by Wilcoxon signed-rank test. The level of statistical significance was $P<0.05$. All data were analyzed by IBM SPSS v.26.

Results

Baseline Assessments

Fourteen patients completed the program (control, n = 7 and SEBT, n = 7). All s*ubjects*had unilateral knee pain. All basic demographic data are shown in Table 1.

Star excursion balance exerciseimproves static postural stability in a patient with OA knee

In clinical setting, the SEBT is a series of 8 lower-extremity–reaching tasks purported to be useful in identifying lower extremity functional deficits. Here we used the SEBT as the exercise and found that it reduced the static postural sways in the left anterolateral (0.6±0.1 to 0.0±0.0) and posterior directions (5.4±1.0 to 0.0±0.0) (Fig. 2B). Meanwhile, none of the post-intervention static postural sways were changed in the control group (Fig. 2A)

Star excursion balance exercise reduces pain

The numeric pain rating scale (NPRS) in control was not changed (62.9±4.3 to 54.3±5.5 in baseline and post-intervention, respectively), but significantly reduced from 47.9±7.4 to 33.3±6.0 in the exercise group (Fig. 3A).

Star excursion balance exercise improves dynamic balance during walking

The TUG developed by Podsiadlo and Richardson is a method for evaluating for the dynamic balance during walking.[17]In control group, post-intervention TUG was not significantly different from baseline (17.25±1.5 vs 15.7±1.7 s in baseline and post-intervention, respectively). In contrast, the TUG statistically reduced from 13.5±0.9 to 11.5±0.7s in exercise group(Fig. 3B).

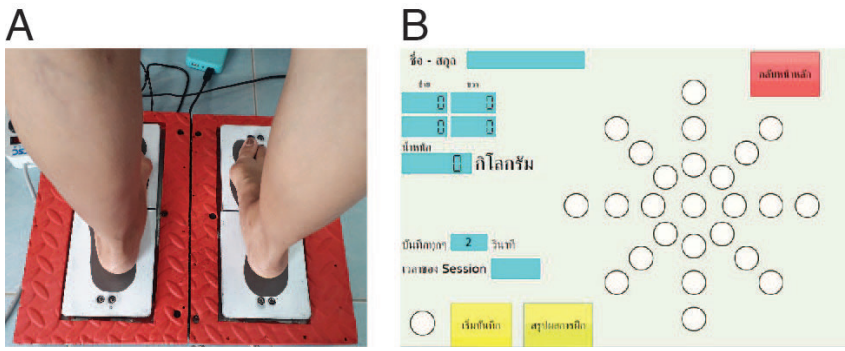

Figure 1Measurement ofstaticpostural stability in a patient with OA knee on the biofeedback posturography machine (A).Directional mapping of the biofeedback posturography machine. 1, Anterior; 2, Rt.Anterolateral;3, Rt. Lateral; 4, Rt. Posterolateral;5 Posterior; 6 Lt. Posterolateral; 7, Lt. Lateral; 8, Lt. Anterolateral (B).

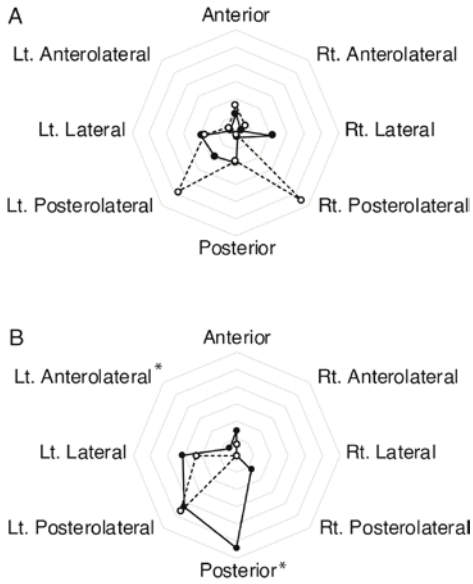

Figure 2Mean of frequency of weight distribution at baseline (0-week, solid line) compared to 4-week post-intervention (dotted line) in control (A) and SEBTx (B) groups. *P<0.05 compared to respective baseline.

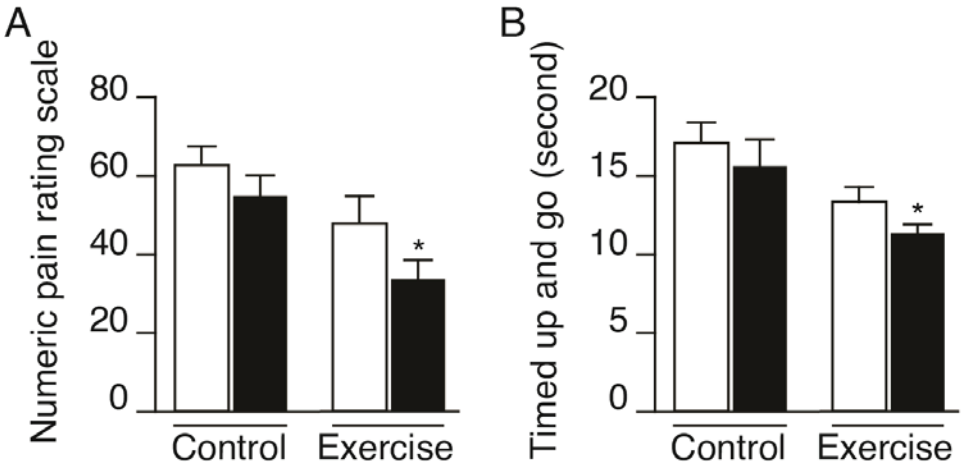

Figure 3Level of numeric pain rating scale at baseline (white bar) and 4-weekpost-intervention (black bar) in control and SEBTx(exercise) groups (A). Timed Up and Go at baseline (white bar) (B). *P<0.05 compared to respective baseline.

TABLE 1Basiccharacteristics of subjects at baseline

Variable	Control	Exercise
Age (years)	57.6 ± 2.5	62.6 ± 2.4
Years of knee pain	3.3 ± 1.0	2.5 ± 0.5
Number of falls in 1 year	0.7 ± 0.3	1.3 ± 0.5
Gender Male Female	 0 7	 1 6
Height (cm)	153.2 ± 1.2	156.4 ± 1.6
Weight (Kg)	59.9 ± 1.9	62.0 ± 2.5
BMI (Kg/m2)	25.5 ± 0.9	25.5 ± 1.2

Discussion

This present study shows that the star excursion balance exercise improves postural and dynamic stability and reduced pain in persons with unilateral osteoarthritis of knee. Our conclusion is based on the following findings: (*1*) The exercise ***reduces***the standing postural sways. (*2*) The exercise reduces time spent for the TUG test**. (3) *T***he exercise reduces pain level**.**

Postural sway has been used to characterize deficits of postural control system during quiet stance.[3, 18] The

postural stability involves coordinated functions of sensorimotor system including muscle activities and mechanosensation in joint capsule.[19] It can be insinuated that the SEBTx augmented postural stability in OA knee by means of activating foot muscle activities and knee joint mechanosensors.

On two-barefoot standing, healthy older individuals had higher plantar pressure on the anterior halves of the feet than the posterior ones (approximately 6:4 ratio).[20] In contrast, this present study found higher plantar pressure on the posterior halves. Moreover, we also found positive effects of the SEBTx on the plantar pressure distribution, especially in the posterior parts of the feet. A previous study showed that SEBTx activated electromyogram signals of tibialis anterior, peroneus brevis, and gastrocnemius muscles. The tibialis anterior activity was particularly activated during posterior-oriented SEBT reaches.[21] Moreover, the tibialis anterior was also highly correlated with improved postural stability after balance board exercise.[22] Therefore, an improvement of the plantar distribution in the present study might be attributed to the enhanced activity of tibialis anterior muscles.

The joint capsule has 4 types of joint receptors in different areas – free nerve endings (pain receptors), Golgi tendon organ (GTO)-like receptors (proprioceptors), Ruffini corpuscles (stretch receptors), and Pacinian corpuscles (mechanoreceptors).[23-25]All these joint receptors maintain normal joint sensation.[26]However, only the Pacinian corpuscles sense mechanical stress and provide afferent information on joint position and velocity.[27]Moreover, functions of these mechanoreceptorare impaired in OA knee.[28]Additionally, TGFβ1-mediated inflammation in OA knee might lead to intra-articular ligament dysfunctions.[29]Therefore, further study might be beneficial to investigate whether the SEBTx exercise probably stimulate mechanical functions of the Pacinian corpuscles through inhibition of TGFβ1-mediated pathway.

Effects of exercises on pain reduction have been widely studied. Takacs and co-workers reported that balance training program improved and numeric pain rating scale (NPRS) in the persons with OA knee.[10]It has been shown that long-term exercise reduced pro-inflammatory substances including substance P and interleulin-6.[30]Mechanistically, the SEBTx exercise might reduce pain scale through neuromodulation system.

Dynamic balance during walking in community is challenging for the persons with OA knee.[31] In this present study, the post-intervention dynamic balance improved in the exercise group as measured by the TUG. Our finding was in line with UzunkulaoGlu et al.who recently illustrated that the balance training with tandem movements improved from 13.2 to11.2 s.[32]Moreover, the time spent for TUG in the present study was lower than those previously reported fall risk cut-off points .[33,34]

In conclusion, these findings suggested that 30-minute SEBT exercise training 3 times/week for 4 weeks was efficient to improve static and dynamic balance in the persons with the unilateral OA knee. Further study should invest more time per training session to see if it can fall rate per year.

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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Navicular Position in Plantar Fasciitis: A Cross Sectional Study

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Abstract

Background: The foot is a complex structure with multiple functions like weight bearing, propulsion and shock absorption. Plantar fasciitis is an important public health disorder and most of the population may have such a presentation at some point in their lifetime. Abnormal weight-bearing, standing for prolonged periods can cause excessive loading on the plantar fascia causing heel pain. Navicular positions may have an impact on the fascia hence this study intended on assessing the navicular position in subjects with plantar fasciitis.

Methods: Written informed consent was taken from all subjects. 49 subjects were recruited for the study of which 46 were females and 3 were males. The navicular height was measured using a goniometer.Descriptive statistics were used for calculation of percentage values.

Conclusion: Our study concluded that subjects with plantar fasciitis did not have a navicular drop. Majority of the participants had a high arch. Future studies should include larger sample size and also consider recruiting all genders equally for optimal results.

Key Words: *Plantar fasciitis, navicular height, flat foot.*

Introduction

Plantar fasciitis (PF), typically a localized inflammatory condition of the plantar aponeurosis is a common cause of inferior heel pain.[1] One out of 10 people in the United States experiences a persistent pain due to PF.[2] Studies have highlighted the importance of plantar fascia in forming a part of the passive mechanism that can modify the arch stiffness in relation to the load applied. It is also responsible for the windlass mechanism which aids in forward propulsion during gait. There are numerous local and systemic factors that can produce plantar heel pain but the diagnosis is based on clinical sy9limptoms. Pain over the medial tubercle is the most accepted clinical symptom.[3]

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There is a close relationship of flat foot and navicular drop. Biomechanical factors such as pescavus, foot pronation, calcaneal valgus and flat foot can lead to PF. In case of flexible flat foot the subtalar joint remains pronated which can lead to chronic subluxation. Consequently, the forefoot is abducted and talus and navicular are depressed.[4] This mechanism might stretch the plantar fascia which in turn might contribute in developing PF.Excessive and repeated loading of the plantar fascia is believed to be the most common cause of PF. Hence treatment strategies to reduce the excessive strain on the plantar fascia must be used to facilitate recovery of the PF.[5] Treatment techniques like stretching, counter strain techniques, icing, use of orthosis etc. have been used to treat the symptoms of PF. Also, approximately 85%-90% patients with symptoms can successfully be treated without surgery.[6]

Flat foot can be assessed by measuring the navicular drop. Navicular drop can be assessed by measuring the navicular position. The head of first metatarsal, navicular

tuberosity and a point at the Achilles tendon are marked. The position of the navicular bone can be measured with the centre of the goniometer on the navicular tuberosity and the arms of the goniometer on the head of the first metatarsal and the marking on the Achilles tendon, respectively.[7]This study hence aims at identifying the navicular position in plantar fasciitis.

Methodology

SAMPLE POPULATION- Patients diagnosed with PF.

STUDY DESIGN- Cross- sectional study

SAMPLING TECHNIQUE- Purposive sampling

SAMPLE SIZE AND SAMPLING PROCEDURE

$n = Z2\alpha\ p(1-p)$

$e2$

The above formula has been used to calculate the sample size.

$p = 10.5/1000$

$Z\alpha = 1.96$ at 95% C.I

Error (e) at 3%

Sample size (n) = 45

Inclusion Criteria

Patients with PF

All genders

Age group between 18-60yrs

Exclusion Criteria

Foot injury or bony pathology

Ligament injury at or around the ankle

Degenerative or rheumatoid arthritis at the ankle

Musculoskeletal deformities of foot and ankle

Measurement Tools

Goniometer

Outcome Measure

Navicular drop test

Procedure

Ethical clearance was obtained. Based on the inclusion and exclusion criteria, subjects were recruited for the study using purposive sampling. Written informed consent was taken from all the subjects. After obtaining consent, a brief introduction about the study was given to the subject. The navicular position of the affected limb was assessed using the navicular position test. The head of first metatarsal, navicular tuberosity and a point at the Achilles tendon were marked. The position of the navicular bone wasmeasured with the centre of the goniometer on the navicular tuberosity and the arms of the goniometer on the head of the first metatarsal and the marking on the Achilles tendon, respectively.

Statistical Analysis

Descriptive statistics were used for calculation of percentage values.

Results

Statistical analysis was done using descriptive statistics. SPSS version was used.

Table 1: Population with navicular drop

	Low arch	High arch
PLANTAR FASCITIS	3(6.1)	46(93.9)
% within NAVICULAR POSTION RANGE	100.0%	100.0%

Discussion

The current study aimed finding out the percentage subjects withnavicular drop in those diagnosed withPF. One of the assumptions of this study was that subjects with PF may have a flat foot. The plantar fascia functions to provide support and maintain the height and shape of the medial arch and hence is considered to be an important structure in the foot.[8] A flat foot cannot optimally perform the task of weight bearing. Due to excessive pronation of the foot, the toes are forced into

dorsiflexion which in-turn places tremendous stress on the plantar fascia. This is also known as windlass mechanism. Also, in cases of flexible flat foot, the foot fails to lock and remains pronated during gait. This leads to abnormal weight bearing which in turn leads to subluxation of talocalcaneal joint over a long period of time. This subjects the plantar fascia to inflammation or microtears when running or walking.

In this study, 49 subjects were assessed for navicular drop, out of which 37 were females and 12 were males. Out of the 49 subjects, only 3 were found to have a navicular drop while the rest had a high arch. This study concludes that subjects with a high arch had a higher chance of developing PF when compared to subjects with a flat foot. Conversely, a study conducted by Huang Y[9]et al concluded that subjects with a flexible flat foot had a higher incidence of developing PF when compared to the normal arch group. This difference in the results may be attributed to smaller sample sizes included. Future studies may need to include larger sample sizes to come to consensus. Also, in the current study, the number of males and females recruited were not even. Only 12 males were recruited, while the rest were all females. Future studies should recruit equal samples to give optimal results as sex differences can have an association with foot posture and foot pain[10].

Conclusion

In conclusion, subjects with PF did not have a navicular drop. Hence there is a need for future studies to be conducted to establish an association whilst using larger sample sizes to confirm it. Also equal males and female subjects need to be recruited to check for gender differences.

Conflict of Interest: Nil.

Ethical Clearance: Ethical clearance was obtained from Father Muller Institutional Ethics Committee.

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Effect of a Comprehensive Loop System on Whole body Exercises Using Elastic Bands

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Abstract

Background:- Strength is the capability of the neuromuscular system to produce force against an external resistance.[1] Muscular performance is regarded as one the significant component in quality of life. Strength training helps to increase the muscular tension which eventually increases the muscular performance.[2] The repeated and consistent resistance training strengthens the muscles.[3] Most of the studies shows the effect of elastic resistance training with short term interventions on muscle strength(isotonic elastic resistance training) and have shown positive outcomes[4]. This is the first study investigating on increase in the strength of concentric, eccentric , as well as isometric muscle contraction and also, as a whole body exerciser with targeted muscle and group muscle training. In this study we lack the knowledge on how elastic resistance training affects the muscle strength in upper and lower body. Therefore, it is important to know if this comprehensive loop system, as a special training variable, could improve the strength in adult healthy individuals. This study will help to determine the effect of comprehensive loop system on whole body exerciser using elastic bands, and assess if four weeks of training are sufficient to change upper and lower limb strength.

Methodology:- Total 30 subjects were included in the study. All the subjects are healthy individuals were included from orthopedic departments, physiotherapy OPD, physiotherapy clinics, sports academy. Demonstration of the test with help of video and test trial was given in order to gain confidence and break their fear. Latin square design chit was made and participants were asked to randomly pick up the chits. Subjects has to follow the same order of the test from in order to avoid learning bias. They were assessed for push-up test and squat test for strength before and after the training. And a four weeks training protocol was taken to assess the upper and lower limb strength respectively.

