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Original Article

Correlations of Anthropometric Measurement and Handgrip Strength between Collegiate Cricket Fast and Spin Bowlers

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Abstract

Background: More dimensions in anthropometric variables and dominance of the hand aid in bowler's success and is easier for coaches/teams to pick and hire on the basis of fast and spin bowlers. Little is known to date on the relationship between anthropometric measures and handgrip power in collegiate bowlers. Present study is an attempt to quantify the handgrip power of collegiate male cricketers, and to explore its correlations with some selected anthropometric variables.

Methods: Forty fast and 37 spin bowlers, aged between 20-25 years (mean age= 22.7±1.2 years) were selected from match practice group of different colleges in Rahata taluka, Maharashtra. Body height and mass were measured to calculate body mass index. Handgrip strength was measured with standard dynamometer. Statistical analysis was carried out for each variable and independent *t*-test was used to analyze differences between the two groups. Pearson's correlation coefficient test was done to obtain relationship between handgrip strength and selected anthropomorphic variables. The significance was set at 0.05.

Conclusion: Anthropometric variables were directly related to handgrip strength among bowlers in this study. Forearm lengths of spinners were longer than fast bowlers. Handgrip strength was more in dominant hand and spinners had more handgrip strength than fast bowlers. These parameters will help in future for talent identification in handgrip-related sports and/or clinical settings.

Keywords: *Anthropometry, dynamometer, hand grip strength, male bowler, cricket.*

Introduction

Cricket is one of the oldest organized sports but very few scientific studies are documented[1-4] . It is a popular field-based team sports, in terms of participants, spectators and publicity, with the display of an array of skills during batting or bowling[5-7]. In sports, the optimal success tends to have definite physical parameters such as height, weight, and physical fitness variables like speed, agility and flexibility[8-12]. Cricketers are also exposed to more stringent practices, that involves extensive stretches of preparation and training[13], this massive workload is the foremost negative factor contributes to an increase in the incidence of injuries[14-17]. For a variety of sports and other fields, it has been well established that specific anthropometric profiles specify whether the player would be suitable for the competition at the

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highest level[18-20], however this knowledge is lacking in cricket.

Anthropometric measurements are useful for providing an important role in identification of talents[21]. Cricket is focused on specific abilities such as catching, batting, and bowling. Bowling is a combination of running, leaping, swinging, stopping, and using hand grip and strength to deliver a ball through vertical rotations of the hand[22]. Cricket player's anthropometry and hand grip strength (HGS) are critical to their success since they are tall and muscular[23]. It, as such supremacy, is important in deciding the player's power values[24]. For a positive score, a player with a bigger hand and better grip strength helps in simple ball gripping as well as stronger basic hand movements[25]. Very little is being done before for classifying cricketers based on physical and anthropometrical demands of cricket especially in India. Only limited studies are available on the morphological and anthropometric features and handgrip ability of cricket players[26-29]. Hand length, hand weight, forearm length, arm length, upper extremity length, and hand grip power are measured in this study to analyze the players based on selection in collegiate fast bowlers and spin bowlers, as this can help players to perform better at higher levels of cricket.

Material and Methods

Source of Data: Male cricketers were selected from different colleges selected from match practice group of Rahata taluka, Ahmednagar, Maharashtra, India.

Study setting: The study was conducted in the department of Orthopaedic Physiotherapy, Dr. APJ Abdul Kalam College of Physiotherapy, Loni, Ahmednagar, Maharashtra.

Type of Data: Quantitative data.

Sampling Method: Simple Random Sampling.

Sample size: Total number of participants in this study was 100, of which 77 were analyzed (fast-bowlers n=40, spin-bowlers n=37), while 23 samples could not be assessed due to the Covid-19 pandemic and the participant's inability to partake.

Method of collection of data: Data was collected by the primary investigator.

Study Duration: 2 years.

Equipments used: Handgrip dynamometer, Measuring tape, Stadiometer, Weighing scale.

Materials used: Participant's consent and information forms, Inform consent form, Data collection form, Evaluation chart, Screening form, Pen and pencil.

Selection Criteria:

· **Inclusion criteria:** Healthy, physically active participants of 20-25 years old college level male cricket bowlers willing to participate and to submit written informed consent form.

· **Exclusion criteria:** Participants with any genetic, psychological, neurological or chronic diseases affecting hand function and anthropometric measurements and also with recent injuries and fractures.

· **Variables/Outcome Measures:** Height, Weight, body mass index (BMI), hand width, hand length, forearm length, arm length, upper extremity length, hand grip strength (HGS).

Procedure: Ethical committee approval (Ref. No.- PIMS/CPT/IEC/2020/76) was taken from the Institutional Ethical Committee. Participants were included in the study according to the inclusion and exclusion criteria after explaining to them about the nature of the study, duration of intervention in the language best understood by them. They were encouraged to clarify any queries regarding the study. After obtaining a written consent form, demographic data were collected, assessed and participants were subsequently allocated into two groups based on the method of convenience sampling. Participant's height (m) and weight (kg) were measured using stadiometer

and analog weighing scale respectively. Measurements of anthropometric variables (hand width, hand length, forearm length, arm length, upper extremity length) and the HGS was carried out using measuring tape (Fig. No.1) and the hand dynamometer respectively.

Data analysis:

· Standard descriptive statistics (mean ± standard deviation) were determined for directly measured and derived variables. The data showed normal distribution encouraging using parametric statistics.

· Data were compared for statistical significance using Student's *t*-test. The significance level for all statistical analyses was $p<0.05$.

· Pearson's correlation coefficients were used at 5% (p, 0.05) and 1% (p, 0.001) level of significance to establish the correlations of dominant and non-dominant HGS with other variables in fast and spin bowlers.

· Photographs were taken using camera of OnePlus8T phone. Figure was made by Adobe Photoshop CS4 programme.

· Data were analyzed with SYSTAT software (made by Crane's software, Bangalore) version-12; a licensed copy.

Findings and Discussion

The main objectives of the study was to analyze hand anthropometry and HGS, and to correlate them among collegiate level fast and spin bowlers. As a result, we will be able to learn more about the success of players and in preventing sports accidents. Hand length, hand width, forearm length, arm length, upper extremity length (Fig. No.1), and HGS were measured to evaluate bowlers, as this can help players to perform better at higher levels of cricket. The demographic variables such as age, height weight and BMI were examined between the two groups, and found that they were comparable among fast and spin bowlers (Table No.1). Anthropometric studies in many other sports documented that optimal success tends to have definite physical parameters and physical fitness[9-12]. Also earlier studies advocated that the height and arm length of the bowler was critical for bowling speed, as height is directly proportional to the projectile and boosts angular velocity and enhances ball velocity[30-31].

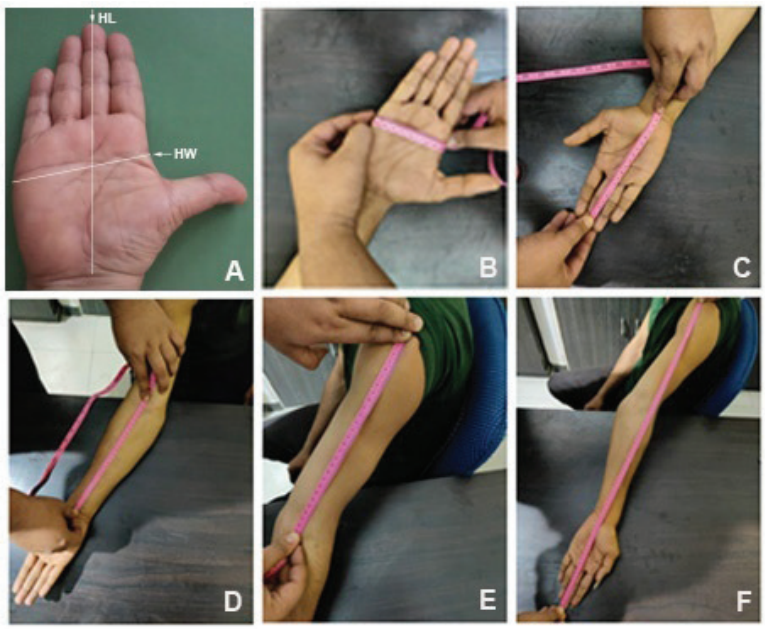

Fig. No. 1: Measurement of hand anthropometric variables using measuring tape

Interpretation: A: hand length (HL) and hand width (HW) demarcations. **B:** hand width. **C:** hand length. **D:** forearm length. **E**: arm length. **F:** upper extremity length.

Table No. 1: Demographic characteristics of collegiate cricket bowlers.

Demographic characteristics	Fast bowler (n= 40)	Spin bowler (n= 37)	p value
	Mean ± SD	Mean ± SD	
Age (years)	22.60 ± 1.20	22.8 ± 1.23	0.51
Height (m)	1.76 ± 0.05	1.77 ± 0.05	0.61
Weight (kg)	75.03 ± 4.50	74.68 ± 4.80	0.75
BMI (kg/m²)	24.2 ± 0.10	23.9 ± 1.20	0.21

kg: kilograms; m: meters; m^2: square meters; SD: standard deviation.

Except for the forearm length, rest of the anthropometric variable measurements were insignificant among fast and spin bowlers (Table No.2). Forearms of fast bowler were significantly smaller than that of spin bowler; $p<0.05$ and $p=0.01$ for the right and left forearms respectively (Table No.2, marked #). Earlier reports have suggested that, longer arm length was an essential factor to generate greater speed and the cricket ball travels larger distance, because longer lever increases the ball release velocity, thus has an added advantage in bowling performance[32-34].

Table No. 2: Anthropometric measurements of collegiate cricket bowlers.

Anthropometric measurement (cm)	Fast bowlers (n=40)	Spin bowlers (n=37)	p value
	Mean ± SD	Mean ± SD	
Right hand width	10.53 ± 0.85	10.41 ± 0.80	0.53
Left hand width	10.53 ± 0.85	10.38 ± 0.79	0.44
Right hand length	16.45 ± 1.36	16.65 ± 1.30	0.51
Left hand length	16.40 ± 1.34	16.65 ± 1.30	0.41
Right forearm length #	25.95 ± 1.36	26.54 ± 1.10	0.04*
Left forearm length #	25.78 ± 1.40	26.51 ± 1.07	0.01*
Right arm length	28.10 ± 1.24	28.35 ± 1.09	0.35
Left arm length	28.00 ± 1.30	28.27 ± 1.10	0.33
Right upper extremity length	70.40 ± 3.73	71.40 ± 3.30	0.22
Left upper extremity length	70.10 ± 3.69	71.35 ± 3.33	0.12

cm: centimeters; SD: standard deviation.

Table No. 3: Hand grip strength (HGS) of collegiate bowlers (Pooled Data).

Dynamometer HGS (kg)	Right hand	Left hand	p value
	Mean ± SD	Mean ± SD	
Right hand fast bowler (n=35)	42.03 ± 4.44	33.89 ± 4.55	0.001**
Right hand spin bowler (n=32)	43.68 ± 2.84	36.94 ± 3.09	0.001**
Left hand fast bowler (n=5)	35.20 ± 5.81	43.60 ± 4.72	0.01*
Left hand spin bowler (n=5)	39.40 ± 3.44	44.20 ± 2.49	0.001**

kg: kilograms; SD: standard deviation.

Anthropometric variables are directly related to HGS among bowlers. Majority of the fast bowlers (35 out of 40) and spin bowlers (32 out of 37) analyzed were right hand dominated, only 5 in each group were left hand dominating bowlers. We compared the HGS of right hand vs. left hand of right handed pace and spin bowlers. Irrespective of type of bowler, our data showed that the dominating right hand showed significantly more HGS than the non-dominant left hand (Table No.3). Though the sample size of left hand dominating bowlers were small (n=5 in each group), the HGS measured was significantly higher for the bowling left hand than the non bowling right hand (Table No.3). HGS data of fast bowlers against spin bowlers showed that, former had significantly less HGS than the later (Table No.4, pooled data).

Table No. 4: Hand grip strength (HGS) of collegiate bowlers (Pooled Data).

Handgrip strength (HGS) (kg)	Fast bowlers (n=40)	Spin bowlers (n=37)	p value
	Mean ± SD	Mean ± SD	
Right hand	41.18 ± 5.08	43.16 ± 3.24	0.043*
Left hand	35.10 ± 5.56	38.27 ± 4.34	0.01*

kg: kilograms; SD: standard deviation.

Cricket player's HGS and anthropometric factors have a strong correlation and are critical to their achievement since they are tall and well-built[33]. It, as such supremacy was important in deciding the player's power values. For a positive score, a player with a bigger hand and better grip strength helps in simple ball gripping as well as stronger basic hand movements[34,35]. The non-dominant hand has less grip strength than the dominant hand, making it harder for the player to understand. This would be a disadvantage during bowler's selection, resulting in bad results and consistency. More dimensions in the

anthropometric variables and dominance of the hand aid in the bowler's success. As a result, it is easier for coaches and teams to pick bowlers and hire on the basis of fast bowlers and spin bowlers.

Hardly any research has been conducted to date on the inter co-relationship between anthropometric measures and HGS in collegiate level fast and spin bowlers. Based on height, the longer the player's hand length, arm length, and upper extremity length, the stronger the player's hand grip and power to bowl spin or fast[35]. Also, longer limbs will have more muscle mass to exert energy and augment pace bowling ability[35]. We tried to express the degree and direction of linear association between HGS and anthropometric variables and our data showed a strong correlation which was given in Table Nos. 5 and 6. The HGS of both hands showed positive ($p<0.05$) correlation with height, weight and BMI of fast (Table Nos. 5) and spin (Table Nos. 6) bowlers. Similarly, hand and arm anthropometric variables also showed significant positive correlation with each other.

Table No. 5: Inter-correlation matrix of HGS and anthropometric variables among collegiate cricket fast bowlers (Karl Pearson's correlation) (r) value

	Weight	BMI	RHHW	LHHW	RHHL	LHHL	RHFL	LHFL	RHAL	LHAL	RHUEL	LHUEL	RHGS	LHGS
Height	0.786*	-0.269**	0.856*	0.844*	0.379*	0.374*	0.507*	0.514*	0.572*	0.538*	0.564*	0.538*	0.181*	0.445*
Weight	-	0.383*	0.766*	0.742*	0.441*	0.397*	0.487*	0.632*	0.554*	0.426*	0.558*	0.573*	0.225*	0.444*
BMI	-	-	-0.105**	-0.105**	-0.184**	-0.198**	0.011*	0.022*	-0.009**	-0.050**	-0.060*	-0.080**	0.166*	0.024*
RHHW	-	-	-	-	0.481*	0.495*	0.603*	0.641*	0.683*	0.652*	0.671*	0.656*	0.068*	0.522*
LHHW	-	-	-	-	0.481*	0.495*	0.603*	0.641*	0.683*	0.652*	0.671*	0.656*	0.068*	0.522*
RHHL	-	-	-	-	-	0.987*	0.778*	0.753*	0.660*	0.623*	0.648*	0.664*	-0.131**	0.238*
LHHL	-	-	-	-	-	-	0.761*	0.781*	0.675*	0.632*	0.667*	0.687*	-0.162**	0.209*
RHFL	-	-	-	-	-	-	-	0.675*	0.662*	0.635*	0.645*	0.629*	0.429*	0.429*
LHFL	-	-	-	-	-	-	-	-	0.621*	0.699*	0.674*	0.642*	0.472*	0.447*
RHAL	-	-	-	-	-	-	-	-	-	0.687*	0.663*	0.675**	0.405*	0.424*
LHAL	-	-	-	-	-	-	-	-	-	-	0.698*	0.635*	0.404*	0.412*
RHUEL	-	-	-	-	-	-	-	-	-	-	-	0.665*	0.413*	0.433*
LHUEL	-	-	-	-	-	-	-	-	-	-	-	-	0.422*	0.442*
RHGS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LHGS	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Weight BMI RHHW LHHW RHHL LHHL RHFL LHFL RHAL LHAL RHUEL LHUEL RHGS LHGS

*** positive correlation** i.e. as the value of one variable increased so does the value of the other variable increased.

**** negative correlation** i.e. as the value of one variable increased so does the value of the other variable decreased.

BMI: body mass index; HGS: hand grip strength; LHAL: left hand arm length; LHFL: left hand forearm length; LHGS: left hand grip strength; LHHL: left hand hand length; LHHW: left hand hand width; LHUEL: left hand upper extremity length; RHAL: right hand arm length; RHFL: right hand forearm length; RHGS: right hand grip strength; RHHL: right hand hand length; RHHW: right hand hand width; RHUEL: right hand upper extremity length.

Table No. 6: Inter-correlation matrix of HGS and anthropometric variables among collegiate cricket spin bowlers (Karl Pearson's correlation) (r) value

	Weight	BMI	RHHW	LHHW	RHHL	LHHL	RHFL	LHFL	RHAL	LHAL	RHUEL	LHUEL	RHGS	LHGS
Height	0.710*	-0.281**	0.822*	0.808*	0.312*	0.322*	0.492*	0.502*	0.524*	0.515*	0.553*	0.515*	0.142*	0.412*
Weight	-	0.324*	0.741*	0.735*	0.428*	0.391*	0.477*	0.636*	0.556*	0.418*	0.563*	0.423*	0.192*	0.416*
BMI	-	-	-0.112**	-0.125**	-0.169**	-0.187**	0.012*	0.037*	-0.007**	-0.051**	0.057*	-0.074**	0.158*	0.025*
RHHW	-	-	-	-	0.423*	0.464*	0.599*	0.631*	0.663*	0.661*	0.663*	0.663*	0.065*	0.515*
LHHW	-	-	-	-	0.434*	0.497*	0.599*	0.643*	0.663*	0.661*	0.663*	0.615*	0.065*	0.520*
RHHL	-	-	-	-	-	0.947*	0.761*	0.742*	0.648*	0.615*	0.614*	0.652*	-0.127**	0.229*
LHHL	-	-	-	-	-	-	0.750*	0.762*	0.666*	0.645*	0.648*	0.667*	-0.153**	0.200*
RHFL	-	-	-	-	-	-	-	0.685*	0.652*	0.630*	0.632*	0.618*	0.413*	0.416*
LHFL	-	-	-	-	-	-	-	-	0.607*	0.677*	0.655*	0.637*	0.470*	0.436*
RHAL	-	-	-	-	-	-	-	-	-	0.632*	0.652*	0.667**	0.415*	0.441*
LHAL	-	-	-	-	-	-	-	-	-	-	0.675*	0.624*	0.416*	0.410*
RHUEL	-	-	-	-	-	-	-	-	-	-	-	0.658*	0.403*	0.425*
LHUEL	-	-	-	-	-	-	-	-	-	-	-	-	0.417*	0.437*
RHGS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LHGS	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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*** positive correlation** i.e. as the value of one variable increased so does the value of the other variable increased.

**** negative correlation** i.e. as the value of one variable increased so does the value of the other variable decreased.

BMI: body mass index; HGS: hand grip strength; LHAL: left hand arm length; LHFL: left hand forearm length; LHGS: left hand grip strength; LHHL: left hand hand length; LHHW: left hand hand width; LHUEL: left hand upper extremity length; RHAL: right hand arm length; RHFL: right hand forearm length; RHGS: right hand grip strength; RHHL: right hand hand length; RHHW: right hand hand width; RHUEL: right hand upper extremity length.

Conclusion

As very few studies are reported in connection with hand anthropometry data at college level cricket in developing countries, the present study made an effort to analyze hand anthropometry data of male collegiate cricket bowlers. Due to ongoing Covid-19 pandemic, the sample size was small, still we observed a significant correlation between HGS and some selected anthropometric variables among collegiate cricket fast as well as spin bowlers. More research on bowlers of different age groups and ranks is needed to establish detailed guidance for coaches and teams to pick bowlers and hire on the basis of fast bowlers and spin bowlers. The information provided in this analysis has a wide range of practical applications as it will help players in selecting a bowling style based on their characterized skill and anthropometry and aid in future for talent identification, players selection, talent recognition as well as in designing training protocols in the field of cricket.

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Conflict of Interest: The authors do not have any conflict of interest to declare.

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Original Article

Effect of 6-Week Functional Training on Speed and Agility of Basketball Players

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Abstract

Introduction: Basketball is a game which includes high intensity activities like dribbles, sprints and screens, these activities require change of direction and sprinting ability. Functional training which includes low load training and closed kinematic chain activities tends to improve motor skills. The athletes with finer skills are less prone to injury and hold a better chance at scoring.

Objectives: The main objective of this study is to observe the effect of six week functional training on speed and agility in basketball players.

Method: Based on inclusion criteria and exclusion criteria 20 subjects of 18-24 years were selected by random Sampling and Informed consent was taken. Pre-exercise tests were performed before the beginning of training and it included field tests to evaluate lower extremity power and agility then a six-week-long Functional training program was applied, followed by post-exercise tests.

Statistical Analysis: Data was meaningfully assorted through calculation of Mean and SD and Paired't' test was applied at the $p<0.05$for the comparison within the groups for the variable speed and agility.

Keywords: *Basketball players, speed and agility, Functional Training*

Introduction

Basketball is an aerobic and anaerobic based sport which requires high intensity activities such as jumping (for rebounds, blocks and shots), turns, dribbles, sprints, screens and low intensity activities such as walking, stopping and joggingas stated by Aiyegbusi et al.[1] According to Jakovljević et al.[2]number of times the situation of game demands multiple rapid changes of direction in the relatively small space of the court, because of which agility has a special importance in basketball. He stated that basketball practice must contain agility exercises with an emphasis on technique, sprint and strength training.Abbas Asadi[3] stated sprinting ability plays an important role in the game of basketball as during turns players has to run fast as possible for the offensive and defensive structures.

Agility and speed abilities are different and independent abilities of a sportsman. Variations which are involved in change of direction movements, which controls agility performance, are therefore specific qualities and should be trained for better performance in basketballas reported by Horička et al.[4]As studied by Bhardwaj & Kalla[5] each player of the team represents diferrent physical activity during game depending on player's position. As discussed by Cook et al.[6] the Functional Movement Screen (FMS) is a popular means of assessing the fundamental movement patterns an individual, it also helps in predicting performance and evaluating readiness of an athlete for return to sport. It helps in prescribing specific fitness protocols to athletes and active population groups. FMS consists of 7 functional tasks involving movement patterns of the trunk and both extremities[6].

Functional training is required for developing special and tactical skills. Functional training is an individual approach and the type of training should resemble conditions encountered by player during the game. Most important role of functional training is to accurately perform fundamental movement patterns and maintain an optimal balance between mobility and stability as reported by Boyle et al.[7]

The functional training program executed in this study was on ground of functional training applied in selected sport fields as stated by Baron et al.[8] and by Suzuki et al. [9], function training includes low load exercises. The protocol has been known to have positive effects on sports performances in athletes of various sports disciplines.

Material and Method

Study Design: Experimental study (Pre-test and post-test design).

Sampling Technique: The subjects were be selected byPurposive Sampling.

Source of Data: Subjects were taken from stadiums of ludhiana .

Eligibility

Inclusion Criteria

•Players with age ranging from 18 to 24 years were selected for research.

•The minimum years of the playing was at least three years.

•They remain participating in off-season training programs

Exclusion Criteria

•Subjects with lower extremity reconstructive surgery in the past two years were excluded.

•Subjects with musculoskeletal problems such as lower limb fracture and sprain or strain excluded.

•Subjects with problems as well as respiratory or cardiovascular system excluded.

•Subjects those are smokers and users of medications known to affect cardio respiratory function were not selected for research.

PROCEDURE

Based on inclusion and exclusion criteria 20 subjects were selected. The training program was based on Functional training. All subjects agreed not to change or increase their current exercise habits during the course of the study. The functional training group participated in a six week training program performing Deep Squat, Hurdle step, Active Straight Leg Raise, Trunk Stability push up and Balance and Coordination Exercise followed by foam rolling in cool down procedure. All subjects were directed to not initiate any lower extremity strengthening programs during these six weeks and to only perform activities of normal daily living. Prior to the study, procedures and guidelines were presented orally and in written form. Subjects agreeing to participate signed an institutionally approved consent form. The intensity of training was diminished so that fatigue would not be a factor during post-testing. The functional training group trained at the same time of day, two days a week, throughout the study. During the training, all subjects were under direct supervision and were instructed on how to perform each exercise.

Pre-training and Post-training testing procedure

1). 50 meter run test for speed: The test involves running a single maximum sprint over 50 meters, with the time recorded. Speed of the subjects was calculated by dividing the distance covered (in meters) by time taken (in seconds) by them Anuranjan[10].

(2). T test for agility: Three cones were set five meters apart on a straight line. A fourth cone was placed 10 meters from the middle cone so that the cones form a T.

•Athlete starts at the base of the “T”.

•Examiner gives signal to go and when athlete crosses the photocell the time begins.

•Athlete runs to middle cone and touches it.

•Athlete side steps 5 meters to the right cone and touch it.

•Athlete side steps 10 meters to the far cone and touches that one.

•Athlete side step 5 meters back to the middle cone and touches it.

•Athlete runs 10 meters backwards and touches the cone at the base of the T. Time stops when athlete crosses the photocell Miller[11].

Result

Data was meaningfully assorted through calculation of mean and standard deviation (SD). Later on Paired't' test was applied for comparison within the before and after test. The level of significance was fixed at $p < 0.05$.

Table 1. Comparison of speed (seconds) within group before and after training

Paired 't' Test	**Speed (in Seconds)**	
	Variable	
.	Before	After
Mean	7.50	6.55
S.D.	0.607	0.510
Mean Difference	0.95	
Number	20	20
Maximum	9	7
Minimum	7	6
Range	2	1
Paired T Test	8.324	
P value	<0.001	
Table Value at 0.05	2.09	
Result	Significant	

Table1. shows calculated value 8.324 is more than the table value at 5% level of significance with degree of freedom (df) 19 i.e. 2.093. The result is showing that there is a significant difference within PRE and POST value in variable with respect to variable Speed (in Seconds).

Table 2.Showing comparison of agility (in seconds) within group before and after training

Paired 't' Test	Agility (in Seconds)	
	Variable	
.	Before	After
Mean	10.90	9.95
S.D.	0.641	0.686
Mean Difference	0.95	
Number	20	20
Maximum	12	11
Minimum	10	9
Range	2	2
Paired T Test	6.190	
P value	<0.001	
Table Value at 0.05	2.09	
Result	Significant	

Table No.2: Calculated value 6.19 is more than the table value at 5% level of significance with degree of freedom (df) 19 i.e. 2.093 So the null hypothesis is rejected, mean the difference between Pre and post value is not due to change, its due to treatment given to the subjects The result is showing that there is a Significant difference within PRE and POST value in Variable w.ith respect to variable Agility (in Seconds).

Table 3. Mean difference of speed (in seconds) in pre and post training group.

Variables	Speed (in Seconds)
Group	Variable
Mean Difference (Pre-Post)	0.95

Table 3. shows the value of mean difference of speed (in seconds) between pre and post test group that is 0.95

Table 4. Mean difference of agility(seconds) in pre and post training group:

Variables	Agility (in Seconds)
Group	Variable
Mean Difference (Pre-Post)	0.95

Table 4. shows the value of mean difference of agility (in seconds) between pre and post test group that is 0.95.

Discussion

The Paired 't' test was applied for comparison between pre-test and post-test values of speed and agility which gives 't' value 8.324 for speed which was more than the table value at 5% level of significance with df 19 i.e. 2.093 and 't' value 6.190 for agility which is more than the table value at 5% level of significance with df 19 i.e. 2. It means the result is statistically significant.

Based on the results of this study, it can be accepted that there can be a significant increase in agility and speed after administering a Functional Training program in Basketball players within the time span of six weeks.

Bernardes et al.[12]stated that lack of appropriate functional fitness can result in acute and overuse injuries, the intensive training can result in overload and can make the player prone to injury. Sprague et al.[13]proposed that some irrevocable changes due to the injuries can last for longer time span and athlete has to tussle with it even after he completes his playing years. Baron et al.[8] concluded that dearth in dexterities such as coordination; mobility and stability can lead to restrictions in directed motor skills such as strength, speed, power and endurance.

Cook et al. [5]stated that athletes who have finer functional skills show better performances especially in sports which require ability like sprinting and quick change in direction for scoring. One of the exercises in the implemented program was Hurdle step. Janicki et al.[14]concluded that it contributes in increasing the range of motion of ankle joint.

In our study, subjects who underwent Functional training were able to improve their times significantly on both the T-test and 50 meter run test. Therefore, we found a positive relationship between functional training and improvements of both agility and speed tests. For 50 meter run test, times were improved, by looking at the results of the study, it can be easily concluded that the six weeks training program can be useful for development of the speed of the basketball players as the effect of functional training program on the sprint performance has found positive results.

In a research by Suzuki et al. [9], it was found that when the training was stopped, the results achieved by training were also reversed and players returned to their previous abilities. Therefore, it was stated that to maintain the performance the training should be continued.

Conclusion

This study concluded that there is a positive effect of six week functional training on speed and agility of basketball players. The training protocol should focus on the specific abilities required for increasing the probability of scoring. As in basketball the positions on which the player is playing differs, the training protocol should be specified accordingly.

Limitations

All the athletes were also going through their normal training routines, so the results achieved may not be 100% purely due to the effect of the considered variables. No specialized test for estimation of neuromuscular changes like electromyography (EMG) was done.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Prior to the study, procedures and guidelines were presented orally and in written form. Subjects agreeing to participate signed a consent form. (copy is attached).

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Original Article

Effect of Music Therapy and Frenkel Exercise on Reaction Time in Geriatric Population-A Comparative Study

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Abstract

Background: Co-ordination is a key factor for smooth movements in human body. To study co-ordination of an individual measuring reaction time is an important tool.

Prolonged reaction time in addition with difficulty in recognition of stimuli affects co-ordination specially in geriatric population. Frenkel's exercises improves reaction time, thus improves co-ordination. Listening to music is enjoyed by all and has shown to be useful in cognitive functions. Studies have shown that listening to music enhances co-ordination and improves reaction time.

Objective: To compare effects of Frenkel exercise with classical music and effects of Frenkel exercises with heavy metal music on simple and choice reaction time (SRT and CRT) in geriatric population.

Methods: 60 geriatric individuals with age group 65-70 years were examined for simple and choice reaction time. Individuals were divided into 2 groups equally. Group A received classical music with Frenkel exercises and group B heavy metal music with Frenkel exercise. Participants were given Frenkel exercise 2 weeks daily for 30 minutes and post reaction readings were taken for reaction time.

Results: After analysing the results by Mann Whitney U test,

Mean pre SRT group A was 499.29, mean pre SRT group B was 540.80. Mean post SRT group A was 379.76, mean post SRT group B was 586.56 ($p<0.001$)

Mean pre-CRT group A was 970.70, mean pre-CRT group B was 1107.6 ($p<0.001$). Mean post CRT group A was 894.30, mean post CRT group B was 1151.7 ($p<0.001$)

Conclusion: There is significant difference in simple and choice reaction time after receiving classical music and heavy metal music with Frenkel exercise

Training for co-ordination can yield significant improvement on receiving classical music as an adjuvant to Frenkel exercise.

Keywords*: Frenkel's exercise, classical music, heavy metal music, reaction time, geriatric individuals.*

Introduction

The problems of co-ordination increase with age. It has been found that as we age the neuromuscular communications becomes weak. It was noted that age related changes in visual perception affects hand eye co-ordination. Movements including those in the hand receives information from the cortex and there is a relationship between old age and decline in fine motor skills. It was observed that hand-eye coordination is compromised due to brain's reaction time.[1]

REACTION TIME –It is a measure of how quickly an individual reacts to particular stimulus.

Reaction speed is the ability to give a quick motor response to a definite stimulus, while the time that elapses between the sensory stimulation and motor reaction is called reaction time. Reaction times can be subdivided according to number of different stimuli that subject already expects and responds with a specific automatic motor reaction.

Simple reaction time- these are experiments which record the time interval with only one stimulus and one response. Choice reaction these are experiments which record the time interval with multiple stimuli responses. Reaction time depends upon many factors such as age, gender, physical fitness, fatigue, alcohol, arousal, left vs right hand, direct vs peripheral vision, brain injury, illness and other factors.[2]

It is observed that music has a physical and a psychological component. Music has relaxation effect and changes the emotional status of individual, increasing the dopamine which is involved in neuroplasticity and neuron reward network of the brain. Music helps in relaxing effect and concentration of the individual listening to it. It is known to improve the concentration and it has been observed that effect of music on motor reaction time and interhemispheric relations showed that music shortened reaction time. music exerts complex influences on the central nervous system manifested in changes to a number of neurophysiological reactions causing changes in flow of excitations in cortico-thalamic and cortico-limbic circles. Attempting to explain sound perception and how it affects human beings is complicated, however the physics of sound and music has its origin in changing the blood pressure and pulse rate. There are studies that prove that stimulating music cause an increase in pulse rates while decreased pulse rates that is associated with listening to sedative music.[3-7]

The greatest benefit to health is very evidently observed with classical and meditation music, whereas stimulating music such as heavy metal music has negative impacts on brain activity. There are little known studies about the impact of heavy metal music on arousal and thereby on reaction time.

FRENKEL EXERCISES are known to be series of motion of increasing difficulty that helps in restoration of co-ordination in ataxic patients and geriatric population.

Exercises require a high degree of mental concentration and effort

The main principles of Frenkel exercises are-

• Concentration

• Precision

• Repetition

Designed primarily for coordination, not for strengthening. First simple exercises then progressing to more difficult patterns. [8-9]

Previous study has concluded that simple reaction time and choice reaction time is decreased in geriatric population. Studies have concluded that Frenkel exercise are beneficial to increase co-ordination among ataxic and old age patients. Listening to music effects arousal, mood which has great impact on co-ordination and can improve reaction time. Considering data from previous research, There is a need to check which music has beneficial effect with Frenkel exercise for improving reaction time in geriatric individuals.

The principal aim of the research was to compare the effect of classical vs heavy metal music as an adjunct to Frenkel exercise on simple and choice reaction time of geriatric population.

Objective

To assess the simple reaction time (SRT) and choice reaction time (CRT) prior to the administration of music therapy and Frenkel exercise.

To assess SRT and CRT after administration of Frenkel exercise and classical music

To assess SRT and CRT after administration of Frenkel exercise and heavy metal music and assess the difference between pre and post in SRT and CRT

in Group with Frenkel exercise and classical music. Assess the difference between pre and post in SRT and CRT in Group with Frenkel exercise and heavy metal music.

To compare Group receiving Frenkel exercise with classical music and Group receiving Frenkel exercises with heavy metal music.

ALTERNATIVE HYPOTHESIS • There will be significant difference in simple reaction time and choice reaction time in group receiving classical music with Frenkel exercise and group receiving heavy metal music with Frenkel exercise.

NULL HYPOTHESIS • There will be no significant difference in simple reaction time and choice reaction time in group receiving classical music with Frenkel exercise and group receiving heavy metal music with Frenkel exercise.

MATERIAL AND METHOD

• STUDY DESIGN

• Study Type- Experimental study

• Duration of study -6 months Sampling- Convenient sampling

• Sample size- 60

• Target population – geriatric population

• Study place- community old age health centre

Selection Criteria

• Inclusion criteria

• Individual willing to participate voluntarily who were informed about research in their vernacular language and taking written consent for the same.

• Age: 60-75 years

• Individual with proper visual acuity and hearing ability to hear 60 decibels in headphones –

• Both male and female

• Exclusion criteria- • Participants with ENT defect, hearing, majorly affected vision(blindness), cataract, glaucoma, loss of vision

• Participants with pre-existing neurological such as stroke, multiple sclerosis, Peripheral neuropathy, Parkinson disease and musculoskeletal defects such as fracture of upper limb for the past 6 months.

OUTCOME MEASURE:

• Deary-Liewald software

• The Deary-Liewald computer-based software measures the simple reaction and choice reaction time. This was designed by IJD and programmed by DL.

• Reliability for Deary-Liewald: Internal consistency for Deary-Liewald for SRT is 0.94 and choice reaction time is 0.97.[10]

SIMPLE REACTION TIME

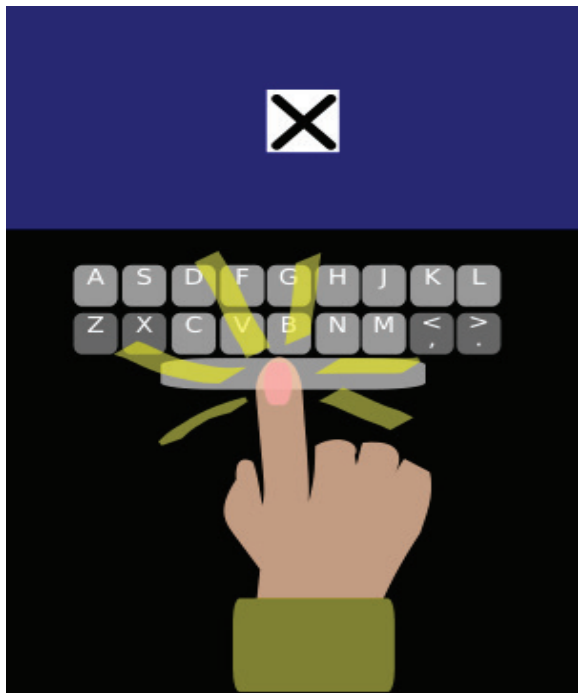

Figure 1. Simple reaction time

In simple reaction time experiments (Fig 1), you need to wait until you see a black cross on white square and when that happens, one need to press the space bar. There is one stimulus (black cross) and a reponse (press space bar).

Participants will be tested for simple reaction time where there would be no distraction Participants have to press a key in response to stimulus. This will be done to get the simple reaction time. 10 trials and the mean would be calculated for both groups.

Choice Reaction Time:

In choice reaction time (Fig 2) one needs to wait until a black cross appears on one of the four white squares (e.g. there are four different black cross position, which counts as four different stimuli.) when that happens, one need to press the corresponding key(Z ,X,. , or,).