Result:- There is a positive increase in the strength of the muscle which was checked using the push-up and squat test for upper limb and lower limb respectively. With increase in the counts of push-up test (o.ooo) pre and post training session and with the squat training ($p>0.05$) pre and post training session, there is a subsequent positive increase in the strength gain of an healthy individual.

Conclusion:- There is significant change in the muscle strength after four week of elastic training protocol of healthy adult individuals. Therefore, the tool kit is helpful as a whole body exerciser as well as a specific targeted muscle exerciser to increase a individual muscle strength and to improve the way of exercising without any hindrance in the aspects of space and heavy machine.

Keywords:- *Resistance tubes, strength training, whole body exercise, squats, pushups.*

Introduction

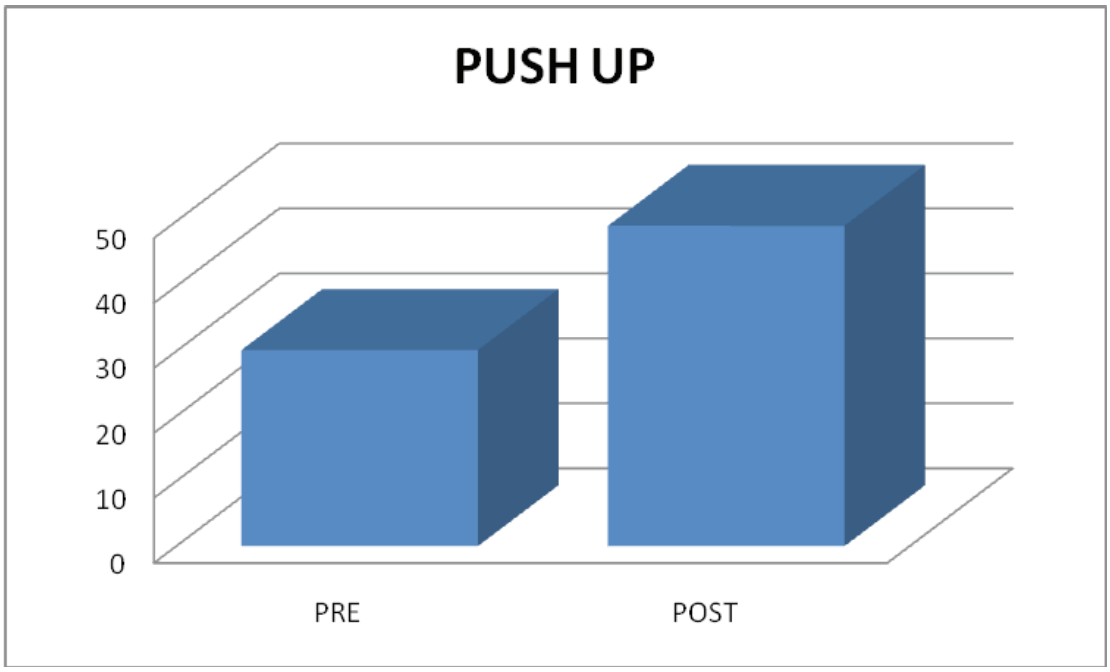
Strength is the capability of the neuromuscular system to produce force against an external resistance.[1] It is the ability to create muscle tension. Muscular performance is regarded as one the significant component in quality of life[1]. Strength training helps to increase the muscular tension which eventually increases the

muscular performance.[2] Resistance training is the use of resistance of muscular contraction to build the strength, anaerobic endurance and size of skeletal muscles.[2] It is the principle that muscles of the body will work to overcome a resistance force when they are required to do so.[3] The repeated and consistent resistance training strengthens the muscles.[3] Strength training is important to improve functional activity to increase strength and performance. By stressing your bones, strength training increases bone density and reduce the risk of osteoporosis.[4] A well- rounded fitness program includes strength training to improve bone, joint function, bone density, muscle, tendon and ligament strength, as well as aerobic exercise to improve your heart and lung fitness, flexibility and balance exercises.[5] The full-body workout can help you progress and is easy to fit into your schedule. Among, the other factors, muscular strength is considered as the most significant component which is reduced by aging.[6] Decreased muscular strength can bring about various problems and complications such as increased risk of chronic diseases, intensified risk of fall, lack of dependence and ultimately, reduced quality of life.[7] The performance of an athlete is affected severely with various other complications. Reduced strength also accounts for muscle weakness, reduced muscle mass and decreased resistance exerted by the body hampering various aspects of the training program and reducing capacity of the body.[8]

Methods

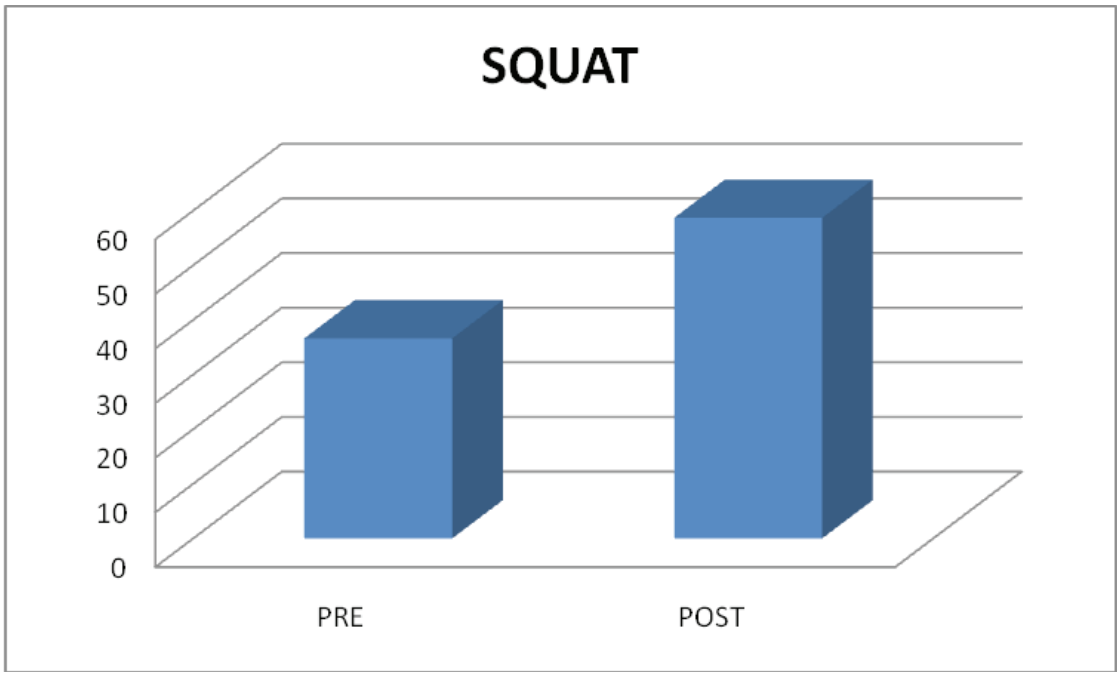
30 participants as healthy individuals are included in the study with inclusion criteria as Amateur sportsmen/Healthy individuals with no musculoskeletal /neurological/cardiovascular impairments. To avoid performance bias as it is a new instrument and studies are not performed on such instrument before and after the phase one of the too exercise. A four week protocol was followed where in the upper limb and lower limb exercises with resistance bands are performed. Training sessions of 4 days per week were given for four weeks. This training was carried out at DR. D.Y.Patil college of Physiotherapy.

Data Analysis and Interpretation:



Graph no. 1: Pre and post push up test data analysis.

Interpretation: According to the graph no.1 there was a significant increase with the count of push up was seen after the protocol regimen. This suggests that the exercise regimen with resistance helps in increasing the strength of an individual.



Graph no.2: Pre and post squat test data analysis.

Interpretation: According to the graph no. 2 a significant increase in the count of squats were recorded pre and post. This suggests that the exercise protocol for squat with resistance tube had a positive impact and increased the strength for lower extremities.

Results

In this study, 30 healthy individuals were taken. The study suggest a significant increase in the pre and post values of the push up and the squat test. The mean value of the push up test recorded (29.87). and the mean difference recorded was 18.93 and the t-value for the pushup test -16.85 with a significant p value ($p>0.05$). Similarly for the squat test the mean calculated was 58.37 with a standard deviation of 8.66 shows a significant increase in the squat recording pre and post of the training sessions with a p value significant as (>0.05) and concluded with an increase in the muscular strength. By applying wilcoxin signed rank test the comparison of pre and post training session was made and a significant increase in the strength gains was seen.

Discussion

The present study was done to determine the effectiveness of the loop system as a whole body exerciser using elastic bands. Resistance exercise using elastic bands has been used as an important intervention for increase in the strength of upper limb and lower limb respectively. The findings of our study is in accordance with positive effects on muscular strength gain from the use of elastic tubes.

A study was conducted on effect of short term elastic resistance training on muscle mass and strength in older adults with push-ups by Ricardo Jaco et.al did not found any significant increase in the mass and the strength whereas our study showed an increase in the muscular strength which was tested by push-ups test and a significant gain and strength of the muscles can be seen after a four weeks protocol regimen.[9]The findings for the push-up by calatyud et.al who reported that push-ups performed with resistance band exercise were equally effective to bench press in activating the prime-movers however, as push-ups is a relatively heavy body weight exercise, the comparsion component accounts for a smaller change than In our study which could explain that the strength using the loop system has effectively increased and has shown an improvement in the strenghth of an individual with solely using the resistance tubes.[10] These study results were similar to a study conducted by Micheal R. Guigan et.al on effect of elastic bands on force and power characteristics during back squats exercise which stated a significant increase

in the force and power of the muscle gained, as compared to this study shows the increasing strength of the muscle while performing the squats.[11]

However, the elastic tubes helpful in resistance training (the kit) is more easily available and affordable exercise kit for the adult population. Also this tool is practically low cost and travel-friendly.[12] No interuuption in the exercise protocol can be seen due to its versatile features. One of its most versatile characteristic is the portability that allows training programs in outdoor situations.[13] In additon, overload training stimulus could be self-regulated by the use of the colour-code (elastic tubes with different dimensions and forces) and corresponding to target muscle training protocol.[14]

This study on whole body exerciser using elastic bands found that the strength and the potential of an individual increased during the training sessions. Also the functional capacity is said to be improved with the resistance training. The device is useful in strengthening the muscle group as a whole or a targeted muscle as and when required by the individual.

Conclusion

This research study concluded that that there is significant change in the muscle strength after four week of elastic training protocol of healthy adult individuals. Therefore, the tool kit is helpful as a whole body exerciser as well as a specific targeted muscle exerciser to increase an individual muscle strength and to improve the way of exercising without any hindrance in the aspects of space and heavy machine. As a training modality, the relationship between the increase in the push-up and squats with regards to the upper limb and lower limb increasing strength. Nevertheless, it has also shown a positive result with increased strength for the same.

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Conflict of Interest: There was no conflict of interest in this study.

Source of Funding – Self

Ethical Clearance- Done

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Effects of Elastic Tape on Balance Ability in Athletes with Ankle Instability: A Pilot Study

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Abstract

Background: Ankle instability may lead to a loss of stability during the static stateas well asduring movement. Elastic tape may increase balance ability in participants displaying ankle instability.

Objective: Tostudy the effect of elastic tape application on the static state and dynamic balance in athletes with ankle instability.

Method: Ten participants exhibiting ankle instability were included in the study. They received elastic taping at the ankle joint (affected side). The researcher assessed static balance and dynamic balance (the star excursion balance test) before and immediatelyafter the test.

Results: There were no significant differences within the group in terms of static and dynamic balance - except for dynamic balance at the postereolateral direction. However, balance ability showed an increase after taping. These results demonstrate that elastic taping could improve dynamic balance in the posterolateral direction. Moreover, the elastic taping tended to increase balance ability.

Conclusion: Elastic tapemay be employed as an alternative treatment in order to increase balance ability in the posterolateral direction.

***Keywords*:** *ankle instability, elastic tape, balance ability*

Introduction

Knee and ankle injuries are the most frequently occurring sports injuries among athletes.[1] Spraining of the ankleoccurringat 5 - 45 percentof total injuries,commonly leads to ankle instability (AKI)[2], particularly with injury to the lateral tendon of the ankle[3]which leads to injury re-occurrence. ThoseexhibitingAKI experience instability during movement or weight bearing,[4] predominantly in the anterior direction when tested using the Y balance test[5]. Subjects demonstratingankle instability presentdeficits amid both static and dynamic conditions[6].A plethora of methods aimed at treating ankle instability among athletes incorporate medical treatment, i.e.surgery as well as conservative treatment,for instance, physical therapy. Physical therapy integrates a variety of approaches such as exercise to elevateankle stability, modalities to decrease pain, proprioceptive training to increase proprioceptive function, and utilising tapingin order to maintain and enhance sports performance[7]. In a previous study which discussed the effect of employing elastic tape, it was discovered that taping had the ability toenhance ankle instability atthe point of testing via the Y balance test[8]. Although tapingcanboostankle stability, a greater effect onPNFand muscle activation overa focus on ankle support may occurr[9].

Athletic performance however,employs both static and dynamic balance ability. To date this aspect has not been sufficiently studied,hence, the objective of this researchwasto study the effect of elastic tape application

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on static aswell as dynamic balance among athletes displaying ankle instability.

Materials and Methods

Study Population

This study wascross sectional study in design. Subjectswere recruited atBurapha UniversityMuang district, Chonburi province, Thailand. All subjects wereathletes presentingankle instability.

As this was a preliminary study, ten participants (2 women, 8 men; aged21.20±0.44; height 171.7 ± 7.24 cm; weight 70.9 ± 13.81 kg; BMI 23.91± 3.47; leg length 89.05 ± 5.12 cm) exhibiting AI were recruited primarily from athletes withinBurapha University. For the purpose of the study, ankle instability was defined as the Foot and Ankle Ability Measure (FAAM - Thai version)[10]and positive special test. The special test consisted of the Anteriordrawer test and the talar tilt test. Subjects were also required to have had at least one ankle sprain within thetwelve months prior; but not within thesix months preceding testing.

All subjects reported good health, normal body mass index (BMI), no contraindication concerning the elastic taping, no history of pain at thelower extremities, norany orthopedic or neurologic disorders within theprevious 6 months.

Equipment and protocol

The measurements of outcome in this study were assessedviathe star excursion balance tests(SEBT) before and immediately after taping by the same investigators.

The examiner visually demonstrated the SEBT in the antero-medial, medial and postero-medial directions of the star[11], wherebythe SEBT test was conducted inall 8 directions. Volunteers stood barefoot at the center of all 8 directions using the right foot to reach and the left to stand on in orderto test balance. During the test the participant should not place their weight onto the reaching foot when touching the line. Both of the athlete's handsare placed at the hip area. The subject then stretches the other leg as far as they can using the toes. This was done three times in each direction, with a 5 second break between lines, and a ten second break between each set of three reaches. This process was carried out before, and immediately after taping. For each individual, a 20 minute gap was included from taping or removal of tape prior totesting. The same researcher carried out all measurements.

Static balance was evaluated using time to balance loss using single balance tests on stable and unstable surfaces. All tests on theunstable surface were done using a foam pad. They were conducted in eight conditions for each surface: without tape eye-open (EO) on a firm and foam surface, with tape eye-closed (EC), and with tape EO on a firm and foam surface. Participants were asked to stand on the affected foot with hands on hips. The assessor recorded the maximum time for each test.

Elastic tape was applied to the instable ankle. The participant was then set in the prone position. Firstly, the ankle was taped on the side of the lateral malleolus side, then dragged down through the lateral malleolus, passing through the heel to the medial malleolus with a U-shaped pattern and stirrups attached. Both lines were approximately 2/3 tape width, with 75 percent tensile strength. Tape was attached to the inner side of the medial malleolus, then detoured to the outside of the heel, then passed through the heel - back to the end of the lateral malleolus. In addition, further tape was attached to the achiles tendon area, with the two tapes separated by a hole in the muscle. The gastrocnemius medial head incorporated 50 percent tensile strength.

Finally, the subject lies on their back. The foot is then dragged along by the tibialis anterior muscle with 50 percent tension.

Statistics

All data were analyzed using SPSS version 19. Descriptive data was expressed as mean with standard deviation. The paired t-test was implemented to compare balance ability at pre and post- test. A p-value of less than 0.05 was considered statistically significant. All data are presented as mean±standarddeviation.

Results and Discussion

Subjects' demographic and clinical characteristics are shown in Table 1. There were no significant differences within the group

Table 1: Subjects' baseline characteristics.

Characteristic	Participants (n=10)
Age (years)	21.20±0.44
Height (cm)	171.7 ± 7.24
Weight (kg)	70.9 ± 13.81
Body mass index (kg/m2)	23.91± 3.47
Leg length (cm)	89.05 ± 5.12

Dynamic Balance ability

Comparison between volunteer groups before and after thousands of Anterior, Anteromedial, Medial, Posteromedial, Posterior, Posterolateral, Lateral and Anterolateral tape application types revealed that there were no significant differences in all directions - except in the postero-lateral direction. The balance star excursion test outcomesare shown in Table 2.

Table 2Dynamic balance ability comparison before and after elastic taping within the group.

Balance ability in each direction (cm)	Participants (n=10)		P
	Baseline	Immediate reading	
Anterior	80.85±11.81	82.55±13.53	0.51
Antero-medial	89.55±11.76	92.75±11.45	0.17
Medial	93.50±14.32	93.90±13.28	0.84
Postero-medial	80.75±15.96	81.65±14.51	0.77
Posterior	72.35±16.17	76.80±15.26	0.87
Postero-lateral	71.50±17.06	75.60±16.22	0.20
Lateral	66.27±16.92	71.25±15.26	0.02
Antero-lateral	70.95±8.38	71.45±10.29	0.81

Static Balance Ability

Static balance ability is shown in Table 3. There were nosignificant differences in all conditions.

Table 3: Static balance ability comparison before and after elastic taping within the group.

Balance ability in each condition (Second)	Participants (n=10)		P
	Baseline	Immediate reading	
Eyes open on firm surface	24.47±7.52	25.39±6.92	0.12
Eyes closed on firm surface	9.07±8.53	11.69±5.34	0.32
Eyes open on foam surface	11.65±9.67	11.65±5.34	0.77
Eyes closed on foam surface	1.99±.71	2.33±0.61	0.25

Results of the effects of tape conditioning showed more extended static balance ability with tape compared to no tape conditioningamidankle instability, yettherewas no significant difference. This indicates improved balance in subjects with ankle instability due to elastic taping application.

After taping recording, there was an increased change observed in the Star exclusion balance test (SEBT)in all directions. Especially in the posterolateral direction,a statistically significant increase was revealed. Balance ability during static condition was not significantlydifferent in all conditions.

The suggested explanation for improved balance in subjects suffering from ankle instability with the elastic tape application in this study is likely due to improved proprioception of the ankle region.Proprioception is enhanced by the elastic tape due to stimulation of the cutaneous mechanoreceptors. Enhanced proprioception is likely responsible for improved postural control and better response to perturbations[12,13].

The current study showed outcomes that agree with Jackson et al. in that 18 subjects demonstrated balance improvement in 48 hours post KT application, which remained even 72 hours later[19]. Therefore, in this study the test for the immediate effect of the elastic tape on balance abilitymay be insufficientto represent the true effect of taping.

This study observed significant enhancementof dynamic balance in the posterolateral direction. For this reason, elastic taping may increase ankle stability. Moreover, participantsexperienced difficulty in reachingthe posterolateral lateral and posterior positions (table2). For these reasons,participantsexhibited little base support amid the lateral side of the foot. Thus,taping may increase the ankle's lateral stability.

Conclusion

Future studies ought toincorporate a greater number ofparticipants in each group in order to compare different taping techniques. These results demonstrate that elastic taping can improvedynamic balance in the posterolateral direction. Hence, additionaltaping procedures should be comparedin relation to dynamic and static balance.

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Ethical Clearance: this study was a pilot study and conduct with certificated ICH Good Clinical Practice

Conflict of Interest No conflict of interest is declared

Source of Funding Faculty of allied Health Sciences, Burapha University

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Effectiveness of Reverse Pressure Softening of Areola in Women with Postpartum Breast Engorgement

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Abstract

Background and Objectives: Breast engorgement is a frequent problem for lactating mother. It can be extremely painful and may predispose to nipple tenderness, fissures and abscesses. It is associated with termination of lactation.There are many suggested treatments, these interventions alone did not show any significant results.The objective of the research was to study the effectiveness of Reverse Pressure Softening of Areola in postpartum breast engorgement and to determine whether Reverse Pressure Softening of Areola with manual expression of milk and proper latching and breastfeeding techniques are effective as compared to only manual expression of milk and proper latching and breastfeeding techniques.

Methods: 80 subjects with postpartum breast engorgement were randomly allocated in two groups. Group-A (40 subjects) underwent interventions such as correction of breastfeeding and latching technique and manual expression of milk. Whereas in case of group-B (40 subjects) , along with correction of breastfeeding and latching technique and manual expression of milk, this group was given an additional treatment called as "Reverse Pressure Softening of Areola." The outcome was assessed in terms of Numeric Pain Rating Scale (NPRS) and Six Point Breast Engorgement Scale (SPBES) at baseline and immediately post intervention.

Result and Interpretation: The result of the present study demonstrated significant improvement with experimental group.

Conclusion: Both the interventions in control group and experimental group were found to be individually effective in reducing pain and engorgement of breast among women with postpartum breast engorgement. Further, the reduction observed in pain and engorgement of breast was more among the subjects treated in experiment than the reduction observed in pain and engorgement of breast in control group.

Key words*: Postpartum breast engorgement, Reverse Pressure Softening of Areola, breastfeeding and latching technique, manual expression of milk.*

Introduction

Exclusive breastfeeding is defined as giving an infant breast milk from within the first hour after birth and for the first 6 months of life without other food or water.[1] Based on evidence, WHO and UNICE now recommend that every infant should be exclusively breastfed for the six months of life with continued breastfeeding for up to two years or longer. Breastfeeding benefits mothers as well. It can prevent breast cancer, improve birth spacing, and might reduce a woman's risk of diabetes and ovarian cancer.[2]

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1.NUMERICAL RATING PAIN SCALE [NRPS] [16]

NRS for pain is a unidimensional measure of pain intensity in adults. NRS is a segmented numeric version

of the visual analog scale (VAS) in which a respondent selects a whole number (0–10 integers) that best reflects the intensity of their pain. The common format is a horizontal bar or line. The NRS is anchored by terms describing pain severity extremes.

2. SIX POINT ENGORGEMENT SCALE [17]:

The following operational grades are used by breastfeeding mothers to rate breast changes on the six point engorgement scale:

1. Soft, no changes
2. Slight changes
3. Firm, non-tender
4. Firm, beginning of tenderness
5. Firm, tender
6. Very firm and very tender.

Higher the grade severe is the engorgement of the breast.

MATERIAL AND METHOD:

A) **STUDY DESIGN**:

Type of study: Experimentalstudy.

Duration of study: 1 year.

Place of study: Maternity hospitals, metropolitan city.

B) **STUDY DESIGN:**

Sample size: Group A- 40

Group B -40

Sample population: patient with post-partum breast engorgement

Sampling: Convenient.

C) **SELECTION CRITERIA**:

INCLUSION CRITERIA[8, 17]:

· Females with postpartum [day0-14] breast engorgement.

· Age 18-40 years.

· First time breastfeeder [primiparous women].

· Second/more time breastfeeder. [multiparous women]

· vaginal delivery.

· Cesarean section

Exclusion Criteria:

· Mastitis[8]

· Plugged ducts in breast[8]

· Abscesses[8]

· Malignant breast tumor[8]

· Women unwilling to participate

· HIV positive mother[8]

· Mother of baby having sucking anomalies[8]

· Mother undergoing medical treatment for breast engorgement[8]

D) **MATERIAL USED :**

· Consent Form

· Numeric pain rating scale

· six point engorgement scale

· couch

· Gloves

· Notepad

· Pen

PROCEDURE

The **EthicalApproval**

As the study includes human subjects ethical clearance is obtained from ethical committee of K.T.G. College of physiotherapy and KTG Hospital, Bangalore as per the ethical guidelines for Bio-Medical research on human subjects, 2000 ICMR, New Delhi.

Informed Consent

All subjects fulfilling the inclusion criteria were informed about the study. Once the subject agrees to participate in the study, an informed written consent was taken from the subjects.

Procedure:

Subjects were selected according to inclusion and exclusion criteria and randomly grouped as control group and experimental group.

The assessment included demographic data, delivery history and engorgement details. With respect to the study, certain parameters evaluated specifically for both the groups. This involved a subjective and an objective assessment of the engorgement. Both the groups were subjected to common treatment of manual expression of milk and advice on appropriate feeding and latching technique. The experimental group received additional treatment with Reverse Pressure Softening of Areola.

Group A

This was the control group having 40 subjects with postpartum breast engorgement, according to inclusion and exclusion criteria. This group underwent interventions such as correction of breastfeeding and latching techniques and manual expression of breast milk.

Breastfeeding Latching Technique[20]

After obtaining engorgement history, the subject was asked about the feeding history, which included feeding from one or both breasts, latching of the baby to the breast, frequency of feed, duration of feed. Emphasis was given on the latching technique. If faulty, then the mother was taught the appropriate way of getting the baby to form a 'teat

The subject was also explained following points to maintain appropriate posture during feeding.

• Get in a comfortable chair with great back support to feed your baby. Using a stool to rest your feet on will help with good posture and prevent you from straining your neck and shoulders.

• Use your breastfeeding support pillow if you have one. (And if you don't, use whatever kind of pillows you can find to help support you and the baby.) A good breastfeeding pillow can make a huge difference in getting the baby in a proper position to latch on well.

• Make sure your baby is tummy-to-tummy with you at all times.

• Make sure you bring your baby to you, do not try to lean into the baby. Not only will this cause severe strain on your neck and shoulders, but it can affect the baby's position.

• Remember to keep your baby's ear, shoulder, and hip in alignment, which will make swallowing easier.

• The baby's nose should be opposite the nipple.

• You might need to hold your breast to help guide the nipple to your baby's mouth. Grasp the breast on the sides, using either a "C" hold or "U" hold. Make sure to keep fingers far from the nipple so you don't affect how the baby latches on.

• Aim the nipple toward the baby's upper lip/nose, not the middle of the mouth. You might need to rub the nipple across the top lip to get your baby to open his/her mouth.

• The baby's head should be tilted slightly back. You do not want his chin to his chest.

• When he opens his mouth wide with the chin dropped and tongue down, he should latch on to the nipple. If he does not open wide, do not try to shove the nipple in and wiggle the mouth open. It is best to move back, tickle the lip again with the nipple and wait for a wide open mouth.

• Try to get as much of the lower portion of the areola (the area around the nipple) in the baby's mouth.

• The baby's chin should indent the lower portion of your breast.

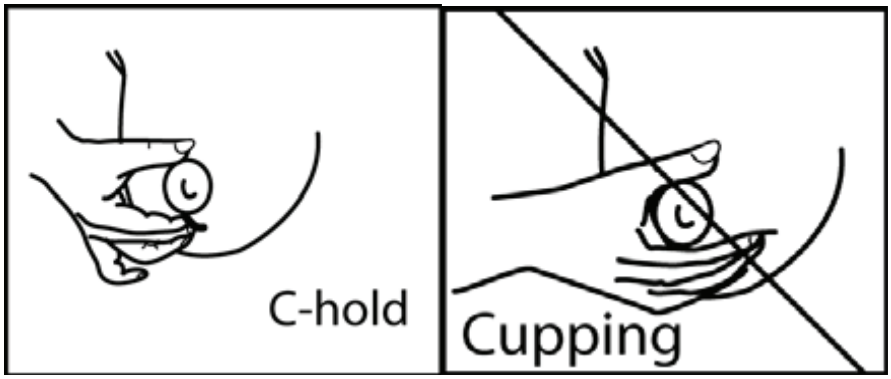
• Look to see if the baby's bottom and top lip are flanged out like fish lips. If they are not, you may use your finger to pull the bottom one down and open up the top one more.

Manual expression of the breast Milk[30]

The subjects were explained about the need for expression of breast milk and asked to follow the same technique during self-expression. Using the Marmet Technique expression was carried out.

Following instructions were taken into consideration to perform Marmettechnique :

1. Position the thumb and first two fingers on the breast about 1" to 1 1/2" (2.5 to 3.75 cm) behind the base of the nipple. The areola varies in size from one woman to another. Place the thumb pad above the nipple at the 12 o'clock position and the finger pads below the nipple at the 6 o'clock position forming the letter "C" with the hand, as shown. This was a resting position. Note that the thumb and fingers are positioned so they are in line with the nipple. Avoid cupping the breast.



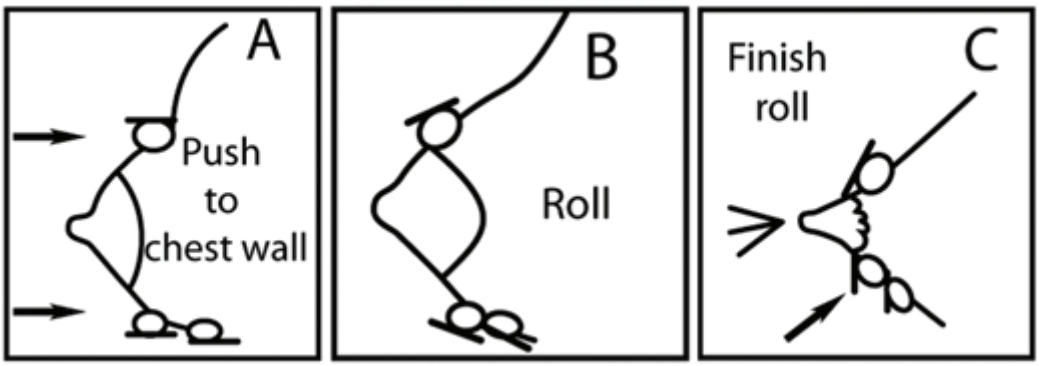
PICTURE 1- C-HOLD PICTURE 2- CUPPING HOLD

2. Push straight into the chest wall. Avoid spreading the fingers apart. For large breasts, first lift and then a push into the chest wall.

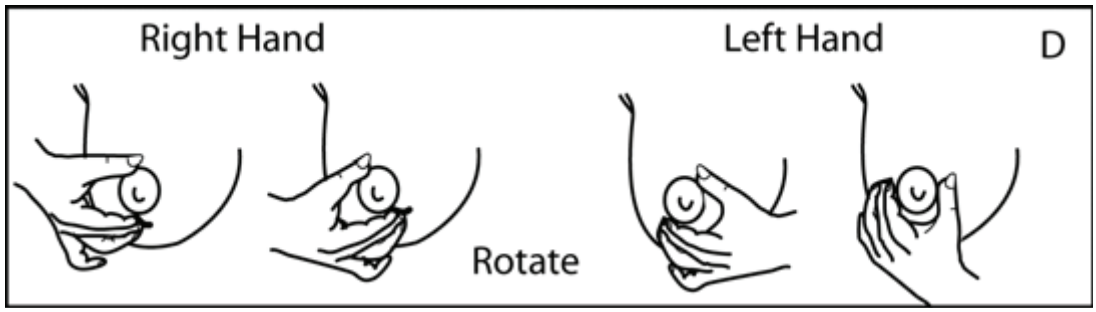
3. Roll thumb forward as if taking a thumbprint. Change finger pressure from middle finger to index finger as the thumb rolls forward. Finish roll. The rolling motion of the thumb simulates the wave-like motion of the baby's tongue and the counter pressure of the fingers simulates the baby's palate. The milking motion imitated the baby's suck by compressing and draining the terminal milk ducts without hurting sensitive breast tissue.

4. Repeat rhythmically to drain the terminal milk ducts. Position, push, roll; position, push, roll.

5. Rotate the thumb and finger position to reach other terminal milk ducts. Use both hands on each breast.



PICTURE 3-STEPS TO PERFORM MERMET TECHNIQUE.



PICTURE 4- ROTATION OF NIPPLE

6. Avoid These Motions:

• Squeezing the breast. This can cause bruising.

• Pulling out the nipple and breast. This can cause tissue damage.

• Sliding on the breast. This can cause skin burns.

Group B

This was the experimental group having 40 subjects with postpartum breast engorgement, according to inclusion and exclusion criteria. Along with interventions such as correction of breastfeeding and latching techniques and manual expression of breast milk as described above, this group was given an additional treatment called as "Reverse Pressure Softening of Areola."

Reverse Pressure Softening of Areola (RPSA)[31]

Following instructions were followed to perform RPSA:

· Position the mother with breast engorgement flat on her back during RPS which delays re-entry of swelling, allowing a longer window of time for latching. Or in sitting position

· Firmly but gently, press steadily on the areola, right at the nipple base.

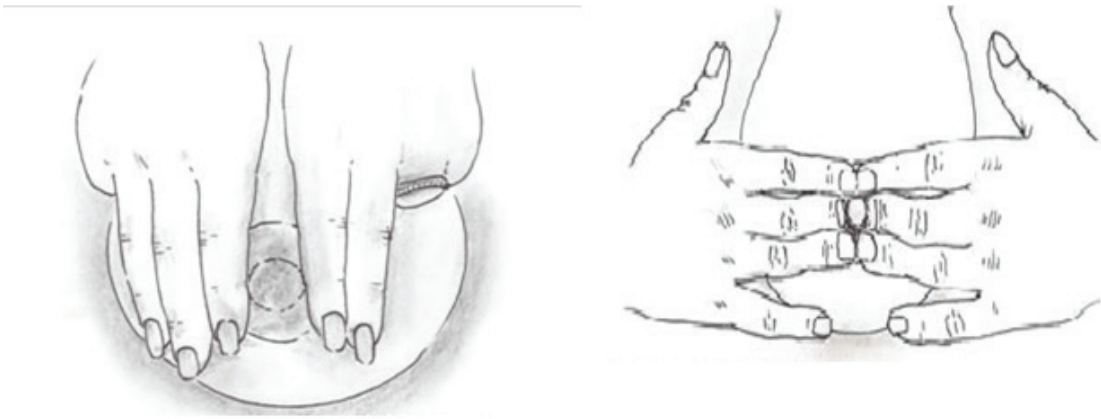
· Pressure should not be firm enough to cause pain. Avoid discomfort with less pressure for longer intervals.