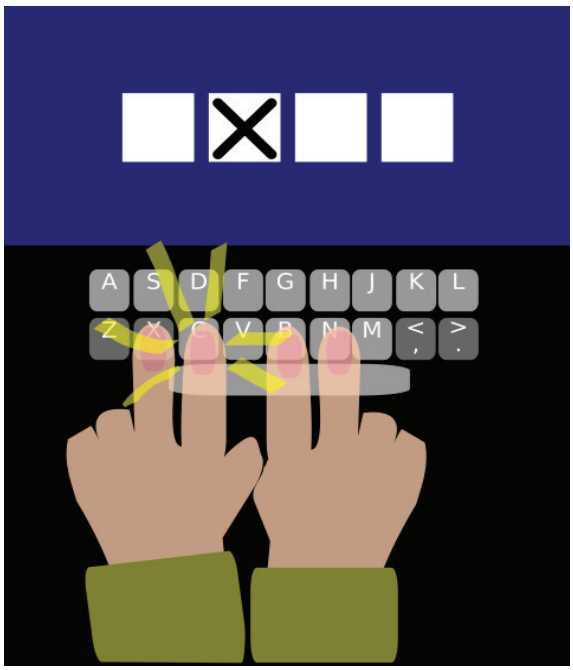

Figure 2 Choice reaction time

Participants will be tested for choice reaction time. In choice reaction time there were four stimulus and participants had to press the key according to their choice. Participants have 10 Choice reaction experiments and the mean taken for both groups.[10]

PROCEDURE

• Subjects will be screened according to inclusion and exclusion criteria

• Those who will be selected and wish to participate in this study will be ask to sign consent form which explains the procedure in the preferred language.

• Each subject's simple and choice reaction time will be screened by Deary –Liewald reaction time software in the following:

• GROUP A- Participants will be given 5 practice trials before the session. Participants will have 10 test trials for simple and choice reaction times. Then the individual will be given Frenkel exercises for upper limb (10 repetitions) for each exercise and readings were recorded. Later the participants would be made to hear classical music for 10 minutes and after session the reaction times will be recorded.

• GROUP B - Participants will be given 5 practice trials before the session and 10 test trials for both simple and choice reaction time recorded. Participants will be made to perform Frenkel exercise for upper limb 10 repetition for each exercise. Then participants would be made to hear metal music for 10 minutes and then reaction times would be recorded.

The procedure was done repeatedly 30 minutes for 2 weeks regularly for both groups.

Findings

Table 1: Mean value of SRT and CRT in both group A and B

	Group	N	Mean	Std. Deviation	Test statistic	p value
Age	Group A	30	64.43	2.46	1.52	0.13
	Group B	30	63.53	2.11		
Pre_SRT	Group A	30	499.29	120.01	323.5	0.06
	Group B	30	540.80	86.16		
Post_SRT	Group A	30	379.76	135.69	179.5	<0.001
	Group B	30	586.56	74.59		
Pre_CRT	Group A	30	970.70	93.80	254	<0.001
	Group B	30	1107.6	205.19		
Post_CRT	Group A	30	894.30	85.05	131	<0.001
	Group B	30	1151.7	241.81		

· Unpaired t test was done to compare between age of the subjects between group A and group B. It was found that there was no significant difference between age of the subjects from group A and group B. Mean age of subjects from group A was 64.43 years and mean age of subjects from group B was 63.53 years.

· Mann Whitney U test was done to compare between Pre and post simple reaction time and choice reaction time of subjects.

Ø It was found that there was no significant difference between pre SRT from group A and group B. Mean pre SRT of subjects from group A was 499.29 and mean pre SRT of subjects from group B was 540.80.

Ø It was found that there was significant difference between post SRT from group A and group B. Mean post SRT of subjects from group A 379.76 was significantly lower than mean post SRT of subjects from group B 586.56 ($p<0.001$)

Ø It was found that there was significant difference between pre CRT from group A and group B. Mean pre CRT of subjects from group A 970.70 was significantly lower than mean pre CRT of subjects from group B 1107.6 ($p<0.001$)

Ø It was found that there was significant difference between post CRT from group A and group B. Mean post CRT of subjects from group A 894.30 was significantly lower than mean post CRT of subjects from group B 1151.7 ($p<0.001$)

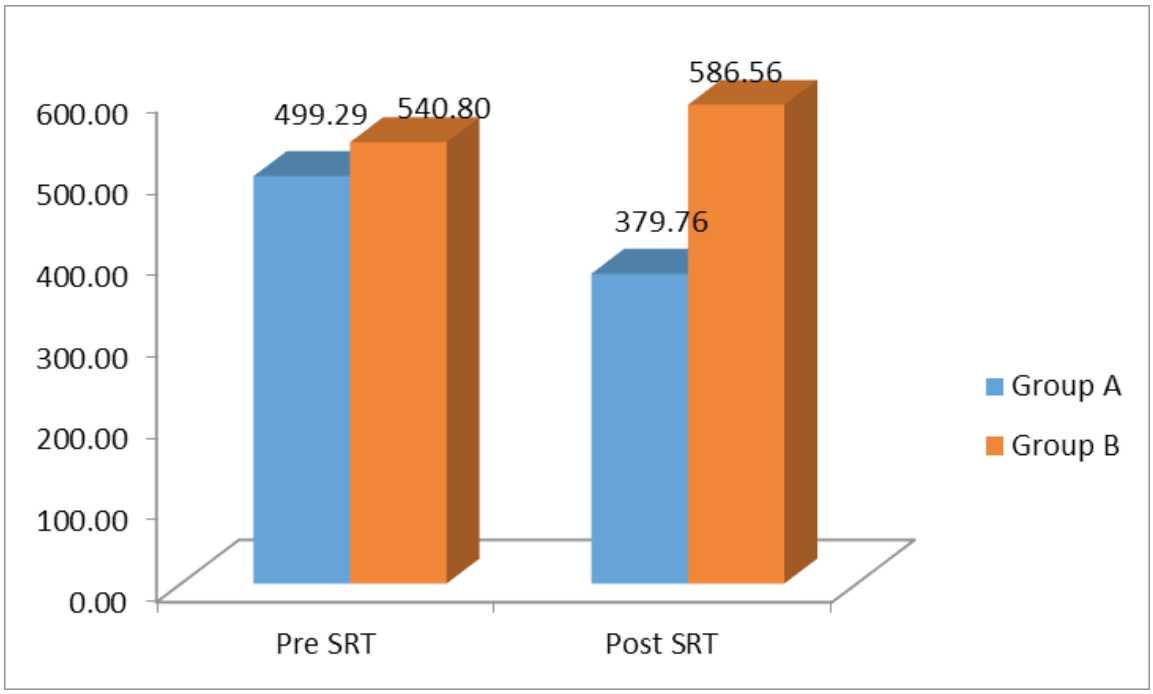

Figure 3. Comparison of SRT in both groups

Table 2: Mean difference of SRT between group A and B

	Mean		Std. Dev.		W statistic	p value
	Pre SRT	Post SRT	Pre SRT	Post SRT		
Group A	499.29	379.76	120.01	135.69	465	<0.001
Group B	540.80	586.56	86.16	74.59	421	<0.001

Wilcoxon matched pair sign rank test was done between pre and post SRT for both the groups A and B.

For group A, there was significant difference between Pre SRT and Post SRT ($p<0.001$).

Mean pre SRT (499.29) was significantly higher than post SRT (379.76).

For group B, there was significant difference between Pre SRT and Post SRT ($p<0.001$).

Mean pre SRT (540.80) was significantly lower than post SRT (586.56).

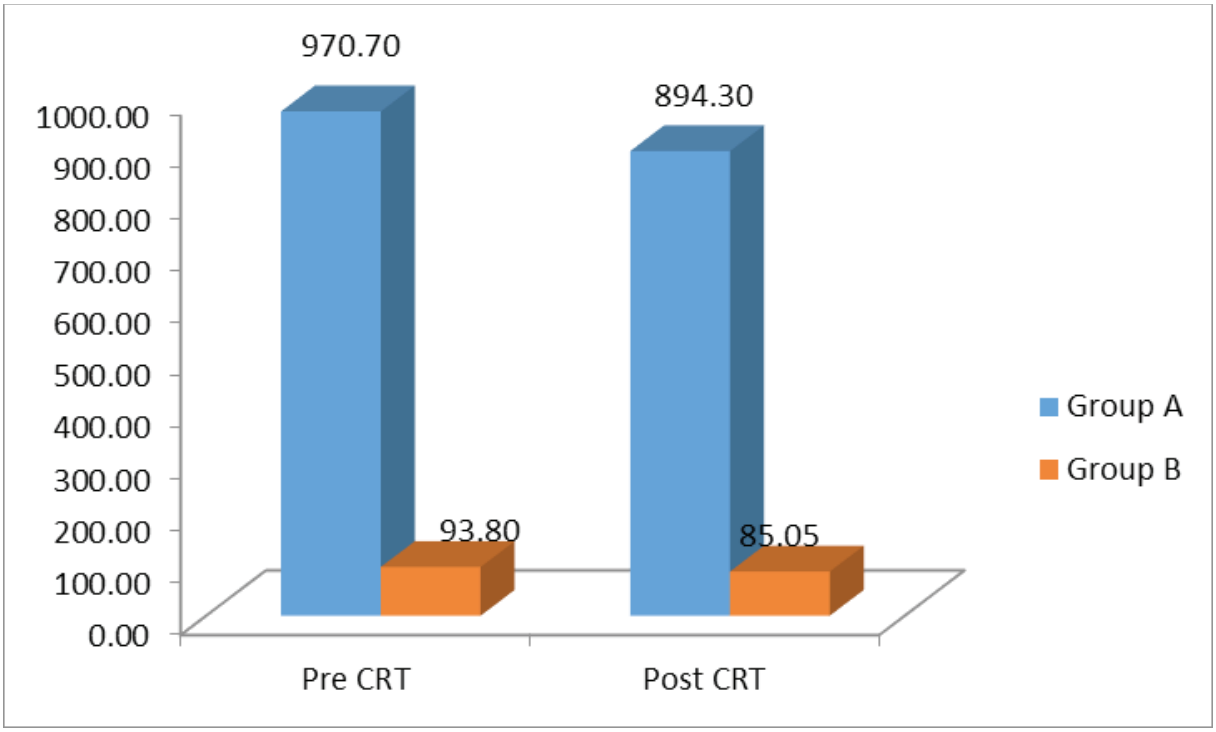

Figure 4. Comparison of CRT in both groups

Table 3: Mean difference of CRT between group A and B

	Mean		Std. Dev.		W statistic	p value
	Pre CRT	Post CRT	Pre CRT	Post CRT		
Group A	970.70	894.30	1107.60	1151.70	458	<0.001
Group B	93.80	85.05	205.19	241.81	344	<0.001

Wilcoxon matched pair sign rank test was done between pre and post CRT for both the groups A and B.

For group A, there was significant difference between Pre CRT and Post CRT ($p<0.001$).

Mean pre-CRT (970.70) was significantly higher than post CRT (894.30).

For group B, there was significant difference between Pre CRT and Post CRT ($p<0.001$).

Mean pre-CRT (93.80) was significantly lower than post CRT (205.19).

Discussion

Here is an experimental study of classical and heavy metal music as an adjunct to Frenkel exercises. The results indicate improvement in reaction time for using classical and heavy metal music with Frenkel exercise. But significant improvement in the study was found with using classical music together with Frenkel exercise for both simple and choice reaction time. This proves that there is facilitation in the

processing of stimuli in somatosensory cortex and hence leading to acute motor response. Music exerts complex influences on the central nervous system causing an increase in interhemispheric co-ordination and arousal, which coupled with Frenkel exercises promotes in decreasing reaction time.

Roopa Harish Thakker, Parag Kulkarni found that Frenkel exercises gave an improvement in geriatric population by conducting tests for simple reaction time and choice reaction time. They found that since Frenkel exercises improves co-ordination and arousal, better performances was noted. Two groups were made, one receiving Frenkel exercises and the control group that did not receive it. They were made to respond simple and choice reaction time. Their analysis showed that there was significant difference for the group that received Frenkel exercise.[1]

Prasad B.K conducted a study with instrumental and heavy metal music on reaction time for visual reaction time and auditory reaction time. He found that there was significant improvement for visual and auditory reaction time after listening to instrumental music.[3]

Maja Meško, Strojnik, Videmšek, Karpljuk examined the effect of reaction time for participants listening to techno music which is a stimulant music. In this study, shortened reaction time was noted after listening techno music.[4]

The results of this study are similar to the study conducted by BK Prasad to compare the effect of music on visual and heavy metal music.

Conclusion

This study concludes that there is improvement in simple and choice reaction time with classical and heavy metal music as an adjunct to Frenkel exercises. It proves the hypothesis that significant difference for classical and heavy metal music with Frenkel exercise. Also, significant improvement was found using classical music with Frenkel exercise as it is a relaxing type of music, better arousal was noted. It should also be noted that majority of geriatric population in India prefers to listen classical instrumental music over heavy metal music.[11] The results of the study have to be confirmed over larger population and among the patients whose reaction time is disturbed due to lack of co-ordination in hand and brain network.

Conflict of Interest: -None

Source of Funding: - Self

Ethical Clearance: - Obtained by College of Physiotherapy, Wanless Hospital.

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Screening of Stroke Patients Using Performance Oriented Mobility Assessment (POMA) Scale

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Abstract

Background: The rapid growth of the elderly population has resulted in a corresponding rise in the number of elderly individuals who experience disability during their lifetimes.

Objective: The purpose of this study was to test the usefulness of four established clinical measures of balance, gait, and subjective perceptions of fear of falling as screening methods for referring community individuals living in residential care for detailed physical therapy evaluation and possible intervention.

Methods: 50 elderly individuals living in two residential care for the elderly were tested on clinical measures of balance and mobility. Their performance on these measures was compared with a physical therapist's brief evaluation of disability and appropriateness for more detailed evaluation. The usefulness of these tools as screening methods was determined by calculating validating levels using the physical therapist's evaluation as a standard.

Results: Thus, it can be analysed that the $p < 0.0001$ was kept as a highly significant reference value.

Conclusion: This study concludes that screening for balance and gait in elderly stroke patients with a combination of components which mainly measures the balance and gait using the performance oriented mobility assessment (POMA) scale gives the highest validity for the screening of stroke patients compared to the other scales.

Keywords: *Performance Oriented Mobility Assessment (POMA)*

Introduction

According to the World Health Organization (WHO) the Stroke is defined as "rapidly developing clinical signs of focal (or global) rapidly growing of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin[(2)].

The Performance Oriented Mobility Assessment (POMA) is also called "Tinetti– Scale".The Tinetti-scale was published by Mary Tinetti (Yale University) to assess the balance and gait in older adults and also to assess the perception of balance and gait during activities of daily living and fear of the falling. It also is a very good indicator of the fall risk of an individual[(3)].

But for the stroke patients, the level of functional independence is not only more reduced but it is more frequently disclosed then the risk of falls, since impairments such as muscle weakness, abnormal muscle tone, loss of sensory function, deficit of postural control and abnormal gait pattern appear to be due to the brain lesions[(3)].

The Performance Oriented Mobility Assessment (POMA) also examines the level of the balance and gait to determine the degree of the fall risk in the older adults.However, an assessment using both the

components of the Performance Oriented Mobility Assessment (balance and gait) may proven when assessing a specific impairment of an individual patient or predicting falls[3].

The Performance Oriented Mobility Assessment (POMA) balance component may be useful tool for predicting the occurrence of falls and examining the balance ability in the stroke patients. The balance component consists of 9 tasks scored in a ordinal scale including sit to and stand, standing with eyes closed,turning and pertubated balance[4].

The gait component examines the step length and height, gait initiation, step symmetry and continuity, straightness of the path of a travel while trying to walk in a straight line, trunk position and base of support during the period of double support[4].

Methods and Materials

Source of data:

1) B.J Medical College and Civil Hospital, Ahmedabad

2) VINS Hospital, Baroda

Research design:

Observational study

Sample design:

Simple random sampling

Sample size:

50

Selection criteria:

The elderly and geriatrics age groups (40 to 70 years)

Sex: Both

Muscle Power: More than 3 – Movement against gravity according to Manual Muscle Testing (MMT) of oxford scale

Exclusion criteria: Brain Tumor

Encephalopathy

Meningitis

Encephalitis

CNS Abscess

Procedure:

The test requires a hard armless chair, a stopwatch and 15 feet even and uniform walkway.

It has 2 sections:

a) To assess balance abilities in a chair and in standing;

b) To assess dynamic balance during gait on a 15 feet even walkway.

The patient has to sit in an armless chair and will be asked to rise up and stay standing.

The patient will then turn 360° and then sit back down.

This is to test the patient's balance.

Testing this, the evaluator will look at several key points including how does the patient rise from and sits down on his/her chair, whether or not the patient stays upright while sitting and standing, what happens when the patients' eyes are closed or when the patient gets a small push against the sternum.

Next, the patient has to walk a few meters at a normal speed, followed by turning and walking back at a "fast but safe" speed.

Then, the patient will sit back down.

As well as in the first part of the test, there are some pointsthat the evaluator has to look for.

These are:

a) The length and height of the steps,

b) The symmetry and continuity of the steps and

straightness of the trunk.

During this test, the patient can use any assistive devices (walking stick, crutches, walkers) they would normally use.

Thus we had taken the Performance oriented mobility assessment (POMA) scale to check the balance and gait component.

Data Analysis : Data was analysed with single t – test with MedCalc® Version 12.5.0.0 Windows XP/ Vista/7/8

Results

TABLE 1: COMPARISON OF COMPONENTS OF BALANCE AND GAIT SCORE IN STROKE PATIENTS

Components	Mean	SD	P-value
Balance	15.36	2.12	P < 0.0001
Gait	6.14	1.05	

TABLE 2: SCORE OF COMPONENTS OF BALANCE IN STROKE PATIENTS

BALANCE	Score 0		Score 1		Score 2		Total
	No.	%	No.	%	No.	%	
Sitting Balance	0	0.00	0	0.00	50	100.00	50
Arising	0	0.00	26	52.00	24	48.00	50
immediate standing balance	1	2.00	17	34.00	32	64.00	50
Side-by side standing balance	0	0.00	3	6.00	47	94.00	50
pull test	0	0.00	3	6.00	47	94.00	50
Turn 360	5	10.00	6	12.00	39	78.00	50
Able to stand on one leg for 5 Sec	27	54.00	14	28.00	9	18.00	50
Tandem stand	45	90.00	4	8.00	1	2.00	50
Reaching up	1	2.00	0	0.00	49	98.00	50
Bending over	33	66.00	17	34.00	0	0.00	50
sit down	7	14.00	4	8.00	39	78.00	50

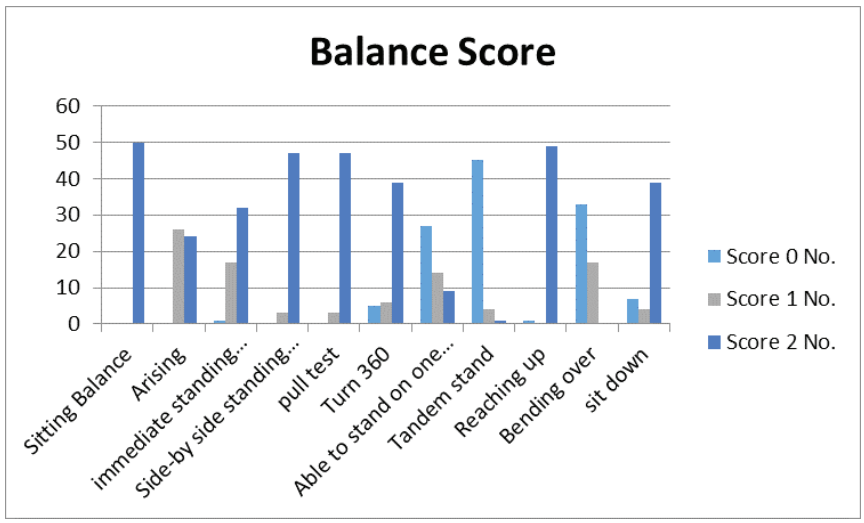
TABLE 3: SCORE OF COMPONENTS OF GAIT IN STROKE PATIENTS

GAIT	Score 0		Score 1		Score 2		Total
	No.	%	No.	%	No.	%	
Initiation of gait	41	82.00	9	18.00	0	0.00	50
Path	0	0.00	49	98.00	1	2.00	50
missed step	0	0.00	16	32.00	34	68.00	50
Turning	0	0.00	15	30.00	35	70.00	50
step over obstacle	9	18.00	4	8.00	37	74.00	50

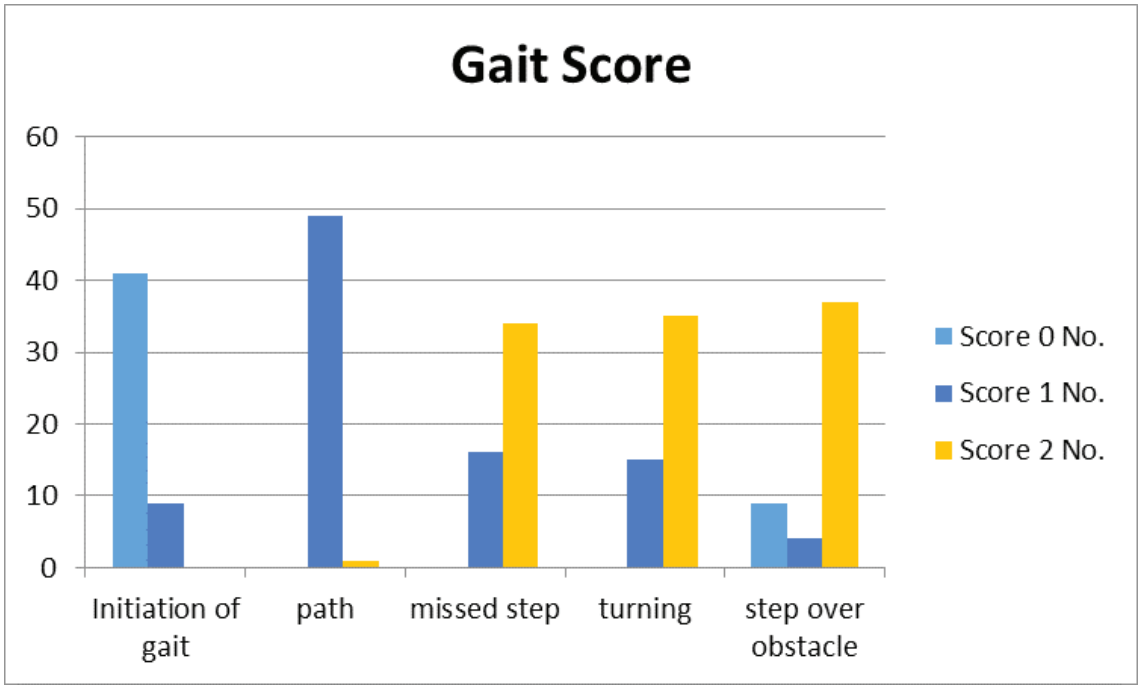
TABLE 4: SIGNIFICANCE OF P VALUE ALONG WITH MEAN AND STANDARD DEVIATION (SD) FOR BALANCE AND GAIT FOR SHOWING THE VALIDITY OF THE PERFORMANCE ORIENTED MOBILITY ASSESSMENT (POMA) SCALE WHICH INCLUDE BALANCE AND GAIT IN STROKE PATIENTS

	Mean	SD	P-value
Overall Score	21.50	2.65	$P < 0.0001$

GRAPH 1: DISTRIBUTION OF SCORE OF COMPONENTS OF BALANCE IN 50 STROKE PATIENTS



GRAPH 2: DISTRIBUTION OF SCORE OF COMPONENTS OF GAIT IN 50 STROKE PATIENTS



Discussion

According to data of Table 1, there is comparison of components of balance and gait score in the stroke patients. According to data of Table 2, there is presence of score of components of balance in stroke patients. According to data of Table 3, there is presence of score of components of gait in stroke patients.

According to data of Table 4, there is a significance of p value along with mean and standard deviation (SD) for balance and gait for showing the validity of the performance oriented mobility assessment (POMA) scale which include balance and gait in stroke patients.Thus the $p < 0.0001$ was kept as a highly significant reference value.

In general, stroke patients continue to adapt to their balance and gait deficits by avoiding the risk of falling or by using compensatory strategies; however their physical activity is further limited because of their fear of falling due to the psychological burden after a fall. For the stroke patient s, fall is a factor which reduces the quality of life so these patients should be treated with appropriately.

This present study was mainly conducted to study the validity of the performance oriented mobility assessment (POMA) scale in the patients of stroke. From our finding which indicates that the cut off value for the balance and gait component of the performance oriented mobility assessment (POMA), which could also predict the falls in the chronic stroke patients also. Mainly the performance of all the items is scored from 0, 1 or 2 for a maximum score of 28 with a higher score indicating better balance and gait. Thus, a total score of 19 or less indicates a high risk of falling and a score between 19 and 24 indicates a moderate risk. But the low scores of the performance oriented mobility assessment (POMA) scale have been shown to co – relate with the fall of the risk of the older adults.

In the previous study of the stroke patients , Z Gerontol Geriotar et al, showed that the performance oriented mobility assessment (POMA) scale has been recommended and widely used in the older adults to assess balance, gait and prediction of falls[5]. While S. Schulein (2014) demonstrated that performance oriented mobility assessment (POMA) scale can be used as a fast screening tool to evaluate the risk

of falling or changes in the balance or gait abilities and thus this study strengthened the validity of the performance oriented mobility assessment (POMA) scale in the patients of stroke[6].

Thus, from the results of this study, it can be taken as a note that by screening the stroke patients using performance-oriented mobility assessment (POMA) scale gives the highly significant level of the validity in the stroke patients.

Conclusion

This study concludes that screening for balance and gait in elderly stroke patients with a combination of components which mainly measures the balance and gait using the performance-oriented mobility assessment (POMA) scale gives the highest validity for the screening of stroke patients compared to the other scales.

Conflict of Interest: None

Source of Funding: All expenses of the study were funded personally by the researchers.

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Original Article

Comparitive Study of Effect of Moist Pack V/S Effect of Core Strengthening Exercises in Primary Dysmenorrhea for Three Consecutive Months

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Abstract

Background: Primary dysmenorrhea is considered the most common gynaecologic disorder among young females. Primary dysmenorrhea is defined as painful and difficult menstrual flow in the absence of any pelvic disorders.

Objective: The study was carried out to examine the effect of Heat application on relieving pain of primary dysmenorrhea, examine the effect of core strengthening exercises on relieving pain of primary dysmenorrhea, compare between heat application and core strengthening exercises on relieving pain of primary dysmenorrhea among young females

Methodology: Subjects Included in the study were between 25_35 years with primary dysmenorrhea selected from female. Three tools were used in this study, tool one: interviewing questionnaire which include; socio demographic data, menstrual history. Tool two; assessment of dysmenorrheal symptoms. Tool three; WALLID SCORE Scale. random sample was used to select the participants of the study, total sample was 50 females.

Results: P-value of group 2 is less than P-value of group 1 , we conclude that dataset of group 2 is more significant, and it means that Core Strengthening exercises is more statistically significant to reduce degree of pain in dysmenorrhea.

Conclusion: core strengthening exercises (Group 2) was effective in reducing pain of dysmenorrhea as compared with moist pack application (Group 1) this clearly observed in reduction in the mean of pain scoring in group 1 after 4 weeks, and reduction the mean of pain scoring in group 2 after 8 weeks but the great improvement in pain scoring was observed in group 2 at the end of 12 weeks.

Keywords: *Menstrual cycle, primary dysmenorrhea, pain score, heat application, core strengthening exercises.*

Introduction

Primary dysmenorrhea is not a real threat of life, but it can affect the quality of female life. It can cause psychological problems in some of the females leading to their loneliness and inactive participation in various social activities [(7)]. In many countries, primary dysmenorrhea is the main reason for recurrent short-term school and work absenteeism in young girl and women [(1)].

Most young females experience cramping lower abdominal pain usually concentrated in the pubic area and may radiate to the back of the legs or the lower back due to primary dysmenorrhea[(6)].

The pain of menstruation normally evolves within hours of the start of menstruation and peaks as the flow becomes heavier for the first 24 hours but may persist for 2 days. The most popular impact of primary dysmenorrhea on the quality of life, reported by adolescent girls was in the form of rest hours for long periods followed by inability to study[3].

It is believed that symptoms of primary dysmenorrhea stem from increased concentrations of prostaglandins F2" (PGF2") resulting in uterine contractions and ischemia. One possible mechanism for increasing prostaglandins is that, during the premenstrual phase, progesterone declines leading to the synthesis of prostaglandins in endometrial cells by membrane phospholipids. This process is supported by the ability of prostaglandin synthesis inhibitors in pain relief, as these inhibitors only provide pain relief in 70% to 75% of women[8] .

Exercise is known to cause the release of endorphins hormones in the brain that raise the pain threshold and is shown to improve the mood of exercising subjects[10].

In the past two decades, the relationship between Physical activity, application of heat and menstrual disorders including primary dysmenorrhea has significantly been studied. Researches results have indicated that physical activity and the application of heat can affect menstruation in many ways including reduce the symptoms of premenstrual syndrome and dysmenorrhea[6].

Physical exercise is also an important assistant behavioural factor, people who identify themselves as active had lower levels of inflammatory biomarkers than their sedentary peers (Daley, 2008). Physical exercise can be defined as an activity that requires physical exertion, especially when carried out to develop or maintain fitness[9].

Research in the general population has demonstrated that women who participated in regular, moderate exercise had less pain and behavioral changes, than non-exercisers during period cycles. That reduction of dysmenorrhea may be due to impacts of hormonal changes on uterine epithelial tissues or an increase in endorphin levels. It seems that exercise has analgesic implications that operate in a non-specific manner[4].

Core strengthening exercises will allow small intrinsic muscles around the lumbar spine to be conditioned to increase performance; this training allows the isolation and strengthening of core muscle groups. When these muscles are strong, they are much more ready to deal with daily troops of natural biomechanics, even when the body is under the tension of the monthly cycle. Core strengthening is a description of the muscular control around the thoracic spine to keep the function stability[5].

Core strengthening exercises and heat application are widely accepted as a means of moderating stress and stress related symptoms[1].

Methodology and Materials

Study Duration: ?

Source of Data:

Areas of Vadodara City:

1. Vasana
2. Panigate

Research Design:

Comparative Study.

Sampling Design :

Simple Random Sampling.

Sample Size : 50

Selection Criteria : Females in the age group of 25-35 years having Body mass index of 18.5 to 23 were selected. They were able to perform abdominal curl ups, Bridging and cat and camel exercise against gravity that is grade 3 without resistance.

Exclusion Criteria: ?

Procedure: subjects Intervention were given by Abdominal curl up, Bridging and Cat and Camel exercise in form of Grade-3 for 10 repetitions in one session per day which was carried out for 3 continuous days. These procedures were carried out for three consecutive months.

Data Analysis:

Data was analyzed with patients using ANOVA test and single t test. R studio version 1.2.1335 was used for the analysis part.

Results

Table1: BASELINE CHARACTERISTICS OF SUBJECTS IN BOTH GROUPS

	GROUP 1 (Moist Pack)		GROUP 2 (Core Strengthening exercise)		P VALUE
	MEAN	SD	MEAN	SD	
AGE (years)	30.28	3.588	30	3.041	0.7
CYCLE LENGTH	29.84	0.553	28.68	1.842	0.004
DURATION OF FLOW	5.84	0.553	4.36	0.757	3.24e-10
INTENSITY	2.08	0.571	2.04	0.675	0.82

Table 2: COMPARISON BETWEEN THE STUDIED GROUPS AS REGARDS TO REGULARITY OF MENSTRUATION, INTERVAL OF MENSTRUATION AND THE DURATION OF MENSTRUATION.

(N=50)

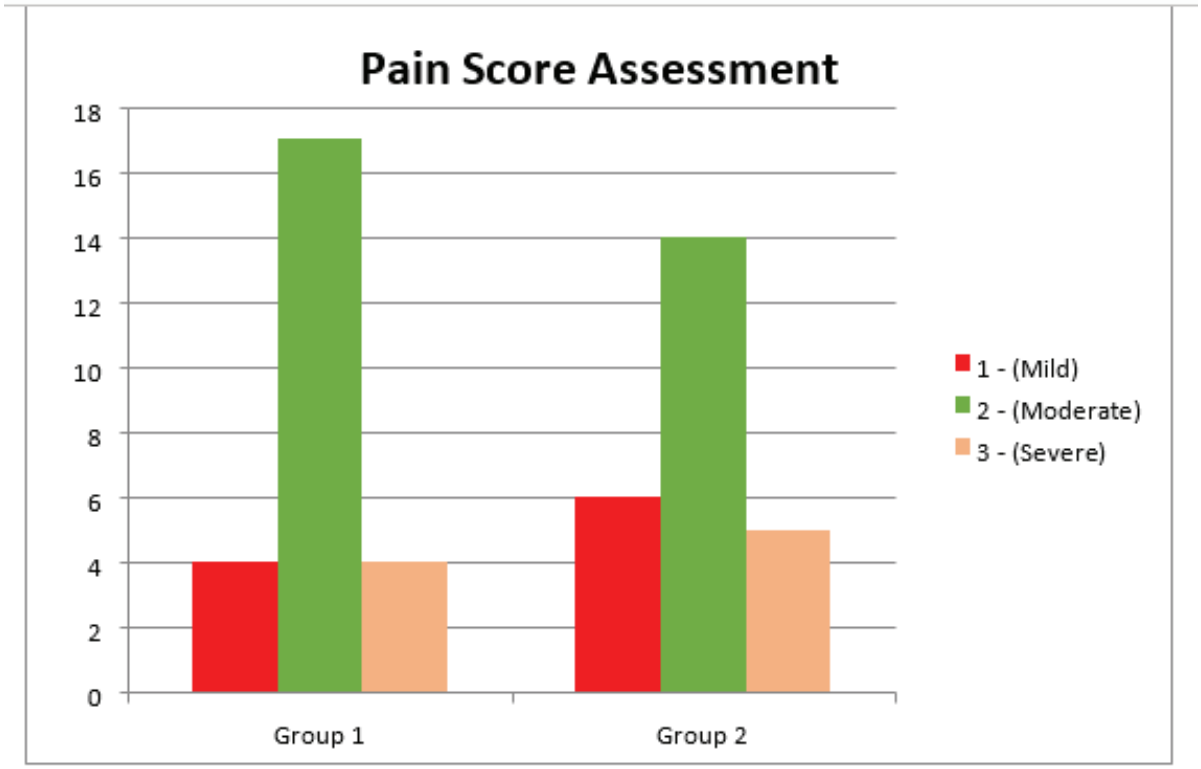
Variables			Groups of the study		Total	X 2	P-value
			Group 1	Group 2			
Regularity of menstruatio n	Regular	Numbe r	25	24	49	> 0.5	> 0.05
		%	50%	48%	98%		
	Irregular	Numbe r	0	1	1		
		%	0%	2%	2%		
Interval of menstruatio n	21 <= 25 days	Numbe r	0	2	2	0.68	0.004
		%	0%	4%	4%		

Cont... **Table 2: COMPARISON BETWEEN THE STUDIED GROUPS AS REGARDS TO REGULARITY OF MENSTRUATION, INTERVAL OF MENSTRUATION AND THE DURATION OF MENSTRUATION.**

	25 - 28 days	Number	2	0	2		
		%	4%	0%	4%		
	29 - 31 days	Number	23	23	46		
		%	46%	46%	92%		
Duration of menstrual flow	<=4	Number	2	20	22	0.54	3.24e-10
		%	4%	40%	44%		
	5-6	Number	23	5	28		
		%	46%	10%	56%		
Degree of Pain	1 - (Mild)	Number	3	5	8	6.7	0.8
		%	6%	10%	16%		
	2 - (Moderate)	Number	17	14	31		
		%	34%	28%	62%		
	3 - (Severe)	Number	5	6	11		
		%	10%	12%	22%		
Assessment of Score	1 - (Mild)	Number	4	6	10	1.6	0.8
		%	8%	12%	20%		
	2 - (Moderate)	Number	17	14	31		
		%	34%	28%	62%		
	3 - (Severe)	Number	4	5	9		
		%	8%	10%	18%		

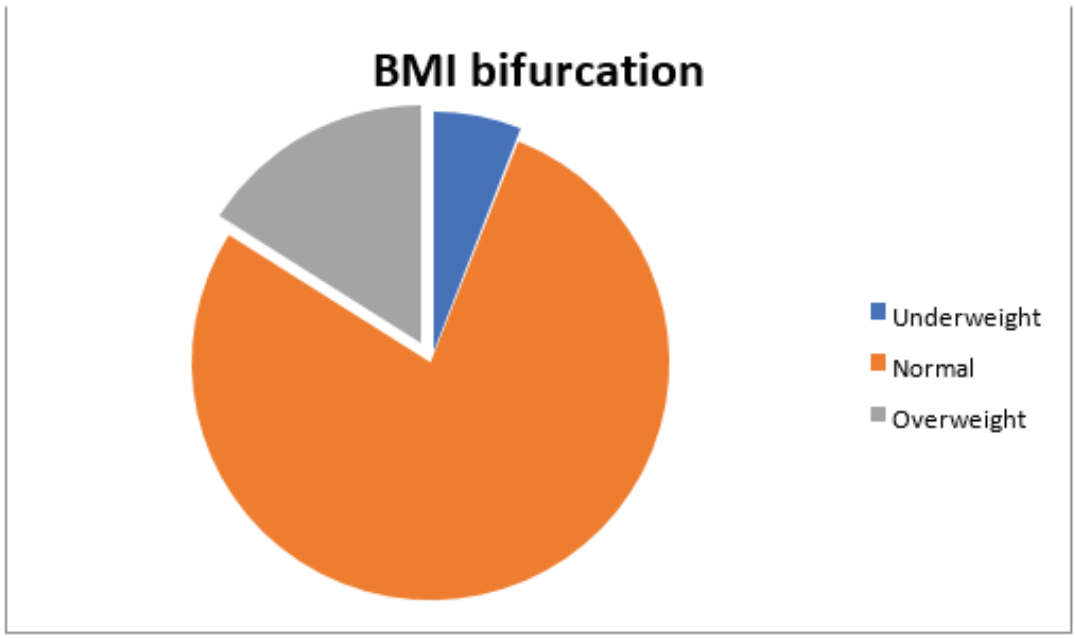
Table 3: ASSESSMENT OF PAIN SCORE AT DIFFERENT TIMES IN THE TWO GROUPS (MOIST PACK AND CORE STRENGTHENING EXERCISES) (N=50)

Variables	Degree of Pain	Group number	Mean	99	ANOVA	P-value
Moist pack (Group 1)	After 3 months application of moist pack	1	2	0.333	285.15	2.7e-114
Core Strengthening Exercise (Group 2)	After 3 months of regular exercise	2	1.96	0.456	262.42	e-115



BAR GRAPH 1: COMPARISON OF THE OVERALL PAIN SCORE AMONG TWO STUDIED GROUPS

As per Bar graph 2 , group 1 shows maximum readings as moderate to severe pain, and group 2 shows maximum readings as mild to moderate pain. Thus, in conclusion group 2 (Core Strengthening exercises) is more effective than group 1 (Moist pack), in reducing intensity of pain experienced and the overall pain score.