· Press inward toward the chest wall for a full 60 seconds or longer (10-20 minutes or more if needed. This is a good time for instructions.

Use the flats of two thumbs or the first several fingers on each hand lengthwise above and below the nipple, creating a 1-2 inch long depression. Continue to alternate in opposite quadrants, with repeated 2 minute periods of pressure, partially overlapping the first set of pits, to keep oedema displaced from the entire area at the base of the nipple

1. Two handed method: Fingernails short, fingertips curved, each one touching the side of the nipple. Using 2 or 3 straight fingers on each side, knuckles touching nipple. Move ¼ turn above and below nipple.

2. Two thumbs method: Using straight thumbs, base of thumbnail even with side of nipple. Move ¼ turn. Repeat above and below nipple.



PICTURE 5- TWO HANDED METHOD OF RPSA

PICTURE 6- TWO THUMB METHOD OF RPSA

Choosing how to perform RPS depended on the following:

• The angle of access,

• The severity of oedema,

• The length of the fingernails,

• The availability of help for the mother, and her ability to understand directions.

Pre and post intervention evaluation:

For both the groups A and B certain parameters were evaluated pre and post intervention. This involves Numerical Rating Pain Scale [NRPS] as a subjective scale for assessment of pain and Six Point Engorgement Scale as an objective assessment of severity of breast engorgement.

Results

· Both the interventions in control group and experimental group were found to be individually effective in reducing pain and engorgement of breast among women with postpartum breast engorgement.

· Further, the reduction observed in pain and engorgement of breast was more among the subjects treated in experiment than the reduction observed in pain and engorgement of breast in control group.

Discussion

In the present study, 80 subjects with postpartum breast engorgement were randomly allocated in two groups. Group-A (40 subjects) underwent interventions such as correction of breastfeeding and latching

technique and manual expression of milk. Whereas in case of group-B (40 subjects) , along with correction of breastfeeding and latching technique and manual expression of milk, this group was given an additional treatment called as "Reverse Pressure Softening of Areola.." The outcome was assessed in terms of Numeric Pain Rating Scale (NPRS) and Six Point Breast Engorgement Scale (SPBES) at baseline and immediately post intervention.

The result of the present study showed significant improvement with experimental group.Both the interventions in control group and experimental group were found to be individually effective in reducing pain and engorgement of breast among women with postpartum breast engorgement.Further, the reduction observed in pain and engorgement of breast was more among the subjects treated in experiment than the reduction observed in pain and engorgement of breast in control group.

Anticipatory guidance regarding the occurrence of breast engorgement should be given to all breastfeeding mothers before birth center or hospital discharge. In countries where women may have longer hospital stays, engorgement may occur in the birth hospital. However, many women are discharged before the expected time of peak symptomatic engorgement. Mothers should be counseled about symptomatic treatment options for pain control. In addition, contact information for breastfeeding supportive advice should be provided. Healthcare personnel seeing either the newborn or mother after discharge should routinely inquire about breast fullness and engorgement.These techniques are simple and convenient to be inculcated to educate patients in the antenatal and postnatal sessions.

Conclusion

The present study concludes that the interventions in control group and experimental group were found to be individually effective in reducing pain and engorgement of breast among women with postpartum breast engorgement. Further, the reduction observed in pain and engorgement of breast was more among the subjects treated in experiment than the reduction observed in pain and engorgement of breast in control group.

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Immediate Effect of Active Release Technique Versus Muscle Energy Technique in Subjective with Hamstring Tightness: A Rendomized Clinical Trial

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Abstract

Research Topic: To study and compare the effectiveness of active release technique and muscle energy technique in subjects with hamstring tightness.

Method: 60 normal healthy subjects (30 in each group) were recruited in the study under simple randomization method. Group A received single session of Active Release Technique and Group B received single session of Muscle Energy Technique for hamstring tightness. Active knee extension test (90-90 test) were measured pre-intervention and post-intervention. Data was analyzed using t-test.

Results: Statically there is significant ($p<0.05$) effect of active release technique than the muscle energy technique on subjects with hamstring tightness.

Conclusion: A single session of active release technique is better as compared to muscle energy technique to improve hamstring flexibility and range of motion. There for active release technique can be used with conventional techniques in clinical settings.

Keywords*: Hamstring tightness, Active release technique, Muscle energy technique, flexibility.*

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.[1] 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.[2]

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The hamstrings comprise three large muscles namely semi-tendinous, semi-membranous and biceps femoris which originate from the inferomedial impression on the upper part of the ischial tuberosity and gets inserted on the upper part of posterior surface of tibia. They are located in the posterior compartment of the thigh and acts on the hip and knee joint. Hence, they are extensors of hip and flexors of the knee.[3]

The tightness of hamstring muscle is one of the main factors hindering performance in daily activities. Reduction in the flexibility of the hamstring has been reported to increase the risk of damage to the musculoskeletal [4,5] of the Hamstring is important for general health and physical fitness.[6,7]Tightness of these muscles produces decrease range of motion and reduced flexibility of the pelvic, hip and knee joints.[8]

Maintain normal muscle length requires regular stretching to prevent muscle stiffness, decrease risk of musculoskeletal injuries and enhance physical performance. Maintaining the flexibility of hamstring muscle is important for general and athletic population and of utmost importance for health care professionals, to achieve this goal one needs to know the most effective and efficient technique to gain hamstring flexibility.[1]

According to Austin Sports Therapy, the active release technique, or ART, was developed by chiropractor DR. P. Michael Leahy to work on a variety of muscle, tendon, ligament, fascia and nerve issues. According to Austin Sports Therapy, ART treatments involve tension or massage and guided movements. Active release technique therapy for the hamstrings is designed to alleviate pain and tightness and help the hamstring to return to its normal condition.[9]

Muscle energy technique (MET) is an manual technique developed by osteopaths and is now used in many different manual therapy professions.[11]One such approach which targets the soft tissues primarily has been termed as MET and this is also known as active muscular relaxation technique.[10,11] It is claimed to be effective for a variety of purposes including lengthening a shortened muscles, as a lymphatic or venous pump to aid the drainage of fluid or blood and increasing the range of motion.[11,12]

GONIOMETER The instrument, which is used for measuring the range of motion (ROM) of the joint, it's called as goniometer. (In Greek: Gonio: angle, matron: measurement).

To measure a ROM of a Particular joint, the therapist should have a thorough knowledge on the ROM of an individual joint. Selection of goniometer is important factor while measuring the ROM of the joint. The universal goniometer is designed by Mr. Moore. This is the commonest variety having stationary arm, movable arm, and body. The body or axis of the goniometer is placed over the axis of the joint, which has to be measured. The stable arm does not have any motion and is placed over the proximal segment of the measuring joint. The movable arm is aligned with the distal segment of the measuring joint.[13]

Active Knee Extension Test

For AKE test 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. With the foot in neutral position and the knee flexed at 90^0, a standard universal goniometer was placed over the lateral femoral condyle, with 1 arm aligned along the thigh in direction to the greater trochanter and the other arm aligned over the leg in the direction of the lateral malleolus. From this position, subjects were instructed to extend the knee until they felt a strong resistance, holding this final position for 2 to 3 seconds to allow the goniometric reading. The result recorded corresponded to the amplitude, in degrees, of the knee-extension movement, starting from the initial test position (knee flexed at 90^0 which corresponded to the goniometric 0^0)[14]

Need of Study

There are many ways of reducing hamstring tightness but very few techniques give an immediate result. Active release technique and Muscle energy technique are convenient, quick, simple and easy to apply.

There has been a study to find out an immediate effect of Active release technique and Muscle energy technique. However, there was a paucity to compare both techniques and find out their comparative effect on hamstring tightness.

So, this study is an effort to find out the immediate effects of active release technique and muscle energy technique in subjects to improve the hamstring flexibility and also the joint range of motion.

Aim of Study

The aim of present work is to study and compare the effectiveness of Active Release Technique and Muscle Energy Technique in normal healthy subjects with hamstring tightness.

Objective of the Study

1. To find out the immediate effect of Active Release Technique on Hamstring Tightness.

2. To find out the immediate effect of Muscle Energy Technique on Hamstring Tightness.

3. To compare the immediate effect of Active Release Technique and Muscle Energy Technique on Hamstring Tightness.

HYPOTHESIS **Null hypothesis:** There is no significant difference between the immediate effect of Active Release Technique and Muscle Energy Technique on hamstring tightness subjects.

Alternative hypothesis: There is significant difference between the immediate effects of Active Release Technique and Muscle Energy Technique on hamstring tightness subjects.

MATERIAL

- Couch / Plinth
- Foam mattress
- Universal full circle metal goniometer
- Stop watch
- Consent form
- Assessment form
- Pen & paper -

Methodology

- **Study Setting:** Shri U.S.B. College of Physiotherapy, Abu Road

- **Source of data:** Abu road (Rajasthan), Nakhatrana & Lunawada (Gujarat.) - **Study population: Healthy subjects with hamstring tightness young adults.** - **Sample size: 60 Healthy subjects (M & F).**

- Sampling method: Random convenient sampling
- Study design: A Comparative study

Inclusion Criteria

- Age 18-35 years adults
- Gender: Both (male and female)
- Normal healthy subjects
- Minimum 20^0 restriction in SLR unilaterally

Exclusion Criteria

- Any history of lower extremity injury in past 3 months
- UMN and LMN
- Subjects involving in any sports and gymnasium activity
- Unwilling to participate and sign the informed consent

Measurment Procedure

Under convenience sampling, 60 Subjects were recruited randomly, who fulfilled the inclusion and exclusion criteria were taken for study purpose. Written informed consent was signed by the subjects with hamstring tightness before proceeding for the study procedure. Before staring the study a brief assessment was taken. Subjects were explained about the test and procedure to be conducted.

Total 60 healthy subjects with hamstring tightness were randomly allocated to two study groups. Group-A (n=30) received Active Release Technique and Group-B (n=30) received Muscle Energy Technique.

Assessment of tightness of hamstring was measured by using 90-90 test (active knee extension test) before and after the treatment.

Treatment protocol: GROUP-A (Active Release Technique): Subjects received single session of Active Release Technique (ART) on dominant side. There are 3 steps to perform ART. Step 1: Subjects lies supine on the plinth and gentle tension was applied to the hamstring muscle along the entire length while stretching the leg in different positions to better work the muscle. Step 2: Gentle tension was applied at the origin and insertion of the hamstring muscle.

Step 3: Gentle tension was applied around the adductors and gluteus muscle because hamstring connects to these muscles and that could be the source of hamstring tightness.[15]

GROUP-B (Muscle Energy Technique): Subjects received single session of Muscle Energy Technique (MET) on dominant side. The subject's knee was extended to the position where the subject first reported of any hamstring discomfort and moderate isometric contraction (approx. 75% of maximal) of the hamstring muscle was then elicited for a period of five second. After a period of three seconds of relaxation, the technique was repeated three times (for a total of four contractions).[11]

Results and Tables

Data was analyzed by SPSS version 20 for windows. Independent sample t-test was used to find out the effect of ART and MET techniques in 60(male:25 female:35) random convenient subjects with hamstring tightness. In this test t- value for Group A is -14.409 & for Group B is -23.923 and level of significance is 0.001 which is less than 0.05.

Table 1: Showing distribution of age & gender in Group-A & Group-B.

Variable	Group A	Group B
Sex	M-12 & F-18	M-13 & F-17
Average Age (yrs)	23.4±3.9	23.5±5.4

● Interpretation: Table 1 shows gender and age distribution.

Table 2: Descriptive statistics for AKE test

Measures/Group		Pre-intervention		Post-intervention		p value
		Mean	SD	Mean	SD	
AKE-test	Group-A	42.4	11.078	75.633	12.933	<0.05
	Group-B	51.833	8.094	81.2	10.838	<0.05

● Interpretation: The above table 2 shows the descriptive statics for AKE, which shows there was significant difference between the pre and post AKE (p<0.05).

Table 3: Inter-group difference.

Paired Samples Test									
Group		Paired Differences					t	df	p value
		Mean	SD	SD error	95%conf.int.diff				
					Lower	Upper			
Group A	ART	-33.2333	12.571	2.2952	-37.9277	-28.539	-14.4791	29	<0.05
Group B	MET	-29.3667	6.7235	1.2275	-31.8773	-26.8561	-23.9232	29	<0.05

● **Interpretation:** The above table-3 shows the inter group difference calculated by paired t-test which shows significant difference between group A and group B.

Discussion

The intent of the study was to compare the immediate effect of Active Release Technique and Muscle Energy Technique in subjective with Hamstring Tightness.

In present study, when the values of pre-treatment and post-treatment Active release technique and Muscle energy technique were analyzed, it was proved statically significant that Active release technique is more effective than the Muscle energy technique.

Hamstring tightness increases from early childhood and with advancing age other contributing factors like lack of physical activity, prolonged sitting also Play an important role in decreased hamstring flexibility and range of motion.

It was found that there was marked increase in the hamstring muscle flexibility after a single session of active release technique is more than the application of single session of muscle energy technique which stated significant outcomes.

1.Vijay kage and Rakhi ratnam, conducted a study on Immediate effect of active release tech. versus mulligan bent leg raise in subjects with hamstring tightness and concluded that a single session of ART is effective as compared to MBLR to improve hamstring flexibility and ROM.[18]

2. Dixit mohini,samal,subrat, conducted a study on immediate effect of muscle energy technique and active dynamic stretching on hamstring flexibility in healthy female adult of age and concluded that MET resulted in significant improvement as compared to dynamic stretching on hamstring tightness.[17]

3.Mohd.Waseem, shibili nuhmani,and C.S.Ram, conducted a study on efficacy of muscle energy technique on hamstring muscles flexibility in normal collegiate males and concluded that there is significant increase in popliteal angle followed by treatment of MET.[16]

4.**George, James& Tunstall,Andrew &Tepe, Rodger& Skaggs ,**conducted a study on effect of active release technique on hamstring muscle flexibility and concluded single ART treatment increased hamstring flexibility in healthy male patients.[15]

CLINICAL IMPLICATIONS

Results suggests that from both the techniques, single session of Active release technique is more effective than the single session of Muscle energy technique.

LIMITATIONS

● Subjects of 18-35 years of age were considered for study thus results cannot be generalized to all age group.

● Only immediate effect was studied Short and long-term effects were not studied that would have helped to find the maintenance of the improved outcome measures.

● Only AKE ROM was measured.

● Study was done only on normal subjects.

FURTHER RECOMMENDATIONS

● Further study on other techniques in combination with ART or MET needed to find the effect for individual with limited hamstring flexibility.

● Further studies are needed to find the effects of these techniques in conditions with secondary hamstring tightness.

● Further study can be done by using other outcome measures.

● Further study can be done with different sample size.

Conclusion

A significant difference is seen after the application of both the ART and MET techniques. A single session of active release technique is better as compared to muscle energy technique to improve hamstring flexibility and range of motion. There for active release technique can be used with conventional techniques in clinical settings.

Conflict of Interest: Nil.

Source of Fund: No fund was needed.

Ethical Clearance: From Shri USB College of

Physiotherapy, Aburoad, Rajasthan.

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To Compare the Effect of Eccentric Exercise Vs Concentric Exercise when Combined with Wobble Board Exercise on Propriception of Knee Joint after Inducing Fatigue in Quadriceps Muscle

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Abstract

Background: Proprioception, as the perception of positions and movements of the body segments in relation to each other, without the aid of vision, touch or the organs of equilibrium[1,6].

Objective: The main objective of this study is to focus on the difference between the effect of eccentric exercise vs concentric exercise when combined with wobble board exercise on proprioception of knee joint after inducing fatigue in quadriceps muscle.

Study Design: Experimental Study.

Methods: In this experimental studytotal 40 subjects were selected by convenient sampling and divided into two groups. Subjects of both groups were selected according to Inclusion/Exclusion criteria and informed consent were taken from all subjects and methodological protocol was introduced and applied to subjects and statistical analysis is done with the help of unpaired-t test.

Results: There were significant differences seen in that eccentric and concentric exercises with wobble board exercise are very effective in improving proprioception. But eccentric exercise with wobble board exercise has better effect in improving proprioception.

Conclusion: It is concluded that fatigue decreases the proprioception and eccentric exercise with wobble board exercise give better result to improve proprioception.

Key Words: *Proprioception, Fatigue, Goniometer, eccentric and concentric exercise*

Introduction

In 1906, Sherrington defined "Proprioception" as the perception of positions and movements of the body segments in relation to each other, without the aid of vision, touch or the organs of equilibrium[1,6]. The importance of the proprioception in knee function, stability injury prevention has been studied extensively in literatures. Proprioceptors are responsible for the deep sensations. These receptors receive stimuli from muscles, tendons, ligaments, joints and fascia and are responsible for position sense awareness of joint at rest, movement and vibration[2]. Proprioception includes balance, co-ordination and agility because the body's ability to react appropriately to external forces[3].