PIE-CHART 1: BIFURCATION OF THE BMI OF TWO STUDIED GROUPS

Discussion

Pain in general has disabling nature and makes primary dysmenorrhea stressful and it can become important irritating factor in the life of many women. Some women are completely prostrated and cramped to bed, whereas others are able to remain in the works with the support of analgesics. So, many studies were done to replace medications by physical exercises in the management of primary dysmenorrhea.

The present study was conducted to compare the impact of physical exercises versus moist pack application in relieving pain of primary dysmenorrhea for three consecutive months and which protocol are better either exercises or moist pack \application. As Regard to the sociodemographic characteristics of the subjects \; the current study revealed that the range of age of total subject is 25-35 years. The majority of the subjects had normal body mass index according to WHO classification of BMI. This finding is in line with (Noorbakhsh Mahvash et al jan

2012). The highest percent of the sample has regular menses. This finding is in line with (Noorbakhsh Mahvash et al jan 2012). The entire sample of current study was complaining from dysmenorrhea. This finding is in line with (Noorbakhsh et al., 2012) who investigated the effect of physical activity on primary dysmenorrhea of female and stated that there were no significant differences in the demographic characteristics between subjects of group 1(moist pack) and group 2 (core strengthening exercise). This minimized the effects of group differences that could affect outcome measures. In the current study, the treated females in group 1(hot pack) reported a significant reduction in menstrual pain at an average of 4 weeks and in group 2 (core strengthening exercise) reported a significant reduction in menstrual pain at an average of 8 weeks as reported by WALIDD scale. Pain of primary dysmenorrhea has significantly reduced according to the intensity of pain that is mild and moderate type of pain in group 1 compared to group 2 but in moderate type of intensity of pain it is decreased in group 2 compared to group 1.

According to Table 1, the overall mean of data of group 2 is less than mean of group 1 for baseline characteristics (age , cycle length, duration of flow and intensity) and the overall standard deviation of group 2 will be more than group 1 for baseline characteristics (age , cycle length, duration of flow and intensity). According to Table 3, the value of chi square and p value when comparing both the groups (group 1 and group 2) the overall significance of p value is less in group 2 compared to group 1 and the overall value of chi square is more. According to Table 4, As Error sum of squares in ANOVA is less for Group 2, we conclude that dataset of group 2 has less variability. As P-value of group 2 is less than P-value of group 1, we conclude that dataset of group 2 is more significant, and it means that Core strengthening exercises is more statistically significant to reduce degree of pain in dysmenorrhea.

The current study showed the moist pack application was effective method for relieving pain of primary dysmenorrhea. This finding was in the line of (Akin et al., 2004). As regard to the effect of moist pack and core strengthening exercises the current study revealed great improvement in the pain scores of primary dysmenorrhea as it decreased to $2.7e^{-114}$ (p value) in group 1 (moist pack) and e^{-115} (p value) in group 2 (core strengthening exercise) in the third cycle.

Regarding to comparing moist pack application to physical exercises in reducing pain scores. The current study revealed that; core strengthening exercises (group 2) was effective at the end of second cycle and the moist pack application (group 1) was effective at the end of first cycle but the great improvement was found at the end of third cycle for both the groups according to WALIDD scale. But the great improvement in pain scoring was observed in group 2 and this showed a statistical significant difference between the two intervention groups. This finding is supported by previous studies carried out by Hayam Fathey A. Eittah and Eman Seif S. Ashour, 2017 and Noorbakhsh Mahvash et al jan 2012.

There is evidence that core strengthening exercises has a positive effect in the treatment of primary dysmenorrhea in female subjects. The current study revealed that; core strengthening exercises (Group 2) was effective in reducing pain of dysmenorrhea as compared with moist pack application (Group 1) this clearly observed in reduction in the mean of pain scoring in group 1 after 4 weeks, and reduction the mean of pain scoring in group 2 after 8 weeks but the great improvement in pain scoring was observed in group 2 at the end of 12 weeks.

Conclusion

Primary dysmenorrhea experienced entire sample of current study, heat application and physical exercises help in decreasing the intensity of pain of primary dysmenorrhea in group 1 and group 2. There is evidence that core strengthening exercises has a positive effect in the treatment of primary dysmenorrhea in female subjects. The current study revealed that; core strengthening exercises (Group 2) was effective in reducing pain of primary dysmenorrhea as compared with moist pack application (Group 1) this clearly observed in reduction in the mean of pain scoring in group 1 after 4 weeks, and reduction the mean of pain scoring in group 2 after 8 weeks but the great improvement in pain scoring was observed in group 2 at the end of 12 weeks.

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Spatiotemporal Gait Parameters and Walking Characteristics in Community-Dwelling Ambulatory Stroke Survivors

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Abstract

Background: Gait dysfunction is a major sequalae of stroke which negatively affect stroke survivors' walking and community re-integration. Understanding the impairments that determine their community functioning willassist in development of effective treatment strategies for them to overcome their disability.

Aim: The aim of the study was to explore thespatiotemporal gait parameters and walking characteristics in community-dwelling ambulatory stroke survivors and determined howthey differ across time of commencement of ambulation and duration of ambulation post-stroke.

Method: This study involved 164 (83males) community-dwelling ambulatory stroke survivors in Kano, Nigeria. The spatiotemporal gait parameters wereassessed along 12-meter distance walking path. Spatiotemporal symmetry was computed from the spatiotemporal parameters. Lower limb motor impairment, lower extremity function, and functional ambulation were assessed using Fugyl-Meyer assessment scale, Lower Extremity Functional scale, and Modified Emory functional ambulatory profile respectively. Their physical mobility was assessed using Modified Rivermead mobility index, walking confidence using ambulatory self-confidence questionnaire while Berg balance scale was used to measure balance. Functional mobility and walking endurance was assessed using the Time up and go test and 6-minute walk test respectively.Walking status was assessed with functional ambulatory category.

Results: The participants were aged30years and abovewith 61% above 50years. Most (59.8%) participants commenced ambulation within 1-month of stroke with 65.9% being independent in functional ambulation. Their spatiotemporal, mobility and balance parameters as well as spatiotemporal symmetry characteristics were severely affected and are significantly inversely related to their times of commencement of ambulation post-stroke.

Conclusion: Spatiotemporal gait parameters, mobility parametersand balance performances are severely abnormal in community-dwelling stroke survivors and negatively impact on their walking ability and community functioning.

Keywords: *Ambulation, Community-Dwelling, Spatiotemporal Gait,Stroke Survivors, Walking Characteristics*

Introduction

Ambulatory dysfunction occurs in a lot of stroke survivors resulting in difficulties in performing activities of daily living and mobility(1). This dysfunction is associated with deviations in EMG, spatiotemporal, kinematics, and kineticsvariables in stroke survivors(2). Human walking mediated by

complex neural control mechanisms is usually not giving much concern [1].

After a stroke, the gait quality assessed with spatiotemporal symmetry worsen over the years[3]. This post stroke gait has been reported to come up with complex relationship among the spatiotemporal asymmetries, biomechanical parameters and sensory motor deficits [4]. It has been found that stroke relatedbalance and gait deficits have vital role in causing fall among stroke survivors [5]. Hence, stroke survivors with spatiotemporal asymmetric gait could be linked to more post-stroke falls[6]. The hemiplegic gait in stroke involves and depicts mechanical consequences of interactions among muscle weakness, spasticity,spastic activations, and abnormal synergistic activation[1]. Since mixture of deviations and compensatory motion dictated by residual functions characterized the post-stroke hemiplegic gait, it is important to identify and document the gait pattern of each stroke survivor[2].Altered spatiotemporal parameters such as low velocity, low cadence, short stride length, increased double support phases, and asymmetric single limb loading are typical characteristics of stroke survivors' gait [7]. Mobility recovery is a vital goal of rehabilitation for stroke survivors [8]. The development of effective gait training strategies will be aided through understanding the impairments which primarily determine the ability of stroke survivors to walk [9].

Hence this study is designed to determine the spatiotemporal parameters and walking characteristics and further determine how these parameters and characteristics differ across categories of time of walking onset post-stroke and categories of post-stroke duration of walking in stroke survivors.

Materials and Methods

This study purposefully recruited 164 community-dwelling ambulatory stroke survivors (without cognitive dysfunction) from four major tertiary hospitals in Kano, Nigeria. Those with gait disorders/ dysfunction before the stroke and those with severe/ limiting knee arthritis were excluded from the study. They were interviewed for their sociodemographics characteristics after which their spatiotemporal gait parameters and mobility parameters were clinically assessed. Their spatial variables including step length, step width/base of support (BOS), and stride length were measured in line with the method used previously [10]. During the measurement, a temporary ink was used to show the foot-print of the participants during ambulation, in order to obtain the foot print to measure the spatial gait parameters, an ink is placed on the posterior heel area of the feet of the participantsand they wereasked to walk through a 12-metre distance. The measurements were taken within the 10-metre measure with the walking through the first and last metre taken as acceleration and deceleration points. Participants were instructed to walk freely within the distance without being told what will be measured. This was done to disallowed trick movement that may affect the outcomes measured. The participants repeated each procedure for three times and the average best performance was documented as their measures.

The step length was measured as distances between heel contact of one foot to the following heel contact of the other foot while their Base of support was measured as the horizontal distance between two feet. Stride length was measured as distances between heel contact of one foot to the following heel contact of the same foot. In measuring temporal variables, stopwatch was used in measuring the parameters in seconds. Gait speed in meters per second was measured with 10-meter walking test, the gait speed was computed by dividing distance covered by the time taken to cover it. Cadence (steps per minute) was obtained as the number of steps covered per minute. Swing phase duration measured in seconds entails measuring period when a foot is not in contact with the ground during the swing phase of the gait cycle while stance phase duration measured in seconds entails measuring period when a foot is in contact with the ground during the stance phase of the gait cycle. The gait cycle duration was measured by combining periods of swing and stance phases duration and measured from first ground contact of a referenced

lower extremity to the period when the same extremity contacts the ground again. Paretic initial double limb support time was measured as the period when both feet are on the ground firstly.

Participants' gait spatiotemporal symmetry characteristics/indices: gait asymmetry, symmetry ratio, symmetry index, and symmetry angle were derived from the primary spatiotemporal variables using the standardized recommended formulae[11]. The spatiotemporal symmetry characteristics were computed as follows

Gait asymmetry (GA): = |100 × [ln(Vparetic/ Vnon-paretic)]|

Symmetry ratio (SR): = Vparetic/Vnon-paretic

Symmetry index: = [(Vparetic ― Vnon-paretic)/0.5(Vparetic + Vnon-paretic)] ×100%

Symmetry angle: = [(45^0 ― arctan (Vparetic/ Vnon-paretic)) ×100%]/90

Where V in all the four symmetry equations above represent the spatiotemporal parameters including Step length, stride length, Swing time, stance time, intra-limb ratio, and initial double limb support time.

In addition to assessing gait spatiotemporal and symmetry parameters, walking characteristics were assessed by assessing the mobility variables (including lower extremity motor impairments, functional mobility, walking endurance, physical mobility, walking confidence, ambulation status, lower extremity function, and functional ambulation), and balance. The level of motor impairments in the lower extremities of the participants was measured with Fugyl-Meyer assessment scale which is highly recommended as a clinical and research tool[12]. Their functional mobility was measured using the Time up and go test (TUG)[13,14]. Walking endurance was measured using the 6-minute walk test [15]. Modified Rivermead mobility index was used in assessing physical mobility[16]while their walking confidence was measured using ambulatory self-confidence questionnaire[17]. Berg balance scale was used to measure balance [18].Their walking status was assessed with functional ambulatory category (FAC) [19]while the Lower Extremity Functional scale was used to measure the function of the lower extremity[20]. Modified Emory functional ambulatory profile was used to measure functional ambulation[21].

Data obtained was analysed using Statistical Package for Social Sciences (SPSS). Descriptive statistics of frequencies, percentages, mean, standard deviations, variance, and standard error was used to present the data on mobility and spatiotemporal parameters as well as spatiotemporal symmetry characteristics. Kruskal Wallis test was used to determine differences in spatiotemporal parameters and mobility parameters across categories of walking onset post-stroke and categories of post-stroke walking duration. Statistical significance was set at $p \leq 0.05$.

Results and Discussion

Results

The participants were aged 30 years and above. Larger percentage (54.9%) of the participants were within the age range of 51-71 years, the males were marginally (50.6%) more than females (49.4%) (Table 1). More (29.3%) of the participants had suffered stroke for between 3-6 months duration which equals to percentage of participants who suffered stroke for more than 12 months. More (39.6%) of the participants were discharged from inpatient hospital care within 24 hours of stroke onset. Most (59.8 %) of the participants commenced ambulation within the first one month of having a stroke while 29.3% of them had walked for between 1-3 months after stroke. Most (65.9%) participants were within functional ambulatory category of >4-≤6 (Table 1).

Table 2 contains the general description of mobility, spatiotemporal and balance parameters of the participants. The variabilities in mobility, spatiotemporal and balance parameters are shown in table 2. The spatiotemporal symmetry characteristics derived from the spatiotemporal parameters are also

presented in table 3. In Spatial symmetry characteristics, stride length symmetry values including symmetry ratio, symmetry index, symmetry angle, and gait asymmetry were shown to be better than step length symmetry values (table 3). The result of the study revealed that gait temporal symmetry characteristics including stance time, swing time, and intralimb-ratio are in order of increasing gait asymmetry, symmetry index, and decreasing symmetry angle. In addition, double limb support time, stance time, swing time, and intralimb-ratio were found to be in order of increasing symmetry ratio (table 3).

The result of the study revealed that many of the spatiotemporal and mobility parameters significantly differ across categories of time of walking onset post-stroke (Table 4). Physical mobility, lower extremity function, walking confidence, balance, base of support, paretic swing phase duration, and paretic gait cycle duration significantly differ across categories of walking duration post-stroke (Table 5).

Table 1: Sociodemographic and clinical characteristics of the participants

Variables	N	%
Age categories (Years)		
30-50	64	39
51-71	90	54.9
72 and above	10	6.1
Duration of stroke (Months)		
≤ I	17	10.4
>1 to ≤ 3	36	22
>3 to ≤ 6	48	29.3
>6 to ≤1 2	15	9.1
>12	48	29.3
Onset of Walking post-stroke (months)		
≤ I	98	59.8
>1 to ≤ 3	44	26.8
>3 to ≤ 6	14	8.5
>6 to ≤12	7	4.3
>12	1	6
Duration of walking post-stroke (months)		
≤ I	24	14.6
>1 to ≤ 3	48	29.3
>3 to ≤ 6	35	21.3
>6 to ≤1 2	16	9.8
>12	41	25

Cont... **Table 1: Sociodemographic and clinical characteristics of the participants**

Status of walking categories		
Dependent	56	34.1
Independent	108	65.9
Duration of hospitalization (days)		
≤ 1	65	39.6
>1 to ≤ 7	26	15.9
>7 to ≤ 14	39	23.8
>14 to ≤ 28	24	14.6
>28	10	6.1

N:Frequency %: percentage

Table 2: Description of mobility, spatiotemporal, and balance parameters of the participants

Variables	Mean±SD	SE	Variance
Ambulation			
Mobility parameters			
Walking endurance	141.88±77.90	6.08	6067.79
Ambulatory self-confidence	98.65±39.75	3.10	1580.19
Lower extremity function	34.55±17.66	1.38	311.98
Lower extremity motor impairment	23.88±7.41	0.58	54.86
Physical Mobility	35.33±6.30	0.49	39.68
Functional Ambulation	199.53±279.52	21.83	78128.95
Functional Mobility	44.8±64.16	5.01	4116.81
Gait spatiotemporal parameters			
Spatial variables			
Paretic stride length	65.40±23.24	1.81	539.92
Non-paretic stride length	60.89±22.65	1.77	513.12
Paretic step length	35.74±12.16	0.95	147.98
Non-paretic step length	32.26±12.22	0.95	149.21
Stride width/Base of support	20.38±05.79	0.45	33.56
Temporal variables			
Gait speed	0.43±0.27	0.02	0.072

Cont... **Table 2: Description of mobility, spatiotemporal, and balance parameters of the participants**

Cadence	53.84±22.75	1.78	517.47
Paretic Swing phase duration	0.82±0.55	0.04	0.31
Non-paretic swing phase duration	0.72±0.46	0.04	0.20
Paretic Stance phase duration	0.95±0.73	0.06	0.54
Non-paretic stance phase duration	1.03±0.69	0.05	0.48
Paretic Gait cycle duration	1.77±1.1	0.86	1.20
Non-paretic Gait cycle duration	1.75±1.0	0.78	1.00
Paretic Initial double limb support time	0.56±0.55	0.43	0.30
Non-paretic Initial double limb support time	0.61±0.63	0.49	0.40
Balance	40.78±11.43	0.89	130.61

SD: Standard deviation; SE: Standard error

Table 3: Description of Spatiotemporal symmetry characteristics of the participants

Variables	Mean±SD	SE	Variance
Gait spatiotemporal symmetry characteristics			
Spatial symmetry characteristics			
Stride length gait asymmetry	11.25±9.64	0.75	92.85
Step length gait asymmetry	18.1±12.03	0.94	144.64
Stride length symmetry index	11.19±9.34	0.73	87.27
Step length symmetry index	18.74±15.11	1.18	228.41
Stride length symmetry ratio	1.12±0.13	0.01	0.02
Step length symmetry ratio	1.22±0.21	0.02	0.05
Stride length symmetry angle	48.98±0.94	0.07	0.88
Step length symmetry angle	49.07±0.39	0.03	0.15
Temporal symmetry characteristics			
Swing time gait asymmetry	24.5±20.5	1.60	419.58
Stance time gait asymmetry	17.84±17.06	1.33	191.16
Intra-limb ratio gait asymmetry	35.33±28.85	2.25	832.32
Swing time symmetry index	23.84±19.46	1.52	378.58
Stance time symmetry index	21.58±53.34	4.16	2844.81
Intra-limb ratio symmetry index	34.38±26.54	2.07	704.47
Swing time symmetry ratio	1.29±0.32	0.02	0.10
Stance time symmetry ratio	1.20±0.21	0.02	0.05
Intra-limb ratio symmetry ratio	1.53±0.97	0.08	0.94

Cont... **Table 3: Description of Spatiotemporal symmetry characteristics of the participants**

Double limb support time symmetry ratio	1.16±0.35	0.03	0.12
Swing time symmetry angle	49.11±0.13	0.01	0.02
Stance time symmetry angle	49.19±0.13	0.01	0.02
Intra-limb ratio symmetry angle	49.09±0.15	0.01	0.02

SD: Standard deviation; SE: Standard error

Table 4: Comparison of mobility, spatiotemporal, and balance parameters across post-stroke walking onset categories

Variable	≤ I month (v) (n=65) Median (IQR)	>1 - ≤ 3 months (w) (n=65) Median (IQR)	>3 - ≤ 6 months (x) (n=65) Median (IQR)	>6 months (y) (n=65) Median (IQR)	H-value	p-value	Post-hoc
ML PRM.							
WEN	155.59(104.43)	96.00(129.79)	88.90(54.11)	97.85(108.61)	17.97	<0.001*	v, &w, v &x
LEMI.	28.00(10.25)	19.50(12.25)	19.00(13)	21(11.25)	21.83	<0.001*	v, &w, v &x
PML.	39(08)	38(11.25)	37.5(06)	38.5(6.75)	02.23	0.527	
FMB	20(16.63)	35(49.44)	37.56(35.51)	41.31(66.08)	25.40	<0.001*	v, &w, v &x
LEF	35.5(28.25)	34(31.75)	30.5(17)	35(28.25)	01.77	0.623	
FAMB	80.26(50.38)	153.15(308.89)	162.06(212.59)	165.97(394.40)	23.67	<0.001*	v, &w, v &x
ASC	100.5(52.25)	95.5(58.50)	93.5(51)	94.5(69)	03.58	0.310	
Balance	43.5(12.25)	41.5(19.75)	40.5(14.75)	44(27.25)	04.98	0.174	
GSPTV.							
PSTRL	72(34.5)	56(34)	48(29)	50(24.5)	11.80	0.008*	v &x
PSTPL	36(15)	32(20)	32.5(12)	36.5(16.75)	04.30	0.231	
BOS	19(05)	20(06)	22(10.5)	18.5(20.25)	02.60	0.457	
Gait speed	0.46(0.31)	0.29(0.37)	0.27(0.19)	0.27(0.30)	23.33	<0.001*	v, &w, v &x
Cadence	52(30.25)	43.5(31)	39(39.5)	45(44)	12.64	0.005*	v &w
PSWPD	0.60(0.46)	0.94(0.74)	1.28(1.26)	0.63(1.02)	08.80	0.044*	
PSTPD	0.79(0.41)	01.00(0.69)	1.01(0.76)	1.03(1.14)	11.78	0.008*	v &x
PGCD	1.45(0.73)	01.97(1.09)	2.47(1.70)	1.75(2.07)	15.35	0.002*	v, &w, v &x
PIDLS	0.30(0.31)	0.75(0.64)	0.83(0.57)	0.40(0.72)	26.69	<0.001*	v, &w, v &x

IQR: Interquartile range; ML PRM.: Mobility parameters WEN: Walking endurance, LEMI: Lower extremity motor impairment; FAMB:

Functional ambulation, PML: Physical mobility; FMB: Functional mobility; LEF: Lower extremity function, ASC: Walking confidence;

PSTRL: Paretic stride, length; PSTPL: Paretic step length; BOS: Base of support PSWPD: Paretic swing phase duration, PSTPD: Paretic stance phase duration; PGCD: Paretic gait cycle duration; PIDLS: Paretic initial double limb support time

Table 5: Comparison of mobility, spatiotemporal, and balance parameters across post-stroke walking duration categories

	Ambulatory duration post-stoke in months							
Variable	**≤ I(V) (n=65) Median (IQR)**	**>1 - ≤ 3(W) (n=65) Median (IQR)**	**>3 - ≤ 6(X) (n=65) Median (IQR)**	**>6 - ≤12(Y) (n=65) Median (IQR)**	**>12(Z) (n=65) Median (IQR)**	**H- value**	**P-value**	**Post-hoc**
ML PRM.								
WEN	127.50(111.00)	130.95(144.76)	180.00(139.70)	117.36(120.00)	120.00(91.10)	2.07	0.722	
LEMI.	29.00(12.00)	25.50(12.00)	26.00(10.00)	24.00(13.00)	20.00(15.00)	5.33	0.255	
PML.	39.00(08.00)	36.50(16.00)	39.00(16.00)	40.00(01.00)	39.00(04.00)	11.29	0.023*	X&Y
FMB	22.67(27.13)	20.25(23.61)	20.00(24.14)	24.91(43.45)	26.00(29.00)	4.49	0.344	
LEF	26.00(24.00)	30.00(27.00)	30.00(27.00)	36.00(26.00)	40.00(25.00)	11.56	0.021*	V&Z, X&Z, W&Z
FAMB	93.35(88.89)	90.00(154.55)	79.06(100.01)	94.31(181.18)	120.54(119.02)	4.69	0.321	
ASC	87.50(46.00)	90.50(49.00)	94.00(61.00)	109.00(56.00)	114.00(49.00)	12.20	0.016*	W &Z
Balance	41.00(13.00)	40.50(18.00)	41.00(15.00)	51.00(10.00)	46.00(10.00)	10.31	0.036*	W &Z, W&Y, V&Y
GSPTV.								
PSTRL	62.50(43.00)	62.50(37.00)	66.00(34.00)	75.00(41.00)	65.00(34.00)	2.05	0.726	
PSTPL	32.50(24.80)	32.00(19.80)	34.50(11.00)	38.00(16.00)	36.00(18.00)	3.07	0.546	
BOS	18.00(04.50)	19.00(04.00)	19.00(05.00)	22.00(08.80)	20.00(09.00)	9.82	0.043*	V&Y
Gait speed	0.39(0.28)	0.40(0.44)	0.50(0.41)	0.36(0.37)	0.36(0.25)	2.94	0.569	
Cadence	50.00(28.00)	49.00(32.00)	53.00(32.00)	51.00(34.00)	48.00(31.00)	1.36	0.851	
PSWPD	0.50(0.32)	0.60(0.48)	0.64(0.58)	1.20(1.47)	0.96(0.83)	15.20	0.004*	V&Z, V&Y
PSTPD	0.75(0.36)	0.80(0.52)	0.79(0.50)	1.00(0.58)	0.99(0.79)	2.80	0.592	
PGCD	1.36(0.66)	1.57(0.77)	1.47(0.92)	2.15(2.13)	1.85(1.30)	9.64	0.047*	V&Z, V&Y, X&Y
PIDLS	0.34(0.36)	0.37(0.43)	0.28(0.62)	0.86(0.62)	0.40(0.65)	8.36	0.079	

IQR: Interquartile range; ML PRM.: Mobility parameters, WEN: Walking endurance, LEMI: Lower extremity motor impairment; PML: Physical mobility; FMB: Functional mobility; LEF: Lower extremity function, FAMB: Functional ambulation, ASC: Walking confidence; PSTRL: Paretic stride length; PSTPL: Paretic step length; BOS: Base of support; PSWPD: Paretic swing phase duration, PSTPD: Paretic stance phase duration; PGCD: Paretic gait cycle duration; PIDLS: Paretic initial double limb support time

Discussion

The study evaluated spatiotemporal gait parameters and walking characteristics in community-dwelling ambulatory stroke survivors and determine how they differ across time of commencement of ambulation and duration of ambulation post-stroke. It is interesting to note that the stride length and step length of the paretic limb are longer than the non-paretic. This may be due to trick and compensatory strategies used during ambulation in hemiparetic stroke survivors. This corroborates the opinion of previous authors that longer paretic step length is associated with greater compensatory mechanisms of non-paretic limb propulsion as well as dependence on abnormal plexor and extensor synergy [22]. However, the results that the stride length symmetry values were better than the step length symmetry values may not be unconnected with the fact that stride length is attained with a complete gait cycle which entails series of coordinated activities and involve a full complement of all neuromuscular biomechanism during a gait cycle in contrast to the step length that only involve some biomechanism during a gait cycle.

The study has shown that in terms of temporal symmetry ratio, data of the study participants revealed that in order of increasing asymmetry; that double limb support time, stance time, swing time, and intralimb ratio symmetry ratios were found to be asymmetric and outside normal symmetry ratio range of (0.1-1.1) as reported by Alexander *et al*, (2009)[23]. This shows that the asymmetry observed in temporal parameters of gait in stroke survivors is due to the loss of neuromuscular synergy in the affected limb.

The fact that the obtained values of temporal symmetry ratio which were higher than the normal range, and that of the non-paretic stance phase being higher than paretic stance phase duration is of clinical relevance. It points to the fact that, to attain symmetry in gait of stroke survivors, rehabilitation experts should focus on the temporal parameters symmetry for improved walking performance and walking proficiency. It has been similarly reported by Alexander *et al*, (2009)[23] that increased non-paretic limb weight bearing duration with reduced paretic limb stance phase duration indicate temporal symmetry ratio higher than 1.1 during ambulation. It could therefore be deduced that walking with more even distribution in stance phase duration between paretic and non-paretic lower extremities may be ensued when better temporal symmetry ratios that are within normal range. Hence, to avoid usual falls due to loss of balance during walking in stroke survivors, more emphasis and attention should be focused on the concept of gait symmetry post-stroke. A previous study by Zhang *et al*, (2018)[24] had observed that gait asymmetry is one among the typical resulting impairments due to hemiparesis. Since spatiotemporal gait asymmetry is common post-stroke resulting in instability and injury during ambulation [25], efforts should be directed at providing clear understanding of their characteristics and extent as well as how they can be focused on during rehabilitation for better clinical outcomes for independent community functioning in stroke survivors.

The results of this study show significant difference in the walking endurance, lower extremity motor impairment, functional mobility, and functional ambulation across different categories of time of commencement of walking post-stroke. Notably, the differences were also significant in paretic stride length, gait speed, cadence, paretic stance phase duration, paretic gait cycle duration, and paretic initial double limb support time across categories of walking onset post-stroke. Most importantly, in most cases

those who began walking within 1-month post-stroke had better parameters than those who commenced walking later. Although it may be assumed that those who commenced walking earlier post-stroke may have recovered motor function faster than those who commenced walking later, this cannot be associated with their severity of stroke at onset as it was difficult to retrospectively assess this even when their hospital record was explored. However, our assumption that they may have recovered motor function faster can be substantiated by the fact that they had lower limb motor function and ambulatory parameters better than the others who returned to walking later. The trends in the result of this study have shown that better outcomes in the parameters decreases in order of increasing categories of time of commencement of walking with those who commenced walking at above 3 months to as late as 6 months post-stroke having poorer outcomes in many of the parameters.This shows that the earlier the stroke survivors commence ambulation, the earlier their gait rehabilitation will commence and their prospect of improvement in their mobility and spatiotemporal gait parameters. This gives credence to early ambulation of stroke survivors to expedite functional recovery for community re-integration and possible return to work. This will reduce redundancy in stroke survivors and subsequently reduce the burden of cares on the informal caregivers. This supports the findings of Cumming *et al*, (2011)[26] that improvement in recovery of function and return to independent walking is accelerated with earlier and intensive post-stroke mobilization.It also agrees with that of Coleman *et al*, (2017)[27]that commencement of rehabilitation in the first two weeks post-stroke may result in improved outcomes. An earlier study had reported relative faster clinical improvement during three months post-stroke and continue thereafter slowly at 3-6 months post-stroke [28].

The result of this study shows that Physical mobility, lower extremity function, walking confidence and balance differ significantly across categories of walking duration post-stroke.Lower extremity function and walking confidence of those who have been walking for more than a year was better than those that have been walking for not up to a year. While Physical mobility and balance are better in participants who have been walking for more than six months but not more than a year. Therefore, the decreased physical mobility and balance in those who have been walking for not up to six months may not be unconnected with the fact that those group were just returning to walking after the onset of stroke and they may not have regained their confidence in walking and their balance still remains unstable

It is also worthy of note that the base of support, paretic swing phase duration, and paretic gait cycle duration were better in stroke survivors who had walking duration of at least six months than those who had been walking for less than six months. Consequently, there are better spatiotemporal and mobility gait parameters in those who had walking duration up to a yearpost-stroke, except for lower extremity function and walking confidence which extend beyond one year. It could be deduced from the findings that the mobility and spatiotemporal parameters are better with longer walking duration of greater than six months up to a year and even beyond. This is in tandem with the assertion that improvement and recovery in function post-stroke occur in the first 6 months and can continue beyond [28–30].This shows that the more and the longer a stroke survivor walks; the more they gain proficiency in walking and get better in several parameters and components required for normal walking function.

Conclusion

Spatiotemporal gait parameters and mobility parameters are severely abnormal in community-dwelling stroke survivors. Mobility and spatiotemporal parameters are better in stroke survivors who commenced walking as early as one month of stroke than those who commenced walking later and that the later the commencement of walking in stroke survivors, the more likelihood of having abnormal gait parameters. The earlier the commencement of walking and longer walking duration in stroke survivors, the more likelihood of recovering the mobility and

spatiotemporal gait parameters/symmetry.

Conflict of Interest: None

Ethical Clearance: Ethical approval for the study was sought and obtained from the Health Research and Ethics Committees of College of Medicine of the University of Lagos, Aminu Kano Teaching Hospital and Kano State Ministry of Health. Participants consented to participate in the study before they were included in the study.

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Original Article

Prevalence of Low Back Pain among Doctor of Physical Therapy Students

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Abstract

Objective: This study aimed to identify prevalence of Low Back Pain (LBP) among Doctor of Physical Therapy (DPT) students in 12 month, 1 month and 7 days and its risk factors, also to find out which year of physiotherapy study has most severe LBP.

Methodology: A cross-sectional survey was conducted in the College of Physiotherapy, JPMC, Karachi, Pakistan in January 2021. Data was collected from 115 DPT students. Students aged between 18 to 25 years were included in the survey. Nordic Back Pain Questionnaire was use to the collect data. Data was analyzed using descriptive statistics, frequency, mean and chi- square test.

Results: Results reveals that DPT students aged between 20 and 22 were more at risk of LBP, most commonly due to poor posture furthermore educational subjection of 'sitting looking down' and 'treating patients' were related to LBP.Strong association was found between gender and LBP during last 12 months. Highest % of LBP during last 12 months was found in female in 1-7 days. Considering the response of all categories of LBP prevalence (LBP in 12 months, LBP in 1 month and LBP in 7 days) we have found that in 5th year the highest prevalence of LBP was in 1 month (565.21).

Conclusion: The data suggest that LBP faced daily by many of physiotherapy students in each year level of undergraduate program. Hence this survey concluded that awareness and knowledge regarding proper body mechanics must be spread among DPT students so the global burden of LBP could be reduced.

Keywords: *Doctor of Physical Therapy, Doctor of Physiotherapy, low back pain, students*

Introduction

Low Back Pain (LBP) is categorized as one of the most common musculoskeletal disorder (MSD) round the globe[1-3]. It is extremely common in young population that 80% of adult worldwide experience this condition at least once in their life span [4] and Pakistan is of no exception with 40% LBP prevalence, which is far greater than global prevalence rate [5]. Hence, LBP is regarded as one of the major universal health issue[6].

According to S. Kinkade, LBP is "pain that occur posterior in the region between the lower rib margin and the proximal thighs"[7]. Scientific evidence reported poor posture as commonly adapted by the physiotherapy students and activities such as sitting with poor body mechanics, lifting, repetitive work

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and prolonged hours of activities being some of the common causes of LBP [8]. Apart from suffering from various painful symptoms by the LBP, there is huge economic cost both to theeffected individual and the society from medical costs, disability and lost work [9-11].

In 2017 Leysen et al. conducted a cross-sectional study on attitudes and beliefs concerning LBP among physiotherapy students in Belgium, he claimed that 46% experienced LBP at some point of their life [12]. Recently 29.3% prevalence of LBP appears to be reported by Furtado et al.[13] in students aged between 18 to 29 years which is alarming for whole society. Likewise, LBP prevalence among physiotherapists is 72.9% in Pakistan[14] while 54% in US[15], 62% in UK[16]and49% in Canada[17].A prudent and worthwhile study reported that teaching proper body mechanics, posture to students can reduce LBP[13].

As awareness related to LBP will lead to a better understanding of body mechanics for physiotherapy students hence future therapists. Therefore this study aimed:

- To explore information on LBP prevalence (12 month, one-month, one-week), and its risk factors.
- To find out which year of physiotherapy study has most severe LBP.

Methodology

A cross-sectional survey was conducted on the Doctor of Physiotherapy (DPT) students in the College of Physiotherapy, JPMC, Karachi, Pakistan in January 2021 using non-probability convenient sampling. The approval for this study was sought fromInstitutional Review Board (IRB) of Jinnah Postgraduate Medical Centre (Ref NO.F.2-81-IRB-GENL/1504/JPMC).

DPT students who give written informed consent and aged between 18 to 25 years were included in the survey. The sample size of the study was 115 DPT students, calculated via OpenEpi calculator. Five batches of DPT students were approached during their free hours. In each batch 23 self-administered questionnaire were distributed and explained among students by self-approach.

LBP prevalence questions were taken directly from an established instrument (Nordic Back Pain Questionnaire) that captured information retrospectively on lifetime, 12-month, one-month and one-week prevalence. We use a self-administered questionnaire that contained extracts from the questionnaire utilized in the study by Nyland and Grimmer, which has strong validity and reliability (Kappa = 0.87) [18].The given instrument found standard information on gender, age, height, weight, amount and type of all occupational and sporting activities, and current levels of fitness were self-assessed. It also included purpose-built questions on exposure to perceived workplace hazards for physiotherapy students. Questionnaire included both open and close ended questions.

The questionnaire was composed of three sections: In the first section of the questionnaire data on age, gender and year of study were obtained. The second section of the questionnaire contained questions on the amount of time the students spent on specific educational activities within one month prior to the study. The activities "sitting at lectures," "sitting during personal study," "practicing techniques on others," "having others practices techniques on self and treating patients." The third section of the questionnaire enquired about 7-day, 1-month, 12-month, and lifetime prevalence of LBP with questions such as "have you had low back trouble at any time during 7 days," "have you had low back trouble at any time during the last month," "have you had low back trouble at any time during the last 12 months" and "have you ever had low back trouble," respectively.

The data analysis was done on SPSS Windows Version 21.0. LBP and prevalence data was described by year level and in gender strata, using percentages, frequency and mean. Chi-square test was applied for association shown between gender and year level of the study.

Results

The response rate of this study was 95%. Out of 115 DPT students 74.8% were female and 25.2% were male. It was found that the age of students between 20 and 22 years were having higher risk of LBP, most commonly due to poor posture furthermore educational subjection of 'sitting looking down' and 'treating patients' were related to LBP.

There was found no significant difference in the age for male or female for any of the prevalence measures of LBP. The overall age of students without LBP were 18 year (8.7%), compared the students with any back pain (average age 20 years) (16.5%), the maximum LBP in the age (22 years) (28.7%). It was found that in 5th year there is highest prevalence of LBP in 1 month (565.21).