Balance is defined as person's ability to maintain an appropriate relationship between the body segments and between the body and the environment and to keep the body's center of mass over the base of support when performing a task[9]. It is assumed that some form of muscle spindle desensitization or perhaps ligament

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relaxation and Golgi tendon desensitization occurs with excessive fatigue which leads to decreased efferent muscle response and poorer ability to maintain balance[10].

It is believed that the Central Nervous System (CNS) links together afferent propriocep- tive feedback from multiple joints of a limb segment and redundancy of the afferent information can be used as an "error check" to improve proprioceptive feedback in order to maintain function.[1,4] Reproduction ability is decreased; possibly due to increased sensitivity of capsular receptors from muscle fatigue-induced laxity[8]. The assessment of potential injury risk before sports participation followed by intervention may decrease the relative injury incidence in athletes. The integrity and control of the proprioceptive acuity is essential for the maintenance of balance[1,5.]

In humans, the effect of fatigue on proprioception has been investigated at various joints. For the shoulder joint, Voight (1996), Carpenter (1998) concluded the proprioceptive acuity following fatigue has been shown to be reduced Sterner and co-workers (1998) showed that the force capacity of the subjects was rapidly reversed after the fatiguing protocol used, suggesting that the fatigue state was not deep and long-lasting, which might explain the missing effect on proprioception[11,17].

Torres R, VasquesJ (2010) also concluded that eccentric exercise leading to muscle damage alters joint proprioception, suggesting that there might be impairment in the intrafusalfibers of spindle muscles and in the tendon organs[16]. There are also many studies which suggest that decreased proprioception alters balance of a person. Hussein (2015) and GajananaPrabhu (2013) concluded in their studies that combined balance and isotonic exercise have better results in increasing proprioception[13,3].

In this study we also can identifying the effect of fatigue on proprioception and which isotonic exercise with wobble board exercise has better results to increase proprioception.

Aims and Objectives

The aim of this study is to investigate either eccentric strengthening exercise combined with wobble board training or concentric strengthening exercise combined with wobble board training is better to improve the proprioception in physiotherapy students.

1. To compile a literature on eccentric and concentric strengthening exercise in detail.

2. To compile literature of balance board or wobble board training in detail.

3. Literary study of proprioception.

4. Effect of either eccentric strengthening exercise combined with wobble board training or, concentric strengthening exercise combined with wobble board training on proprioception in physiotherapy students.

Methodology

Study Design

The study design is experimental in nature.

Sampling Method

Convenient sampling was done.

Sample

40 healthy subjects both male and female physiotherapy students with mean age 20.9±2, were selected for the study after using selection criteria & were divided in two groups A & B by convenient sampling.

PLACE

This study was performed in the research lab of physiotherapy department at College of Physiotherapy, Baba Mastnath University, AsthalBohar, Rohtak.

Selection Criteria

Inclusion criteria

1. Physiotherapy students, having healthy status

2. Age 18-21 years.

3. They should be regular.

4. Who did not undergo in any form of medication for any knee pathology condition during the course of the study or

5. any other interventions which could influence the study?

Exclusion criteria

1. Knee joint pathology
2. Musculoskeletal problem such as pain, fracture
3. Psychiatric condition like depression, anxiety
4. Uncooperative subject
5. Respiratory and heart problems
6. Pregnancy

VARIABLES

Independent variable

1. Eccentric and Concentric exercises
2. Wobble board

Dependent variable

1. Strength
2. Proprioception
3. ROM

INSTRUMENTATION

Strain gauge was used to measure strength of quadriceps muscle before and after fatigue[1,12].

Universal goniometer was used to measure proprioception and wobble board was used to improve balance[13,14].

Static cycle was used to induce fatigue.

Chair was used for eccentric and concentric exercise protocol.

Material and Methods

40 healthy subjects, both male and female physiotherapy students, with mean age 20.9±2, having no injury or pathology in knee joint, were selected for the study & were divided in two groups A & B by convenient sampling.

All the patients signed an informed consent form and were informed about the whole procedures before testing and training[13,14.]

The subject was asked to be seated on the couch with 90º flexion of the knee joint and goniometer was placed on knee joint. Axis of the goniometer was placed in the region of lateral condyle of the femur, moving arm was placed parallel to the lateral mid-line of the fibula towards the lateral malleolus and stationary arm was placed parallel to the lateral mid-line of femur. Then asked to close the eyes and then the leg of the patient was passively extended at 50º and then the leg was returned back to the same original position. The subject was asked to repeat this actively three times and three different readings were recorded by goniometer.

The same subjects in both the groups were put to fatigue by asking to do static cycling for the period of 20 minutes. The strain gauge was used in order to record the strength of the quadriceps muscle in the above fatigued subjects. Now in both the groups A and B proprioception of knee joint was again measured post fatigued by using universal goniometer. The subject was asked to be seated on the couch with 90º flexion of the knee joint and then asked to close the eyes and the leg of the patient was passively extended at 50º and then the leg was returned back to the same original position. The subject was asked to repeat this actively three times and three different readings were recorded.

After the completion of the above protocol the subjects in group A were submitted to eccentric contraction exercises in form of active strengthening exercises with minimum resistance (10 repetitions with 3 sets), starting from standing and asked the patient to sitting on chair slowly (90°), 6 seconds rest between each repetition and 1 minute rest between the sets. After this the subjects were asked to perform wobble board exercise in standing position for 15 minutes.

The subjects in group B were submitted to concentric contraction exercises in the form of active strengthening exercises with minimum resistance (10 repetitions with 3 sets), from 90° to 0° sitting on chair, asked the patients to extend his knee to zero position, 6 seconds rest between each repetition and 1 minute rest between the sets. After this the subjects were asked to perform wobble board exercise in standing position for 15 minutes.

All the readings were assessed pre- and post-fatigue after 8 weeks.

Result

Data was meaningfully assorted through calculation of Mean and Standard Deviation. Thereafter Paired and Unpaired' test was applied in group A and group B within and between the groups. The level of Significance was fixed at <0.05.

Table 1: Description of the subjects with mean age (standard deviation)

Groups	Mean	Standard Deviation	Number of Subjects
Group A	18.55	0.60	20
Group B	19.85	6.54	20

Table shows description of the subjects with mean value of age with standard deviation for the Group A (n=20) Normal subjects are 18.55±0.60 respectively. Group B (n=20) Subjects with mean value of age and standard deviation 19.85±6.54 respectively.

Table 2 Comparison between pre intervention proprioception error in group A before and after fatigue

Paired 't' Test	Pre intervention	
Groups A	**Pre fatigue**	**Post fatigue**
Mean	6.17	9.82
S.D.	5.73	7.68
't' value	2.7	
Result	S	

P>0.05 Non significant (NS)

P<0.05 Significant (S)

Table shows comparison betweenpre reading proprioception error in group A before and after fatigue find out with the help of paired-t test and 't' value was 2.702672367. The results were significant for proprioception error(p>0.05).

Table 3 Comparisons between pre intervention proprioception error in group B before and after fatigue

Paired 't' Test	Pre intervention	
Groups B	**Pre fatigue**	**Post fatigue**
Mean	5.32	8.15
S.D.	5.02	7.59
't' value	2.93	
Result	S	

P>0.05 Non significant (NS)

P<0.05 Significant (S)

Table shows comparison betweenpre reading proprioception error in group B before and after fatigue find out with the help of paired-t test and 't' value was 2.93877. The results were significant for proprioception error(p>0.05).

Table 4 Comparisons between post intervention proprioception error in group A and before and after fatigue

Paired 't' Test	**Post intervention**	
Groups A	**Pre fatigue**	**Post fatigue**
Mean	5.78	3.67
S.D.	3.25	2.53
't' value	4.19	
Result	S	

P>0.05 Non significant (NS)

P<0.05 Significant (S)

Table shows comparison betweenpost reading proprioception error in group A before and after fatigue find out with the help of paired-t test and 't' value was 4.190544. The results were significant for proprioception error(p>0.05).

Table 5 Comparisons between post intervention proprioception error in group B and before and after fatigue

Paired 't' Test	**Post intervention**	
Groups B	**Pre fatigue**	**Post fatigue**
Mean	5.83	6.53
S.D.	5.14	3.37
't' value	0.73	
Result	NS	

P>0.05 Non significant (NS)

P<0.05 Significant (S)

Table shows comparison betweenpost reading proprioception error in group B before and after fatigue find out with the help of paired-t test and 't' value was 0.73315. The results were non- significant for proprioception error(p<0.05).

Discussion

The data of present study reveals that Group A (n=20) healthy subjects with mean age 18.55±0.60 and Group B (n=20) healthy subjects with mean age 19.85±6.54examined for proprioception before and after fatigue. Paired-t test was applied within the group A and group B before and after fatigue and pre- and post-intervention and Un-paired t test was applied between the group A and B before and after intervention. In group A during pre-intervention shows mean difference in subjects for proprioception error pre-fatigue 6.28±5.69 and post- fatigue 9.78±7.55 (paired 't' value was 2.7), mean difference in normal subjects of group B for proprioception error pre-fatigue 5.31±5.02 and post-fatigue 8.15±7.55(paired 't' value was 2.93), result shows significant difference in both groups on pre intervention. Paired-t test was also applied in group A and group B post intervention. Mean difference in normal subjects of group A for proprioception error pre fatigue 5.63±3.26 and post fatigue 3.68±2.60 (paired 't' value was 4.19), result shows significant difference in group A, mean difference in normal subjects of group B for proprioception error pre-fatigue 5.87±5.28 and post fatigue 6.65±3.42 (paired 't' value was 0.73), in group B after intervention there is no significant difference found. Un- paired t test was applied between the groups A and B post intervention for proprioception error pre- and post-fatigue. Mean difference in normal subjects for proprioception error pre- fatigue post intervention in group A 5.78±3.25 and in group B 5.83±5.14 (Un-paired 't' value was 0.036) and result shows non-significant difference on pre fatigue, mean difference in normal subjects for proprioception error post- fatigue post intervention in group A 3.67±2.53 in group B 6.53±3.37 (Un-paired 't' value was 3.04) and significant difference found on post fatigue. So, this study shows a significant improvement in perception of joint position sense, thereby alternative hypothesis is accepted.

Gurney B, Milani J and Pederson ME conducted a study role of fatigue on proprioception of the ankle and concluded that the muscle spindle may provide a main component of joint proprioception, but it appears from the results of this study that non-weight bearing proprioception of the ankle joint is not altered by muscular fatigue of the plantar and dorsi-flexors.

Hussein NAMM, Saad MMAH and Sawey NAHEI (2015) concluded that balance training with isotonic resistive exercise gives better improvement of the functional status, muscular strength and knee proprioceptive accuracy in patients with knee osteoarthritis[39]. Mi-Kyoung Kim et al (2015), concluded that muscle fatigue generated by the exercise affected the decline in muscle activity and balance control; it also influenced the side that did not perform the exercise before fatigue due to this effect.

The result of the present study indicated that fatigue reduces knee joint proprioception and after giving isotonic exercise we can improve knee joint proprioception.As we also fatigue the muscle then give a session of eccentric exercise with wobble board exercise to one group and concentric exercise with wobble board exercise to second group for 8 weeks (3-4 days in a week) for improving strength of quadriceps muscle and outcome measures show that eccentric exercise when combined with wobble board exercise improves proprioception of the subjects.

So, it is concluded that eccentric and concentric exercises with wobble board exercise are very effective in improving proprioception. But eccentric exercises with wobble board exercise have better effect in improving proprioception.

Conclusion

The data reveals that Group A(n=20) normal healthy subjects with mean age 18.55±0.60 and Group B(n=20) subjects with mean age 19.85±6.54 examined for proprioception before and after fatigue. The results showed that there were clinically and statistically significant differences between these two groups. It is concluded that fatigue decreases the proprioception and eccentric exercise with wobble board exercise give better result to improve proprioception.

Ethical Clearance- Taken from Departmental head, Department of Physiotherapy, Baba Mastnath University

Source of Funding- Self

Conflict of Interest -Nil

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Is Tech Neck A Growing Hazard among the Young?

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Abstract

Background: Tech neck is the term used to describe the neck pain and damage caused by looking down too often and for too long on the mobile phone, tablets or other digital devices. Digital devices can position the head in different uncomfortable postures This study aim to determine the influence of duration of usage of digital devices on cervical range of motion and the craniovertebral angle.

Material & Method: This prospective study included 88 participants between the ages of 18 and 25 who have been using digital devices from Yenepoya (Deemed to be University) for six months or more were chosen using a convenience sampling method after obtaining institutional ethical clearance and consent from the participants. Participants were divided into four categories according to the duration of usage of digital devices i.e less than 1 hour a day, 1-2 hours a day, 2-4 hours a day and more than 4 hours a day. Each group will be composed of 22 participants. By lateral photography method they were tested for cervical range of motion using goniometer and craniovertebral angle.

Results: There is a significant decrease in cervical flexion among groups but there is no significant difference between groups in cervical extension and craniovertebral angle.

Conclusion: The present study suggests that repeated use of digital devices may have an effect on raising neck flexion ability. Tech neck may thus be an increasing danger among the young.

Keywords: *Smartphone addiction, Craniovertebral angle, Cervical Flexion, Cervical Extension.*

Introduction

Text neck most frequently causes discomfort and soreness in the neck. Furthermore, looking down on the smartphone too much can lead to back pain ranging from constant, extreme back pain to acute and severe muscle spasm, back pain and tightness, likely leading to intense muscle spasm on the shoulder.[1] Seventy-nine percent of the population between the ages of 18-44 have their mobile phones with them nearly all the time, with just two hours gone without cell phones. Indian practitioners, 30 per cent of whom suffer from neck pain and neck pain absenteeism is 41%. In this report, the prevalence of neck pain in computer users was 28%.[2]

Particularly neck pain is seen as one of the major health problems in modern societies. It also increases in intensity, frequency and severity due to greater stress and strain on the upper back and neck area.[3] Over the past few years, the number of smartphone users has steadily risen worldwide and, with rising usage of smartphones, concerns about musculoskeletal issues associated with the extended use of smartphones have also risen, resulting in incorrect posture such as defective head posture, slouched posture or rounded shoulders.[4] Typically people bend their neck backward while using a smartphone to look at the lowered target and hold the head in a forward position for long periods of time, which may cause musculoskeletal disorders such as “upper crossed syndrome.” In addition, keeping

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a head-forward posture reduces cervical lordosis of the lower cervical vertebrae and produces a posterior curve for keeping equilibrium in the upper thoracic vertebrae.[5]

Our study aimed to determine the influence of duration of usage of digital devices (smartphones, laptop, tablet and desktop) on the cervical range of motion and craniovertebral angle.

Material & Method

This crossectional study was conducted on students and staff of constituent colleges of Yenepoya University who were 18-25 years of age, using digital devices like smartphone, laptop, desktop and tablet since six month or more, and used these digital devices for at least 5days/ week, both male and female were included in the study. Informed consent was obtained from all participants. Subjects who had history of trauma to cervical spine, surgery of cervical spine, any deformities and non-cooperative patients were excluded from study.

Materials used were, ruler, pencil, protactor, datasheet, universal goniometer, measuring inch tape, micropore surgical tape, tripod stand, single lens reflex camera (Canon EOS 1100D, Taiwan). The study was initiated after obtaining the institutional ethics clearance from institutional ethics committee. Participants were screened for the inclusion and exclusion criteria. Selected individuals were classified into four groups based on the duration of usage of these digital devices i.e. less than 1hour/day, 1-2hours/day, 2-4 hours/day and more than 4hours/day. Each group included 22 participants both males and females.

Procedure for measuring the cervical range of motion:

a) Cervical range of motion was measured using a goniometer.