Characteristics of sample of different batches is shown in table 1.

The length of time having LBP trouble for last 12 months is shown in figure 1.

Prevalence of LBP among five DPT batches is shown in table 2.

Table 1: Characteristics of sample

Year level study					
	1st	2nd	3rd	4th	5th
Gender					
Male	2	7	5	6	9
Female	21	16	18	17	14
Mean age in years (sd)	19	20	22.6	22.1	23
available subjects (n)	23	23	23	23	23

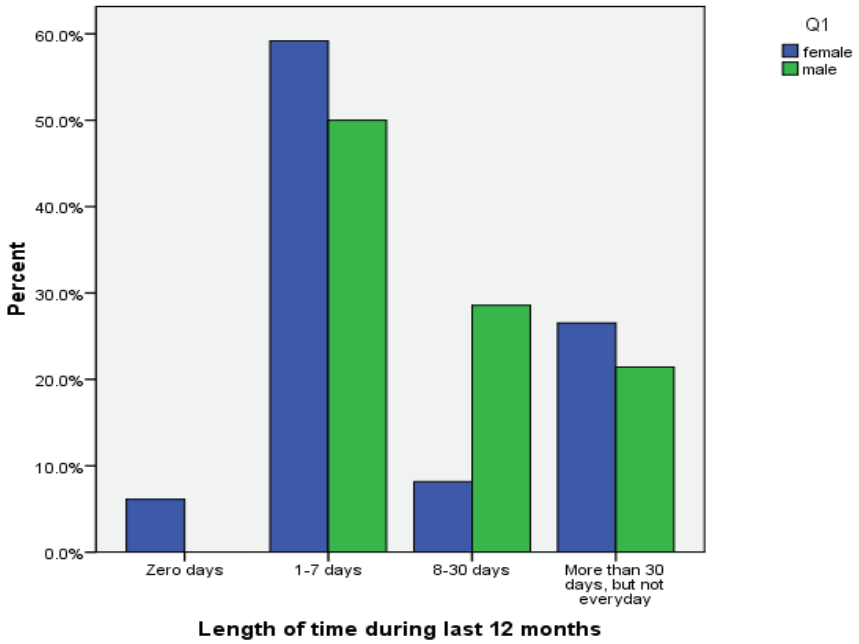

Figure 1: Frequency of LBP in context of prevalence of LBP

Table 2: Prevalence of low back pain among five DPT batches

Year level of study	12 month	1 month	7 days
1st year	43.47	347.82	173.91
2nd year	0	347.82	260.86
3rd year	43.47	260.86	260.86
4th year	217.39	478.26	347.82
5th year	260.86	565.21	391.3

Discussion

This crossectional-survey aimed to identify prevalence of LBP among DPT students in 12 month, 1 month and 7 days and its risk factors, also to find out which year of physiotherapy study has most severe LBP.

The findings of this study are in line with the study conducted by Elaine Burger et al. which concluded that physiotherapy students are prone to LBP due to a flexion posture while studying, lifting patients and working in incorrect positions [19]. Similarly study reported higher prevalence of LBP in DPT students when compared with medical students [20].

According to this survey students aged between 20 and 22 years were having higher risk of LBP, most commonly due to poor posture furthermore educational subjection of 'sitting looking down' and 'treating patients' were related to LBP. However Nyland and Grimmer highlighted other educational activities like prolong sitting as risk factor for LBP [18].

It is noteworthy that education of physiotherapy students incorporates vast theoretical knowledge i.e. it includes attending lectures as well as clinical training to gain hands on experience. This puts novice students at a risk of developing musculoskeletal disorders, sometimes resulting in injuries [21]. Finding of this survey reported that female students are more prone to LBP.

This study was limited in that it was a cross-sectional survey and sample size was not enough to develop definitive findings, also data was collected from only those students who were accessible at specific time, hence limit the generalization of findings.

Further studies with large sample size and long follow-up duration must be conducted to get more understanding and hence reduction of this global health problem.

Conclusion

The data suggests that LBP faced daily by many of physiotherapy students in each year level of undergraduate program. Hence this survey concluded that awareness and knowledge regarding proper body mechanics must be spread among DPT students so the global burden of LBP could be reduced.

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Conflict of Interest: The authors declared no conflicting interest regarding this study.

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Ethical Clearance: Ethical clearance was sought fromIRB of JPMC (Ref NO.F.2-81-IRB-GENL/1504/JPMC).

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Original Article

To Find out Depression Rate in Common Clinical Condition

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Abstract

Background and Purpose: Depression is a biological based mental illness that can have lasting emotional and physical effects. It frequently goes unrecognized in primary care, but screening has been shown to increase detection and can lead to improved outcomes when linked to adequate treatment. The **Hamilton Rating Scale for Depression** has been commonly used for the assessment of depression in clinical practice. A finding of the depression following **Stroke, COPD, Neck pain, Back pain and OA** knee indirectly affect prognosis of the rehabilitation which is documented in many literatures but how much it is affected in particular disease is still controversy. So keeping this in the view the objective of the study is to find out depression rate in clinical condition of Stroke, COPD, Neck pain, Back pain and OA knee.

Method: Thirty patients of subacute and chronic conditions (>3 months of duration) of **COPD, Stroke, Back pain, Neck Pain and OA knee** in each group were included for the study. The **Hamilton Rating scale for Depression** was taken and the patient was categorized as mild, moderate and severe.

Result & Conclusion: Prevalence of depression was higher in **COPD (**21.23 ± 8.21(SD)) and **Stroke** (19.53± 7.54 (SD)) patients compared to other clinical condition whereas severely depressed patients were found in **COPD** and **Back pain** (19.53± 7.54 (SD)) groups.

Key Words: *Depression, Depression with disease, Hamilton Rating Scale of Depression.*

Introduction

" Depression is a common mental disorder that presents with depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration".[1]

Signs and symptoms of Depression [2]

Sad, anxious or "empty" feelings, Feelings of hopelessness, Feelings of guilt, worthlessness, Irritability, restlessness, Loss of interest in activities or hobbies once pleasurable, including sex, Fatigue and decreased energy, Difficulty concentrating, remembering details and making decisions, Insomnia, early–morning wakefulness, or excessive sleeping, Overeating, or appetite loss, Thoughts of suicide, suicide attempts, Persistent aches or pains, headaches, cramps or digestive problems that do not ease even with treatment.

Depression and Disease

The World Health Organization reported that **depression is the fourth leading cause of burden** among all diseases.[3] Prevalence of disease and relative risk by General Diagnostic Category for Depression having higher risk of physical co-morbidities shows that out of 1000 cases Neurological (197), Respiratory condition (209), Cardiovascular (178), Musculoskeletal (436) had been seen.[4]

Depression also often co–exists with other serious medical illnesses such as heart disease, stroke, cancer, HIV/AIDS, Diabetes, and Parkinson's disease.

Studies have shown that people who have depression in addition to another serious medical illness tend to have more severe symptoms of both depression and the medical illness, more difficulty adapting to their medical condition, and more medical costs than those who do not have co–existing depression. [5] Research has yielded increasing evidence that treating the depression can also help improve the outcome of treating the co–occurring illness.[6]

Objective of the Study

To find out the depression rate in subacute and chronic clinical condition of Stroke, COPD, Neck pain, Back pain and OA knee.

Methodology

Method: The written consent was taken from the participants before the starting of the study. The Questionnaire format was given to patients of sub-acute and chronic clinical condition (>3 month of duration) of COPD, Stroke, Back pain, Neck pain and OA. The title of scale was kept blind to patients.

Participants: Total 150 patients were selected for the study. Each condition consists of total 30 numbers of patients.

Source of data: Data were collected from various hospitals and physiotherapy centers of Rajkot.

K.K.Sheth physiotherapy college, G.T.Sheth Orthopedic Hospital, H.T.Sheth Physiotherapy Center, Pandit Dindayal Upadhyay Civil Hospital.

Sampling: Purposive sampling

Inclusion criteria:

1. Subacute and chronic cases of stroke, COPD, neck pain, back pain, and osteoarthritis knee with associated signs and symptoms(>3 months duration)

2. Both male and female

3. Age group 30 – 60 years

Exclusion criteria:

1. Patient who have more than 1 clinical condition (i.e., stroke, COPD, neck pain, back pain and osteoarthritis knee)

2. previously depressed patients (retrospective analysis by Hamilton scale)

3. Any major surgical intervention (orthopedic/ neurological/other surgery) in last 3 months

4. Mentally unstable patients

5. Patients who have sever cognitive disorder

6. Sever anemic patients

7. History of any other psychological disorders

8. patients with any other neurological, cardiovascular and orthopedic disorders

Outcome measure:

THE HAMILTON RATING SCALE FOR DEPRESSION (21-point scale) [7, 8]

It is reliable and valid.

Mild - 10-13

Moderate - 14-17

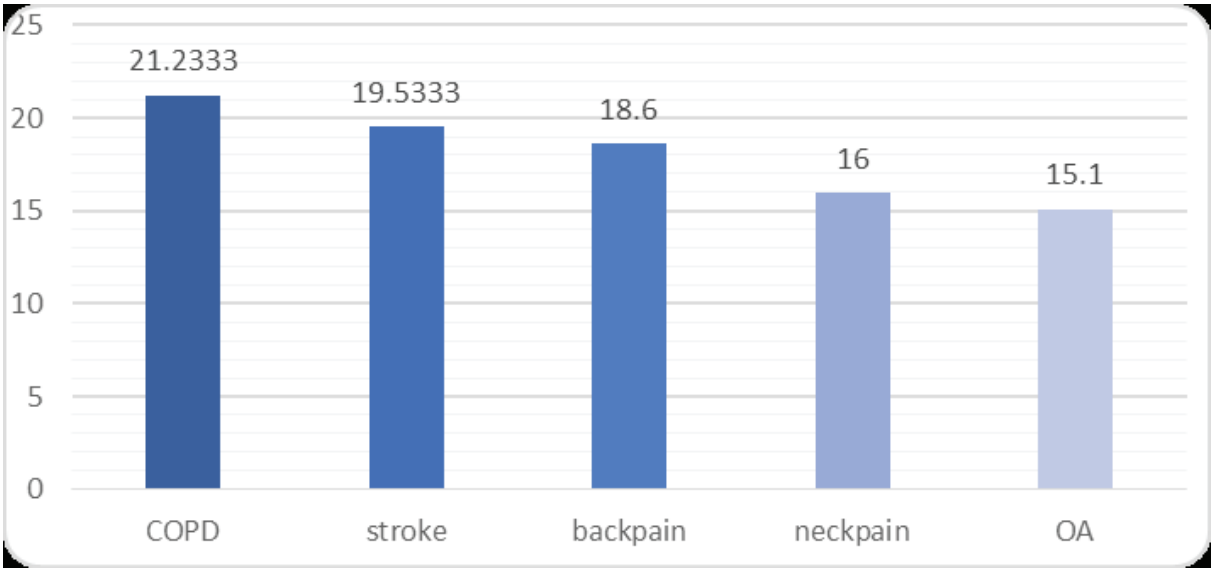
Severe - >17

Results

Comparison of Mean values of Stroke, COPD, Neck pain, Back pain and OA knee.

	N	Minimum	Maximum	Mean	Std. Deviation
COPD	30	8.00	37.00	21.23	8.21
STROKE	30	2.00	34.00	19.53	7.54
BACK PAIN	30	4.00	27.00	18.60	6.24
NECK PAIN	30	8.00	25.00	16.00	4.49
OA	30	5.00	33.00	15.10	6.55

Interpretation: The above table shows the mean of depression score in **COPD** is 21.23 ± 8.21(SD), **Stroke** 19.53± 7.54 (SD), **Back pain** 18.60 ± 6.24 (SD), **Neck pain** 16.00 ± 4.49(SD) and **OA** 15.10 ± 6.55 (SD) for the present study.



Discussion

Depression is a mental state characterized by pessimistic sense of inadequacy and despondent lack of activity. [9] The risk of major depression is increased with neurological condition of stroke [10], cardiovascular illness like COPD[11], musculoskeletal conditions like OA[12], neck pain[13], and Back pain[14] etc. During recent years, numerous studies have found an association between minor depressive symptoms and physical functioning from illness and injury.[15]

There is no clear anatomic or physiologic cause can directly explain depression. Most experts agree that it can be diagnosed on presentation of clinical symptoms. [3] Result of present study shows that there is high level of depression in COPD patients compare to other clinical condition like Stroke, Back pain, Neck pain & OA knee.

Loss of functionality is a strong mediator of the development of depression in chronic illness, with an attributable risk.[16] Functional inability is the major cause of depression which may include decreased mobility, inability to carry out prior occupational activities, shifted roles within the family constellation and decreased ability to physically participate in previously enjoyed recreational activities, patient's ability to adjust to the burden of illness is the patency of internal coping mechanisms, dealing with a chronic illness and perceived level of social support. [17]

Many have suggested that standardized rating scale can be used in clinical practice to monitor the course of treatment, however the time demand of clinical practice make it difficult to use such measures. [18] So, we are using self-report depression questionnaire which is cost effective, systematically, reliably and validly evaluating clinical status of the patients of depression. Other brief scales such as Zung Self Rating Depression Scale can also be used for this purpose and future research should determine the appropriate cut off score to identify remission.[8]

Many studies shows that **Depression** slows down the prognosis of rehabilitation. So, psychological councelling is necessary in rehabilitation protocol which is supported by the study of **Wu et al. (1995)** stated that in inpatient rehabilitation programme, depressed patient tend to use program less effectively, make less progress and have an increased length of stay. After discharge depressed patients leave the

house less often, don't become involved in recreational pursuit, & report having less contact socially. So, rehabilitation providers must recognize the symptoms of depression and provide the necessary treatment for these patients as part of overall treatment plan. [19]

Limitations:-

- Small sample size (in order to justify a particular clinical condition, we have taken the patients who have only one existing clinical condition. Which made the sample size less in each group)

- Diabetic patients (major of the common clinical conditions are associated with Diabetic patients, for the same purpose we did not exclude the diabetic patients).

- Age related depression was not evaluated, though there are no clear cut studies available about correlation between age and depression.

- Depression because of any other factor like socioeconomic background (poor social and family back ground, broken family, poor financial background) were not assessed although retrospective analysis for the depression was taken for all the patients.

FURTHER RECOMMENDATION:-

- Large survey can be done.

- Comparative study of depressive symptoms before & after treatment of depressive disorders.

- Study to find out whether treatment of depression can improve the rehabilitation outcome and enhance the prognosis of underlying disease.

- Depression in combination of associated disease such as diabetes and hypertension.

- Correlational study between depression and socioeconomic study (with diseased patients)

- Comparing male and female ratio for depression with disease.

- Survey can be done by other depression rating scale e.g. Zung Self Rating Depression Scale.

Clinical Implication:

Patients with a chronic medical condition who will get treatment for co-existing depression may experience an improvement in their overall medical condition, achieve a better quality of life, and find it easier to follow through with their treatment plan

Conclusion

Depression is hidden disease among common clinical conditions. COPD and Stroke patients shows the higher level of depression compared to other common clinical condition. COPD and Back Pain shows the higher level of severely depressed patients compare to other common clinical conditions.

· **Ethical Clearance**: - Informed written consents were taken from all participants of the study.

· **Source of Funding**: - Self

· **Conflict of Interest**: - Nil

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Original Article

The Effectiveness of Trigger Point Release in Myofascial Pain of Calf Muscle

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Abstract

Introduction: Myofascial pain syndrome is one among common disorder in the world population. In a study on patients with pain complaints, 31% had acute trigger points in all age groups and both sexes.

Objective: To find whether there is any additional benefit when trigger point release technique is given along with phonophoresis than phonophoresis alone in reducing myofascial pain of Calf muscle.

Method: The study is experimental in nature. Thirty samples were selected, using simple random sampling method and were divided into equal groups. Pretest measurement was taken for pain using visual analogue scale. After the pretest experimental group one, received phonophoresis with trigger point release techniques and experimental group two received phonophoresis alone once a day for a period of seven days. Posttest measurements were recorded for both the experimental groups at the end of the seventh days.

Result: The data was subjected to statistical analysis and the following results were obtain. Phonophoresis and Trigger point release technique is significantly effective in reducing myofascial pain of Calf muscle. Phonophoresis is also significantly effective in reducing myofascial pain of Calf muscle. Phonophoresis with Trigger point release technique is significantly more effective in reducing myofascial pain of Calf muscle than phonophoresis alone.

Conclusion: The results of the study makes us to conclude that Phonophoresis with Trigger point release technique is significantly effective in reducing myofascia pain of Calf muscle than phonophoresis alone.

Key words: *Myofascial pain, Trigger point release, Phonophoresis, Ischemic compression,Unilateral stretch.*

Introduction

Myofascial pain syndrome is simply a medical term for muscle pain. The muscles in the body have a lot of different roles, they help the heartbeat, they help you lift, walk and even help you blink. The muscles most commonly involved in myofascial pain syndrome are the skeletal muscles that connect to the bones in your body.

Myofascial trigger points (tiny contraction knots) in overworked or poorly conditioned muscles are the most frequent cause of pain in the ankles, feet, and toes more particularly in calf muscles.

Myofascial pain syndrome is one among common disorder in the world population. In a study on patients with pain complaints, 31% had acute trigger points in all age groups and both sexes.

Janet travel, MD, developed the concept of myofascial pain syndrome in the 1950. She defined it as a regional muscle pain disorder that is characterized by a tender spot in the taut band of muscles that refers pain to areas overlying or distant to the tenderness.

Myofascial pain syndrome is a common source of discomfort and disability. Patients have dull, aching and deep pain, which can be constant or sporadic. The effect of pain causes restriction of range of motion, muscles weakness with sustained shortening of muscle fibers causing difficulties in daily activities.

The common method of treatment are myofascial release techniques, phonophoresis, tens, moist heat application, soft tissue release by manual method, active movement, progressive exercise program, slow passive stretching, relaxation therapy with ergonomics assistance, strain counter strain, acupuncture and superficial or subcutaneous dry needling.

Phonophoresis is movement of drug through skin into the subcutaneous tissue under the influence of ultrasound. High frequency sonic vibration may accelerate this process.

Trigger point therapy is a soft tissue manipulation done to desensitize trigger points, improve circulation and there by aid in pain reduction.

Materials and Methods

Research Design:

The study is experimental in nature. Thirty samples were selected, using simple random sampling method and were divided into equal groups. Pretest measurement was taken for pain using visual analogue scale.

After the pretest experimental group one, received phonophoresis with trigger point release techniques and experimental group 2 received phonophoresis alone once a day for a period of seven days.

Posttest measurements were recorded for both the experimental groups at the end of the seventh days.

1. EXPRIMENTAL GROUP I:

Day 1 ---------- Day 7

Phonophoresis + Trigger point release

Pretest post test

2.EXPRIMENTAL GROUP II:

Day 1 ----------Day 7

Phonophoresis

Pretest posttest

Criteria For Selection:

Inclusion Criteria:

- Patients with myofascial pain for Calf muscle were only included.
- Patients with age 20-40 years were only included.
- Patients belonging to both sexes were included.
- Patients with exquisite spot tenderness of a nodule on a taut band were only included.
- Patients who were psychologically fit were only included.
- Subjects with unilateral involvement were only included.

Exclusion Criteria:

- Patients with dermatitis were excluded.
- Patients with any open wounds and scar over the Calf muscle were excluded.
- Patients with sensory deficits were excluded.

Population:

All the patients who fulfilled the selection criteria were taken as the population of the study.

SAMPLE SIZE AND METHOD OF SELECTION:

Thirty samples were selected from the population using simple random sampling method.

VARIABLES:

1. Independent variables:

Phonophoresis.

Trigger point release.

2. Dependent variable:

Myofascial Pain.

VALIDITY AND RELIABILITY OF THE TOOL USED:

Visual analogue scale is a valid and reliable tool to measure pain.

SETTING:

This studywas conducted in the outpatient clinic,department of physical therapy , College of Applied Medical Sciences, Jazan University, Jazan.

Methodology

Thirty samples were selected using simple random sampling method and were divided into two equal groups.

Both the groups underwent pretest assessment of pain using visual analogue scale, which consisted of a 10cm unmarked horizontal line with two end points, one end marked as 'No pain' and another end as 'maximum pain'.

No pain ---------- Maximum pain

The subjects were requested to place a mark on line which corresponded to the level of pain intensity he/she felt during the application of a mild passive stretch to Calf muscle.

After the pretest analysis of pain the experimental group I were given phonophoresis with trigger point release techniques.

Patients were lying in prone position in a relaxed manner. The area was cleaned and frequency of 1MHZ with hydrocortisone gel 10% was given by direct contact method in a pulsed mode 1:1 with an intensity of 0.25-0.75 w/c for a 8 minutes duration once a day for a period of seven days.

After the phonophoresis the experimental group I were given trigger point release technique once a day for a period of seven days.

Trigger point release technique included

- Ischemic compression
- Unilateral stretching

Ischemic Compression

After locating the trigger point, a Firm digital compression was applied with a single finger pad. The pressure was gentle at the beginning and was gradually progressed deeper into tissues and clocked approximately up to 4 kilograms of force. It was performed very slowly to accommodate the patient's pain threshold level.

The compression was maintained for 5 seconds and released it for 2 -3 seconds. This same cycle was repeated till the patient has reported a reduction in local or referred pain or an increase in pain or until 2 minutes has passed without any change in pain level.

A small amount of talcum powder was applied over the trigger point, before the procedure in order to reduce the noxious Skin friction, after this method subjects were brought to the position of comfort.

Unilateral Stretching:

The patient was positioned in supine lying with the full knee bend and foot was grasped with one hand and other the hand over knee joint was stabilized. Then foot was taken for dorsiflexion and it was maintained strictly and slowly the leg was extended till the full knee extension. Then this stretch was maintained for

20 to 30 seconds and the cycle was repeated three to four times.

Post-test measurement of pain was collected at the end of seventh day in a similar manner as that of pretest measurement.

Exrerimental Group Ii:

Phonophoresis:

After the pretest analysis of pain the experimental group 2 were given phonophoresis in a similar fashion as that of Experimental group I.

The posttest measurement of pain were collected at the end of the seventh day in a similar manner as that of pretest measurement and recorded.

Findings

The collected data were analyzed using paired 't' test and independent 't' test:

Expermental Group 1:

Effectiveness of Phonophoresis and Trigger point release(paired 't' test).

Table 1.1:

Variable	't' Cal value	't' table value
Myofascial pain	26.39	2.26

The 't' calculated value was matched with 't' table value at 5% level of significance and found that 't' calculated value is greater than 't' table value. There is a significant reduction in pain following Phonophoresis and Trigger point release.

Expremental Group 2:

Effectiveness of Phonophoresis(paired 't' test).

TABLE 1.2:

Variable	't' Cal value	't' table value
Myofascial pain	12.69	2.26

The 't' calculated value was matched with 't' table value at 5% level of significance and found that 't' calculated value is greater than 't' table value. There is a significant reduction in pain following Phonophoresis.

INDEPENDENT't' TEST:

TABLE 1.3

Variable	't' – Cal value	't' table value
Pain	3.26	2.101.

The 't' calculated value was matched with 't' table value at 5% level of significance and found that 't' calculated value is greater than 't' table value. Phonophoresis with Trigger point release technique is significantly more effective in reducing myofascial pain of Calf muscle than phonophoresis alone.

Discussion

Phonophoresis with 10% hydrocortisone gel is significantly effective in reducing myofascial pain may be because of the following reasons. The possible mechanisms for the effectiveness of phonophoresis may be because it relies on more rapid particle movement and thus encouraging absorption of drug combined with the therapeutic effects of ultrasound.

The heat produced by ultrasound in large myelinated nerve fibers which may reduce pain through the gating mechanism. It is also stated that during the early inflammatory phase of repair macrophages and mast cells occupy the inflamed site and it has been shown that these cells are responsive to therapeutic ultrasound. Therapeutic ultrasound accelerates the inflammatory phase, resulting in a more rapid entry into the proliferative phase. The drug would have given an additional benefit of pain relief.

Byl. N. N (1995)[1]:Stated that phonophoresis is effective in reducing the tenderness of active myosfascial trigger points.

Ø Trigger point release is significantly effective in reducing myofascial pain of Calf muscle may be because.

Trigger point release technique alters the dynamics of circulatory imbalance affecting trigger points and deactivate them. It also increases the pain threshold level and extensibility of soft tissues. The mechanical is component is not addressed by the phonophoresis which is taken care by trigger point release. So this is an additional benefit.

HOU C. R, Tsai L. C, Cheng F. and Hong C. Z, (2013)[2]:concluded that ischemic compression therapy provides immediate pain relief in myofascial trigger point.

Phonophoresis with trigger point release is significantly more effective in reducing myofascial pain than phonophoresis alone may be because of the following reason. Myofascial Trigger point release with phonophoresis technique alters the sensation of the trigger point and improves the extensibility of soft tissues, and helps in absorption of drug, which was not attained by the group treated by phonophoresis alone.

GERWIN.R.D (2005)[3]found that, trigger point release technique was significantly effective in reducing myofascial pain of Calf muscle than phonophoresis alone.

Conclusion

The results of the study make us to conclude that Phonophoresis with Trigger point release technique is significantly effective in reducing myofascial pain of Calf muscle than phonophoresis alone

Conflict of Interest: None

Source of Funding: Self

Ethical Clearance: Taken from Department Research Committee

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Original Article

Effect of Scapular Stabilization Exercise Program on Neck Disability and Forward Head Posture among Computer Operators

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Abstract

Background: Computer workers are prone to suffer from cumulative disorders due to constant exposure to occupational hazards. Prevalence of neck pain is 60% which are reported to have forward head posture and neck disability among computer operators. The neck pain is most common chief complaint in computers

Subjects and Method: Two eighty six participants was screened and Thirty participants were recruited according to selection criteria and were randomly allocated to scapular stabilization training for group A (n=15) and control group B (n=15).The scapular stabilization group underwent training for 30 minutes, 3 times per week for 4 weeks:, the control group performed cervical isometric exercises for 4 weeks. After training the Scapular stabilization exercise program group showed significant improvement in terms of Numerical Pain Rating Scale , Craniovertebral Angle and Neck Disability Index showed extremely significant ($p < 0.0001$) .On comparison between two groups, it was observed that there was no statistically significant difference between two groups.

Conclusion: Scapular stabilization Exercise program showed improvement in posture through activation of neck muscles, the lower trapezius, and the serratus anterior. Therefore, intervention has positive effect on neck alignment by reducing compensatory movements of muscles involved in forward head posture and Structural changes were observed when compared to Scapular stabilization exercise program found to be more effective.

keywords: *Craniovertebral angle, Forward head posture, Mechanical Neck pain, Neck Disability Index Scapular stabilization Exercise*

Introduction

The glenoid fossa of scapula articulates with humeral head, providing a stable base for normal upper-extremity movement. every 2° of elevation motion contributed by glenohumeral joint, 1° of motion must occur from the scapulothoracic articulation. Weakness of scapular muscles was prime to dysfunction of scapulohumeral rhythm, which may source or lead to shoulder injury. Scapular dysfunction is initiate in many as 68% of rotator cuff problems and 100% of glenohumeral instability diagnoses.[1] Computers has been an become an integral part of offices and work places. However, also there is increasing prevalence of upper quadrant symptoms with computer usage. The risk factors for these WMSD contain physical office environment and psychosocial work related factor.[2] Repetitive movements, forceful exertions also awkward positions are associated with development of Non-specific Pain in computer users. Long time work on computer show static posture of upper body.[3] While using computer, frequency of breaks, method of operating keyboard, position and type of monitors and workstation faults like repetitive movements to reach the mouse and leaning forward for long time lead to occurrence of neck and back pain(fig 1.3).[4]

Neck pain is very common musculoskeletal disorder were pathological basis of neck pain is not clear and complaints are labelled as ‘non-specific’ or ‘mechanical’ neck pain. It has shown that constant neck pain was result in more disability, limitations in performing activities, restrictions in daily living

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and working times(fig 1.4).[5] Continuous neck pain also has potential to change biomechanics of cervical spine in our human body.[6]

Incidence ranging 22% to 30% usually accompanied by substantial effect on our daily life and result in extensive use of healthcare resources. Over the past years, many studies have association between reduction in strength and endurance capacity of muscles in cervical region tends to weaken neck most often these muscle are deep and anterior cervical flexors [7]

The most common consequence of faulty posture in the computer worker is Forward head posture (FHP). It involves flexion of lower cervical spine in combination with extension of the upper cervical spine in body and is often accompanied by protracted shoulders.(fig 1.5) [8]

Forward head is risk factor for impingement syndrome of shoulder and sub acromial region which shows great role in development of pain-related occupational injuries that varies between 8% and 41% depend on exposure of stress.[9]

FHP is head-on-trunk misalignment and described (in sitting or standing) as excessive anterior positioning of head in relation to vertical reference line with increased lower cervical spine lordosis ,rounded shoulders having thoracic kyphosis of spine and posture associated with weakness in deep cervical short flexor muscles and mid-thoracic scapular and shortening of opposite cervical extensors, pectoralis muscles is also known as upper crossed postural syndrome.[10]

Scapula plays important role in facilitating the optimal shoulder function when scapular anatomy and biomechanics interact for produce efficient movement in shoulder. When weakness or dysfunction is present in scapular musculature, normal scapular positioning and mechanics may be transformed.[11] Although scapular stabilization exercises are usually used as part of shoulder rehabilitation programs, scientific rationale for training effect of scapular stabilization exercises is still not cleared. McClure et al[8] reported that 6-week course of traditional exercises had no significant effect on scapular kinematics Similarly, Struyf et al[9] reported that scapular-focused stretching and muscular control training program has no good significance on scapular upward rotation in participants with Scapular instability.(fig 1.6)[12] Training intensities of 60% of maximal voluntary force and higher generally are recommended to obtain improved strength.[13]

Measuring craniovertebral (CV) angle is common objective methods in assessing body head posture.[15] To measure subjects' craniovertebral angle (CVA), the application, ON Protractor was downloaded from Android Play Store to a V30 smartphone (LG Electronics, South Korea). The photography and radiography of the application are proven to be methods with high validity in CVA measurement) (fig1.8) . A marker was attached at the spinous process of seventh cervical spine of each subject and the CVA was measured using the ON protractor application. smartphone was mounted horizontally on tripod at head height to subject. The CVAs of the subjects' NHP was in the 49° to 59° range.[16]

Measure the craniovertebral angle by palpating spinous process of C7 and pointed it to the finger then used the "On protractor" application to measure the angle between the transverse plane of the spinous process of C7 and the tragus of ears around C7. To measure the head position angle, investigator A pointed to the jugular notch with the fingertip and measure the angle between the jaw and the jugular notch around the tragus of ears.[19]

Material and Methodology

Source of Data: Employees working on computer under Pravara institute of medical sciences (deemed to be university), Loni, taluka- Rahata, District-Ahmadnagar. Maharashtra state , India 413736

Study setting: The study was conducted in department of Orthopedic Physiotherapy, Dr. A.P.J Abdul Kalam college of physiotherapy, Loni, taluka-Rahata, District-Ahmadnagar, Maharashtra

Type of Data: Quantitative data

Intervention period: 3 days in a week for 4 weeks.

Participants- Both male and female Employees working on computer under Pravara institute of medical sciences (deemed to be university), Loni.

Method of collection of data: Data was collected by the primary investigator.

Study Design: Randomized control Trial

Study Duration: 2 years

Intervention period- participants received 3 sessions per week for 4 weeks.

Sample size: The sample size was 30 calculated with open EPI software considering the closest article and no dropouts

Sampling Method: Convenient probability sampling.

Equipment

- Trans electrical muscle stimulation
- Plinth for exercise
- Chair

Materials to be used:

Screening form

Consent form

Data collection sheet

Evaluation chart

Neck disability index scale

Neck Disability Index

Pen

Selection Criteria:

Inclusion criteria:

- Participants willing to participate
- Participants working for minimum 3 YRS
- Males and females
- Group age 25 to 55 years
- Pain rating minimum 3 to 6 on NPRS scale
- Craniovertebral angle less than 50 degrees.
- Nonspecific chronic neck pain for less than 3 months

Exclusion criteria:

- Cervical radiculopathy
- TMJ surgery
- Recent injuries and surgeries around neck and shoulder region.
- Infection or inflammatory arthritis
- Pain with any cause in or around shoulder and scapula
- Pregnancy

OUTCOME MEASURES:

1. Neck disability index:

The reliability is 0.93 with ICC values 0.30 and 0.90 respectively.

2. Craniovertebral angle:

The reliability of is >0.972. with ICC values 0.879 and 0.991 respectively.

3. Numerical pain rating scale:

The reliability is >0.95 with ICC values 0.86 to 0.95 respectively.

PROCEDURE:

All the participants were selected as per inclusion and exclusion criteria. The informed written consent was obtained from participants regarding the procedure prior to the study in which they were randomly allotted and screened according to inclusion and exclusion criteria and further divided into Study group and Control group in fig 3.2.

Baseline information of dependent variables was taken at the beginning of study on day one, for Craniovertebral angle (CVA) and Neck disability Index (NDI). Forward head posture was measured using ON protractor application.

Group A(study group) was given Scapular Stabilization program plus conventional training(SSE +CIT) fig 3.1 and group B(Control group) was given only conventional training (CIT) for 4 weeks under supervision in fig 3.8.

Group A (study group)

Two sets of eight repetitions was given for first 2 weeks and then 12 reptations for 2 sets was given each different exercises, with rest period of at least one minute between every new exercise or until participants was considered themselves able to continue.

SHOULDER SHRUGS

Position- sitting on chair or standing.

Action- shrug your shoulders, bringing them up towards your ear relax and repeat

Monitor- Avoid moving your head forward or backward.

PUSH UP PLUS-

Position- start in standing position leaning against wall hands and shoulders width apart keep back hips in line. Elbow straight against wall.

Action- Have the patient stand against wall keep hand on the wall push the trunk away from wall .Then ask the patient to give extra push to protract the scapulae.

Monitor- avoid flexing the thoracic spine or extending the neck during exercise.

UPRIGHT PRESS UPS

Position- sitting on the chair with hands resting on arm of the chair

Action- Sitting position lift of your body by applying pressure on the hands places on arm chair emphasize scapular depression

Monitor- not to shrug the shoulders and place equal amount of pressure on both hands placed on the chair.

SHOULDER BLADE SQUEEZE

Position-Prone position lying on the bed

Action-In prone shoulder at 90 degrees elbow flexed and forearm perpendicular to the floor. relax head and trunk on the bed . squeeze the shoulders at the back.

Hold for 10 seconds and rest for 5 seconds.

Avoid- shrugging of the shoulders should not be done

ELEVATION OF ARM ABOVE HEAD

Position-Prone position lying on the bed

Action-In prone shoulder at 180 degrees elbow flexed and forearm touching both the ears. relax head and trunk on the bed try to lift the hands, head and shoulders together .

Hold for 10 seconds and rest for 5 seconds.

Avoid- lifting trunk and legs in air.

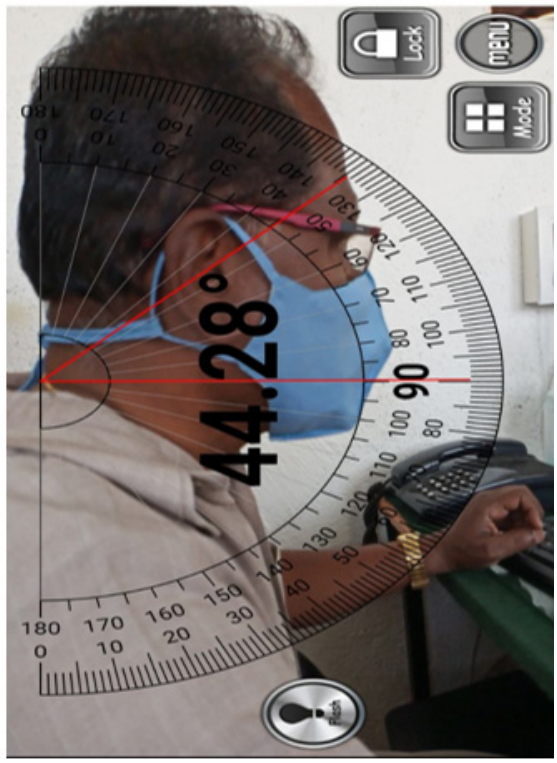

Figure 1: Craniovertebral angle see on "ON PROTRACTOR APPLICATION"

Figure 2: Overhead arm raise scapular exercise

Group B(control group)

Cervical isometrics was performed in the sitting position with the head supported on hands by resisting at the forehead for cervical flexion, extension, rotation and side-bending for 5-10 sec hold for 12 reptations 2 sets with 15-sec breaks between holds. Chin tucks by looking straight ahead and tucking the neck back and hold it for 10 seconds and return to neutral position.

Figure 3: cervical isometrics exercises

1) Conventional TENS administered at frequency of 80 Hz with 10–30 mA intensity for 30 min. Four surface electrodes, 5 × 5 cm each, placed over painful area in the neck region. The intensity of TENS adjusted to produce tingling sensation was approximately 2–3 times with patient's sensory threshold.

Data Analysis and Interpretation

To study effect of scapular stabilization exercise program on neck pain disability and forward head posture among computer operators. Results were analyzed basis of data obtained pre and post intervention with NPRS (Numerical Pain rating Scale), craniovertebral angle on "ON PROTRACTOR APPLICATION" and NDI (Neck disability index). Data was analyzed with Graph Pad Instat Trial Version 13.3 application Descriptive statistics for all outcome measures expressed as means, standard deviations and test significance such as paired t test used to compare data within each group and unpaired t test for comparing the data between groups. Confidence interval was set at 95%.

Total of Two eighty six participants were screened in which thirty met at inclusion criteria. participants were divided into two groups. Group A integrated in experimental group for fifteen participants and Group B integrated in control group for fifteen participants.

DEMOGRAPHIC DATA

Mean age of participants in group A was 37.06±9.63 mean age of participants in group B was 37.93±5.99 years.