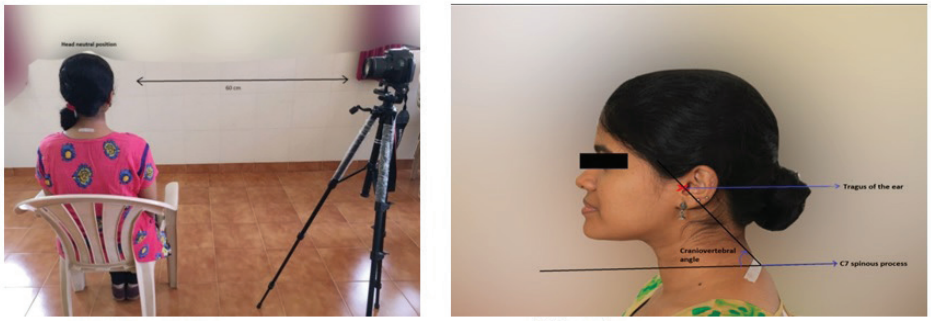
Position- The participant was seated in a chair with thorax and lumbar spine well supported by the back of a chair, position the head in 0 degrees of rotation and lateral flexion. Fulcrum of the goniometer was placed over the external auditory meatus, proximal arm so that it is either perpendicular or parallel to the ground, distal arm with the base of the nares. The participant was asked to do active cervical flexion and the same position and stabilization is carried out for cervical extension and also the participant was asked to do active cervical extension. Then, cervical flexion and extension angle was measured. The range of motion was assessed three times by maintaining 1 minute interval for each and the average of three values were recorded. (Fig 1)

Figure 1: Shows procedure for measuring range of motion of cervical flexion (a - starting point, b - End position); Shows procedure for measuring range of motion of cervical extension (c - starting point, d - End position)

b) Procedure for measuring craniovertebral angle:

Position-The participant was seated in a chair with thorax and lumbar spine well supported by the back of a chair, position the head in 0 degrees of rotation and lateral rotation. The C7 spinous process and the tragus of the ear were marked. Participant's identity was concealed by blacking out the eyes in the facial photographs. In case, if data is published or presented their identity will not be revealed. Then the photographs of participants were taken in lateral view by using a digital camera (Canon EOS 1100D,Taiwan) which was kept on tripod, in such a way that the distance between the camera and the subject was 60 centimetres. The images which were obtained was analyzed by drawing a horizontal line which passed through C7 spinous process and a line extending from tragus of the ear to C7.The angle formed between them was measured. Thus, craniovertebral angle was assessed

three times by maintaining 1 minute interval for each and the average of three values were recorded. (Fig 2)



a) starting position b) Procedure

Figure 2: Shows procedure for measuring craniovertebral angle

Statistical analysis - the data were entered in Microsoft excel sheet and analysed using the SPSS version 21 operating on windows 10. The data were represented as mean, standard deviation, frequency and percentage in tables and figures as appropriate for the type of data. The multiple groups with non-parametric analysis was performed by Analysis of Variance-Kruskal Wallis test, with p-value <0.05 considered statistically significant.

Results

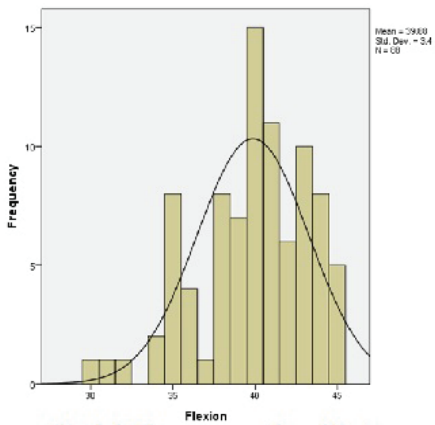
A total of 88 participants were included in present study after obtaining the informed consent. Among them, males were 42 and females were 46, with mean age off 21±3.51 yrs.

Table 1:Descriptive statistics

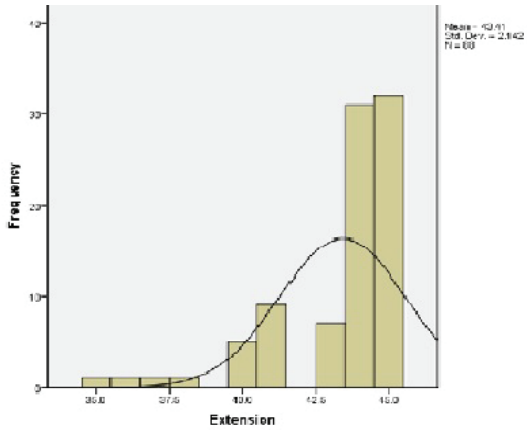
		N	Mean	SD	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Flexion	< 1 Hour	22	41.50	3.447	39.97	43.03	30	45
	1-2 hours	22	40.36	2.555	39.23	41.50	34	45
	2-4 hours	22	38.86	3.468	37.33	40.40	32	45
	> 4 hours	22	38.77	3.477	37.23	40.31	31	44
	Total	88	39.88	3.400	39.15	40.60	30	45
Extension	< 1 Hour	22	44.41	.908	44.01	44.81	41	45
	1-2 hours	22	43.09	2.486	41.99	44.19	35	45
	2-4 hours	22	43.23	1.926	42.37	44.08	38	45
	> 4 hours	22	42.91	2.617	41.75	44.07	36	45
	Total	88	43.41	2.142	42.96	43.86	35	45
Craniovertebral anfle	< 1 Hour	22	44.00	8.586	40.19	47.81	31	62
	1-2 hours	22	47.45	5.697	44.93	49.98	37	59
	2-4 hours	22	47.77	6.156	45.04	50.50	35	56
	> 4 hours	22	46.68	7.161	43.51	49.86	36	64
	Total	88	46.48	7.027	44.99	47.97	31	64
P<0.05 is considered statistically significant								

The result of Table 1 shows; Mean value of flexion for participants in group1 is $41.50^0 \pm 3.447^0$; Mean value of flexion for participants in group2 is $40.36^0 \pm 2.555^0$; Mean value of flexion for participants in group3 is $38.86^0 \pm 3.468^0$; Mean value of flexion for participants in group4 is $38.77^0 \pm 3.477^0$; Thus, there is significant reduction in cervical flexion; Mean value of extension for participants in group1 is $44.41^0 \pm 0.908^0$; Mean value of extension for participants in group2 is $43.09^0 \pm 2.486^0$; Mean value of extension for participants in group3 is $43.23^0 \pm 1.926^0$; Mean value of extension for participants in group4 is $42.91^0 \pm 2.617^0$; Thus, there is no significant difference in cervical extension; Mean value of craniovertebral angle for participants in group1 is $44.00^0 \pm 8.586^0$; Mean value of craniovertebral angle for participants in group2 is $47.45^0 \pm 5.697^0$; Mean value of craniovertebral angle for participants in group3 is $47.77^0 \pm 6.156^0$; Mean value of craniovertebral angle for participants in group4 is $46.68^0 \pm 7.161^0$; Thus, there is no significant difference in craniovertebral angle.

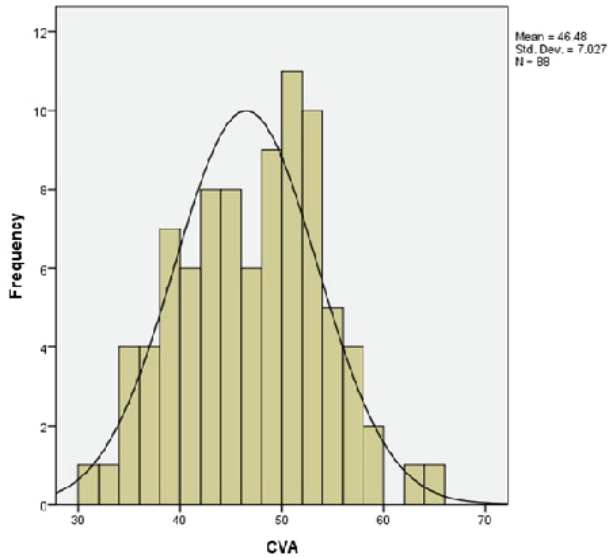
There is a statistical significant difference in flexion variable between groups (p-value=0.008). There is no statistical significant difference in Extension variable between groups (p-value=0.051). There is no statistical significant difference in CVA variable between groups (p-value=0.294).



Graph 1: Shows mean value of flexion range of motion between groups.



Graph 2: Shows mean value of extension range of motion between groups



Graph 3: Shows mean value of craniovertebral angle between groups

Discussion

The research was conducted among university staff and age group students ranging from 18-25 years of age using digital devices for six months or more. Participants were divided into four classes based on the period of use of digital devices, i.e. less than 1 hour / day, 1-2 hour / day, 2-4 hour / day and more than 4 hours / day. Researchers found that those who used smartphones for more than 2 hours had problems that were higher than those who used less than 2 hours a day.[6]

The study results showed a statistically significant decrease in the range of cervical flexion in group 4 relative to other groups ($p<0.05$) and no substantial difference in cervical extension among groups. The study results are confirmed by "The presence of altered craniocervical posture and mobility in South Korean smartphone addicted adolescents with temporomandibular disorder" by Kee et al, who concluded that smartphone addicted adolescents showed substantial decrease in cervical flexion, extension, lateral flexion and rotation.[6] In support of our finding, another study on cervical proprioception in young people, which spends long periods on mobile devices in Austrailia, by Portelli et al., concluded that there is a substantial difference in cervical flexion but there was no difference between groups for other cervical movements (extension, lateral flexion and rotation).[7] In contrast some studies showed males with greater use of the computer was associated with increased flexion of the head and flexion of the spine and in females, greater use of the computer was associated with increased lordosis.[8] Other studies concluded that over usage of smartphones in non-neutral neck, there was a substantial reduction in extension, right and left flexion, and right and left neck rotation except neck flexion.[9]

The present study did not show any statistical significant difference in craniovertebral angle between the groups, which was supported by a study conducted on 68 subjects by Selvaganapathy et.al.,[10] Cervical angle between heavy user group and control group (according to their responses on smartphone addiction questionnaire), there was significant difference in head position angle but not in the craniovertebral angle.[3]

Limitations of study: Research limitations were small sample size, participants mostly used smartphones so analysis more revolved on smartphones, length comparison could not be achieved using different devices. No educational interventions were assessed for the outcome changes in the participants.

Conclusion

This study indicates that spending long hours using digital devices may have an effect on reducing neck flexion ability. Tech neck may thus be an increasing danger among the young. Musculoskeletal neck pain in children and adolescents is a common multifactorial disorder, meaning that multiple risk factors contribute to its growth. By-understanding of lifestyle changes, we can avoid neck pain, and few easy arrangements at work according to ergonomics will minimize neck pain.

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Conflict of Interest: No conflit of interest

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Assesment of Neck Pain Causes and Its Intensity among the Students of Department of Eastern Medicine, University of Balochistan, Quetta, Pakistan

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Abstract

Background: In musculoskeletal disorders the neck pain is the fourth common disorder. Annually it affects huge numbers of patients specially the working males, who are more likely to get affected by neck pain. Among the students the intensity was found dependent mainly on the affected area and gender.

Methods: A cross sectional study was conducted among the Eastern medicine students of city campus, university of Balochistan, Quetta, Pakistan from June to August 2018. A self-constructed proforma was used among 284 participants and Spss version 23 was used.

Results: The majority (n=229, 80.6%) belongs to age group of 18 to 23 years and (n=149,50.4%) were male. In the involvement of side (unilateral/ bilateral) were significantly associated with the higher intensity of neck pain (p=0.05).

Conclusion: The study summarized that the male participants who were suffering from bilateral neck pain were experiencing severe pain and were facing hindrances during their regular personal care. They should keep themselves aware regarding their neck heath.

Keywords: *Neck pain, Causes, Pain intensity, students, Quetta, Pakistan.*

Introduction

In musculoskeletal disorders after low back pain the neck pain is found the most common throughout the world[1]. Neck pain is found more common specially in females, people with low socio economic status and in population of urban areas[2, 3]. The persons who are in between the age of 35 to 49 are more prone to develop the neck pain[4]. Aging, gender, genetics, use of alcohol and obesity are the main risk factors for neck pain. Age, gender and heredity are being considered as the non-modifiable risk factors for neck pain, while the modifiable risk factors are obesity, excessive use of alcohol or tobacco and increased mental stress. However, In modern society it puts a significant impact on patients personal life ,on their families, on their business, on community and also on health care system[1, 5]. The estimated annual incidence of neck pain ranges from

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12% to 20.6%, furthermore the higher incidence were noted in students, office workers and computer users. The higher incidence of neck pain among the students , office workers and computer users is because of the lack of posture awareness and lack of knowledge regarding the their correct working positions[2, 5]. The mean score for the prevalence of neck pain among general population is 27%[2, 6]. It was reported that annual recovery of neck pain patients ranges from 30% to 70%[2, 3].

In the treatment of neck pain, studies suggests the use of muscle relaxants, exercise therapy, epidural corticosteroid injections and surgery. The muscle relaxants along with exercise therapy are more beneficial in mild to moderate neck pain while in patients with radiculopathy or myelopathy the epidural corticosteroids and surgery are indicated and found more beneficial [1, 6-8].

Methods

Study Design, Settings and Duration

A cross sectional descriptive study was conducted from June to August 2018, and data was collected from the undergraduate students of Department of Eastern Medicine, university of Balochistan, Quetta, Pakistan

Sampling

Convenient Non-Probability Sampling Technique among the 284 selected participants were used. Participants with both genders (male & female), willing to participate were included in the study. While, patient with a previous history of any surgical intervention, with any pathology, with central nervous system alteration and not willing to sign inform consent were excluded.

.Data Collection Tool

A self-constructed proforma was used to collect the data, which include the demographic Characterstics age, gender, marital status and Speciality. While, the included disease Characterstics were the involvement of side (unilateral or bilateral), use of medication (yes or no) and the causes of pain (sleeping, working, reading, lifting objects, concentrating or recreational activates)

Data Analysis Procedure

Descriptive statistics; categorical variables were measured as frequency and percentage where continuous variables were expressed as mean standard deviation. Inferential statistics. Data was analyzed by using Statistical Package for Social Sciences (SPSS) version 23

Ethical Concern

As the approval was taken from the ethical review committee of Faculty of Pharmacy & Health Sciences, University of Balochistan, Quetta, Pakistan. Informed consent was taken from participants containing that their participation is voluntary, their information will be kept confidential and anytime they can leave the study, after that the proforma was filled for data collection.

Results

DEMOGRAPHICS CHARACTERSTICS

Demographics Characterstics are described in table 1, which states that the majority (n=229, 80.6%) belongs to age group of 18 to 23 years and (n=149, 52.5%) were male. After checking the marital status of participants we found that (n=261, 91.9%) were unmarried.

Table 1: Demographic Characterstics

Characterstics	Frequency	Percentage
Age group		
18-23 years	229	80.6
24-29 years	55	19.3
Gender		
Male	149	52.5
Female	135	47.5
Marital status		
Married	23	8.1
Unmarried	261	91.9

INVOLVEMENT OF SIDE AND USE OF MEDICATION

Involvement of side and use of medication are described in table II, which states that majority (n=188, 66.2%) of participants experienced unilateral neck pain and (n=151, 53.2%) were using medications to subside the pain.

Table II: INVOLVEMENT OF SIDE AND USE OF MEDICATION

Variable	Frequency	Percentage
Involvement of Side		
Unilateral	188	66.2
Bilateral	96	33.8
Medication		
Yes	151	53.2
No	133	46.8

VISUAL ANALOGUE SCALE STATUS

Visual analogue scale status is described in table III, which states that majority (n=95, 33.5%) reported with level 3 pain followed by (n=72, 25.4%) reported the level 4 pain.

Table III: VISUAL ANALOGUE SCALE STATUS

Variable	Frequency	Percentage
1	15	5.3
2	47	16.5
3	95	33.5
4	72	25.4
5	28	9.9
6	19	6.7
7	08	2.8

PRIMARY CAUSE OF PAIN

Primary Cause of pain is described in table IV, which states that the majority (n=180, 63.4%) of participants experienced the neck pain during their sleep, followed by (n=33, 11.6%) experienced the pain during reading book**.**

Table IV: PRIMARY CAUSE OF PAIN

Variable	Frequency	Percentage
Sleeping	180	63.4
Working	17	06
Reading book	33	11.6
Lifting objects	19	6.7
Concentrating	18	6.3
Recreational activities	17	06

CORRELATION BETWEEN VISUAL ANALOGUE SCALE, DEMOGRAPHICS CHARATCERTSTICS AND DISEASE CHARACTERSTICS.

Correlation between visual analogue scale, demographics Characterstics and disease Characterstics are described in table 5, which states that the gender and involvement of side (unilateral or bilateral) are statically significant ($p<0.05$) with neck pain (visual analogue scale).

Table V: CORRELATION BETWEEN VISUAL ANALOGUE SCALE, DEMOGRAPHICS CHARATCERTSTICS AND DISEASE CHARACTERSTICS.

Variable	Correlation coefficient	P VALUE
Vas Vs Age	0.877	0.189
Vas Vs Gender*	0.377	0.00
Vas Vs Marital status	0.359	0.591
Vas Vs Involvement of side*	0.261	0.002
Vas Vs use of medicine	0.80	0.177
Vas Vs cause of pain	0.084	0.160

*p value is significant at 0.05 level

**Correlation is significant at 0.01 level (2-tailed).

Discussion

The current study which was conducted among the students of department of eastern medicine, university of Balochistan, Quetta and disclosed that there is significant relationship between the neck pain (scaled through visual analogue scale) gender and involvement of side. Our study were in line with study conducted by Raftery et al in 1995 and Smith et al in 2008, and concluded that according to their survey female patients reported with more pain as compare to men, they also use powerful analgesics to subside their neck pain[9, 10]. During the literature search we found contrarily results, study conducted by Carstensen et al in 2012, Hagen et al in 1997, and concluded that there is no significant relationship found between the gender and neck pain.

Theses contradictory results can be due to their selection of population[11].

In our study we finalized that the gender is one of the significantly associated factor with neck pain, males are more prone to develop neck pain as compare to the female. The more male affection can because the male gender have more exposure of working environment. The male gender are more likely to perform the challenging tasks like professional drivers, forest machine operators, computer operators, weight lifting. Furthermore among the students, observed reason for neck pain were there in appropriate neck posture especially in their study time [12-17].