The differences in the baseline parameter for pain perceived by the participants in both group A and group B were considered significant(P value is 0.0457, considered significant and t value = 4.514 with 2 degrees of freedom.)

After intervention the mean value of pain among participants in both group A and group B **were 3.5 and 3** respectively. On comparing between the groups, observed there was no statistically significant difference between groups in terms with pain assessed on NPRS (p =0.198, t = 1.316 with df = 28)

The craniovertebral angle was assessed by using ON PROTRACTOR application on mobile phone. In group A pre intervention the mean was 48.4±0.63 and Group B 48.2±1.14 and post intervention mean in group A was 45.93±1.43 and post group B was 46.4±1.05 respectively.

The mean difference in Craniovertebral Angle for participants in group A and was 2 and group B was 2.2 degrees.

On comparison between groups it was observed that the difference between the groups was not significant (p = 0.558, t = 0.591 and df =28. The level of functional disability of participants was assessed by using Neck pain disability Index. In Group A pre intervention mean was 23.06±3.49 and group B was 24.13±3.31 and post intervention mean in group A was 10.73±4.71 and group B was 8.66±4.68. Table 4.1.

Table 1: difference in Neck Pain Disability Index among participants in Group A and group B

NPDI	PRE intervention	POST intervention	t value	p value	Significance
GROUP A	23.06	10.73	30.07	<0.0001	Extremely significant
GROUP B	24.1	8.66	13.16	<0.0001	Extremely significant

The mean difference in Neck Pain Disability Index for participants in group A was is 12.33 and group B is 13.9.

On comparing between groups it was observed that the difference between both the groups was not significant (p = 0.238, t =1.204 with df = 28). Table 4.2

Table 2: Mean difference of Neck Pain Disability Index in between two groups

GROUPS	mean difference in Neck Pain Disability Index	t value	p value	Significance
GROUPS A	12.33	1.204	0.238	Not significant
GROUPS B	13.9			

DISCUSSION

The possible reason for this change can be explained by the fact that Neck pain from poor posture can be explained as in an upright position the head is supported by the spinal vertebrae. Once the head is flexed in forward position, while working on computer, the vertebrae doesn't support the weight of head as much. Muscles, tendons, and ligaments work harder to hold up head.

The intrafusal fiber may be reset with doing exercises, discontinuing cycle of muscle tension and impaired circulation with metabolite accumulation and pain associated with myofascial pain.[35]Neck pain not only interferes with sleep and daytime functional activities but also affects the neurotransmitters[36]

A FHP increases external moment by moving head forward, causing the rear extension muscles to contract persistently. In this study there was significant reduction in CVA in FHP participants with pain compared to people without pain, supporting the findings in the previous study. The reduced cervical ROM of flexion and extension in individuals with FHP experiencing pain is considered to be as a result of limitation of arthrokinematic movements within joint capsule, and increased pressure between the facet joint in addition to physiological change of muscles around the craniocervical area, caused by a decreased CVA.[37]

Weakness of middle trapezius and serratus anterior muscles causes excessive activation of upper trapezius. A reduced craniovertebral angle may change length and tension of levator scapula muscle during scapular upward rotation. Significantly increased levator scapulae activity was reported previously in presence of reduced craniovertebral angle versus a normal head posture[38]

To ensure normal muscle function during scapular motion, main intervention goal is inhibit over-activation of upper trapezius and to enhance weakened lower trapezius, serratus anterior muscles. Scapular stabilization exercises focused on enhancing periscapular muscles, such in serratus anterior, middle, lower trapezius muscles.[39]

In the current study, NDI showed a statistical significant decrease at pre and post intervention in both the groups. The primary outcomes of this study showed that both exercise programs showed a significant increase in CVA, leading to improvement in FHP. This results of the study confirms that SSE is effective in reducing pain and improving functional disability in forward head posture among computer workers. This probably could be the reason for both groups showing equal effectiveness.[40]

In randomized-controlled study by Yildiz et al. effect of cervical and scapular stabilization exercises on nonspecific neck pain were examined and in which patients were randomly allocated to one of two groups as intervention group receiving neck-focused exercise , scapular stabilization training ,control group receiving neck-focused exercise training only. Although a significant improvement was observed in Neck Disability Index scores after six weeks of training in both groups, there was no significant difference in scapula kinematics between the intervention and control groups.[41]

Jordan et al suggested that the gain in strength in these subjects was likely a result of increased confidence. Ylinen et al28 explained that the strength increase in the control group was probably due to biologic variation and learning effect due to repeated testing. Similarly Al-Obaidi et al suggested that an improvement in the cognitive perception of pain, and the fear-avoidance belief about physical activities, might contribute to the improvement of isometric muscle strength in patients with neck pain. [42]

Conclusion

On the basis of the present study, It can be concluded that both Scapular stabilization exercises program and Conventional therapy are effective on pain and functional activity in terms of numerical pain rating scale (NPRS), Forward head posture (CVA) and Neck disability Index (NDI) among computer operators. Scapular stabilization Exercise program

showed improvement in posture through activation of neck muscles, the lower trapezius, and the serratus anterior. Therefore, intervention has positive effect on neck alignment by reducing compensatory movements of muscles involved in forward head posture and Structural changes were observed when compared to Scapular stabilization exercise program found to be more effective.

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Original Article

Effect of Highly Challenging Balance Training on Balance in Subjects with Chronic Parkinson's Disease

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Abstract

Background: Highly challenging balance training has been suggested to induce neuroplasticity in individuals with chronic Parkinson's disease (PD So, the present study aims to find the effect of highly challenging balance training on balance in subjects with chronic Parkinson's disease.

Objective: To determine the effect of highly challenging balance training on balance in subjects with chronic Parkinson's disease.

Method: 30 subjects between the age group of 45-60 years diagnosed with PD were included in the study and conveniently allocated to the single group after fulfilling inclusion and exclusion criteria. Baseline data like age, gender, Hoehn &Yahr stage was noted. Subjects underwent Highly Challenging Balance Training 45minutes per session 4 days/ week for 4 weeks. The pre and post test of balance was done by using Berg balance scales(BBS).

Results: The highly challenging balance training on balance showed significant improvement in balance in post-test and also showed significantly improved balance. ($p<0.05$) in subjects with chronic Parkinson's disease.

Conclusion: The result of the present study shows that highly challenging balance training significantly improved balance and showed promising transfer effects to everyday living. Long-term follow-up assessments can be done to further explore these effects. The results also show that regular training is required for the subjects to maintain progress.

Keywords: *Highly challenging balance Training, Parkinson's disease, Balance, Berg Balance Scale*

Introduction

Parkinson's disease (PD) is degenerative neuropathology characterized by the motor slowdown, rigidity, and tremors, with decreased muscular strength and balance, a negative trend of risk of falls and injuries, fear of falling, a decline in physical activity and decreased quality of life.[1,2]

Movement impairments, especially loss of the ability to maintain standing balance, adversely affect function and quality of life in patients with Parkinson's disease.[3] With the progression of the disease, patients lose postural stability and have gait dysfunction, difficulty managing activities of daily living, and frequent falls.[4] Although some motor dysfunction, such as tremor, may be alleviated with drug therapy, characteristics such as postural instability are less

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responsive to medication and require alternative approaches.[5]

In addition to these abnormalities, gait impairments and walking limitations are common among people with PD. While gait abnormalities are not pronounced in the early stages of PD, their prevalence and severity increase with disease progression.[6] The consequences of gait impairments in PD are significant and include increased disability, increased fall risk, and reduced quality of life.[7]

Exercise is an integral part of the management of Parkinson's disease because physical activity has been shown to retard the deterioration of motor functions and to prolong functional independence..[8] Balance therapies utilizing static and dynamic stance are common and appear to be effective in improving many gaits and balance measures. .[1]

Methodology

Method and Materials

Data was collected from 4 places of Bangalore:Padmashree Physiotherapy Clinic, ESI Hospital,Parkinson's society, Parkinson's and Ageing research foundation. 30 subjects with chronic Parkinson's disease diagnosed by the neurologist were taken for the study and demographic variables such as age, gender, height, weight, BMI were documented. Inclusion Criteria were male and female subjects within age group 45 - 60 years, Subjects diagnosed by the neurologist as chronic Parkinson's disease, in stage 3 or 4 of modified Hoehn and Yahr scales, the ability to ambulate without physical assistance for at least 5 minutes and >3 weeks of stable anti-Parkinson's medication.Subjects with any visual difficulties, neuromuscular and orthopedic disorders, MMSE score less than 24, history of previous surgical management of Parkinson's disease and uncooperative subjects were excluded.

Procedure

Permission for the study was obtained from the respective Institutions and the subjects to carry out the study. 30 Subjects who fulfilled the inclusion and exclusion criteria were selected for the study and informed consent was taken from them. Demographic variables such as age and gender were documented. Once the consent was received, the test procedure was explained to the subjects Prior to the treatment, the balance was assessed using the Berg Balance Scale. Participants received the training(Table 1) for 45 minutes per day ,4 days a week for 4 weeks. The exercise training and pattern of exercises was progressed from simple to complex, according to the challenging level of each exercise using a ten-point Likert (10 being the greatest level of challenge and 1being no challenge) scale. Exercises were tailored to each individual and were progressed to increase the next level when the perceived challenge to balance was <7. After 4 weeks, Post-assessessment was done for Berg Balance Scale. (Table 3)

Intervention

Anticipatory adjustment	Postural adjustments	Sensory orientation	Stability gait	Biomechanical constraints	Stability limits verticality:
Step ups (forward and lateral),	Stance on foam	Squats on foam	Gait at varying speeds with auditory cueing	Calf raises	Functional reach forward
Sit to stand	Perturbations on a stable and unstable surface	Standing on incline	Gait with dual-task conditions	Calf stretch	Functional reach Lateral

Cont... **Table 1: Highly Challenging Balance training.**

Lunges	Ball toes		Gait with head turns, starts, stops and quick turns	Standing hip abduction	Reaching overhead
Single limb stance with reaching.	Standing hip abduction and flexion.		Walking backward	Push-ups or planks	

Fig: Few exercises of highly challenging balance training (Clockwise: Sit to Stand, Stepup, Lunges)

Results

The data was collected for baseline characteristics(Table 2) and values of outcome measures for all the subjects with chronic Parkinson's disease was analyzed through using the statistical software SPSS version 20.0. The level of significance was kept as 0.05 levels.The frequency distribution was used to describe the baseline characteristics such as age and gender of the subjects with chronic Parkinson's disease.The range, mean and SD was used to describe the age and outcome measures of balance (Table 3). The paired t-test was used to test the significant difference between pre and post outcome measurement. The unpaired t-test was used to test the significance of age, BMI, weight, and height of the subjects with chronic Parkinson's disease. The MS Excel and MS Word software were used to generate the tables.

***Cont...*Table-2: Baseline characteristics of participants**

Characteristics of participants	Values
Gender(Male/Female)	26/4
Age(In Years)	55.93±4.59
BMI	26.29±2.45
Hoen and Yahr Scale(Stage 3/Stage 4)	26/4

Table-3: Range, mean and SD of outcome measures of subjects with chronic Parkinson's disease.

S.N	Outcome measures	Pre test		Post test		Paired t-test	p-value
		Range	Mean ±SD	Range	Mean ±SD		
1	BBS	23-36	32.10±2.01	46-51	48.70±1.29	z=4.790*	p<0.001

*denotes –Significant. (p<0.05).

Discussion

In the present study, there was an improvement in balance by highly challenging Balance Training; this may be possible because it contributed to increasing in muscle strength, greater resistance to fatigue or greater tolerance to muscle discomfort during training.[9]

Weakness in muscle group could give the patients the perception that their "muscle give way" while in standing position and lead to a lack of confidence in performing standing or walking activities. Lower extremity muscle strength was independently associated with reduced bone mass in an individual with PD. Muscle weakness may restrict individuals' activities leading to loss of bone mass and an increase in the risk of falls.[9]

Highly challenging balance training derived from a theoretical framework targeting the essential postural control subsystems may also contribute to more robust improvements in balance control and a subsequent reduction in falls. Despite an incomplete understanding of postural control mechanisms underlying postural instability and falling in PD,[10] multiple physiological systems are known to contribute to postural control. Horak and colleagues have identified six different balance control system (biomechanical constraints, stability limits, anticipatory postural adjustments, postural response, sensory orientation and stability in gait) underlying the complex skill of balancing that may be important to systematically target in balance training aimed at improvement of balance in PD.[11]

In the present study, the highly challenging balance training on balance interventions corresponding to the six interacting systems contributing to balance control using a ten-part Likert scales to determine when to progress subjects. At each session, subjects rated the level of difficulty of each exercise based on the level of challenge to balance. The exercises of anticipatory adjustment single limb stance with reaching, postural adjustment of perturbations on unstable surface, sensory orientation of standing on inclined surface, stability gait of gait with dual-task conditions and

biomechanical constraints of push-ups or planks was difficult at the beginning for all the subjects but after the repeated training the subjects were able to perform.

The results of the study according to the Hoehn and Yahr stages of PD stage 3 were able to easily progress the level of difficulty of each exercise based on the level of challenging to balance where they required 3 to 4 session of highly challenging balance training. Most of the subjects who were in stage 4 of PD faced problems in progressing the level of challenging to balance exercise, but slowly after the training, they were able to complete the exercise with balance control.

In the present study it shows that while comparing between male and female according to the age group between 45-60 years, the subjects were able to easily progress the levels of the challenging exercise, while the subjects of age group above 60years found difficult in performing highly challenging balance training. As the results of the present study, the male has significantly improved balance than female.

A study was done by David Sparrow, et.al. stated that highly challenging balance programs appeared to have the most robust outcomes regarding improvements in balance-related activity performance. Prior studies also suggest that balance training that included a strengthening component of balance control (anticipatory postural adjustment, postural responses, sensory orientation and stability in gait) was more effective in improving balance compared to balance training.[12]

The results of the present study are in agreement with the study done by Mark A. Hirsch et.al who mentioned in their study that muscle strength and balance can be improved in persons with Parkinson's diseases by high-intensity resistance training and balance training which showed 3 main effects on balance: (1) training increased the latency to fall (2) training reduced the percentage of trials resulting in falls and (3) participation in the combined group improved the ability to maintain equilibrium, (i.e., sway less) during destabilizing conditions.[9]

Another study was done by Nicola Smania, et al. mentioned in their study that motor strategy, frequently impaired in PD, consists of maintaining balance by activation of the leg, trunk, and neck muscles while the position of the feet (base of support) is constant. Other important balance strategies, also frequently impaired in PD are "protective" responses, which are featured by changes in the base of support (i.e., one or both feet leave their original position in an attempt to maintain balance) their study was a significant reduction in falls during daily life in the experimental group.[13]

Another study done by Asmara Yitayeh and Amare Teshome stated that multifactorial physiotherapy interventions like muscle strengthening, range of movement, balance training, and walking training exercises were found to have a positive effect on treating balance dysfunction and PI among idiopathic patients with PD. Physiotherapy interventions targeted at preventing falls and Exercises of self-destabilization of the Center of body mass during walking and locomotor dexterity have an impact on reinforcing the need to focus attention on maintaining balance when performing mobility tasks in a standing position.[14]

In a study by David Conradsson, et.al mentioned in their study that improved balance and gait performance in the training group, dual tasking exercises were gradually integrated into the program by adding concurrent cognitive (e.g., counting, remembering items) and/or motor tasks (e.g., carrying and/or manipulating objects) to the balance exercises. Moreover, 4 balance components specific to PD impairments were emphasized: (a) sensory integration (walking tasks on varying surfaces with or without visual constraints) (b) anticipatory postural adjustments (voluntary arm/leg/trunk movements, postural transitions, and multidirectional stepping, emphasizing movement velocity and amplitude); (c) motor agility (inter limb coordination under varying gait conditions and quick shifts of movement characteristic during predictable and unpredictable conditions); and (d) stability limits (controlled

leaning tasks performed while standing with varying bases of support, stimulating weight shifts in multiple directions).[15]

Shannon C. Lefaivre et.al conducted a study to know whether sensory attention focused exercise facilitation the utilization of proprioception to improve balance control in PD and they suggested that in order to overcome the inherent dependence on vision, restriction vision during exercise might require the individual to consciously process proprioception information.[16]

Another study conducted by Hasan Daneshmandi et.al, says that Muscular weakness, reduction of ankle irritability and loss of muscle synergy mechanisms all have a role in the falling. Therefore, implementation of the physical readiness program is a proper strategy to avoid falling because it leads to the increase of muscular power, flexibility and motion control.

It is therefore evidenced that Highly Challenging Balance Training has a significant effect on balance in Parkinson's subjects.

Conclusion

Result of the present study showed statistically significant improvement of the effect of highly challenging balance training on balance in subjects with chronic Parkinson's disease from pre to post measurements of berg balance scale scores Thus, the study accepts alternative hypothesis and concludes that "There is a positive effect of highly challenging balance training on balance in subjects with chronic Parkinson's disease".

Ethical Clearance- Taken from Institutional Ethical Committee of Padmashree institute of Physiotherapy

Source of Funding- Self.

Conflict of Interest - Nil

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Case Study

Management of Faecal Incontinence by Pelvic Floor Muscle Exercise and Behavioral Trainning- A Case Study

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Abstract

Background: Fecal incontinence is the inability to control the release of bowel content. Also called bowel incontinence, fecal incontinence ranges from an occasional leakage of stool while passing gas to a complete loss of bowel control. However, successful management of women diagnosed with fecal incontinence dependent on a proper assessment and a tailored made plan. This case study aims to show the effectiveness of physiotherapy treatment in a 45-year-old patient diagnosed with fecal incontinence.

Methods: The patient was taught the kegel exercise and provided with a behavioral training programme. Improvement was noted at the end of the 3 month of physiotherapy treatment plan and the patient no longer had any involuntory leakage episodes.

Conclusions: The case study shows the successful outcome of physiotherapy management in a patient with fecal incontinence.

Key Words*: fecal incontinence, kegal exercises, perineometre , monometry*

Introduction

Fecal incontinence is the inability to control the release of bowel contents. The etiology of can be subdivided into three main group. (1) Functional (2) sphincter weakness (3) sensory loss .[1, 2, 3]

The majority of patients with incontinence are women with an obstetric injury and symptoms can occur even in an elderly population who had experiencened vaginal deliveries earlier in life .[4]

Minor degrees of fecal incontinence are defined as the occasional fecal staining of underwear. Major incontinence is defined as the frequent and inadvertent voiding per anum of formed stool, and represents the most severe form of fecal incontinence. [3]

Several incontinence severity scales have been described in the last 20 years. [5, 6,]

The most popular grading scale is the park's system.[5]

However, this grading scale has the disadvantages f not taking into consideration the frequency of leakage episodes.[7]

Diagnosing the cause and assessing the severity of FI precede any treatment.[8, 9]

The physiology of defecation and continence has been traditionally studied with anorectal manometry.[10]

The prevelence of FI in other countries has been reported. A prevelence of 1 per 1000 was reported in the U.K in 1975.it is more common in women than men at a ratio 8:1 and most of the affected women have had children.[11]

Example of conditions that could be cause abnormal functioning of the anal sphincter and pelvic

floor:

- Constipation
- Prolonged labor
- Trauma over perineum
- Rectal prolapsed
- Sexually abuse
- Brain damage
- Radiation therapy in carcinoma of perineum region

In some cases of carcinoma of rectum begins when healthy cells in the rectum develop changes (mutation) in their DNA. In such cases the best treatment is chemoradiation for 5days/week, up to 5 to 7 weeks side effects of radiations are damage anal tissues, blood vessels (sensory and motor damage) and also chances of vaginal stenosis.[12, 13]

In this study the methods of management of the condition have been used with mixed success. It has focused on the use of pelvic floor contractions.

The present study was designed to report the clinical presentation of fecal incontinence as well as the efficacy of pelvic floor muscles strengthening exercise (KEGEL EXERCISE) and behavioral training on fecal incontinence.

Dr Arnold kegel also invented the perineometre which can be used to measure the improvement in strength and endurance of pelvic floor muscles. It gives an objective evaluation of the result of therapy and gives bio feedback to patients. [14]

History:

The subject for this study was a 45 year old lady who had taken chemotherapy radiation for carcinoma of large intestine , stage 1 for 5 months, in august 2020.then after 6 months gradually she had experience of abnormal leakage of stool occasionally .then the frequency of leakage had been increased day by day .she had concerned to physician at private hospital ,at Ahmedabad.from where she was diagnosed with fecal incontinence and then was referred to physiotherapy treatment at government physiotherapy department at civil hospital ,Ahmadabad.

Height: 152 cm

Weight: 80 kg

Previous medical history: not significant

Previous surgical history: not significant

Family and social history:

Family history not significant

The lady has stop to participate in any social function or even routine outdoor activities because of embarrassment.

Assessment

Instrument:

Evaluation of pelvic floor muscle strength by using PERINEOMETRE (PERITRON). This equipment included rectal electrode, lubricants, and gloves.

We can also grade the fecal incontinence according to PARKS as below.[15]

TABLE 1: GRADINGS OF FAECAL INCONTINENCE ACCORDING TO PARKS

GRADE	DESCRIPTION
Parks 1	Fully continent
Parks 2	Soiling or incontinence to gas
Parks 3	Incontinence to liquid
Parks 4	Insentience to solid stool

Method

The study was conducted in physiotherapy department of government Physiotherapy College, civil hospital, Ahmadabad, Gujrat .Study period was between December 2020 to February 2021 (3 months).

The consent in the written foam was taken from the patient .explained the whole procedure of testing by perineometer equipment as well as kegel exercises which has been done by patient for 3 months.16

The patient was instructed to maintain a diary record of frequency of incontinence per week.

Maximum contraction of pelvic floor muscles (power)in centimeter of water(cm of H2O) and maximum holding capacity of pelvic floor muscles in seconds (endurance) were assessed by perineometer before starting the treatment and after completing treatment.

Patient's position:

Patient was positioned crook lying with pillow support under her head. The patient was adequately draped to permit minimal expose. The main purpose of this test was explained to her very well and she was encouraged to be relaxed while testing

Once she understood the instructions thoroughly, 10 seconds have been given to be relaxed before testing. First of all gloves were put on and the rectal electrode were lubricated. The electrode were gently inserted into the anal canal and then patient was instructed, "on the count of three" to squeeze the pelvic floor muscles as hard as she could and hold the contraction as long as she was able to .this instruction was reinforce by the commands. The same maneuver had repeated for 5 to 7 times. In this study according to PARKS grading patient had grade 4 and according to monometry the patient had weak pelvic floor muscle .[16]

The strength of pelvic floor muscle was graded using monometry values shown below.[17, 18]

TABLE 2: A monometry classification to assess pelvic floor muscle function in women

CLASSIFICATION	MONOMETRY VALUES(cm H2O)
Very Weak	7.5-14.5
Weak	14.6-26.5
Moderate	26.6-41.5
Good	41.6-60.5
Strong	>60.6

Patient was to breathe freely during testing as well as while doing kegel exercises. [1]

Repeat this exercise for 5 to 7 times (photograph 1and 2).

FREQUENCY OF INCONTINENCE: [20]

Fecal incontinence was rates as follows in increasing order of frequency.

Almost everyday

More than (>) once in a week

Less than (<) once in a week

Once in a month

This rating scale has no unit

TREATMENT GOALS

1. To increase pelvic floor muscle strength from weak to strong.

2. To increase anorectal sphincter control with physical stress of coughing.

3. To decrease the frequency and severity of fecal incontinence.

Ø By decreasing the frequency from almost every day to either once in a week or once in a month. The initial interval between meal and defecation reported was 3 minutes (on 15 days of treatment).

Ø By increasing the time lapse between meal and defecation from 3 minutes to 60 minutes

Ø Gradually leaks of few drops or no leakage at all.

4. Timed voiding training (**BEHAVIORAL TRAINING)**

Patient had given planned schedule. The main aim was to keep patient dry by following regular interval to void. Encouraging the patient to control the urge to void by using different techniques below:

Ø Sitting or standing instead of rushing towards toilet

Ø Doing breathing exercise [21]

Ø Doing pelvic floor muscle exercise

Ø By doing interesting task to divert thoughts of voiding

Results

The patient was seen and treated from December 2020 to February 2021 and treatment duration of 3 month. At the first day of examination and treatment, the patient had week pelvic floor muscles (monometry value- 13 cm H_2O). Then kegel exercises were taught to the patient for 2 weeks.

At the end of 2 weeks of treatment, there was no significant difference in the patient's frequency and severity of incontinence .the pelvic floor muscle strength and the patient's attitude to fecal incontinence still remained unchanged. (TABLE 1)

At the end of the one month, an improvement had been seen in pelvic floor muscle strength from weak to moderate (22 cmH_2O) according to monometry values was recorded. (TABLE 2)

The severity of fecal incontinence also reduced according to PARKS grade 4 to grade 3. (Figure 2). The endurance increased from 2 second to 4 second. (TABLE 3).

At the end of two months of treatment, through the pelvic floor muscle strength from moderate to good contraction (41 cmH_2O) was recorded. And the severity also decreased from grade 3 to grade 2 according to PARKS grading.The endurance also has been found that from 4 second to 6 second.

At the end of the 3 months I observed significant increasing in perineometer power of post kegel exercise treatment in comparison to pretreatment as reading in cm of water of perineometer was increased from 13 cmH_2O to 61 cmH_2O .(TABLE 4)

Endurance time was increased from 2 seconds pretreatment to 8 seconds post treatment. It was statistically significant. After 3 month of study, significant improvement has been observed in power and endurance of pelvic floor muscle.

TABLE 1: FREQUANCY OF INCONTINENCE OF THE PATIENT

Duration Of Treatment	Frequency Of In Continence
one month	>once a week
two month	<once a month
three month	once a month

TABLE 2: PATIENTS PELVIC FLOOR MUSCLE STRENGTH ACCORDING TO MONOMETRY AND PARKS GRADING

DURATION OF TREATMENT	MONOMETRY VALUE	PARK GRADINGS
one month	22cmh2o (moderate contraction)	grade 3
two month	41 cmh2o (good contraction)	grade 2
three month	61 cmh2o (strong contraction)	grade 1

TABLE 3: ENDURANCE OF PELVIC FLOOR MUSCLE

Duration Of Treatment	Endurance (Second)
one month	4 second
two month	6 second
three month	8 second

TABLE 4 : PRE AND POST TREATMENT COMPARISION

	PERINEOMETER POWER	ENCURANCE
pre treatment	13 cmh2o	2 second
post treatment	61 cmh2o	8 second

Discussion

The result of this study revealed the effect of pelvic floor muscle strengthening exercise and behavioral training in the management of fecal incontinence .this is consistent with the results of other previous studies.[22, 23] All of reported the efficacy of physiotherapy management in fecal incontinence.

Perineometer equipment was used in this study in place of the very popular vaginal cones, which are commonly strengthening of pelvic floor muscles .the rectal electrode was used because the anorectal sphincter was more affected and there was no vaginal cone of the size and volume which was required for insertion into the anus as at the time of this study.

The rating of the pelvic floor muscle strength by using rectal electrode was repeated thrice and the average of the all three readings was recorded. The increase in the strength of pelvic floor muscles brought about this kegel exercise might be due to an increase in the rate of activation of the number of activates motor motor fibers associated with pelvic floor muscle contraction ; and an increase in endurance and direct feedback that the correct muscles are contrecting.[24]

It could ,however be suggested that if the patient has no difficulty in holding rectal electrode during the exercise , the exercise can further progress to the use of only one finger.[23]

By the use of behavioral training from the first week of the treatment in this study was necessary because the patient was presented with weak pelvic floor muscle .After the one month of treatment, although the strength of pelvic floor muscles increased to moderate strength according to monometry values, the use of behavioral training was continued to normalize the reflex activity of the anorectal sphincter in addition to increasing the strength of the pelvic floor muscles.[24]

The outcome of this study has demonstrated that the effect of physiotherapy management in the form of pelvic floor muscle strengthening exercises (kegel exercise) and behavioral training in the case of fecal incontinence.

Conclusion

Use of perineometre equipment is the best option to treat case of fecal incontinence because it has visual biofeedback as well as it is giving numerical value about strength of rectal sphincter as well as pelvic floor muscles. The case report shows the successful management for 3 months in a patient who was diagnosed with fecal incontinence following kegel exercise and behavioral training. Although the results cannot generalize, this case study highlights the importance of assessment and the effectiveness of physiotherapy management in patient with fecal incontinence.

Ethical Clearance: Written Patient Consent Was Obtained Prior To Publication Of This Study.

Source of Funding: Self

Conflict of Interest: Nil

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Retention Effect of Dual Task Training on Mobility, Fear of Fall and Quality of Life in Subjects with Parkinson's Disease

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Abstract

Background: Impairment in the ability to perform another task while walking i.e. , dual tasking is associated with an increased risk of fall, diminished mobility, loss of independence leading to decrease in the quality of life among patients with Parkinson's disease. So, the present study aims to determine the retention effect of dual task training on mobility, fear of fall, quality of life.

Method: 30 subjects between the age group of 65-75 years diagnosed with PD were included in the study and were allocated to a single group after fulfilling inclusion and exclusion criteria. Baseline data like age, gender, Hoehn&Yahr stage was noted. Subjects underwent dual task training 5 times a week, for 4 weeks. All the subjects were assessed using Timed Up and Go test, Fall Efficacy Scale and Parkinson's Disease Questionnaire-39.

Results: The dual task training on mobility showed significant improvement in mobility, fear of fall and quality of life in post-test 1. Retention effect (post-test 2) also showed significant improvement but compared to post-test 1 ($p<0.001$), it has reduced ($p<0.05$).

Conclusion: The result of present study shows significant retention effect of dual task training on mobility, fear of fall and quality of life. The results also show that regular training is required for the subjects to maintain the progress achieved.

Keywords: *Dual Task Training, Parkinson's Disease, Mobility, Fear Of Fall, Quality Of Life.*

Introduction

Parkinson's disease (PD) is a progressive multi-system neurodegenerative disease affecting people mainly in later years of life. It is the second most common neurodegenerative disease worldwide with incidence and prevalence on the rise along with changing population demographics[1]. The clinical manifestations of this disorder include resting tremor, muscular rigidity, bradykinesia, and postural instability. Other clinical features include secondary motor symptoms (e.g. Dysarthria, dysphagia, micrographia, shuffling gait), non-motor symptoms (e.g. Autonomic dysfunction, cognitive/ neurobehavioral abnormalities sleep disturbances). These motor and non-motor symptoms can impact function to a variable degree[2].

In addition to these abnormalities, gait impairments and walking limitations are common among people with PD. While gait abnormalities are not pronounced in the early stages of PD, their prevalence and severity increases with disease progression. The consequences of gait impairments in PD are significant and include increased disability, increased fall risk, and reduced quality of life[3].

Cognitive impairment, duration and severity of PD symptoms, particularly freezing, involuntary movements, and walking and postural difficulties, were significantly associated with increased risk of

falls[4].

Patients with PD commonly have difficulties in performing movements, particularly when executing two motor tasks simultaneously. This deficiency is correlated with clinical measures of bradykinesia. This problem is not confined to motor tasks; it is also observed in cognitive tasks or combined cognitive and motor tasks, indicating that perhaps the difficulty in performing two tasks simultaneously in PD is not a purely motor problem[5].

During many activities of daily living, people need to perform more than one task at a time. The capacity to do a secondary task is highly advantageous during walking because it allows for communication between people, transportation of objects from one location to another, monitoring of the environment so that threats to balance can be avoided. Dual task performance is also known as "concurrent performance" and involves the execution of a primary task, which is the major focus of attention, and a secondary task performed at the same time. Gait disturbances have previously been shown to increase in people with PD during the performance of a second motor task[6].

T Wu and M Hallet in their study mentioned that difficulty in performing two tasks simultaneously in subjects with PD is probably due to limited attentionalresources, defective central executive function and less automaticity in performing the tasks and that practice can diminish dual task interference and improve performance in patients with PD[5].

Literature review suggests that quality of life improves with dual task training, but there is the lack of evidence showing the long term effects of dual task training and its retention once the training stopped. Hence, the present study aims to determine the retention effect of dual task training on mobility, fear of fall and quality of life in subjects with PD.

Methods

Participants

30 subjects with PD between 60-75 years of age, male and female were recruited for the study from the Padmashree Physiotherapy Clinic and the outpatient department of ESIC Model Hospital, Bangalore during the period of 2017 to 2018. Subjects were included in the study if their disease severity was 2 or 3 on the Hoehn and Yahr scale[7], MMSE Score $\geq$ 23, taking antiparkinson medications and are able to ambulate independently. Exclusion criteria included coexisting serious chronic medical illnesses (eg, orthopedic, psychiatric, or neurological), severe visual deficits, major depression and dementia. Informed written consent was taken from all the subjects prior to the study. Prior to the intervention, mobility, fear of fall and quality of life were assessed by the Timed Up and Go test, Fall Efficacy Scale and Parkinson's Disease Questionnaire-39[8, 9, 10]. The three outcome measures used have been studied for their reliability and validity for their usage in subjects with PD[11, 12, 13,14]. Subjects were given Dual Task Training 5 times a week for a 4 weeks. At the end of 4 weeks, post-test 1 was done and at 8 weeks, post-test 2 was done using same outcome measures. The intervention was performed on subjects during the self-reported optimal 'ON' period, often 1 hour post medication.

Implementation of intervention

In each training session, subjects completed 5 blocks of 5 minutes of walking (i.e., a total of 25 min of walking in each training session). In each 5-minute block, subjects performed different kinds of secondary tasks: serial subtractions, and coin transfer. The order of the tasks in each 5-minute block is shown in Table-1. The therapist had to guard the subject and provide appropriate feedback (knowledge of result and knowledge of performance during the Dual Task training) [15].

Table 1: Training program protocol

Training	Block 1	Block 2	Block 3	Block 4	Block 5
Duration of walk (Total of 25 min each session)	5 min	5 min	5 min	5 min	5 min
Instruction for task prioritization	None	"concentrate mainly on gait task"	"concentrate mainly on cognitive task"	"concentrate mainly on gait task"	"concentrate mainly on transferring the coins"
Kind of feedback & instructions	None	Knowledge of performance "try to walk fast"	Knowledge of result "in block 2, you did X no. of calculations with Y errors. Try to do better than that"	Knowledge of performance "try to walk fast"	Knowledge of result "in block 5 you transferred X no. of coins, with Y errors, try to transfer more with less error than in block 1"
Progression during training	1. Shortening of break times from 4 min (1 min each between blocks) (1st week) to 2 min (2nd week) to 1 min (3rd week), to no breaks (4th week) 2. Adding obstacles. From 2nd week, 3 boxes were placed. Subjects were asked to walk over the obstacles without touching them. Gradually the numbers of obstacles were increased to 4 and finally 5 in the 3rd and 4thweek of training.				

Results

The distribution of the subjects with Parkinson's Disease according to their gender, disease severity and age is mentioned in Table 2. Data of the pretest, post-test-1 and post-test 2 for the TUG score (Table 3), Falls Efficacy Scale (Table 4) and Parkinson Disease Questionnaire – 39 (Table 5) were calculated using ANOVA (Table 3).

Table-2: Distribution of subjects with Parkinson's disease according to gender, disease severity and age

S. No.	Demographic characters	Gender	F & %
1	Gender	Male	12(40.0%)
		Female	18(60.0%)
2	Hoehn and Yahr stage	II	12(40.0%)
		III	18(60.0%)
3	Age in years	Range, Mean ± SD	61-75, 70.00 ± 4.44

Table-3: Range, mean and SD of outcome measures of mobility (TUG in Sec) among the subjects with Parkinson's disease.

S. No.	Mobility (TUG in Sec)	Range	Mean ±SD	Paired t-test		Repeated measure ANOVA
1	Pre test	13.4-43.0	29.89± 9.28	Pre & posttest-1	t=14.756*, p<0.001	Fratio=4.177*, p<0.05
2	Posttest-1	11.3-40.0	25.91±8.67	Posttest-1 & Posttest-2	t=11.35*, p<0.001	
3	Posttest-2	13.5-44.0	27.40±9.24	Pre & posttest-3	t=3.286*, p<0.05	

Note; * denotes –Significant.

Table-4: Range, mean and SD of outcome measures of fear of fall (FES) among the subjects with Parkinson's disease.

S. No.	Fear of fall (Falls Efficacy Scale)	Range	Mean ±SD	Wilcoxon test		Repeated measure NP-ANOVA, Freidman Test
1	Pre test	33.0-59.0	48.70± 7.61	Pre & posttest-1	z=4.710*, p<0.001	F_r=42.00*, p<0.001
2	Posttest-1	25.0-55.0	38.83±7.82	Posttest-1 & Posttest-2	Z=4.507*, p<0.001	
3	Posttest-2	34.0-58.0	47.26±7.05	Pre & posttest-3	z=1.980*, p<0.05	

Note; * denotes –Significant.

Table-5: Range, mean and SD of outcome measures of quality of life (PDQ-39) among the subjects with Parkinson's disease.

S. No.	Quality of life(Parkinson's Disease Questionnaire-39)	Range	Mean ±SD	Wilcoxon test		Repeated measure NP-ANOVA, Freidman Test
1	Pre test	25.0-132.0	63.30± 25.23	Pre & posttest-1	z=4.767*, p<0.001	Fr=43.197*, p<0.001
2	Posttest-1	16.0-93.0	47.20±20.25	Posttest-1 & Posttest-2	Z=4.576*, p<0.001	
3	Posttest-2	17.0-119.0	60.86±23.97	Pre & posttest-3	z=1.954*, p<0.05	

Note; * denotes –Significant.

Discussion

The present study demonstrates the long term effect of dual task training on mobility, fear of fall and quality of life among subjects with PD. This study moves beyond the previous work by implementing cognitive as well as motor secondary task in the training and also checking the retention effect after 1 month of treatment.

Dual tasks were set up with different levels of complexity. After extensive training, most of the healthy subjects could perform all dual tasks correctly. In contrast, subjects with PD could perform only the simpler dual tasks with greater accuracy. Their findings demonstrated that these subjectshave more difficulty than healthy people in performing dual tasks. However, they could still execute some relatively simple dual tasks correctly after extensive training. Difficulty in performing dual tasks lead to decrease in gait variability, increase in fear of fall that decreases the quality of life[5].