Secondly, the involvement of side (unilateral/ bilateral) is significantly associated with neck pain, the participants who were suffering from bilateral neck pain had experienced more pain then the participants who experienced unilateral neck pain[18, 19]. The participants who had experienced bilateral neck were feeling more difficulties in their personal care, while the participants who were suffering from unilateral neck pain were also feeling difficulties in their personal care but the level of difficulty were not so much high like the patients of bilateral neck pain [16-18, 20].

The participants who are male and belongs to personal and professional tasks which are more vulnerable for neck pain should aware themselves regarding their neck health. They ought to keep their necks pain free in order to enhance their health related quality of life and reduce the burden on health care facilities [2, 17, 19].

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Comparision of Effectiveness of Isometric and Stretching Exercise in Pain Management among the Forward Head Posture Patients

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Abstract

Background: Forward head posture (FHP) is an exaggerated anterior lower cervical curve and posterior upper thoracic curve, leading to excessive anterior positioning of the head concerning a vertical reference line, accompanying rounded shoulders with thoracic kyphosis, this Occurs due to imbalance between posterior and anterior neck muscles, causing neck pain. Exercise treatments are effective in reducing FHP alongside associated neck pain.

Methods: A cross-sectional study was conducted from May to October 2019 on 60 patients diagnosed with FHP from different hospitals of Quetta and were equally distributed into two groups, each containing 30 participants. Group A was given stretching exercises and group B was given isometric exercises for 2 weeks. The visual analog scale was used to assess patients before and after treatment. Data were analyzed by Statistical Package for Social Sciences (SPSS) version 23.

Result: Patients were having a mean age of +30.42, Most of them were males (n=34, 57.0%) and from age group of 41-60 years (n=33, 55.0%). Moderate severity was reported by (n=41, 58.3%) and both cervical and thoracic regions were involved in (n=36, 60.0%). Before treatment most of patients were having pain intensity of 6 (n=21, 35.0%) and after treatment were having pain intensity 4 (n=24, 40.0%). There was no significant difference in pain reduction between both interventional groups.

Conclusion: The study concludes that both techniques, the isometric strength training, and stretching exercises are equally effective in correcting forward head posture and associated neck pain reduction.

Keywords: *forward head posture, Neck pain, stretching exercise, isometric strength training, Visual analogue scale.*

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Introduction

An Exaggerated anterior lower cervical curve and posterior upper thoracic curve, is known as the forward head posture or turtle neck posture(1). Forward head posture (FHP) is most often described as excessive anterior positioning of the head concerning a vertical reference line, involving increased cervical spine

lordosis (head forward, middle cervical spine extended, lower cervical spine flexed) and rounded shoulders with thoracic kyphosis[2]. Scapula rotates medially and overall vertebral height shortens[3]. There is an obliteration of the cervical lordosis with a compensatory tilting back of the head at the atlanto-occipital joint. Posteriorly, semispinalis cervicis and anteriorly Longus capitis become stretched and weak, while semispinalis capitis posteriorly and Longus cervicis anteriorly become overactive and shorten[3]. Jung Ho Kang et al states that forward head postures during computer-based work may contribute to some disturbance in the balance of healthy adults [4]. Age and gender were significantly related to neck and shoulder symptoms. Prevalence of neck-shoulder tension and neck-shoulder pain increases with age[5]. A study reported that even after body size and ergonomics are adjusted, women still are the higher risk group for back and neck pain [6].

Previously, a study was conducted which states that cervical and thoracic stretching and strengthening exercise program can improve spinal posture alignment for decreasing forward head posture in subjects [7]. The isometric strength training, comprising of isometric contraction against gentle resistance, to forehead, occiput and temporal area may act to improve cervical muscle coordination and awareness of neck and head position [8]. Stretching intends to expand muscle-ligament flexibility, improve range of motion or musculoskeletal capacity, and prevent injuries. These includes static stretching (active and passive), dynamic stretching (active and ballistic), pre contraction stretching (PNF techniques) and post isometric contraction, post facilitation stretching and medical exercise therapy [9, 10]. Previous studies conducted by Stephanie S Lynch et al, R.M. Ruivo et al and Yong-Soo Kong et al states that exercise interventions are affective in correcting FHP and shoulder protraction [11][12][13]. Bakhtiyar A et al and suggests that combination of stabilization and chin-tuck exercises provides the correction of FHP and effective and stable corrected posture [14]. Hyun Jae Noh et al states that neck stabilization exercises improve unbalanced neck muscle activation and reduces neck pain [15].

The aim of this study was to assess comparison of effectiveness of isometric and stretching exercise in pain management among the forward head posture patients. We hypothesized that both interventions are equally effective in correcting FHP and reducing neck pain.

Methods

Study Design Setting and Duration:

A cross-sectional study was conducted from May to October 2019. The data was collected from different physical therapy OPDs of Quetta, Pakistan.

Sampling:

A convenient Non-probability sampling technique was used among 60 patients, included from different physical therapy OPD settings of Quetta, who were agreed to participate in the study. Patients were included with a confirmed diagnosis of forward head posture with neck pain between the age of 20 to 60 years, while patients with surgical intervention, malignancy, other pathology, severe pain, and those who were unwilling to sign an informed consent and unable to follow up exercise program were excluded from the study.

Data Collection Tool

Visual analog scale (VAS) was used for data collection. VAS was completed by interview before and after 2 weeks of exercise program.

Data Collection Procedure

The patients are equally distributed into two group A & B and each group contains 30 participants both male and female. Participants of Group A were given stretching exercise while the participants of group B were given isometric exercise treatment by their respective physiotherapists, among patients who were clinically determined as patient of forward head posture were included in the study and angle of forward head posture was measured with goniometer as per standard procedure.

Data Analysis Procedure

Data was analyzed by using Statistical Package for Social Sciences (SPSS) version 23 and presented in frequency and percentage for categorical variables, mean values were presented for continuous variables.

Ethical Considerations

As the approval was taken from Ethical review

board of Faculty of Pharmacy & Health sciences, University of Balochistan, Quetta Pakistan and for the data collection the prior permission was taken from the care takers of respective hospitals. Informed consent was taken from the patients prior to data collection that their participation is voluntary, information of their responses will be kept confidential and they can leave the study anytime.

Results

Table 1: Demographic Characteristics.

Demographics	Frequency (n=60)	Percentage (100%)
AGE		
20-40	27	45.0
41-60	33	55.0
GENDER		
Male	34	57.0
Female	26	43.0

Demographic Characterstics of Patient

Table 1: shows the demographic characteristics of patients having mean age of +30.42. According to table most of the patients belongs to age group 41-60 years (n=33, 55.0%) and were males (n=34, 57.0%).

Table 2: Severity and Area of Affection.

Variables	Frequency (n= 60)	Percentage (%= 100.0)
Severity		
Mild	10	16.7
Moderate	41	58.3
Severe	9	15.0
Region Affected		
Cervical	22	36.7
Upper Thoracic	2	3.3
Cervical and upper thoracic	36	60.0

Severity and Area of Affection

Table 2 displays disease characteristics in which severity was classified into mild, moderate, and severe. The majority (n=41, 58.3%) were moderate. Both regions, cervical and upper thoracic, were affected in majority (n=36, 60.0%).

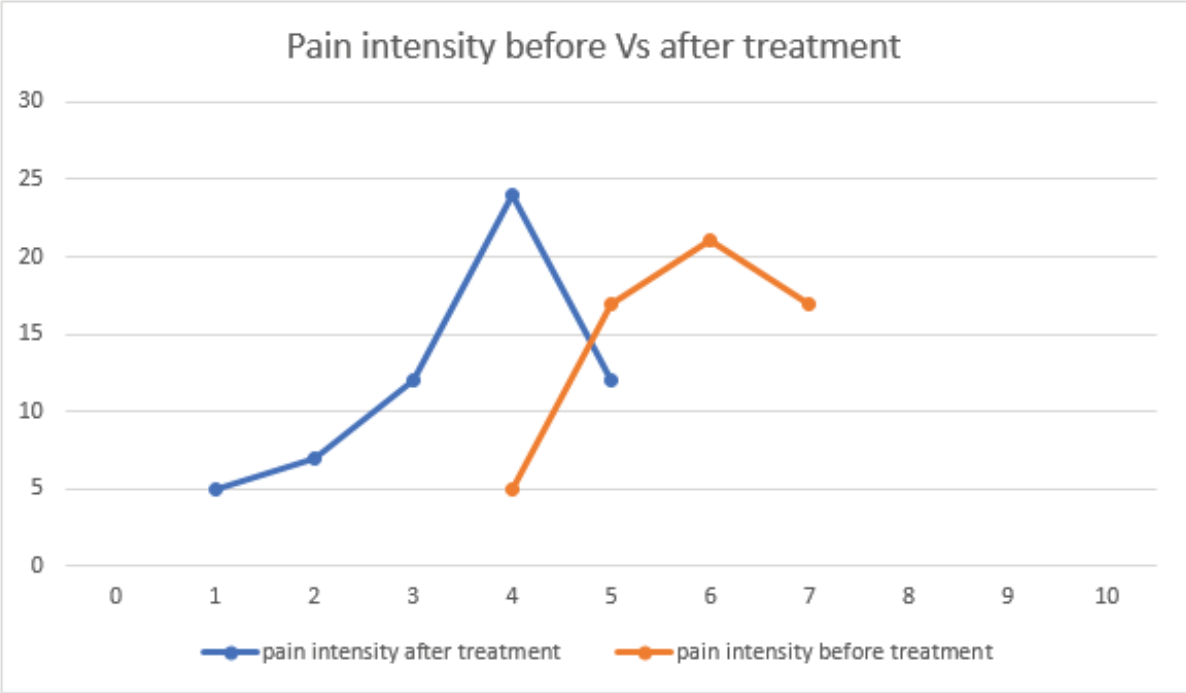

Figure 1: Represents visual analogue scale comparison before and after exercise prescription.

Represents visual analogue scale comparison before and after exercise prescription.

Figure 2 displays the comparison of pain intensity before and after treatment. Before treatment most of the patients were having pain intensity of 6 (n=21, 35.0%) and after treatment majority were having pain intensity of 4 (n=24, 40.0%). There was no significant difference in pain reduction between both interventional groups (isometric and stretching exercises). Both exercises are equal in pain reduction and correction of FHP.

Discussion

The current study discloses that there is no significant difference in pain reduction and correction of forward head posture between stretching and isometric exercise which means both exercises are equally effective. The result of the current study was in line with study reported by Katherine Harman et al conducted study in 2005 in Nova Scotia, reported that 10 week based exercise program which includes strengthening of deep neck flexors and shoulder retractors and stretching of neck extensors and pectoralis major muscle, were have significant impact on range of motion and postural alignment. [(2)]. Similarly, Choi, Young-Jun et al conducted a study in 2010, which states that, cervical and thoracic stretching and strengthening exercise program can improve spinal posture alignment for decreasing forward head posture in subjects [(7)]. H. J. Noh et al, states that neck stabilization exercises improve unbalanced neck muscle activation and contribute to reducing neck pain [(16)]. R.M. Ruivo et al concluded that exercise intervention was successful at decreasing forward head and protracted shoulder in adolescents. Effects of training and detraining after 8 months stretching and strength training were demonstrated. Myoung-Hyo Lee and et al examined the effects of deep flexor muscle-strengthening exercise on the neck–shoulder posture, and the strength and endurance of the deep flexor muscles and concluded that, strengthening cranio-cervical flexor muscles is important for the adjustment of neck posture,

and maintaining their stability is required to improve neck-shoulder posture [17]. R.M Ruivo conducted study in 2016 in Portugal reported that 16 weeks based exercise program which includes stretching and strengthening exercises with postural education, were have significant impact on decreasing FHP but no significant impact on shoulder pain [18]. Study by Thavatchai Suvarnnato et al, stated that 6 weeks of training in both stretching and isometric strength training exercise groups can improve neck disability, pain intensity, CV angle, and neck-muscle strength in chronic mechanical neck pain [19].

Rehabilitation of specific deep neck muscles helps improve neuromuscular control and reestablishes sensorimotor control of cervical spine. These programs are effective for restoration of motor function and proved to be beneficial for reducing neck pain recurrences [20]. To our knowledge FHP causes muscle imbalance between deep cervical flexors and cervical extensors. Leading to middle cervical spine extended, lower cervical spine flexed. Exercising deep cervical flexor muscles improve motor control and helps to correct muscle imbalance between superficial and deep layer of cervical muscles [21]. By training cervical flexor muscles, cervical lordosis can be corrected and so does non-specific neck pain, this opinion is supported by a study [22].

On other hand deep cervical extensors muscles weakness also plays part in FHP and neck pain [3]. Therefore, rehabilitation program should also focus on these deep extensor muscles [23]. A study states that isometric exercise of deep extensors of neck increases strength of these muscles [24]. Therefore, this increase in strength of deep extensors reduces FHP. Cervical flexors as well as occipital extensor muscles become shortened in forward head posture [25]. Therefore, stretching of these muscles can increase muscle length and so does reduces FHP. Different studies such as conducted by Jun Hyung Cho et al, Seung Kyu Park et al), and Syeda Nida Gillani et al, also supports this view. They state that stretching exercises are effective in increasing length of muscles, rom, and changes tone of muscles that are involved in FHP and so does are effective in reducing FHP.

Results of present study concludes that both exercise intervention the isometric strength training and stretching, are equally effective. The limitation of this study is that the targeted population was small. Further studies are required that targets larger population.

Conclusion

Both techniques the isometric strength training and stretching are equally effective in correcting forward head posture and associated neck pain reduction.

Recommendation:

Strength exercises along with stretching are effective in treatment of FHP and should be incorporated in clinic and home exercise programs for chronic neck pain along with postural misalignments.

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Assessment of Frequent Work Related Musculoskeletal Disorders in Patients Visiting the Physiothrapy OPD of Civil Hospital Quetta, Pakistan: A Cross Sectional Survey

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Abstract

Background: Work related musculoskeletal disorders (WRMSD) are the sort of disorders which involves soft tissues. The involvement of soft tissues can be due to the over use, restlessness and improper use. The main target of WRMSD are working indicuduals.it may cause muscle strain, ligament strain, tendon strain, tendentious and bursitis.

Methods: The cross section survey was conducted and data was collected from July to October 2018 from civil hospital Quetta, Pakistan. A self-constructed proforma was used among the 97 patients who meet the inclusion and exclusion criteria and Spss version 23 was used.

Results: The majority (n=49, 50.5%) were belongs to age group of 21 to 35 and were (n=51, 52.6%) were male. In marital status majority (n=64, 66%) were married. In involvement of part majority (n=28, 28.9%) were suffering from lower back problem. After checking the type of injury (n=48, 49.5%) were suffering from muscular strain. In the context of onset of injury majority (N=41, 42.3%) were experienced their problem suddenly.

Conclusion: The study finalized that WRMSD is most common in working individuals especially in older and females. The WRMDS puts heavy burden on the society, annually. As the participants who belongs to low socio economic status are more vulnerable for WRMDS.

***Keywords**: Frequent, Physiotherapy, Work Related, Musculoskeletal Disorders, Quetta, Pakistan.*

Introduction

Work related musculoskeletal disorders (WRMSD) are the sort of disorders which may include, muscles, tendons nerves and other soft tissues as well. Mainly they may appear in the form of muscular strain, tendon strain, tendentious and ligament sprain[1, 2]. They may appear in the different conditions like, carpal tunnel syndrome, epicondylitis, thoracic outlet syndrome, tension neck syndrome, rotator cuff tendentious, tenosynovitis and Bursitis and many other disorders [2-4]. In working adults the more common cause of disability is the WRMSD(5). In old and female workers reported with higher disability rate on comparison with younger and male workers([5, 6]. The WRMSD are more common among the physiotherapist, paramedics, machine operators,

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office workers, carpenters, grocery store workers and truck drivers[7, 8]. During an activity when a person, over uses the muscle, improper uses of their muscle feeling of fatigue for longer time can cause a muscle pain that may called as a muscle strain[1, 2].The over stretching of muscle fibers that usually connects the bone to muscle is called as tendon strain and the inflammation of that fibers is known as tendentious[2, 3]. The tear of ligament is known as ligament sprain. There are mainly three grades of ligament tear. In I grade there is minimal tear of ligament and patients experiences worst pain, in grade II there is partial tear of ligament and patient experiences less pain then grade I but in this grade patient will also suffer from un-stability. In the last there is grade III in which there is complete tear of ligament and patient experiences no pain along with inflammation but patient's knee will be completely un-stable[9].In younger age WRMSD mainly involves the upper extremity of a worker and in older and females the lower back and neck are involved in most of the cases, because the bones of older and females are more fragile as compare to younger males[10, 11]. Those WRMSD which are reported by older individuals are mostly irreversible because the degenerative process get started in older age individuals which is also a leading cause of irreversible WRMSD [11, 12].

Methods

Study Design, Settings, and Duration:

A cross sectional survey was conducted and data was collected from July to October 2018 from the Civil Hospital Quetta, Pakistan.

Sampling:

Convenient Non-Probability Sampling Technique was used among 97 male & female working participants, who must understand the Urdu language (national language of Pakistan) and were agreed to participate in the study, while, patients with any pathology, central nervous system alteration, with any surgical intervention and unwilling to sign inform consent were excluded.