Results of this study show that dual task training improved mobility, fear of fall and quality of life in the subjects post-intervention. Findings are consistent with previous research carried out.Dual task training as a whole task was apparently critical for acquiring attentional control and task coordination strategies. Consistent with this, another study reported reduced activation in brain areas that were initially involved with DT processing after whole-task training, interpreted as an "increase in neural efficiency. In addition to the concept of practicing DT as a "whole task," several additional principles of motor learning support the result of the study[16].

Difficulty in dressing and walking, falls, depression and confusion were PD symptoms, which significantly influenced quality of life scores. Among mobility problems associated with PD, start hesitation, shuffling gait, freezing, festination and difficulty in turning had a significant effect on quality of life score. Taken together the correlation, it suggests that dual task training has a positive effect on quality of life in PD[17]. Fritz and colleagues in a systematic review concluded that individuals with parkinson's disease showed significantly increased gait speed, stride length and gait endurance[18].In another study, Yogev-Seligmann, et al checked the retention effect on gait variability and the authors concluded that dual

task gait training enhances divided attention abilities during walking[15].

Dual task training was found to improve mobility, functional performance and cognition and can be readily implemented for training the subjects to reduce falls[19]. Another study found that dual task training showed significant improvements in body sway during single-support balance and center of gravity alignment during double-support dynamic balance[20].

In this study, at 1 month follow-up (post-test 2), the mean values were higher than the baseline values but were lower than the values at post-test 1 that were taken immediately after the intervention. After post-test 1, though the subjects were advised home exercises like stretching, ROM exercises and gait training for 1 month, it is not sure if the subjects have performed these exercises which could have influenced the scores in post-test 2. This shows that regular practice is required to maintain the achieved results for longer duration.

Findings from this study also provide insights into the effects of practice on dual task performance in subjects with parkinson's disease. Itgenerates new knowledge regarding optimal principles of training to enable subjects with parkinson's disease to overcome debilitating dual task interference during rehabilitation. The major limitation of the present study was that there was no control group. This study sets a platform for future research on its effect on detrimental factors for quality of life in subjects with PD. Further, researchers may also consider giving complex and multiple tasks to see their effect on these subjects.

Conclusion

The results of the present study shows significant retention effect of dual task training on mobility, fear of fall and quality of life. This adds weight to the growing body of literature and sets the stage for clinical implementation of a program that may help to reduce the negative impact of the disease on gait, fear of fall and quality of life.

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Original Study

Assessment of Hand Function in Post Stroke Patients Using 'Jebsen Taylor Hand Function Test'

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Abstract

Aim: After stroke, the majority of stroke survivors experience significant arm-hand impairments and a decreased use of the paretic arm and hand in daily life. The actual use of the affected hand in daily life performance depends on the severity of the arm-hand impairment and is associated with perceived limitations in participation. Severity of arm-hand impairment is also associated with a decrease of health-related quality of life, restricted social participation, and subjective well-being.Thus the study aims to assess the hand function using Jebsen Taylor Hand function test among patients post stroke.

Methodology: Hand function was assessed using the Jebsen Taylor Hand Function Test,which included seven tasks to be performed by the subjects.Hand function was assessed in 22 post stroke patients who had experienced the stroke event at least 6 months prior.

Results: Out of the seven activities performed by 22 patients,the time required for all the activities is given as follows (highest to lowest) –Writing, Simulated feeding, Small; common objects, Card turning, Checkers, Light; heavy objects, Large; light objects.

Conclusion: Overall the study showed that the writing activity required the most amount of time for all the subjects. The study also concludes that the time duration required is greater for the non-dominant hand compared to the dominant hand for all the above mentioned activities.

Keywords: *Stroke, Impairments, Hand functions, Hemiparesis, Jebsen Taylor Hand Function Test*

Introduction

Impaired hand function is one of the most frequently persisting consequences of stroke. Paralysis of the hand or upper limb occurs acutely in up to 87% of all stroke survivors. Some recovery of motor control after a stroke is typical, occurring most rapidly during the first 3 months and usually plateauing by 6 months. Yet, 40% to 80% of all stroke survivors have incomplete functional recovery of the upper extremity at 3 to 6 months post-stroke.[1]

Common upper extremity (UE) impairments after stroke include: paresis, loss of fractionated movement, abnormal muscle tone and/or changes in somatosensation. These impairments are a result of direct damage to the primary motor cortex, the primary somatosensory cortex, secondary sensorimotor cortical areas, subcortical structures, and/or the corticospinal tract.[2]

An essential issue in the assessment of the hand post stroke is how the presence of various impairments contributes to loss of hand function. Here, we use the term function to indicate the capacity to perform activities with the hand.[2] Paresis is the most important impairment causing UE functional loss. It is paresis

across the entire limb that leads to decreased UE function, and the severity of paresis at 3 or more weeks post-stroke that is the strongest indicator of present and eventual UE function.[2]

The hand has many functions, primarily sensation and prehension, with secondary functions of expression, gesture, communication, visceral (food to mouth), protection/ defence/ offence, hygiene, balance/ stabilization, contribution to body image, and thermoregulation, all playing an essential role in our everyday lives. Motor and sensory functions of the hand cannot be dissociated, making the hand an exceptional organ, with the ability to both seek and provide information.[3]

The majority of stroke survivors possess significant arm-hand impairments and decreased use of the paretic arm and hand in daily life after a stroke. The actual use of the affected hand in daily life performance is affected by the severity of the arm-hand impairment and is linked to perceived limitations in participation.

Numerous measures are readily available to clinicians for the evaluation of hand function post-stroke. Many of these measures have been thoroughly evaluated for reliability and validity at multiple time points post stroke. The measures can be generally divided into two categories:

1) Performance measures, where the clinician rates or times a series of UE actions that are performed by the patient, or

2) Self-report measures, where the clinician asks a series of questions about UE actions that are answered verbally by the patient or by proxy. The most frequently cited hand performance measures include the Action Research Arm Test (ARAT), Box and Blocks Test (BB), Chedoke Arm and Hand Activity Inventory (CAHAI), Jebsen-Taylor Hand Function Test (JTT), Nine-Hole Peg Test, and the Wolf Motor Function Test (WMFT). The most frequently cited self-report measures include the Stroke Impact Scale (SIS) and the Motor Activity Log (MAL).[2]

The Jebsen-Taylor Hand Function Test was developed to assess the use of the UE in everyday tasks. There are seven tasks that are tested: writing a sentence, card turning, lifting small objects, simulated feeding, stacking checkers, and picking up light and heavy cans. Each task is timed, and better performance is indicated by faster times. Age- and gender-based normative values on each test are available for comparison.[5]

Most recovery of hand function has been reported to occur during the first three months following stroke. Yet there is substantial evidence that recovery continues at a slower rate over a much longer, unspecified period (months or years).[4] Thus the study aims to assess the hand function using Jebsen Taylor Hand function test among patients post stroke.

Materials and Methodlogy

The study was approved by the Institutional Ethics and Research Committee at D.Y. Patil University. A cross-sectional study was conducted on 22 post stroke patients who had experienced the stroke event at least 6 months prior. The participants were screened based on the inclusion and exclusion criteria. Following that consent was obtained from the participants prior to the study and detailed explanation about the study was informed to all the participants. The participants demographic details were obtained and hand functions were assessed using Jebsen Taylor hand function test. The recorded results were analysed.

Data Analysis

The data collected from the participants was analysed. Descriptive statistics was performed for all the activities performed by the subjects separately for dominant and non-dominant arm and the amount of duration of hand function limitations post stroke in patients was analysed.

Results and Discussion

TABLE 1: Time duration of activities performed by the subjects using Jebsen Taylor Hand Function Test

DOMAINS	VARIABLES (time in seconds)	MEAN ± SD
Writing	Dominant Hand	49.38±6.04
	Non-dominant Hand	56.95±7.20
Card Tuning	Dominant Hand	13.00±2.25
	Non-dominant Hand	13.57±2.62
Small, Common Objects	Dominant Hand	13.72±2.72
	Non-dominant Hand	14.18±18
Simulated Feeding	Dominant Hand	13.85±2.62
	Non-dominant Hand	15.48±2.62
Checkers	Dominant Hand	12.94±2.24
	Non-dominant Hand	13.33±2.50
Large, Light Objects	Dominant Hand	11.51±2.79
	Non-dominant Hand	12.04±3.43
Large, Heavy Objects	Dominant Hand	12.2±2.95
	Non-dominant Hand	13.14±3.72

Inference:

Out of 22 subjects, 5 subjects completed the writing activity in 55-60 seconds using their dominant hand whereas8 subjects completed the activity in 55-60 seconds using their Non-dominant hand.For the Card Turning activity,17 subjects completed the activity in 10-15 seconds using their Dominant hand while15 subjects completed the activity in 10-15 seconds using their Non-dominant hand.17 subjects completed the Small,common objects activity in 10-15 secondsusing their Dominant hand while on the contrary14 subjects completed the activity in 10-15 seconds using their Non-dominant hand.In case of the Simulated feeding activity, 15 subjects completed the activity in 10-15 seconds using their dominant hand whereas 10 subjects completed the activity in 10-15 seconds using the Non-dominant hand.Out of 22 subjects,18 subjects completed the Checkers activity in 10-15 seconds using their Dominant handwhile 13 subjects completed the activity in 10-15 seconds using their Non-dominant hand.Amongst the 22 subjects,14

subjects completed the Large;light objects activity in 10-15 seconds using their Dominant hand while 13 subjects completed the activity in 10-15 seconds using their Non-dominant hand.10 out of the total 22 subjects completed the Large; heavy objects activity in 10-15 seconds, using their Dominant hand whereas 11 subjects completed the activity in 10-15 seconds and using their Non-dominant hand

Discussion

In the present study, we have included 25 post stroke participants with the mean age of 57.04±7.2. Jebson Taylor Hand Function Test was administered on all the subjects to assess the broad range of hand functions required for activities of daily living and to establish the amount of duration of hand function limitations post stroke in patients. The Jebson Taylor Hand Function Test is a performance-based quantitative evaluation based on patients' ability to perform seven tests, measured in time. Time is used as a measure of dexterity and efficiency of movement. Performance tests that focus on the *quality* of completing a series of tasks may be better than the *time* it takes to complete the tasks.[6]

Hand function can be evaluated with respect to impairment, which would include abnormalities in measures such as range of motion, grip strength, and other performance tests. Alternatively, hand function can also be represented by patient-rated disability, or limitations in physical activities, such as activities of daily living. The Jebsen Taylor Hand Function Test has been utilized in the literature as a measure of both impairment and disability.[7]

The study shows that there is a significant difference between the time duration of the dominant and non-dominant hand for each specific activity. The findings of the study are similar to the findings of a study done in 2016 by Greta Culicchia et al. As per the study, writing activity was considered to be most time consuming for all patients. Individuals tend to write in capital letters with their non-dominant hand and in cursive mode with the dominant hand, thus obtaining different results at different times. Moreover, the instructions do not require that the pen be held in any given way. [7]

The writing speed may also be influenced by the education level of each subject. In fact, it was observed that individuals with a lower education level had the tendency to look several times at the phrase as they wrote it, increasing the required time in which to accomplish the task.[7]

Among the seven items, only the third task, "picking up small common objects," is not statistically significant for either hand. This might be related to the fact that the grasp's strength is not relevant for those activities that require grasping and handling of small objects, whereas the control of the movements is the major factor involved in the accomplishment of tasks that require precise movements.[7]

A small scale study by Urbin et al (2015) reported similar results in a group of patients in sub-acute phase (6 months post stroke) comparable with the moderately and mildly affected group (6 months-1 year post stroke) as presented in this study. During the test, the intensity of unilateral arm-hand use on the affected side remains low. One year after stroke, patients with a moderately affected arm-hand function achieved and maintained a certain level of intensity of use of the affected hand in unimanual conditions. In contrast, De Niet et al., and Michielsen et al., found that chronic stroke patients (more than 1 year post stroke) hardly use their affected arm-hand unimanually.[8]

As per a study by Franck, Johan Anton et al (2019),in mildly impaired patients in the post-rehabilitation period, the non-affected hand is used about one and a half time more than the affected hand. In this same period, patients with a moderately affected hand used their non-affected hand about two and a half times more than their affected hand. In contrast, post stroke patients of duration greater than 1 year display a more equal Intensity-of-use between both hands.[9]

Progressions after a significant amount of time, post the stroke event can be explained by: 1) an increase of voluntary movements in flexion synergy in the proximal and/or distal part of the arm; 2) associated movements while moving or performing activities with the non-affected hand; and 3) performing bimanual exercises as learned to maintain the severely affected arm-hand pain free.[9]

Conclusion

As per the present study, functional activities required for daily living such as Writing a sentence, Card Turning, lifting small objects, Simulated feeding, stacking checkers and picking up light and heavy cans were assessed and it was observed that the writing activity required the most amount of time for all the subjects. The other activities performed needed almost similar amount of time, therefore no specific order can be followed to comment on the time duration of the activity. The study even concludes that the time duration required is greater for the non-dominant hand compared to the dominant hand for all the above mentioned activities.

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Association between Balance Confidence and Cognitive-Motor Interference in Stroke Patients – Pilot Study

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Abstract

Background: Functional community ambulation demands the ability to accomplish both mobility and cognitive tasks at the same time (dual-tasking). When gait and cognitive deficits are done concurrently, this is referred to as cognitive-motor interference. Some hypothesis says that Individuals with low balance confidence would have higher cognitive-motor interference, indicating a behavioral change during dual-task settings. The purpose of this study is to see if cognitive-motor interference is linked to stroke patients' confidence in their balance.

Methodology: The participants in this pilot trial were sub-acute and chronic community-dwelling stroke survivors. The MFES questionnaire assessed balance confidence. Participants completed four 10-meter walking trails to evaluate Cognitive-Motor Interference. Two of the walking trails were performed without any additional tasks, while the other two were completed with a concurrent cognitive challenge.

Conclusion: A total of 30 people participated in this study, with a mean age of 64±7.7 years. Pearson correlation discovered a statistically significant ($p=<0.05$) negative correlation ($r=-0.202$) between balance confidence and CMI. This study found that balance confidence is not associated with cognitive motor interference in stroke patients.

Key Words: *Cognitive Motor Interference, Balance confidence, Stroke.*

Introduction

Stroke is one of India's third-leading causes of death and disability. Stroke prevalence rates are expected to be 84-262/100,000 in rural areas and 334-424/100,000 in urban regions. The incidence rate is 119-145/100,000 based on recent studies[1]. However, almost one in four men and nearly one in five women aged 45 years can expect to possess a stroke if they live to their 85th year. Although the lifetime risk of having an acute stroke is higher in men than women, the converse is true for the lifetime risk of dying of a stroke[2, 3]. The neurologic deficit reflects both the location and the size of the infarct or hemorrhage. Hemiplegia stands as the most typical sign of stroke, whether in the cerebral hemisphere or brainstem, but there are many other manifestations, occurring in recognizable combinations[4].

Following a stroke, mobility impairments such as decreased gait speed, decreased walking capacity, balance impairment, altered balance self-efficacy, and fear of falling are common (falls self-efficacy). Such post-stroke mobility impairments are linked to decreased activity and participation[5, 6] Imbalance and weakened muscle strength result in a considerably slow gait speed and short gait time, which causes these patients difficulty in leading an ordinary life[7].

Of community-dwelling individuals recovering from a stroke, up to three quarters may fall within 6 months after discharge from hospital[8]. Balance confidence in his or her ability to maintain balance

and remain steady has been related to falls risk in community-dwelling individuals with stroke. In community-dwelling older adults, participants with greater balance confidence exhibited less center of pressure (COP) excursion during quiet standing and faster walking scores than participants with lower balance confidence[9]. In individuals with sub-acute stroke, low balance confidence was associated with impaired control of quiet standing balance and cautious behavior during gait[10].

Functional ambulation requires the ability to maintain walking performance while engaging in other tasks that demand attention resources. The ability to perform a cognitive task while walking (i.e. dual-tasking) has gained increasing attention in stroke rehabilitation. When a mobility task is performed simultaneously with a cognitive task, there may be deterioration in the performance of one or both tasks compared with the performance of each task alone. This phenomenon is called cognitive-motor interference (CMI) [11].

Stroke recovery is associated with improvements in gait, and patients with stroke often identify a primary rehabilitation goal to be gait improvement[12]. It is not surprising then that one of the most frequently addressed training activities in rehabilitation interventions for stroke is gait training[13]. This typically involves training sessions where a therapist guides a patient to use and enhance the skills needed for ambulation over different walking surfaces[14]. People with stroke are more likely to show significant decrements in motor performance exclusively (cognitive-related motor interference) or decrements in both motor and cognitive performance during gait exercises with an added cognitive task[11]. Dual-task performance in the cognitive-motor domain is extremely important in everyday life. As a result, reduced ability for dual-task performance may obstruct functional mobility and community participation significantly[15]. Any given task is expected to use a portion of the restricted processing capability; thus, the more demanding the activity, the higher the proportion of resources required. If the processing demands of the combined tasks exceed the total capacity, task performance is compromised[16].

Mutual interference in gait-related dual-task conditions may persist in many people with stroke at discharge[17]. Therefore, recovery of balance and gait ability should be prioritized and the primary goal should be the patients' participation in exercise programs. To identify the mobility impairment associated with activity and participation to help rehabilitation therapists better identify appropriate goals and treatment approaches for patients with chronic stroke. An individual with low balance confidence will judge dual-tasking as a greater challenge than single-task conditions and consequently decrease performance to focus on walking as a safety mechanism[18, 19]. In this case, lower balance confidence manipulates their performance on the cognitive portion of the dual tasks as a compensatory strategy. Understanding how the addition of a cognitive task during walking interferes with the mobility performance in people with stroke thus has high relevance for rehabilitation. Hence this study aimed to find out any association that exists between an individual's balance confidence and CMI in stroke survivors.

Methodology

A cross-sectional study was conducted in a tertiary hospital, Southern Karnataka, India. Thirty patients with stroke history fulfilling inclusion and exclusion criteria were recruited using the purposive sampling technique. The inclusion criteria were: unilaterally affected sub-acute and chronic community-dwelling stroke patients, both gender, able to walk with or without assistive devices, and able to follow the instructions. The exclusion criteria were: bilaterally involved, any musculoskeletal conditions related to gait, any neurological conditions related to vestibular deficits, peripheral neuropathy, aphasia. The subjects participating in this study were given a patient information sheet containing the study details and also the informed consent was obtained from the subject prior to the study.

Age, gender, type of stroke, and duration of stroke were documented. Subjectively perceived balance confidence was assessed by using the Modified Fall Efficacy Scale (MFES). CMI assessed by using multiple walking trails with and without cognitive tasks. A one-page form with 14 questions, each pertaining to a specific activity. This scale incorporates a wider range of outdoor activities than the original Fall Efficacy Scale (established by Tinetti et al, 1990). The first 10 items are as described from 0 (not at all confident the task can be performed without overbalancing) to 10 (completely confident). An additional 4 items have been added which question the individual's confidence in performing outdoor activities such as hanging out the washing/gardening using stairs at home, crossing roads, and using public transport[20].

Participants completed four walking trials over a 10-meter distance. Two of the walking trails were completed with no additional task and two were completed with a concurrent cognitive challenge. Participants were asked to list alternate letters of the alphabet as an added cognitive challenge. Participants were not instructed which task should take precedence. Time taken to finish the given distance was noted in seconds for all four trails[21].

Statistical Analysis

Data were analyzed using SPSS v.20.20. Descriptive features of samples were expressed in mean, frequency, and standard deviation. A dependent sample t-test was utilized to analyze differences in performance between the two walking trails with and without a cognitive task. Karl's Pearson's correlation coefficient was used to find the association between balance confidence and CMI in stroke survivors. $p<0.05$ was considered as significant.

Result

This study included 17 males and 13 females, with an average age of 64±7.7, from a group of 30 community-dwelling stroke survivors. (Table 1)

Table 1: shows descriptive statistics of age

	N	Minimum	Maximum	Mean	Std. Deviation
AGE	30	51.00	83.00	64.0000	7.77707

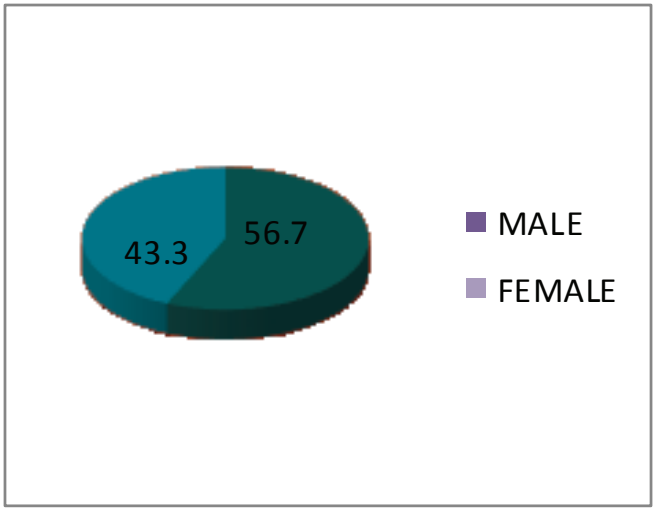

Fig 1: Pie chart representing the gender wise distribution

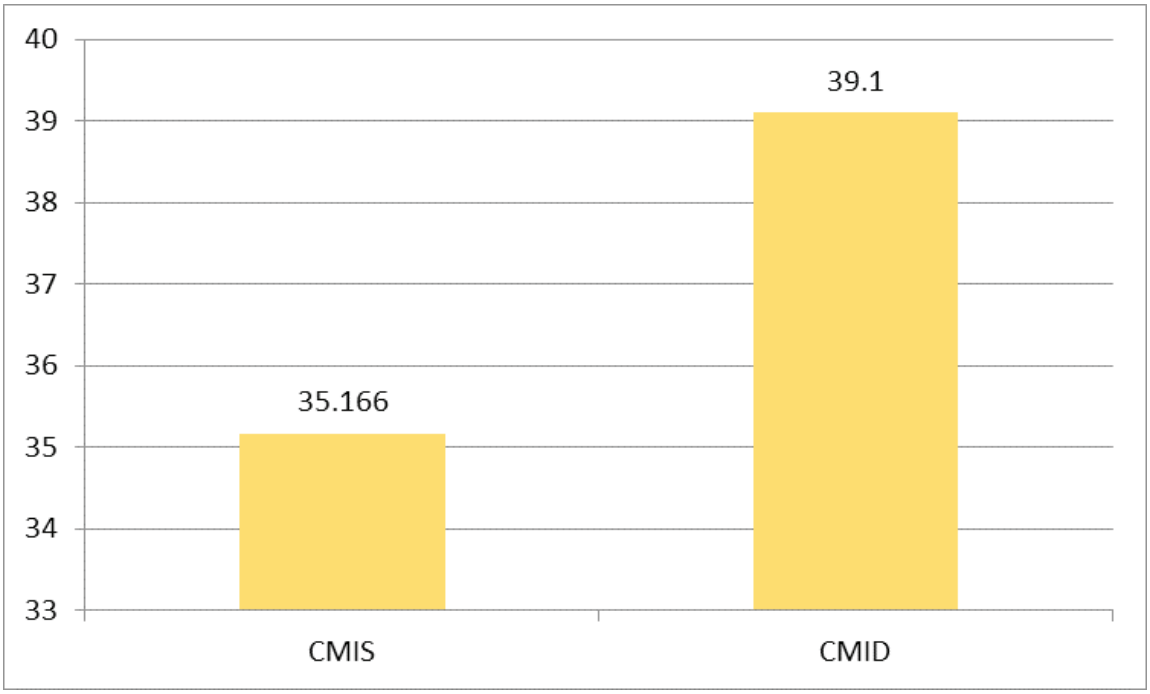

Fig 2: Dependent t test between walking trails with and without Cognitive task

The dependent t-test was used to calculate the difference in CMI performance time (Fig 2). When comparing CMI performance, the gait trail with cognitive task took longer (mean= 39.1±7.33) and had a lower walking velocity than the gait trail without cognitive activity (mean = 35.1±7.27).

Table 2: CMI and Balance Confidence Correlation

		MFES	CMIDD
MFES	Pearson Correlation	1	-.202
	Sig. (2-tailed)		.283
	N	30	30
CMIDD	Pearson Correlation	-.202	1
	Sig. (2-tailed)	.283	
	N	30	30

With an r = -.202 (p= <0.05) value, Karl's Pearson correlation demonstrates a weak negative correlation between balance confidence and CMI, which is statistically significant.

Discussion

The purpose of this study was to see if there was any association between balance confidence and CMI in stroke survivors. In this study, purposive sampling was used. A total of 30 stroke survivors took part in the study. To assess balance confidence and cognitive motor interference, a modified Fall Efficacy scale and multiple walking trails with and without a cognitive task were used. This study proved that there is a negative significant difference in cognitive motor interference with balance confidence in stroke survivors, proving the null hypothesis.

The current study includes 17 men and 13 women who have had a unilaterally involved ischemic or hemorrhagic stroke. The study findings revealed that people with higher balance confidence scores took longer to complete the 10-meter distance with lower walking velocity in the gait trail with the cognitive task. This study concluded that cognitive motor interference is not related to self-administered balance confidence of stroke patients. Arlene et al. (2012), studied chronic stroke patients to determine the relationship between balance self-efficacy and multiple mobility characteristics. She concluded in this study that balances self-efficacy was independently linked with exercise and participation[19]. The most frequently reported gait outcome measure was speed. Slowing down under dual-task settings shows that gait speed control includes higher-order cognitive mechanisms. Recent brain imaging studies have demonstrated not only that gait speed is dependent on prefrontal cortex activation (PFC), but also that the PFC is involved in the preparation of walking tasks[24]. Gait speed has been linked to executive function and memory performance, according to Holtzer et al. (2006), which is likewise dependent on PFC activation[25].

The cognitive tasks domain indicated a loss in gait speed under all dual-task situations compared to single-task in the current study. That is, stride time increased significantly under dual-task settings compared to single-task conditions in the cognitive tasks domain. Some other research confirms that dual-task-related variations in gait speed are sensitive and can identify healthy participants from those with neurological problems, even among those with moderate deficits such as a concussion or minor cognitive impairment[26]. This heterogeneity can be attributed to changes in the postural control parameters being measured, the demands of the specific tasks, and individual factors such as time post-stroke and the severity of motor or balance impairment. Slowing down is considered an adaptive safety measure, therefore the regular pattern of cognitive-related motor interference while walking may imply that patients with stroke preferentially prioritize cognitive task attention over gait performance.

The brain's limited processing capacity can cause a decrease in any of the performances under dual-task settings[22]. Each task demands a percentage of the limited processing capability; hence the more demanding the task, the bigger the proportion required[23].The success of stroke rehabilitation is determined by how quickly stroke survivors can return to their daily activities. This study's findings show how balance and cognitive-motor activities interact in stroke patients. The level of distraction and task prioritizing will differ depending on the type of mobility cognitive task performed.

To enhance balance function in stroke patients, a range of exercise programs (e.g., strength and balance exercises) were applied. However, even if they have balance, most people were more likely to take longer when executing cognitive motor tasks in most daily activities. As a result, rehabilitation should focus more on lowering the effort of cognitive-motor interference or optimizing task priority by evaluating various task combinations in their rehabilitation. To increase their CMI, therapists should integrate several cognitive tasks in addition to typical gait training.

A limitation of this study was the inclusion of stroke survivors with both ischemic and hemorrhagic kinds may have harmed the sample's consistency. We only evaluated the time taken to complete the planned distance when analyzing the CMI; it might be more accurate or reliable if we considered the correctness

of the response of letters and gait metrics.

Conclusion

According to the findings of this study, balancing confidence has a significant negative correlation with cognitive motor interference in stroke patients. This denotes Dual-tasking will be perceived as a larger challenge than single-tasking by an individual with low balance and higher balance confidence, and as a result, performance will be reduced to focus on walking as a safety mechanism.

Conflict of Interest: None declared

Source of Funding: Self

Ethical Clearance: The study was approved by Institutional Ethics Committee

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Original Article

To Study the Relationship Satisfaction and Degree of Loneliness in Romantic Relationships

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Abstract

Background: Romantic relationship satisfaction is defined as an interpersonal evaluation of the positivity of feelings for one's partner and attraction to the relationship. Relationship satisfaction is positively related to life satisfaction and subjective well-being. The satisfaction and dissatisfaction in romantic relationship may contribute to different features such as loneliness, communication and closeness in a relationship. So it is necessary for us to understand the prevalence of loneliness and communication in ones relationship and their level of satisfaction. The aim of the study is to assess the level of satisfaction and dissatisfaction in romantic relationship and to find the degree of perceived loneliness in romantic relationship.

Methods: A total of 50 participants participated in the study, out of which 40% were male and 10% were female. Relationship Assessment Scale, Relationship Satisfaction Scale, UCLA Loneliness Scale were used to assess the Relationship status, Relationship satisfaction and degree of Loneliness respectively. Findings of our study suggested that most of the participants had poor relationship status (80%); they were extremely dissatisfied with their relationship (94%) and reported high degree of loneliness (68%).

Conclusion: The study concluded that the poor is romantic relationship status the lonelier one will feel. Some of the common dissatisfying features in romantic relationships are worry about the relationship, worry about the future, a lack of time, conflict and stress, expectations and love from partner in the relationship doesn't meet and these factors leads to feeling of loneliness. As an Occupational Therapist we can intervene and plan out the strategies to decrease the level of loneliness and dissatisfaction in order to improve the relationship.

Keywords*: Relationship satisfaction, Romantic relationship, Loneliness in Relationship, Occupational Therapy.*

Introduction

Human beings are inherently social and they need to belong, feel connected with others, establish and maintain social relationships. Almost 80% of our waking hours are spent with others such as partner, friends, relatives and coworkers. After leaving the family home, young adults have to rely more on friends for support and companionship. Friends occasionally function a number one attachment figure, in particular amongst the ones now no longer worried in long-term, romantic relationships. However, romantic relationships have also been found to provide a source of support and companionship[1].

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Romantic relationship satisfaction is defined as an interpersonal evaluation of the positivity of feelings for one's partner and attraction to the relationship[2]. Friendship quality is generally referred to as the nature of friendship interactions that affect individuals' development and adjustment. Friendship quality is more important than the number or identity of friends and is characterized by loyalty, help, acceptance, safety and few conflicts. Relationship satisfaction in romantic relationships is positively related to happiness, life satisfaction and subjective wellbeing[3]. High-quality friendships are also positively related to the ability to cope with stressors. Furthermore, several studies have shown that satisfaction in romantic relationships is negatively associated with perceived loneliness. Other studies have found a strong association between dissatisfaction in friendship relationships and a high degree of loneliness. Furthermore, romantic relational quality has been found to buffer against loneliness [4].

Features which have been found to increase romantic relationship satisfaction are for example partner support, trust and intimacy. Furthermore, people tend to experience greater relationship quality when they perceive that their partner understands them. Conflict, on the other hand, has been associated with decreased relationship satisfaction, often predicting declines in satisfaction over time. However, people who feel understood by their partners tend to be buffered against the negative effects of conflict on their general relationship satisfaction. Moreover, friends are more likely to respond to dissatisfying situations by doing nothing (for example waiting and hoping, ignoring the problem), whereas romantic partners are more likely to try to do something. This finding is consistent with research indicating that friends are more likely to deal with conflict in an indirect manner, whereas individuals in romantic relationships are more likely to deal with conflict in a direct manner. Furthermore, studies show that the frequency of disagreements in the relationship, help, security and closeness are aspects relating to the strength of the emotional connection and attachment, along with the sense of affection or "specialness" a person experiences with a friend or partner. However, passion and sexuality, which are fundamental aspects of romantic quality, have not been taken into account in this measurement[5].

Communication has been observed to be critical in growing more dating quality. Communication is a very important component in maintaining a relationship and is used to reinforce relationship bonds. Communication includes the exchange of explicit, verbal, information as well as the communication and detection of nonverbal messages that often do not permeate conscious awareness. As an vital a part of retaining relationships, conversation has additionally been located to steer standard courting satisfaction. Overall relationship satisfaction is lowered when a particular aspect of the relationship, such as communication, does not meet personal expectations. Furthermore, research on couples suggests that explicit and implicit emotional exchanges are powerful indicators and predictors of partner quality. When relationship partners engage in interaction, they are communicating with one another using a multitude of channels: some conscious and explicit, others unconscious and implicit. These implicit messages may have a stronger impact on the quality of the interaction than the explicit information conveyed[6].

Being generally dissatisfied with one's romantic relationship appears to be associated with higher levels of topic avoidance tendencies. Partners' overall dissatisfaction with their relationship may create emotional distancing, which is reflected in avoidant tendencies. Ignoring your partner and quietly allowing the relationship to decay has been found to promote lower levels of satisfaction. Moreover, not spending enough time together and drifting apart scenarios have been found to be more dissatisfying for individuals in romantic relationships than individuals in friendship relationships. This finding suggests that individuals in romantic relationships find it particularly dissatisfying to feel that they are losing contact or closeness with their partner. Perhaps, the thought of slowly breaking up is more dissatisfying for individuals in romantic relationships than in friendship relationships because

they are more worried they might lose the relationship. Thus, it might be a greater worry in response to dissatisfaction in romantic relationships because they are more valued, and not as easily replaced, as friendship relationships[7].

As mentioned earlier, several studies have shown that satisfaction in romantic as well as friendship relationships is negatively associated with perceived loneliness. Perceived loneliness is defined as a distressing feeling arising from the perception that one's social needs are not being met by the quantity or especially the quality of one's social relationships. Thus, loneliness is not synonymous with objective social isolation, but perceived social isolation. It's possible to have a small social network and not feel lonely and, conversely, have a big social network and feel lonely nevertheless. Several different terms, such as emotional or subjective loneliness, have been used by different researchers to describe this phenomenon[8]. However, the term perceived loneliness has been selected in this thesis because it is the term used in the University of California, Los Angeles (UCLA), Loneliness scale, which this study relies on. Studies show that satisfaction with personal relationships is moderately negatively correlated (r = -0.61) with loneliness. Thus, the less satisfied one is with their personal relationships, the more lonely one will feel. Dissatisfaction in friendship relationships is strongly related to a high degree of loneliness in all age groups.

Relationship satisfaction is positively related to life satisfaction and subjective well-being. The main aim of this thesis was to investigate what features that may explain satisfaction and dissatisfaction in friendship versus romantic relationships, and to compare the results. This study also aimed to examine the association between perceived loneliness and the degree of satisfaction in friendship versus romantic relationships. Through thematic analysis it was found that balance, communication, closeness, support, trust, understanding, safety and conflict management were satisfying features in both types of relationships. Lacks of these features were found to be dissatisfying. Other dissatisfying features in romantic relationships were worry, lack of time and stress and in friendship relationships feelings of alienation and superficial relationships were dissatisfying features. Statistical analyses confirmed a bad affiliation among friendship pride and perceived loneliness. A tendency to a similar association with romantic relationship satisfaction emerged. Yet, there had been additionally warning signs of the opposite in regard to romantic dating satisfaction[9].

Rationale of the Study

Relationship satisfaction is positively related to life satisfaction and subjective well-being. The satisfaction and dissatisfaction in romantic relationship may contribute to different features such as loneliness, communication and closeness in a relationship. So it is necessary for us to understand the prevalence of loneliness and communication in ones relationship and their level of satisfaction.

As an Occupational Therapist we can intervene and plan out the strategies to decrease the level of loneliness and dissatisfaction in order to improve the relationship.

Aims and Objectives

- The aim was to assess the level of satisfaction and dissatisfaction in romantic relationship.
- The objective was to find the degree of perceived loneliness in romantic relationship.

Methodology

- **STUDY DESIGN –** Survey
- **SAMPLE SIZE –** 50 subjects
- **SOURCE OF STUDY –**Community
- **POPULATION –** Indian Population
- **SAMPLING METHOD –**Convenience
- **INCLUSION CRITERIA –**Any person within the age group 21-33 years who are in a romantic relationship.

· EXCLUSION CRITERIA –

1. Adolescent diagnosed with any psychiatric condition.

2. Adolescent having a medical condition of long-term nature (epilepsy, and others)

· WITHDRAWAL CRITERIA –

1. Adolescent not willing to participate.

2. Adolescent who does not complete the protocol due to any reason.

OUTCOME MEASURES

· RELATIONSHIP ASSESSMENT SCALE

The RAS is a short 7-item self-report inventory designed to measure relationship satisfaction. Items are scored on a 5-point Likert scale, ranging from 1 (low satisfaction) to 5 (high satisfaction). Total rating can variety from three to 21, with excessive rankings that means higher courting satisfaction[10].

Following scoring ranges was used to rate the Romantic relationship status on Relationship Assessment Scale.

0-10: Good Relationship status

11-20: Fair Relationship status

20-27: Poor Relationship status

· BURNS RELATIONSHIP SATISFACTION SCALE(BRSS)

The BRSS is a seven-item self-report inventory that assesses satisfaction in various areas of the relationship, characterizes the degree of relationship satisfaction, including communication and openness, conflict resolution, degree of caring and affection, intimacy and closeness, satisfaction with roles in relationship, and overall relationship satisfaction[11]. Respondents indicate their degree of satisfaction in each of these areas on a scale from 0 (very dissatisfied) to 6 (very satisfied). Total scores are the sum of items and range from 0–42, with higher scores reflecting greater satisfaction. Internal consistency for the scale is high (coefficient alpha = .94)

· UCLA LONELINESS SCALE

A 20-item scale designed to measure one's subjective feelings of loneliness as well as feelings of social isolation. Participants charge every object as O ("I frequently sense this way"), S ("I every now and then sense this way"), R ("I hardly ever sense this way"), and N ("I by no means sense this way").Within the study we have considered following scoring range, depending on the ratings regarding the feeling of Loneliness by UCLA Loneliness scale[12].

0-20: Not lonely

21-40: Moderately lonely

41-60: Highly lonely

Data Analysis

1. Complete data was gathered in the form of a master chart made on Microsoft Excel 2010.

2. The statistical analysis was conducted using Statistical Package for the Social Sciences 21 (SPSS v.21). Statistical significance at p </= 0.05 was assumed.