Data Collection Tool:

A self-constructed proforma was used to collect the data, which include the demographic Characterstics (age, gender & marital status) while the included work related musculoskeletal disorders characteristics were, involvement of part(shoulder, wrist, neck, lower back , knees & ankle) type of injury(muscle strain, tendon strain , tendentious, ligament sprain & degenerative disorders) and onset of injury (sudden, gradual & accident).

Data Collection Procedure:

During the assessment of patient, trained physiotherapists were asked to fill the questionnaire on the spot.

Data Analysis Procedure

Data was analyzed and presented in frequency and percentages for categorical variables & Spss (Statistical Package for Social Sciences) 23 version was used.

Ethical Consideration

Permission for data collection from the medical superintendent of respective hospital were taken. The approval for this study was taken from the ethical review committee of Faculty of Pharmacy & Health Sciences, University of Balochistan, Quetta, Pakistan.

Results

Demographic Characterstics

Demographic Characterstics are shown in table I, which shows that majority (n=49, 50.5%) were belongs to age group of 21 to 35 and were (n=51, 52.6%) were male. In marital status majority (n=64, 66%) were married.

Table: I

Variable	Frequency	Percentage
Age		
21 to 35	49	50.5
36 to 45	36	37.1
46 and above	12	12.4
Gender		
Male	51	52.6
Female	46	47.4
Marital Status		
Married	64	66
Un-married	33	34

Involvement of Part

Involvement of Part is shown in table II, which shows that majority (n=28, 28.9%) were suffering from lower back problem followed by (n=24. 24.7%) neck problem.

Table: II

Variable	Frequency	Percentage
Shoulder	18	18.6
Wrist	12	12.4
Neck	24	24.7
Lower back	28	28.9
Knees	05	5.2
Ankle	10	10.3

Type of Injury

Type of Injury is shown in table III, which shows that majority (n=48, 49.5%) were suffering from muscular strain followed by (n=19, 19.6%) were suffering from Tendentious.

Table: III

Variable	Frequency	Percentage
Muscle strain	48	49.5
Tendon strain	14	14.4
Tendentious	19	1 9.6
Ligament sprain	02	2.1
Degenerative changes	14	14.4

Onset of Injury

Onset of Injury is shown in table IV, which shows that majority (N=41, 42.3%) were experienced their problem suddenly followed by (=29, 29.9%) experienced their problem during an accident.

Table: IV

Variable	Frequency	Percentage
Sudden	41	42.3
Gradual	27	27.8
Accident	29	29.9

Discussion

The current study disclosed that the majority of population were suffering from the problem of lower back followed by neck problems. As they mostly experienced muscular strain followed by tendentious in context of work related musculoskeletal disorders. The duration is covered in our study into three (sudden, gradual, accidently) main contexts and most of the patients reported that they experienced their problem very suddenly followed by accidental problems. Studies conducted in different parts of the world by Hagberg et al in 1982 & Sormunen et al in 2006 and concluded in work related musculoskeletal disorders mostly patients suffer from muscular strain and in that condition generally patient experiences pain and discomfort. It is also revealed that the workers who are working in cold environment like cold stores, truck drivers, carpenters and paramedical staff are more prone to develop the muscular strain in context of work related musculoskeletal disorders during their scheduled work as compare to the other workers. The participants who used to work in Construction Company they also experienced the muscular strain more [11, 13, 14]. In old days muscular strains are more common among doctors, especially in urologists during the transurethral resections, but now it's reduced due to the availability of endoscopic procedures[2, 15]. Furthermore the tendinitis is second most common among workers because the tendentious is an inflammation of tendon (bunch of fibers which connects bone to muscle) which is cause by the sudden trauma or gradual repetitive injury[2, 13]. As work related musculoskeletal disorders are common among the paramedic staff because during the shifting of patients they are more likely to expose to minor trauma in wrist which can leads to carpal tunnel syndrome as well [2, 4]. The physiotherapists are more likely to have the work related musculoskeletal disorders as compare to other workers due to their nature of work[8].The physiotherapists who are working in chest ward they can also develop the work related musculoskeletal disorders in upper extremity because they continuously perform the percussion among chest patients[16]. Annually the

work related musculoskeletal disorders put huge burden, over the worker among general population[17]). Work related musculoskeletal disorders are more common in working females on comparison with men[5, 17]. The working women's are more prone to work related musculoskeletal disorders because they are not strong as like male workers. The bones and soft tissues of a female individuals are not much stronger. The working women's can get disable earlier than men and that can cost huge burden on their family and on society as well[17, 18].

Conclusion

The work related musculoskeletal disorders are common in workers especially who belongs with low socio economic status like truck drivers, machine operators, carpenters, cold store workers and factory workers. It put huge burden over the effected individual personal life as well as on society. Working females are more prone to develop work related musculoskeletal disorders.

Recommendations

The awareness regarding the ergonomics and postural corrections should be provided to general population, regarding the safety measures of work related musculoskeletal disorders.

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Significance of Cervical Flexors Strength Training Using EMG Bio-feedback on Forward Head Posture among College Students

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Abstract

Background and Purpose: Forward Head Posture is found to be more among college students resulting in decreased Cervical flexors strength & reduction in physical performances. EMG Biofeedback is effective intervention in retraining the muscle strength & facilitates the correction of abnormal Cranio-Vertebral Angle (CVA) and purpose of this study is to find out the effectiveness of Cervical flexors strength training using EMG Biofeedback among college students, to improve Forward Head Posture. **Materials and Methods:** Totally 30 college students selected under selection criteria ages between 18-25 with Forward Head Posture and randomly allocated equally into experimental group (EMG Biofeedback cervical flexors strengthening) and control group (only cervical flexors strengthening ex's).The outcome tools used were Kinovea Software for CVA and Neck Disability Index (NDI) which was measured before and after the treatment. **Statistical analysis:** Analyzed by paired and unpaired t test. **Results:** The results shows that Group A cervical flexors strength training using EMG Biofeedback has significant improvement on FHP by improving CVA and NDI ($p < 0.0001$).**Conclusion:** This study concluded that the experimental group received cervical flexors strength Training using EMG Biofeedback is found to be effective than the control group received only cervical flexors strengthening ex's.

Keywords: *Craniovertebral angle, Electromyography, Forward Head Posture, Neck Disability Index.*

Introduction

Forward Head Posture (FHP) is the anterior positioning of cervical spine or Any alignment in which external auditory meatus is positioned anterior to plumbline through shoulder joint. It is also called as Text Neck, Turtle Neck, Scholar's Neck, Wearies Neck, I hunch, Reading Neck. Moreover it is considered to be one of the commonest postural malalignment found in today's youth[1].

The prevalence of FHP is found to be 70% amongst physiotherapists and physiotherapy student and 63.96% among university students. A study showed prevalance of FHP to be 85.5% and significant association was seen between FHP and gender. A study on heroin users showed that 36.7% had moderate FHP while 20.0% had severe FHP[2,3].

In this Condition, there is an increased external flexion torque to the vertebrae of cervical spine, that is increased extension of upper cervical spine (C1-C3) and increased flexion of lower cervical spine (C4-C7) and upper thoracic spine occurs; causing severe tension of the extensors of neck and surrounding connective tissue occurs. When the head changes its position from normal and moving center of gravity forward from spine leads to abnormal stress on cervical musculature causing muscle imbalance.

There is shortening of occipital extensor and cervical flexors with relation to lengthening of occipital flexors and cervical extensors is also noted. In EMG Studies, activities of middle trapezius, splenii, sternocleidomastoid are reduced due to changes in muscle length has been reported [3,4]. Eventually, there is increased burden on spinal tissue causing persistent spinal malformation.

Major problems associated with FHP are Tightness and weakness. Stretch weakness of Anterior vertebral neck flexors and tightness of neck extensors including the upper trapezius, splenius capitis, Sternocleidomastoid and semispinaliscapitis is noted. Muscular imbalance takes place in the body because of tight and weak muscles which adversely affects the co-ordinated movement of neck control and serves as a high risk to develop neck pain.

One of the accurate way to measure CVA is Kinovea Software. Observation associated with Kinovea Software for measurement of CVA between an imaginary line extending from C7 through the tragus and the horizontal line. The average CVA is about 48-50 degrees. Individuals with cervical pain has a CVA below 45 degrees, Smaller the CVA, greater the FHP [5,6].

Neck pain is a common disorder characterized by ache or soreness experienced in a region between the inferior margin of the occiput and T1. It is clear that improper posture (FHP) is risk factor for reduced CVA and neck pain among College Students. FHP is postural problem caused by extended use of computers, Smartphone, laptops, tablets and e-readers, sleeping with head elevated too high, lack of back muscle strength and lack of nutrients such as calcium[5]. If untreated it leads to secondary complication like abnormal posture, protracted shoulder, thoracic kyphosis and affect cervical joint position sense. The negative effect like difficulty breathing, palpitation, chest distress, sleeps disorders and numbness of arms which results in the altered functional outcome of the individuals [7,8].

The available treatment to correct FHP are Cervical flexors strengthening exercises, Kendall exercises etc,.[9,10,11] In recent times EMG Biofeedback is a new mode of treatment uses computers and surface electrodes that are placed on the skin of the person to reveal their internal physiological events, in the form of visual and auditory signals. This is kind of modalities in physical therapy, assists the individual to understand & control the physiological process that are usually involuntary, through auditory and auditory stimuli. Such method of retraining muscle creates new feedback systems as conversion of myoelectrical signals in muscle into visual and auditory feedback. EMG uses surface electrode to observe changes in skeletal muscle activity and used to increase activity in weak muscle or used to facilitate a reduction in spasticity[12]. EMG biofeedback has been reported to be an effective intervention for reducing pain, improving muscle strength & re-educating posture.. Therefore the purpose of this study focuses on correcting forward head posture by Cervical flexors strength training using EMG Biofeedback along with the postural corrective exercises among college students.

Methodology

Subjects ages between 18-25 years, both male and female college students with FHP (Cranio-Vertebral Angle less than 50 deg) having moderate to severe disability using NDI were included. Disabiling neurological condition such as Cervical spondylosis, Cervical radiculopathy, Cervical fracture, Traumatic neck injury, Intervertebral disc prolapse in cervical spine and Subject with psychological or psychiatric illness were excluded.It is the experimental study at Sri venkateshwaraa college of physiotherapy. Subjects fulfilling the selection criteria were randomly allocated into two groups,15 in each group (A-experimental group, B-control group) and procedure was explained. A written consent form was taken.

Outcome Measures

Neck Disability Index: It is used to measure neck pain and functional disability, and consisted of 10 items: degree of pain, daily living, lifting, reading, headache, concentration level, work, driving, sleep and leisure activity, each of which graded from 0 to 5, to a total of 0-50. 0-4 represented no disability, 5-14 is mild disability, 15-24 is moderate disability, 25-34 is severe disability and >35 is complete disability[18,20].

PGM (Photo Grammetical Measurement) using Kinovea Software: It has a good validity and high inter-rater and intra rater reliability to assess the cranio-vertebral angle. Participants were asked to sit

comfortably on a high backed chair and instructed to visually focus on a point on the wall. The visual point was confirmed by the examiner after the subjects assumed a comfortable sitting position which minimize the flexion or extension of the neck, while maintaining a relaxed head position. A picture of the lateral view of each participant was taken in both position[6,25].

A profile photography showing the measure of CVA using kinovea software.

Procedure

Subjects who fulfilled the selection criteria were included for the study. The benefit of the study and intervention is explained to the subjects and a written informed consent is taken. The subjects will be assessed by using kinovea software for cranio vertebral angle and Neck Disability by NDI. The subjects will allocate randomly into 2 groups consists of 25 subjects each.

Group A: Experimental group.

Biofeedback Training:

Biofeedback training is performed with **NEUROSTIM-NS 2**, a two channel EMG Machine. Clear and full screen displayed the EMG signal and the curve obtained from sternocleidomastoid and anterior scalene muscle[8].

Position: The participant are asked to sit in erect posture with back supported on straight back chair with forearm and hand rested on there laps. They were asked to sit quietly with neck & shoulder relaxed. The treatment area should be silent to avoid noise pollution.

Preparation of the Patient: Before electrode placement, the patients were asked to expose the neck area and the thoroughly washed by saline water to clean and reduce skin resistance. Surface electrodes were used to record muscle activity.

Electrode placement:

A conductive transmission gel is applied to electrodes to ensure good muscle conductivity. **Active electrode:** It fixed on sternocleidomastoid muscle, at mid point of muscle belly, 4cm below the insertion on mastoid process(this distance 4cm is suggested to avoid interference in electrical signal by fibers of platysma muscle).

Inactive electrode: Inactive electrode is placed at Anterior scaleni.

Ground electrode strapped around wrist.

Exercise Manual: Once participant and electrodes are positioned, verbal command to the patient to maintain neck in neutral position and practiced to do isometric maximal voluntary cervical flexors contraction hold for 5sec and rest for 10sec. 3sets with10 repetition per day, 4 sessions per week about 4 weeks. Total Duration: 30 minutes.

EMG Biofeedback training.

Group B: Control group

Cervical extensor stretching: Placing both hands on occipital area in sitting position followed by flexed neck posture with head down to stretch cervical extensors[3,27].

Trapezius self stretching: Placing one hand on lower back and other on opposite side of the head. Then pull the head toward shoulder and looking straight ahead and repeat on other side. 3 sets with 15 sec hold on each[9,27].

Chin tuck in exercise: Ask the participant to sit on chair and tuck the chin posteriorly and inferiorly hold for 5sec and repeated for 10 times[6,15,9].

Trapezius Self Stretch

Cervical Extensor Stretching

Chin Tuck In Exercises

Postural awareness education: Sit with headrest chair and always maintain neck in neutral position and Set up workspace ergonomically by raising the computer that helps eyes to look straight ahead the screen and position the forearm parallel to floor of keyboard with elbow 90 deg. Cervical pillow or rolled towel can be used while sleeping to maintain curvature of cervical spine.

Cervical AROM exercises

AROM exercises for cervical spine: Each movements 10 repetition for about 30 times. 10 sec rest in between every 10 repetition[12]

Data Analysis

In this study, pre and post interventional differences within the two groups were analyzed using paired t test (Tab.1) and between the two groups were analyzed using unpaired t test for each of the outcome measures (Tab.2). Statistical significance was set at $p < 0.0001$.

Table 1: Pre and Post analysis of within the groups

Groups	Mean	SD	T-Value	P-Value
CVA				
GROUP A Pre Test Post Test	 38.53 42.26	2.26 1.94	20.5464	<0.0001
GROUP B Pre Test Post Test	37.13 44.07	2.88 1.39	8.0204	<0.0001
NDI				
GROUP A Pre Test Post Test	 40.93 25.67	 3.59 6.22	7.7978	<0.0001
GROUP B Pre Test Post Test	41.47 32.60	3.74 3.68	14.9637	<0.0001

Table 2: Pre and Post analysis of between the groups

Groups	Mean	SD	T-Value	P-Value
CVA				
Group A Group B	44.07 42.27	1.94 1.39	2.9188	<0.0001
NDI				
Group A Group B	26.67 32.60	6.77 3.68	2.9828	<0.0001

Results

The results shows that there is improvement in both the groups but between the group analysis of the post value shows that the Experimental group is significant ($p<0.0001$) than the control group.

Discussion

Strength gained by EMG biofeedback was explained by Basmajian et al., with the help of auditory and visual clues, patients could control the recruitment and frequency of discharge of motor units. In terms of the present study, one might hypothesis that the visual and auditory cues from the biofeedback unit enable group A to consciously increase either frequency of discharge of active motor neurons or number of motor units recruited by firing as possibly in faster rate and produce greater amount of tension in the muscle[18].

Waley et al., Investigated the Physiological basis underlying the increase in muscle strength associated with use of feedback and found that muscle strength increase could be attributed to an increase in the average firing rate, motor unit recruitment patterns & occurrence of synchronisation of active motor unit[31].

Furthermore, Moritani and DeVries et al.,described neural factors is a facilitation occuring as a result of neurological reorganisation. This theory also hypotheses that the persistent recruitment increases the numbers of motor units by means of biofeedback, causing a reorganisation of facilitation patterns[22]. This reorganisation may be responsible for the greater gains in strength in group A that was exposed to biofeedback.

Relaxation and facilitation of muscles are some of the main areas of treatment using biofeedback in physical therapy. A few studies reported, Biofeedback being used to facilitate and train relaxation in chronic pain. It utilizes the principle of hypostimulation (relaxation) of the central nervous system, which increases the endorphins and forms the neuro endocrine basis of biofeedback for control of pain & corrects the abnormal posture [26].

EMG Biofeedback showed good results in reducing forward head posture in accordance with altering craniovertebral and improves in managing the neck disabilty and activities of daily life. The result obtained in this study is encouraging and best strategy for muscle strengthening by use of EMG Biofeedback.

Conclusion

Therefore, this study concluded that the experimental group received cervical strengthening using EMG Biofeedback shows significant improvement in reduction of Forward Head Posture among college students than the control group who received only cervical strengthening ex's without EMG biofeedback.

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