3. Analysis of variance (ANOVA) and a comparison of mean values were used in order to investigate possible association between romantic relationship status and relationship satisfaction as well as correlations between feeling of loneliness and relationship satisfaction.

4. Descriptive analysis included percentages, means and SD.

Table 1: Participant Characteristics

(N=50)

Demographics	Frequency	Percentage
Age (M = 25.84 years, SD = 3.13 years)		
21-23 years old 24-26 years old 27-29 years old 30-33 years old	13 18 12 7	26% 36% 24% 14%
Gender		
Male Female	40 10	80% 20%
Religion		
Muslim Hindu Christian Sikh	23 19 2 6	46% 38% 4% 12%
Partners Belongs to same religion Partners Belongs to different religion	19 31	38% 62%
Cast		
Partners Belongs to same cast Partners Belongs to different cast	8 42	16% 84%

A total of 50 subjects participated in the study. The mean age of participants was 25.84 years (SD = 3.13 years). Out of 50 participants 80% (N=40) were Male and 20% (N=10) were Female.

1. Relationship status, Degree of Satisfaction and Degree of Loneliness among participants

Table 2: Degree of Interpersonal Relationship Status among respondents

Interpersonal Relationship status	Number of Respondents	Percentage
Good	6	12%
Fair	4	8%
Poor	40	80%

Depending on their ratings regarding the Romantic relationship status on Relationship Assessment scale 80% participants found to have poor relationship status. (Table-2)

Table 3: Degree of relationship satisfaction among respondents

Degree of satisfaction	Number of Respondents	Percentage
Extremely Dissatisfied	47	94%
Very Dissatisfied	2	4%
Moderately Dissatisfied	1	2%

Depending on the ratings regarding their level of relationship satisfaction, measured by the Relationship Satisfaction Scale, the majority of the respondents (94 %) were classified as extremely dissatisfied in their relationships. (Table-3)

Table 4: Degree of Loneliness among respondents

Degree of Loneliness	Number of Respondents	Percentage
Not lonely	7	14%
Moderately lonely	9	18%
Highly lonely	34	68%

Furthermore, Depending on their ratings on the UCLA Loneliness scale, the majority of the participants were classified as highly lonely (68 %) as can be seen in Table 4.

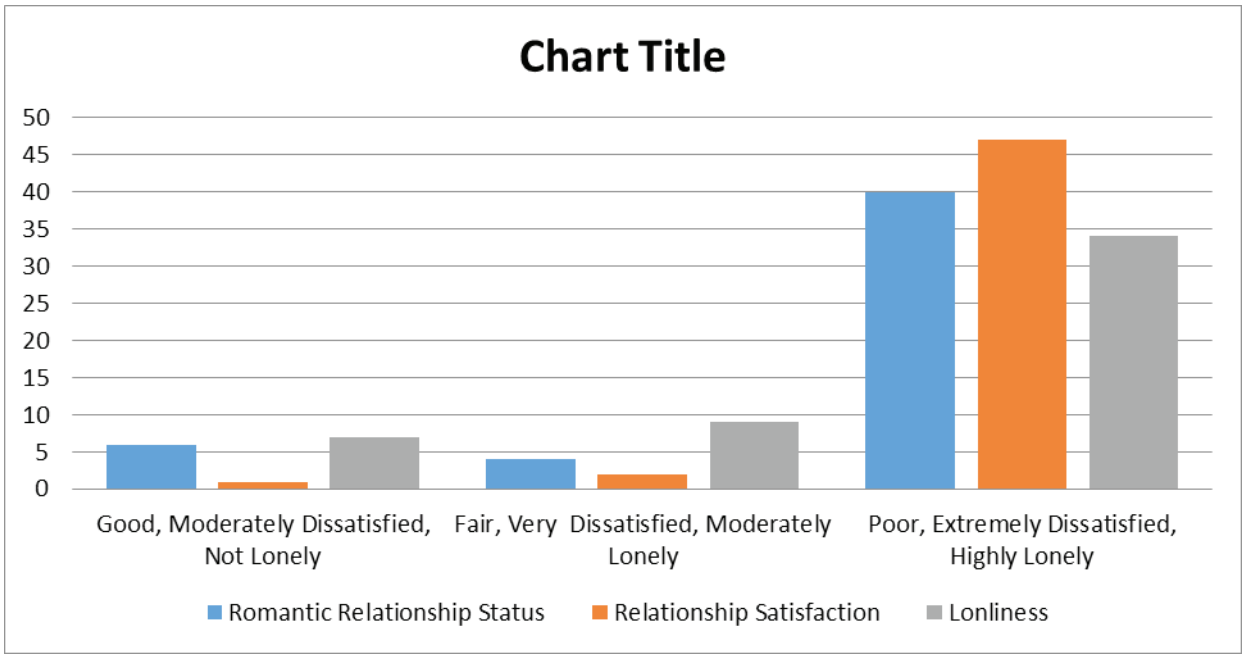

Figure 1: ***Relationship status, Degree of Satisfaction and Degree of Loneliness among participants***

2. Relationship between different factors

1. Relationship between Romantic relationship and relationship satisfaction

Table 4: Analysis of Variance for Relationship Satisfaction Scale and Relationship Assessment Scale *Score*

Source	DF	Mean squares	F	P-value	Effect size (*f*)
Between Groups	1	882.09	3.39	0.000	0.40
Within Groups	98	22.12			
Total	99				

An analysis of variance (ANOVA) showed a significant relationship between romantic relationship status and relationship satisfaction: F (1, 98) = 3.39, p = 0.000, ηp2= 0.40. (Table-4)

As can be seen in Figure 1 below, the results showed a positive relationship between the romantic relationship and relationship satisfaction. Thus result indicated that less satisfied one is in the relationship, the poor is romantic relationship status.

2. Relationship between Relationship satisfaction and Loneliness

Table 5: Analysis of Variance for UCLA Scale and Relationship Satisfaction Scale Score

Source	DF	Mean squares	F	P-value	Effect size (f)
Between Groups	1	59561.21	3.93	0.000	0.79
Within Groups	98	101.57			
Total	99				

Also there found to be a significant relationship between the degree of Loneliness and the degree of relationship satisfaction: F (2, 86) = 3.93, p = 0.00, ηp2= 0.79. (Table-5)

And we found the positive relationship between the Relationship satisfaction and Degree of Loneliness, indicating that the less satisfied one is in their relationships, the lonelier one will feel as shown in Figure-1.

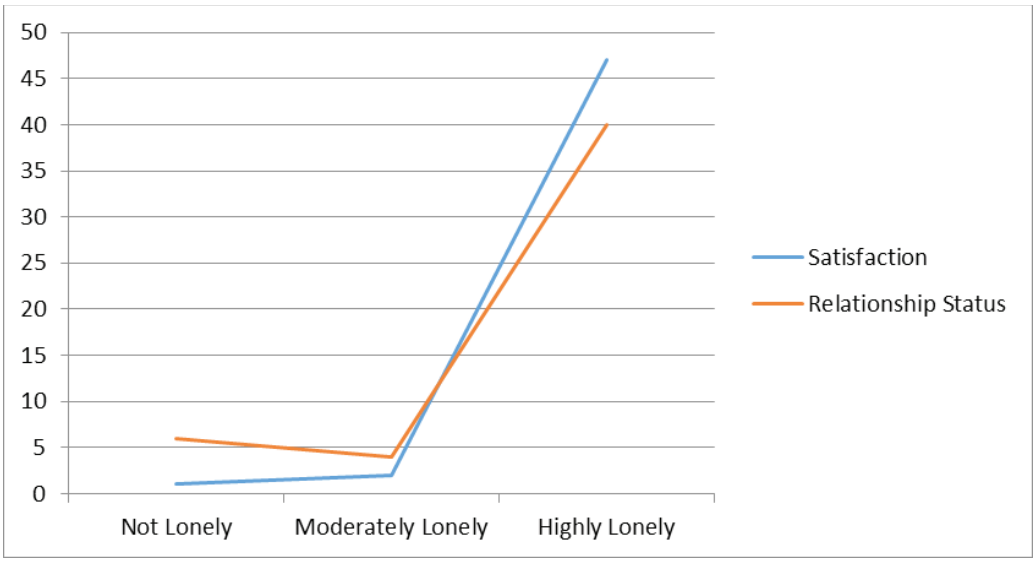

Figure 2: The relationship between the romantic relationship status, relationship satisfaction and perceived loneliness.

3. Features responsible for Poor Relationship status, Dissatisfied Relationship and Loneliness

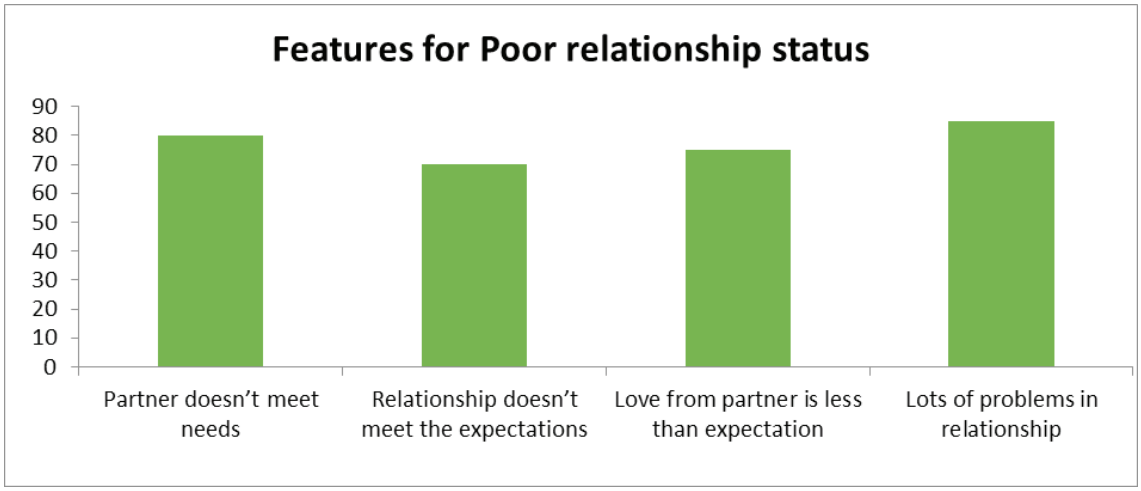

Figure 3: ***The features for poor relationship status according to majority of participants***

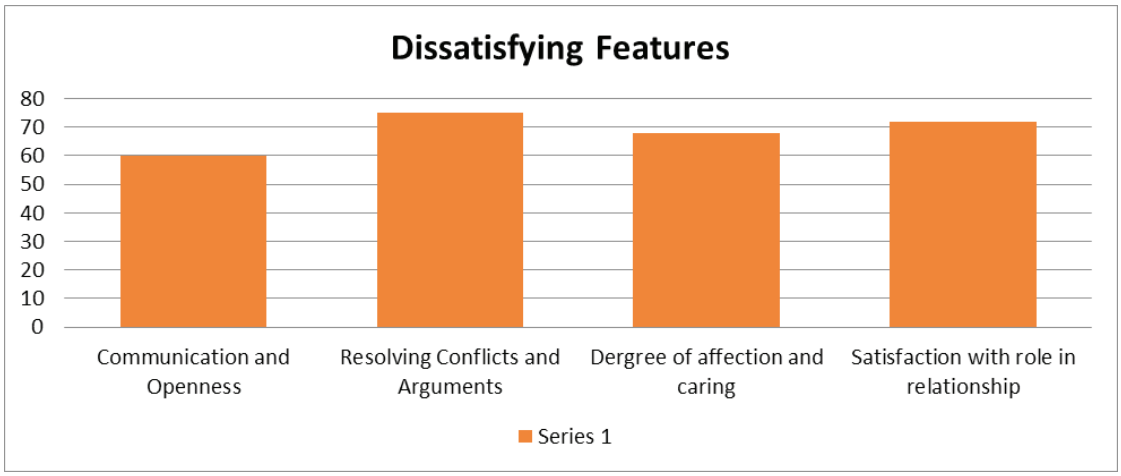

Figure 4: ***The Dissatisfying features among the romantic relationship.***

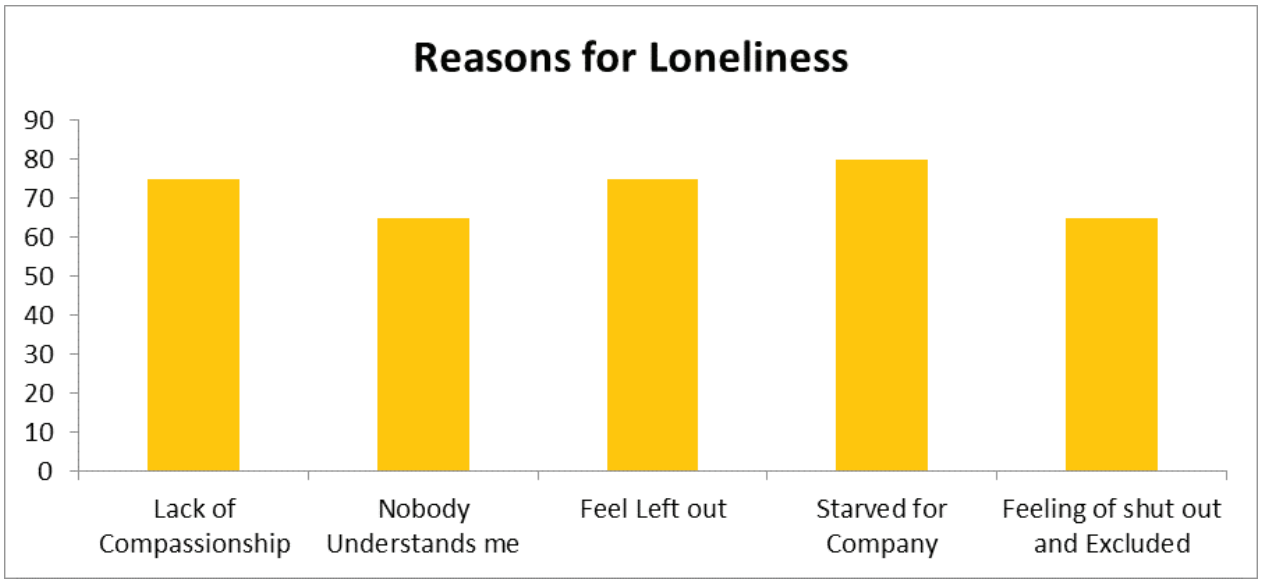

Figure 5: ***The factors that leads to loneliness in relationship.***

Discussion

This study was set out to assess the relationship satisfaction and degree of loneliness in romantic relationships. A total of 50 participants participated in the study, out of which 40% were male and 10% were female. Most of the participants belong to different religion and different cast (Table-1)

Relationship Assessment Scale, Relationship Satisfaction Scale, UCLA Loneliness Scale were used to assess the Relationship status, Relationship satisfaction and degree of Loneliness respectively. Findings of our study suggested that most of the participants had poor relationship status (80%); they were extremely dissatisfied with their relationship (94%) and reported high degree of loneliness (68%).

Our result was supported by the findings of TheréseNäslund and Sophia Reinholdsson, 2016; they studied relationship satisfaction in friendship and romantic relationship. Result suggested that depending on their ratings on the UCLA Loneliness scale the majority of the respondents involved in friendship as well as romantic relationships were classified as moderately and highly lonely (38 versus 41 %) and the majority of the respondents (47 %) were classified as neutrally satisfied and dissatisfied in their relationships[13].

One way Analysis of Variance (ANOVA) was carried out to assess the relationship between romantic relationship status and relationship satisfaction as well as correlations between feeling of loneliness and relationship satisfaction. Result showed a significant relationship among these factors.

Comparison of mean values showed a positive relationship among the Relationship status, Relationship satisfaction and degree of Loneliness. (Figure-2) indicating that less satisfied one is in the relationship, the poor is romantic relationship status. Also less satisfaction in the relationships, leads to feeling of loneliness.

Spithoven & Lodder, 2016 and Segrin et al., 2003 found the similar results. They assessed the adolescents' Loneliness and Depression Associated with Friendship Experiences and Well-Being and result indicated that those who do not feel lonely are satisfied in their romantic relationships or less satisfied one is in their friendship relationships, poor is their relationship status [4,14].

Partner doesn't meet needs, expectations and love from partner in the relationship doesn't meet, lots of

problems in relationship were the factors that lead to poor relationship status. Lack of communication, Conflicts, Lack of affection and caring and lack of satisfaction with role in relationship were the factors responsible for extremely dissatisfied relationship. The factors that lead to feeling of loneliness were lack of compassion, understanding and company, feeling of left out and excluded.

The findings in our study regarding features behind what makes you dissatisfied and lonely in romantic relationships are in general accordant with previous research. *Debrot et al., 2012; Karantzas et al., 2014* assessed the factors necessary for satisfaction in a relationship and found that Support, understanding, safety and trust have been found to be important features for romantic relationship satisfaction and lack of these features leads to dissatisfaction and poor relationship [15,16].

Limitations

1. Sample was taken from only Jamia Hamdard which cannot be generalized to other settings.

2. Sample size for finding the relationship was small; therefore results could not be generalized to masses.

3. No Intervention was given.

Recommendations

1. Further studies with a larger sample size and more specific instruments in this population should be done.

2. Scales with more reliability can be used for better results.

3. Study was a survey. The design can be changed to pre-post experimental design or comparative so that results can be seen with distinction.

4. Further studies are needed to give intervention to these subjects.

Further Implications

Loneliness and social isolation has an impact on the health and wellbeing of the people occupational therapists work with. Occupational therapy practice should include the recognition and assessment of loneliness and social isolation, and interventions to help reduce any impacts on health and wellbeing of young adults. Engagement in occupations, group activities, roles and routines that have value and meaning to an individual have been linked to a reduction in loneliness and social isolation. Occupational therapists are well placed to tackle loneliness and social isolation and need to consider this as part of their professional remit. Further empirical research needs to be conducted with occupational therapists and young adults facing relationship issues.

Conclusion

Our study is one of the few available on relationship satisfaction and degree of loneliness in romantic relationships. Our study suggested that most of the participants reported poor relationship status, extremely dissatisfaction with their relationship and high degree of loneliness. Overall our study indicated that less satisfied one is in the relationship, the poor is romantic relationship status the lonelier one will feel. Some of the common dissatisfying features in romantic relationships are worry about the relationship, worry about the future, a lack of time, conflict and stress, expectations and love from partner in the relationship doesn't meet and these factors leads to feeling of loneliness. Perhaps Practicing effective communication skills like clarifying expectations with partner, defining needs honestly and providing constructive feedbacks can reduce number of stressful misunderstanding and might also change your level of satisfaction in the relationship.

Conflict of Interest: The authors report no conflict of interest in this study.

Ethical Clearance: Verbal and written consent were obtained from all participants.

Source of Funding: Self- financed.

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Original Study

Influence of Lower Urinary Tract Dysfunction on Functional Status among Ambulant Stroke Survivors: A Pilot Study

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Abstract

Background: Stroke is one of the diseases affecting the nervous system which controls the lower urinary tract. Lower urinary tract dysfunction is a broad term of subjective urinary tract symptoms and may vary according to the course of disease. The presence of Lower urinary tract dysfunction is a negative prognostic indicator for a variety of health and rehabilitation outcomes across the spectrum of care. This study was carried out to find whether severity of lower urinary tract dysfunction has an influence on functional status among ambulant stroke survivors.

Methodology: 20 ambulant stroke survivors with the mean age of 68.55±8.02 were evaluated using Core Lower Urinary Tract Symptom Score to assess the severity of lower urinary tract dysfunction and Barthel Index to assess the functional status.

Conclusion: This pilot study found weak negative correlation (r=-0.26) between Core lower urinary tract symptom score and functional status; however it was found to be statistically non-significant (p>0.05).

***Key words**: Barthel index, Lower urinary tract dysfunction, Stroke*

Introduction

Stroke is one of the diseases affecting the nervous system which controls the lower urinary tract.[1] Estimates of the prevalence of stroke in India range from 44 to 843 per 100,000 population.[2] Age is an important non-modifiable risk factor for stroke. The mean age of stroke onset in the South Asian region for example, 63 years in India is lower than in Western countries.[3]

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Lower urinary tract dysfunction (LUTD) is a broad term of subjective urinary tract symptoms such as nocturia, urgency, urinary incontinence and frequency of voiding, defined by the International Continence Society.[1]Lesions in the anteromedial frontal lobe, paraventricular white matter, and putamen are most often associated with LUTD[4]. A cross sectional study by Tibaek S in 2008 has reported the prevalence of atleast one symptom of LUTD in patients with stroke to reach up to 94 %[5]. At 4weeks and 1 year after stroke, a 43.5-53% and 32-37.7% prevalence of urinary incontinence, respectively has been reported .[6,7]

Problems associated with LUTD may vary according to the course of disease. Apart from having significant effects on sleep, daily activities, social life, and relationships; bladder dysfunction has also

been reported to be a predictor of poor functional status.[7]LUT symptoms can have a detrimental effect on the daily activity and health related Quality Of Life(QOL)of stroke patients.[8]LUTD is associated with poor functional recovery. [9] It has been reported that urinary incontinence after stroke is associated with a higher mortality.[8,10] Stroke has differing effects on cognitive, sensory, motor, and autonomic functions. Stroke leads to negative impacts on many components of functioning [11].

The prevalence estimates of other urinary symptoms such as urgency, day time, and night time frequency are also important. However the precise profile of lower urinary tract symptoms among patients with chronic stroke is still unclear according to a study by

Miyazato M in 2017.[12] Previous studies have mostly focused on the prevalence of urinary incontinence (UI) while other symptoms such as urgency, daytime frequency and nocturia are rarely reported and quantified.[7]

Assessment of severity and bother from symptoms is important, which leads to poor functional recovery and ultimately leading to poor functional status and medical help seeing behavior. Chronicity of problems related to the lower urinary system in these patients leads to infections, increases maintenance burden and risk of falling with limitations to social life, and depression.[13.] There are no similar studies which examine the severity of symptoms in Stroke patients. It will be important to assess and detailed information about a stroke patient's actual problems.[5]

There is a clear association between LUTD in particular nocturia, urinary urgency and urgency incontinence, and falls in older adults, with significant associated morbidity, mortality, and healthcare resource use. It is not clear, however, to what extent this relationship is due to falls and LUTD having a common cause, and how much is due to factors such as dual tasking, activity restriction, and other, as yet unrecognised, mechanisms. There are little evidences supporting there being at least an element of "common cause"; that both LUTD and urinary incontinence are common in later life and very common among the frail.[14]The presence of LUTD is a negative prognostic indicator for a variety of health and rehabilitation outcomes across the spectrum of care. There is a need to acknowledge the strong association between bladder control problems, impairments outside the lower urinary tract, function and activity limitations, and rehabilitation outcomes.

Cross-sectional studies are often the first step in understanding the cause-and-effect relationship, and review of the literature clearly reveals that little is known about the influence of lower urinary tract dysfunction on functional status and mobility among ambulant stroke survivors.

Materials and Methods

Twenty, ambulant stroke survivors aged over 60 years and above, in sub acute to chronic recovery, and medically stable, referred by specialists to Physiotherapy in tertiary hospitals in Southern Karnataka were recruited for this study. Purposive sampling was adopted. The study was approved by the Institutional Ethics Committee. Consent was obtained from all participants in our study. Prior history of cerebrovascular disease, presence of a concurrent neurological disorder, presence of an acute systemic disease or a concomitant disorder which could affect urination problems, patients being incapable of answering question due to any reason were excluded.

The participants were given detailed information about the study, following which an informed consent form was signed by the participants.

To evaluate the severity of LUTD Core lower urinary tract symptom score (CLSS) questionnaire was used. It is a comprehensive questionnaire which covers the following 25 Lower urinary tract symptoms defined by the standardization report: increased daytime frequency, nocturia, urgency, urgency incontinence, stress incontinence, nocturnal enuresis, continuous incontinence, other types of incontinence, increased bladder sensation, reduced bladder sensation,

absence of bladder sensation, slow stream, splitting or spraying of the stream, intermittency, hesitancy, straining, terminal dribble, feeling of incomplete emptying, post-micturition dribble, bladder pain, urethral pain, vulval pain, scrotal pain (for men only), perineal pain, and pelvic pain. Symptoms are scored according to their frequency (0: never, 1: rare, 2: sometimes, and 3: often) and their severity (0: none, 1: slight, 2: moderate, and 3: severe). The frequency of voiding is scored as follows: 0 (7 times), 1 (8–10 times), 2 (11–14 times), 3 (15 times) for the daytime, as well as 0 (0 times), 1 (1 time), 2 (2–3 times), and 3 (4 times) for the night time. Each subject is asked to choose up to three symptoms that he/she considered to have a significant impact on daily life.[18] The results of 10 questions were summed, and the total score is reported from 0-30.with higher scores signifying higher severity in LUTD .The questionnaire is found to be reliable to assess lower urinary tract symptoms in patients with chronic stroke as per the study concluded byMiyazato et.al in 2016.[12]

Functional status was then evaluated using Barthel Index . It includes 10 fundamental items of ADL: feeding, grooming, bathing, dressing, bowel and bladder care, toilet use, ambulation, transfers, and stair climbing. The total score ranges from 0 to 20, with higher scores signifying better degrees of function.[15]

Mean and standard deviation was used to summarise quantitative data. Karl Pearson's correlation coefficient was used to test the influence of Lower urinary tract dysfunction on Functional status and mobility among ambulant stroke survivors; p value less than 0.05 was considered significant of this study.

Results and Discussion

Most 12 (60%) of the individuals were in the age group of 60 to 69years (Figure 1).Majority of the study participants 16(80%) were males.(Figure 2) Mean age of 20 participants was 68.55±8.02 with range of 60-90 years .Mean CLSS of 20 participants was 12.85±2.30with range of 8-18 .Mean BI of 20 participants was 69.25±7.304. From Karl Pearson's correlation coefficient, it was observed that weak negative correlation (r=-0.26) exists between CLSS and BI but it was statistically non-significant (p>0.05) (Table 1)

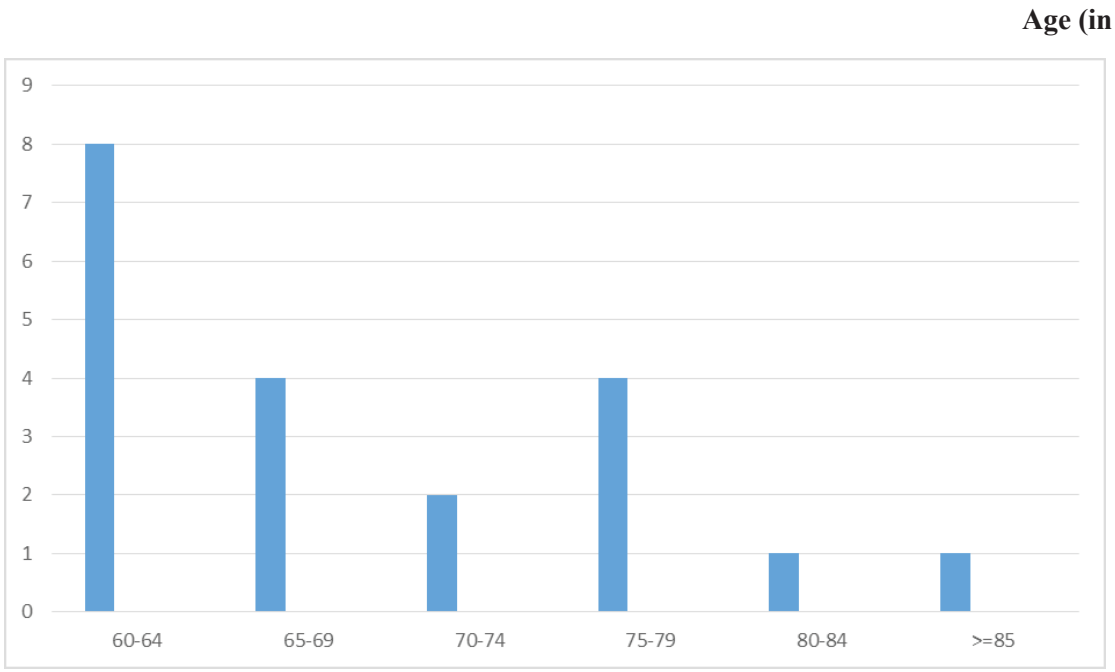

Fig 1: Age wise distribution of participants.

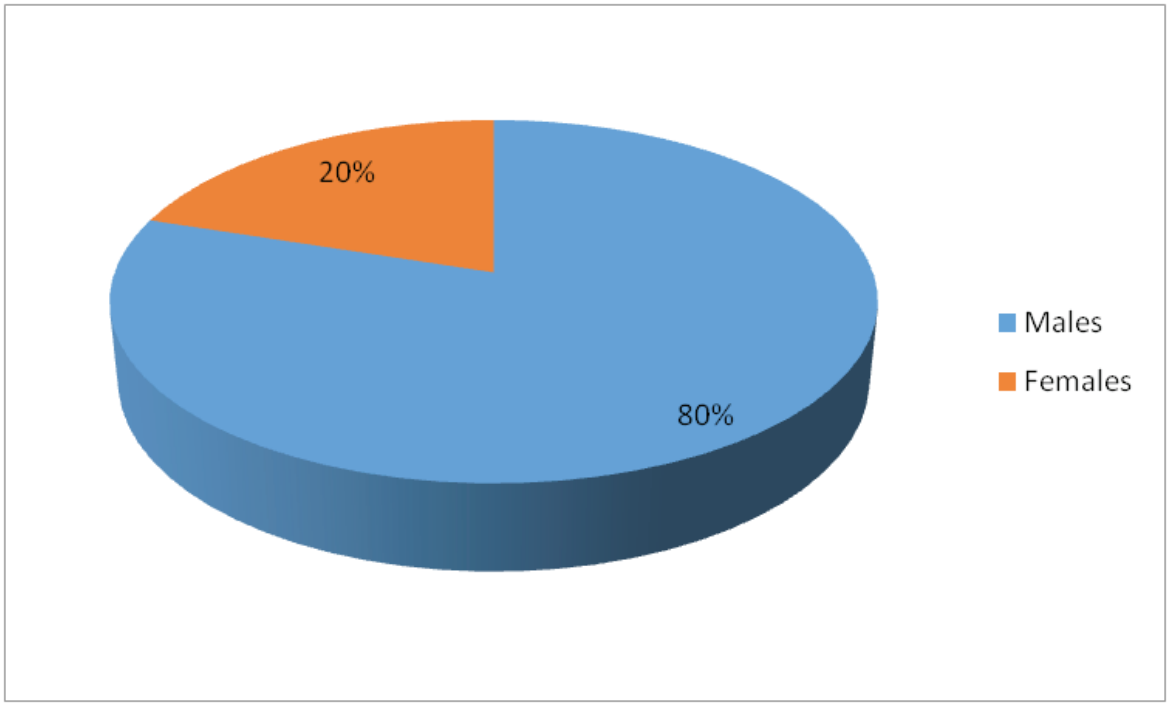

Fig 2:-Gender wise distribution of participants

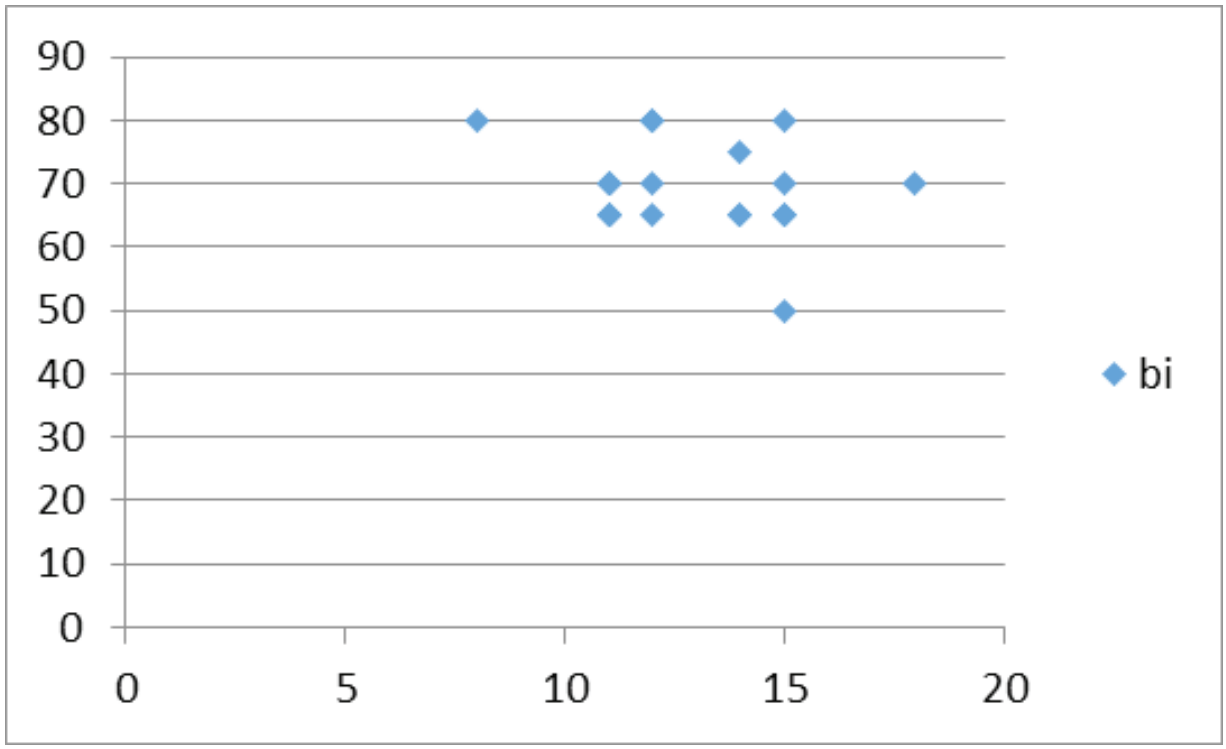

Fig 3:-Correlation of CLSS with BI

Table 1: Correlation of CLSS with BI

		bi	
CLSS	Pearson Correlation	-.258	
	Sig. (2-tailed)	.273	
	N	20	

Several disorders and conditions affecting the nervous system which controls the lower urinary system may result in neurogenic LUTD. Stroke is one of these conditions and it can further increase the problem of LUTD which is common in the aging population. There is a large spectrum of post-stroke urinary symptoms varying from incontinence to retention.[4]The prevalence varies according to the time after stroke [5]. Urinary incontinence, which has recently been recognized as the most common of these symptom, is noteworthy and its prevalence ranges between 40 and 60% .[16]

LUT symptoms can have a detrimental effect on the daily activity and Quality Of Life of stroke patients. Hence this study was carried out to find whether LUTD has an influence on functional status.

Our study demonstrated only a weak negative correlation between severity of lower urinary tract dysfunction (LUTD) and functional status (Barthel Index). In contrast to our results, several studies indicate that urinary retention after stroke is strongly associated with functional status. Akkoc Y et.al found that, LUTD was very common and was also associated with a poor cognitive, functional status in stroke patients with LUTD[13]. Similarly In a longitudinal study including 752 stroke patients, KolominskyRabas PL et al. reported that the Barthel Index scores of those with UI after a period of 12 months were significantly lower and these patients were more confined to the home [7]. In another study by Patel et.al, the effect of post-stroke UI on disability was evaluated and those with persistent UI, irrespective of other factors, were associated with poor clinical outcomes, compared to those without UI[8].. Kong and Young reported that urinary retention is strongly associated with poor functional status and explained that patients with lower functional status are likely to be bedridden [17]. Son SB et.al found that, Urinary retention in post-stroke patients is significantly related to the poor functional status at initial stage of rehabilitation, and also to poor recovery after rehabilitation.[18]

In patients with stroke, urinary retention due to decreased detrusor activity, frequent urination, nocturia, urinary urgency, and urgency-type UI due to increased detrusor activity may be seen[19]. Lower urinary tract dysfunction is a common problem and its frequency ranges from 80 to 90%, depending on the period following stoke. However, studies have shown that the most frequently examined LUTD parameters include UI and urinary retention, whereas the prevalence rates of the other important LUTD complaints such as urgency, pollakiuria, nocturia have not been clearly understood, yet [5].

Several limitations of this study should be considered. Firstly, the sample size was small. Thus further confirmation of these results must be done in a larger population for the generalization of the results. Second, present study population had subjects with both sub acute phase of recovery(15%) and chronic phase of recovery(85%). Studies have indicated that severity of LUTD and functional status are influenced

by stage of recovery. This might have influenced the results.

Conclusion

This pilot study found a weak negative correlation between severity of lower urinary tract dysfunction and functional status.

LIST OF ABBREVATIONS

CLSS- Core Lower Urinary Tract Symptom Score

LUTD- Lower Urinary Tract Dysfunction

BI- Barthel Index

Conflict of Interest: None

Source of Funding: Self

Ethical Clearance: Ethical clearance has been obtained from the Institutional Ethics Committee.

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Original Study

Development of the Hindi Version of the Orebro Musculoskeletal Screening Questionnaire – 12 Items - Cross Cultural Adaptation, Validity and Test–Retest Reliability in Patients with Musculoskeletal Dysfunction

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Abstract

Background: The Orebro Musculoskeletal Screening Questionnaire-12 item (H-OMPQ-12) is used to assess absenteeism, chronicity, pain and impairment in patients with musculoskeletal dysfunction. However, this questionnaire is not available for Hindi speaking population. Thus the aim of this study is to cross-culturally adapt the Orebro Musculoskeletal Screening Questionnaire 12-item into a Hindi language and to assess its psychometric properties (validity and reliability).

Materials and Methods: The Orebro Musculoskeletal Screening Questionnaire 12-item was translated and cross culturally adapted into Hindi language. Hindi version of the scale was administered by 71 subjects with all musculoskeletal conditions. Along with the Hindi version of the scale, subjects were also given the Numerical pain rating scale and Hindi-Modified Oswestry disability Index (MODI). Psychometric evaluation included test re-test reliability and construct and convergent validity.

Results: The translated Hindi version demonstrated good internal consistency ($\alpha = 0.85$) and test–retest reliability (intraclass correlation coefficient was 0.84). The construct validity of the Hindi Orebro Musculoskeletal Screening Questionnaire was seen to be 0.89 and the convergent validity was found by correlation of the H-OMSQ 12 item with Numerical Pain Rating scale as well as with Hindi version of Modified Oswestry Disability Index, which was found to be moderate p=0.632 and p=0.618 respectively .

Conclusion: The Hindi version of the 12 item-OMSQ showed a good internal consistency as well as test re-tests reliability and there was moderate correlation with the Numerical pain rating scale and the MODI.

Key words *– Translation ,musculoskeletal dysfunction, pain, validity, reliability, cross cultural adaptation*

Introduction

Musculoskeletal disorders are one of the most common causes of severe long standing pain and limitation on a person's physical functioning and mobility affecting people across the world. It is widely accepted that the strain caused by different occupation leads to various musculoskeletal disorders among individuals [1].

The Orebro Musculoskeletal Pain questionnaire is among the widely used scale and is validated and translated in various languages and is known to predict absenteeism, chronicity, pain and impairment [2]. The original Orebro Musculoskeletal Pain Questionnaire was developed by Linton et al. in the year 1998 and

was used to identify patients at risk of persistent pain. It was widely used for acute low back pain. The original scale raised several points which included the incomplete clinimetric development process and restricted approach. There were additional points that emerged which included the low content validity and the main concern of not including general musculoskeletal injuries and non-working population [2]. As there were several critiques which came up, there was a need to modify the original Orebro Musculoskeletal Pain Questionnaire (OMPQ). The original Orebro Musculoskeletal Pain Questionnaire was then developed and modified to Orebro Musculoskeletal Screening Questionnaire by Charles Philip Gabel through changes to its wording and item content into 21- item OMSQ [2]. In order to improve practicality and reduce the burden on patients and clinicians, a 12-item version (OMSQ-12) was formed by the same author in 2013. It was a shortened tool of the OMSQ-21 item to OMSQ-12 with reliability of r = 0.94 and validity of 0.97[1].

The purpose of this study is to develop a Hindi version of the 12-item Orebro Musculoskeletal Screening Questionnaire through the translation and cultural adaptation process which can be universally used. English is the most widely used language in the world, but still there are many people who are not able to understand and communicate in English [3]. There are various languages spoken in India. But not everyone understands the same language. Hindi is one of the most commonly spoken language in India. Therefore translation is very important for the spread of information, knowledge and ideas [4].

However, the OMSQ-12 has not been developed and analysed into Hindi language. This study will then allow testing of OMSQ-12 amongst Indian population and will also help in accurate assessment in Indian patients to improve quality of patient care. Thus, this study aimed to translate the Orebro Musculoskeletal Screening Questionnaire (OMSQ-12) for Hindi speaking population when administered to people suffering from musculoskeletal disorders and helps in the development of musculoskeletal screening for Indian society

Materials and Methods

Permission was taken from the developer of the OMSQ Short Form-12 to use and translate the English version of the questionnaire.

An observational study was carried out with the permission from the Institute's ethics committee. Written informed consent was taken from the subjects and their doubts if any were cleared before the administration of the questionnaire.

The American Association of Orthopaedic Surgeons guidelines were used for cross-cultural adaptation and psychometric testing [5].

Sample Size:

The ideal sample size for the questionnaire can be calculated by a sample size to a number of items ratio of no lower than 4:1. As Hi-Orebro Musculoskeletal Screening Questionnaire is a 12-item questionnaire minimum subjects required were 48 [6]. According to the author on the quality criteria for measurement properties of health status questionnaires, recruitment of ≥50 participants are recommended for construct validity and reliability [7]. Thus71 subjects were included in this study. As a high attribution rate for many patients not turning up as it was an outpatient setting for the assessment of test re-test reliability 50 patients were included in this study.

Inclusion/Exclusion Criteria:

The working population, both males and females between the age group of 20 to 65 years having any musculoskeletal dysfunction for more than 3 months, able to read and understand Hindi and English from the various outpatient department and community in Pune were included in the study.

Subjects with history of any recent surgery, infections, rheumatologic disease, fractures, neurologic disorders and those unable to understand the instructions necessary for completion of questionnaire independently were excluded from the

study.

Instruments

Orebro Musculoskeletal Screening Questionnaire 12 item:

It is a screening tool that predicts long term disability and absenteeism from work. The scales consist of 12 items related to pain and were significantly related to daily activities. It is modified version of the Orebro musculoskeletal questionnaire, which has a reliability of 0.73 [8].

Modified Oswestry Disability Index (Hindi Version)

The Modified Oswestry Disability Index is a self-reported questionnaire that measures both pain and functional status. The Hindi scale has a reliability of 0.99 and the original English version has a reliability of 0.89. It is a 10-item scale which is scored from 0-5 and the total maximum score being 50. It consists of items based on pain intensity, personal care, sitting, standing, sleeping, sex-life, social life, and travelling [9].

Numerical Pain Rating Scale (NPRS)

Numerical pain rating scale is used to measure the intensity of pain. It is an 11-point scale, in which 0 represents no pain at all and 10 represents worst pain imaginable. The NPRS has a reliability of 0.99 [10].

Transcultural Translation Process:

The translation process was done in two phases one is Cross-cultural adaptation and other is Cross-cultural validation.

PHASE I: Cross-cultural adaptation:

Cross cultural adaptation is done in two steps a) forward and backward translation b) pilot testing

a) **Forward and Backward Translation:**

Two forward translations were done from the 12-item English version of Orebro musculoskeletal screening questionnaire in Hindi. Both the translations were done by two independent non-medical bilingual translators. The translators aimed for a conceptual rather than a literal translation. After the translation was done it was reviewed by the expert committee for any discrepancy which was noted and a consensus version of the forward translation was developed. The two forward translated scales were then formed into one final translated Hindi scale.

The formed concord Hindi version was then back-translated into English by two independent translators who had no prior knowledge of the OMSQ-12 and were not shown the original wordings of the English version. Expert committee reviewed the back translations for any variations in meaning or terminologies used. Any problematic item was discussed, variations were resolved and a final Hindi translated scale was formed.

b) PILOT TESTING:

The translated Hindi version was then given for a pilot testing to 30 patients. The participants were given the final Hindi translated scale and the original English Orebro Musculoskeletal Screening Questionnaire. This was done to check and compare whether there was any dissimilarity in the given scales. These responses were then checked by the expert committee. No dissimilarity of meaning was recorded and a pre final draft was then finalized into the final Hindi questionnaire with minor corrections.

PHASE II: Cross-Cultural Validation:

This stage was followed by the pilot study. Similar inclusion criteria were followed for the participants. The assessment of test-retest reliability was carried out with 50 subjects. The participants were asked to fill the Hindi OMSQ-12 along with Numerical pain rating scale and Modified Oswestry disability index-Hindi. For the test-retest reliability the same instruments were filled by participants 48 hours after completion of the prior measures.

Statistical Analysis and Results

The software used for the statistical analysis was

SPSS 17.0. Construct validity and Test re-test reliability was calculated by using Cronbach's alpha method and Convergent validity was calculated by Karl Pearson's correlation method. The level of significance adopted for the statistical tests was 5%, that is, $P < 0.05$.

Acceptability

All the Hi-OMSQ-12 questions were well accepted and took short period of time to complete the filling of questionnaire. Additionally, no missing responses or multiple answers were found and there were no problems with comprehension of questions with respect to literal and contextual meaning.

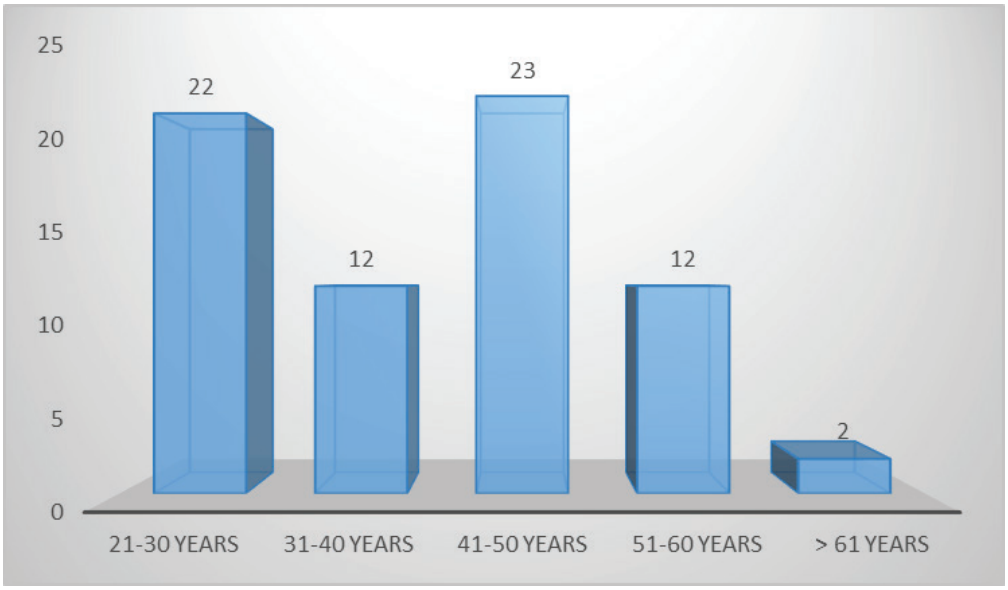

Fig 1. It is seen that there are 22 % subjects in the age of 21- 30 years, 12 % subjects were from the age 31-40 years, 23% from 41-50 years, 12% between 51-60 years and only 2 % subjects were above 61 years of age.

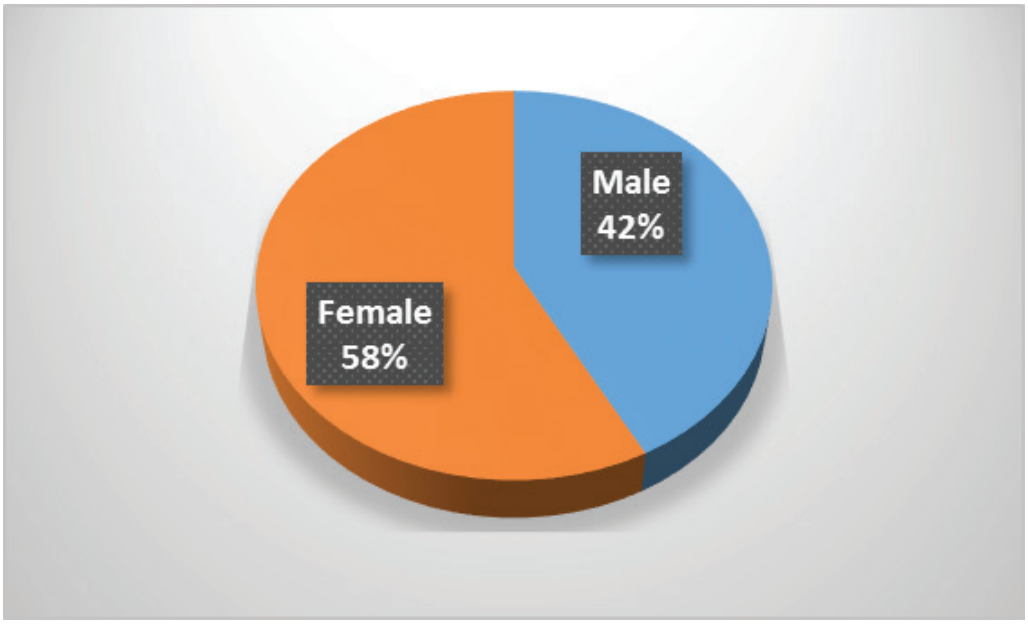

Fig 2. It can be seen that there was 58% females and 42% of male subjects out of the total 71 subjects in the study.

Normalization of data: the normalization of data was carried out by the kolmogrov-Smirnov test which indicated the value of p>0.06 and it was found to be normally distributed.

Reliability:

The reliability (Cronbach's alpha) of Hi-OMSQ-12 was found to be 0.85 .The test re-test reliability was done on 50 subjects. The ICC value for Hi- Orebro Musculoskeletal Screening Questionnaire-12 was 0.84 indicating good test re-test reliability.

Validity:

The construct validity of the Hi-OMSQ-12 is found to be 0.89, while Convergent validity was calculated by correlating the Hi-OMPQS-12 to Hindi version of Modified Oswestry Disability Index and Numerical Pain Rating Scale.

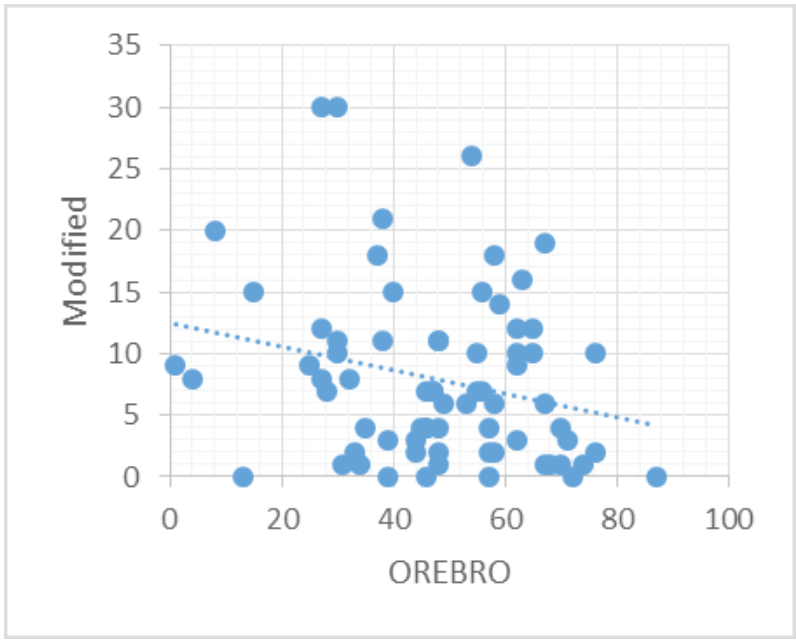

Fig 3: correlation of Hi-OMSQ-12 with Hindi Modified Oswestry Disability Index

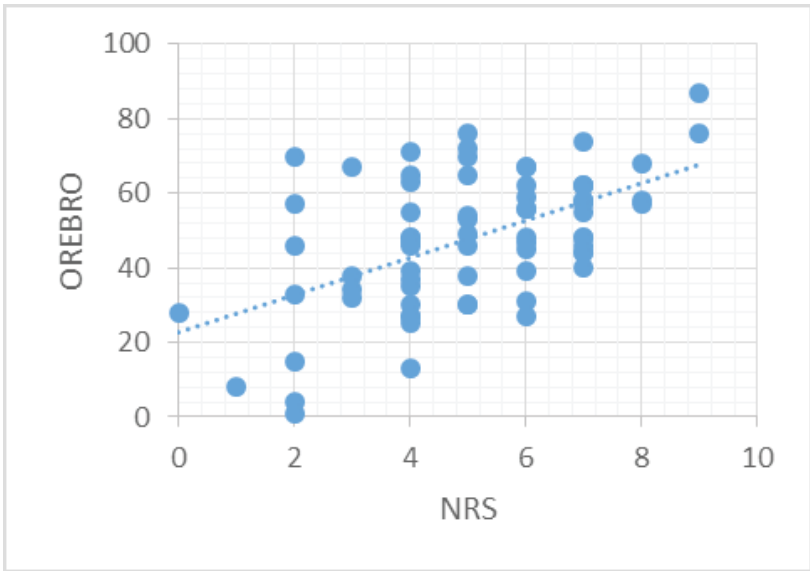

Fig 4: correlation of Hi-OMSQ-12 with Numerical pain rating scale

Table 1 - The co-relation of Hi-OMPQS -12 with Hindi MODI and NPRS

Questionnaire	N	NPRS	Hi-MODI	P-Value
Hi-OMSQ-12	71	0.632	0.618	*0.000

*p<0.05

From above table1 and scatter diagrams(fig 3,4) it can be observed that, there is moderate correlation between, Hi-OMSQ- 12 with Hindi - MODI and NPRS, with the values being 0.618 and 0.632 respectively

Discussion

The purpose of the present study was to translate and cross-culturally adapt the 12-item Orebro Musculoskeletal Screening Questionnaire (OMSQ) into Hindi and then to examine the psychometric properties of the Hindi OMSQ-12.

The cross-cultural adaptation of the Orebro Musculoskeletal Screening Questionnaire (OMSQ) confirmed that the meaning of the original items was not changed during translation and was adequately captured by idiomatic translation .The overall contextual similarity was retained in all the questions as the participants demonstrated no problem in completing and understanding the questions given in the translated Hindi questionnaire. All questions and instructions were easily understood by all individuals in the study. The translated Hi OMSQ-12 was well accepted by all the subjects with a 100% response of all the questions. Thus widening the use of Hi OMSQ-12 for the Hindi speaking population of India.

The results of this study, aimed to test the reliability and validity of the trans-culturally adapted Hi-OMSQ-12 item, yielded it as a reliable and valid tool to assess the absenteeism from work due to musculoskeletal dysfunction in Hindi-speaking patients. The Hi-OMSQ showed good acceptability, with all the subjects completing the questionnaire with no reported confusion in understanding. Results showed that the Hi-OMSQ-12 was easy to understand, quickly completed by patients and had good clinical utilization.

The OMSQ 12-item scale is a short form version of the 21 item OMSQ. The 12-item scale has an internal consistency of 0.73. The original 12-item scale was found to be a useful tool clinically as well as for research purpose [8].

In the present study we found the Hi-OMSQ to be a valid tool, as the results suggests that it has a good internal consistency r=0.85 and the validity of the Hi-Orebro Musculoskeletal Screening Questionnaire was found to be 0.89.

This modified OMPSQ has adequate Psychometric properties and has been culturally adapted[11,12] in many languages across the world like German [10] , Persian [13] , Chinese (Hong-Kong) [14] , Turkish [15] , Brazilian–Portuguese [16], French [17], Spanish [18], Dutch [19], Norwegian [20] Chinese (Mandarin) [21] and Hausa (Nigeria) [22] when compared it with other relevant questionnaires such as Job Strain, the Coping Strategies Questionnaire (CSQ), the Pain Catastrophizing Scale (PCS) and the Tampa Scale for Kinesiophobia (TSK)" the OMPSQ was found to be most helpful in predicting functional problems as well as sick absenteeism. Amongst the various factors of OMPSQ-12, pain and functions were the factors found to be most strongly related to sick leave 3 years later [23].

The results presented by such studies shows an acceptable degree of internal consistency and concludes that the various version adapted has maintained the standards and the purpose of the

original questionnaire.

In this study 50 subjects were included for the test–retest reliability of the Hi-OMSQ-12 which was found to be 0.84. Author suggested that test-retest reliability of a self-reported questionnaire is influenced by the retesting time interval. It also suggests that the consensus results decreases when the time interval is increased for retesting [24] . In this study retesting was done after 48 hrs. which is a shorter duration. Also similar conditions were maintained after verifying that no treatment was taken between test and retest and the painful state was maintained. This could have been responsible for the better levels of reliability.

From Table 1 it can be seen that the Hi-OMSQ-12 was co-related with Numerical pain rating scale and Hi-Modified Oswestry Disability Index.The Pearson's co-relation value with Modified Oswestry Disability Index is 0.618 and with NPRS is 0.632 indicating the moderate correlation.

Analysing the results, the Hindi version of Hi-OMSQ-12 can suitably be included as a tool that can be used as an instrument with high reliability for subjects with musculoskeletal conditions.

Translated version would serve as a valid and reliable tool allowing comparability of data across the cultures, thus providing opportunities for large multicenter and multi-cultural trials. It will also serve as an important tool to improve quality of patient's care. As culturally adapted Hi-OMSQ-12 is simple to understand and easy to administer, it will help in making the clinical assessment better considering the various aspects of the patients care, an appropriate treatment approach and effective research processes.

Study limitation

The study has been done on a smaller sample size. Further studies with larger sample sizes are needed to examine clinical application and the disability predictive capabilities of the questionnaire.

Conclusion

The Hi-OMSQ-12 showed good tests re-test reliability with not many changes in the scores. There was a moderate co-relation between the Hi-OMSQ-12 with the Hindi Modified Oswestry disability index as well as the Numerical pain rating scale, indicating it as valid and reliable tool.

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Conflict of Interest - Nil

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A Comparative Study on the Efficacy of Low Level Laser Therapy (LLLT) of Wavelength 905 NM and 808 NM in Management of Chronic Low Back Pain

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Abstract

Background: low back pain (LBP) is one of the most common musculoskeletal disorders which are highly prevalent among the general population. Management of this disorder includes numerous interventions which depend on severity of pain. Laser therapy is a non-invasive method to help reduce musculoskeletal disorders like chronic low back pain. This study aims to evaluate the efficacy of low level laser therapy with wavelength 905 nm & 808 nm.

Method: The participants received low level laser therapy with wavelength 905 nm & 808 nm once a day for 15 days. Stretching, strengthening and core exercise are also encouraged on the same days to improve the lower back mobility and stability.

Conclusion: The comparison of pain shows an average improvement of 3.20 ± 0.99 and 2.26 ± 0.44 and disability shows an average improvement of 10.67 ± 5.48 and 10.22 ± 4.72 in 905 nm & 808 nm respectively. The findings show that, after 15 treatment sessions, Laser therapy with 905 nm & 808 nm are effective for chronic low back pain. But 905 nm LLLT had a better clinical implication than 808 nm LLLT.

Key Words: *Laser Therapy, LLLT, Low Back Pain, Pain, Disability*

Introduction

Low back pain (LBP) is one of the considerable health problem in all developing countries and are commonly treated in primary health care settings. Low back pain is defined as pain, muscle tension or stiffness and discomfort, localised below the costal margin and above the inferior gluteal folds, with or without leg pain (sciatica).[1,2] All age groups are affected by low back pain and it has been suggested that children and adolescents did not experience low back pain unless they had a serious and a life-threatening disorder. From many epidemiological studies it has been reported that the prevalence of low back pain in teenagers is similar to that in adults. Symptoms, pathology, and radiological appearances are poorly correlated. Pain cannot be attributed to pathology or neurological encroachment in about 85% of people.[3]

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Low back pain may arise from several structures in the lumbar spine which includes ligament that interconnect vertebrae, outer fibers of the annulus fibrosus, facet joints, vertebral periosteum, paravertebral musculature including fascia, blood vessels and spinal nerve roots.[4]

The exact cause of majority of the back pain is unknown, that is 85% of the LBP. Because of this reason certain back pain is now termed as non-specific low back pain. Numerous hypotheses concerning the cause of low back pain has been identified such as reduced trunk extensor endurance, psychological distress, hamstring inflexibility, poor muscle control of trunk, poor posture and low body mass.[3]

Low back pain is usually categorized in three subtypes based on duration of back pain: Chronic LBP is low back pain persisting for 12 weeks or more.[5] Traditional methods of treatment of chronic non-specific LBP includes pharmacological & exercise interventions. These exercises are safe for individuals with back pain, because it does not increase the risk of future back injuries or work absence. A progressive exercise regimen is a therapeutic tool to improve the function, flexibility and strength of the back. Other methods include interferential therapy, laser therapy, lumbar support, short wave diathermy, therapeutic ultrasound, thermotherapy, traction, transcutaneous electrical nerve stimulation , massage therapy, manual therapy.[6,7]

Laser therapy is a non-invasive method to help reduce acute and chronic pain. It can be safely used as an adjunct or replacement for pharmaceutical drugs (an analgesic, muscle relaxant, helps in tissue healing and has bio-stimulation effects). Laser therapy acts by stimulating tissue repair, reduces interstitial swelling by stimulating the speed of lymphatics and has an anti-inflammatory effect. There is certain alternate evidence which says that, laser inhibit A delta and C fibre transmission and it is possible that laser induced neural blockade may then lead to long-term altered nociception. Hence, the repeated application of laser may reduce tonic peripheral nociceptive afferent input to the dorsal horn and facilitate reorganization of synaptic connections in the central nervous system producing pain modulation.[8]

The theoretic principles behind the laser were developed as early as 1917 when Einstein laid the theory "Quantum theory of radiation". The range of laser radiation extends from the ultraviolet through the visible to the infra-red region of the optical spectrum. The laser therapy system also produce a variety of wavelengths which is of varying pulse duration and energy levels. The wavelengths of light that is used for LLLT fall into an "optical window" at wavelengths 600–1070 nm. Wavelengths between 600–700 nm are used to treat shallow tissue, and wavelengths between 780–950 nm, which infiltrate further, are used to treat more profound situated tissues.[9]

The treatment of musculoskeletal disorders with low level laser therapy has been mainly focused on arthritis and soft tissue conditions. Changes in the activity of inflammatory mediators and changes in neural conduction or activation improve the condition.[10] Low back pain is a highly prevalent musculoskeletal disorder which causes pain and disability in the general population. Various studies have been conducted with an aim to relieve this pain. Physiotherapy approaches such as IFT, TENS, IRR, Ultrasound, Laser, stretching, strengthening, stabilization exercise and thermotherapy have been proved to be effective. Low level laser therapy has proven therapeutic effect on inflammation and pain in chronic low back pain. However, to the best of our knowledge there is paucity of study comparing the effect of low level laser therapy of different wavelength in chronic low back pain. Hence, this study aims to find the effectiveness of two different wavelength lasers (905 nm & 808 nm) on chronic low back pain.

Methodology

Study proceeded after ethical clearance from the institutional ethical committee Ref.No: NIPT/IEC/Min/2015-16. The subjects diagnosed with chronic low back pain by an Orthopaedician fulfilling the

inclusion criteria were included in the study. An informed written consent was collected from all the subjects included in the study. With purposive sampling method 60 subjects were included in the pre-post interventional comparative study. Subjects between age group 18-50 years of both genders, mechanical LBP with duration of at least more than 12 weeks with no other pathological problems, LBP at rest, LBP at movement, stress & strain induced LBP, work related LBP disorder were included in the study.

The subjects were divided into two groups; groups with Laser therapy (LLLT) by wavelength of 905 nm and 808 nm. Class 3B single diode infra red laser by Medical Italia (Fig.1) was used to give laser therapy with wavelength of 905 nm and class 3B single diode infra red laser by Technomed Electronics (Fig.2) was used to give laser therapy with wavelength 808 nm. All the subjects were treated with LLLT once a day for 15 days (5 days a week for 3 weeks). Hot packs, stretching, strengthening and Core exercises also given for both groups prior to treatment session for 1 hour.

Laser Parameters: Wavelength of 905 nm & 808 nm, Power density 200mW/cm^2, treatment duration 90 sec in each point, for a total time duration of 8 minutes.

Exercise Regimen: Static stretching of Hamstring and Piriformis muscles was given with 30 seconds of hold for 12 times. cat and camel exercises, extension exercises with prone on hand and prone on elbow for 12 Reps x 3 Sets. Core exercises includes alternative supine straight leg raise, side lying straight leg raise and prone straight leg raise for 12 Reps x 3 Sets.

Outcome Measures: Numerical Rating Scale (NRS) is a subjective measurement of pain intensity in clinical and experimental settings. The clients are instructed to spell out their perceived level of pain intensity from zero (no pain) to ten (worst pain). Its test retest validity varies from 0.71 to 0.9915. Oswestry Disability Index (ODI) is also known as the Oswestry Low Back Pain Disability Questionnaire. The ODI has 10 items that refer to activities of daily living that might be disrupted by LBP. Each item has six responses ranging from 'no problem' to 'not possible'. It is an important tool to measure a patient's permanent functional disability. 0-20% is minimal disability and 81-100% is exaggerated disability.

Statistical Analysis: All the data was analyzed by using SPSS 21.0. The descriptive statistics were summarized by using mean, median and standard deviation. The pre-post interventional comparisons were done by paired t test and between the groups comparisons were done by using independent t test (inferential statistics).

Results

All the variables in the study were summarized in the form descriptive statistics in Table 1. 87% & 60% of participants in LLLT 905 nm & LLLT 808 nm was females (Fig 3).

Among the 30 subjects in the LLLT 905 nm group, pre NRS was 5.93 ± 0.76 and reduced to 2.73 ± 1.01 in post treatment and among 30 subjects in the LLLT 808 nm group, pre NRS was 5.80 ± 0.84 and reduced to 3.53 ± 0.8. The comparison of pain shows an average improvement of 3.20 ± 0.99 and 2.26 ± 0.44 in 905 nm & 808 nm respectively. This shows the treatment improvement were statistically significant within the both groups (Table 2).

Among the 30 subjects in the LLLT 905 nm group, pre ODI was 20.29 ± 5.64 and reduced to 9.62 ± 3.27 in post treatment and among 30 subjects in the LLLT 808 nm group, pre ODI was 23.10 ± 3.94 and reduced to 12.80 ± 3.52. The comparison of disability shows an average improvement of 10.67 ± 5.48 and 10.22 ± 4.72 in 905 nm & 808 nm respectively. This shows the treatment improvements were observed in each group, but statistically not significant within the groups (Table 3).

The study shows an average difference of pain 0.93 between the LLLT 905 nm & LLLT 808 nm, which is statistically significant within the group ($P < 0.05$), and 0.45 average difference of disability between the LLLT 905 nm & LLLT 808 nm was

statistically not significant within the groups (Fig 4).

Figure 1. LASERMED 2100

Figure 2. TECH LASER 302

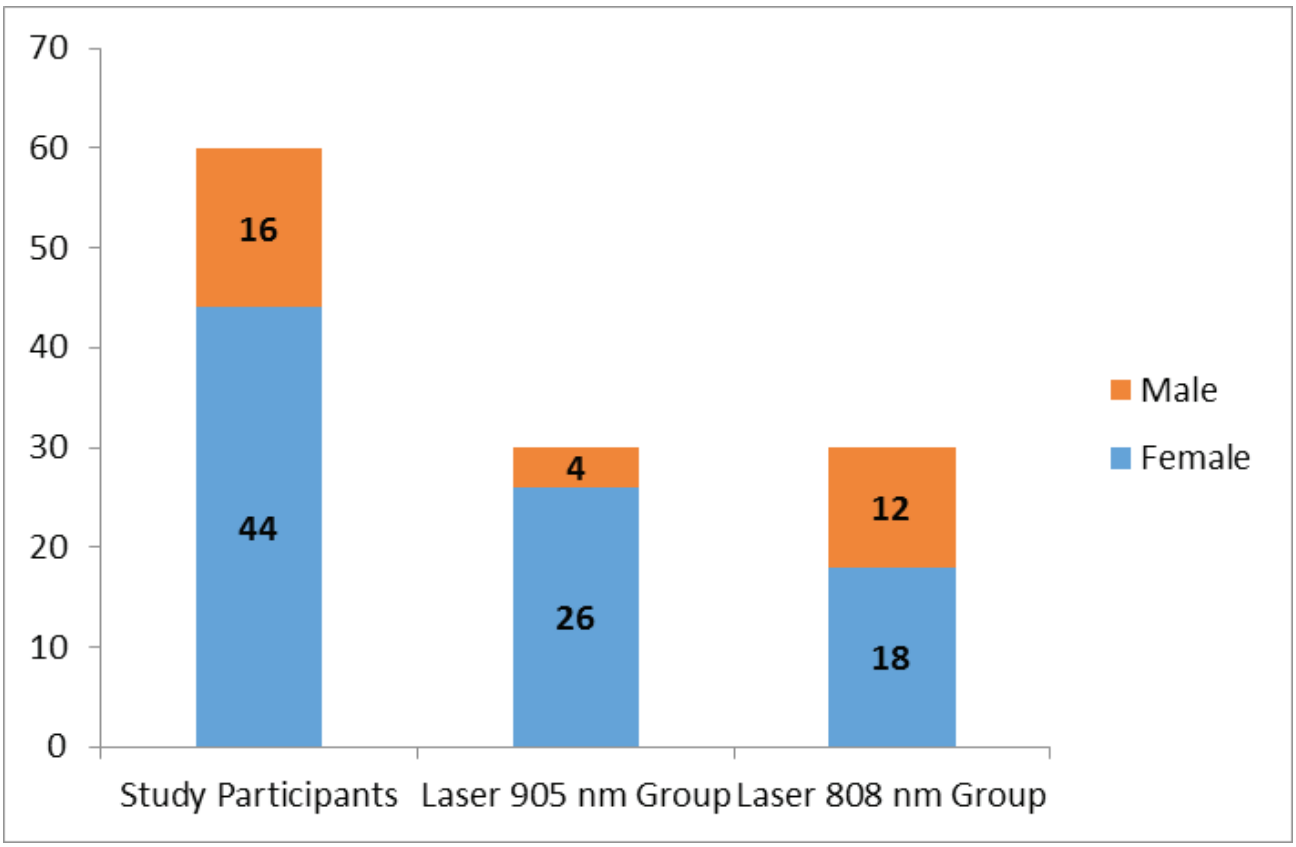

Figure 3. Gender wise distribution of subjects in each group

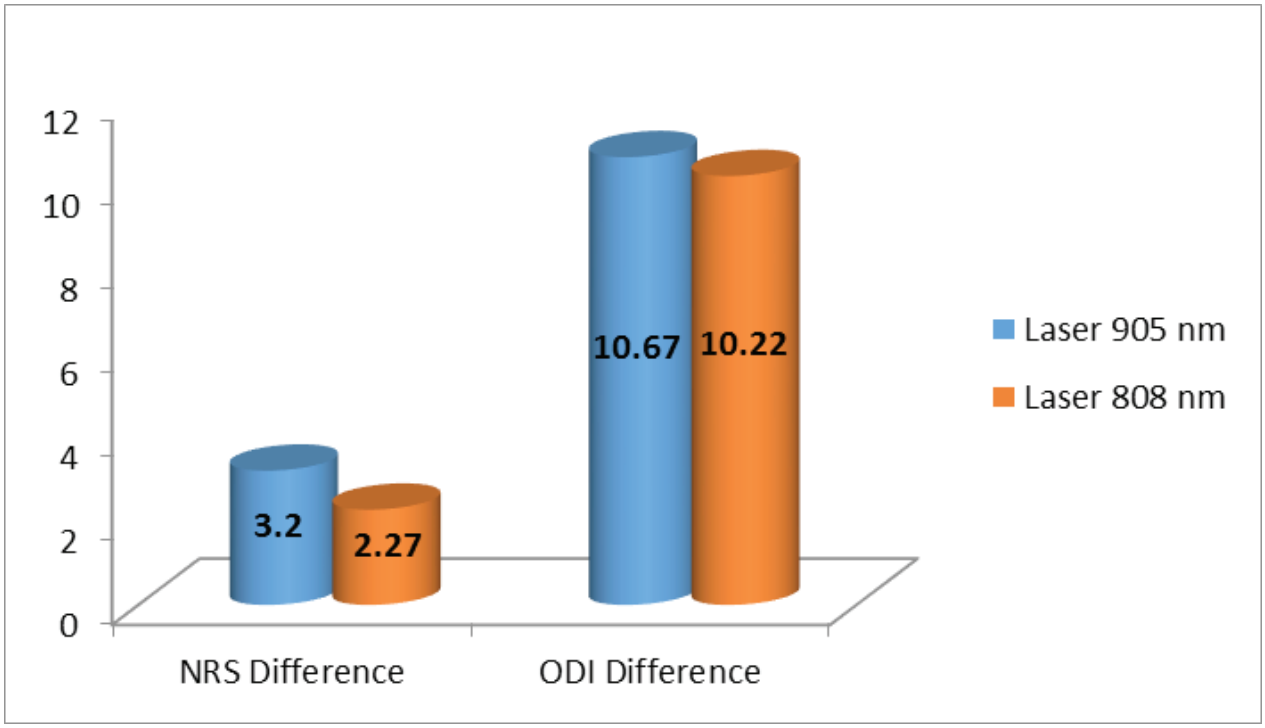

Figure 4. Difference in pain and disability status

Table 1. Descriptive Statistics

Group	Variables	Mean ± SD	Median
All study participants (N=60)	Age	26.20 ± 8.94	22.00
	Pre NRS	5.86 ± 0.76	6.00
	Post NRS	3.13 ± 0.99	3.00
	Pre ODI	21.69 ± 5.03	22.22
	Post ODI	11.25 ± 3.75	11.11
Laser 905 nm Group (N=30)	Age	23.93 ± 5.73	22.00
	Pre NRS	5.93 ± 0.69	6.00
	Post NRS	2.73 ± 1.01	3.00
	Pre ODI	20.29 ± 5.64	17.77
	Post ODI	9.62 ± 3.27	8.88
Laser 808 nm Group (N=30)	Age	28.46 ± 10.92	22.00
	Pre NRS	5.80 ± 0.84	6.00
	Post NRS	3.53 ± 0.81	3.00
	Pre ODI	23.10 ± 3.94	22.00
	Post ODI	12.88 ± 3.52	11.11
NRS = Numerical Rating Scale, ODI = Oswestry Disability Index			

Table 2. Pre-post comparison of pain and disability among LLLT 905 nm & 808 nm group

Group	Variable	Mean ± SD	t value	Sig. (2-tailed)
Laser 905 nm Group	Pre NRS+	5.93 ± 0.69	17.588	P < 0.001*
	Post NRS+	2.73 ± 1.01		
Laser 808 nm Group	Pre NRS+	5.80 ± 0.84	27.603	P < 0.001*
	Post NRS+	3.53 ± 0.81		
Laser 905 nm Group	Pre ODI+	20.29 ± 5.64	10.658	P < 0.001*
	Post ODI+	9.62 ± 3.27		
Laser 808 nm Group	Pre ODI+	23.10 ± 3.94	11.844	P < 0.001*
	Post ODI+	12.80 ± 3.52		
+Paired t test, *Significance Level was P <0.05 at 95% CI				

Table 3. Pain and disability difference within the group

Variable	Group	Mean ± SD	t value	Sig. (2-tailed)
NRS Difference+	Laser 905 nm Group	3.20 ± 0.99	4.676	P < 0.001*
	Laser 808 nm Group	2.26 ± 0.44		
ODI Difference+	Laser 905 nm Group	10.67 ± 5.48	0.340	0.735 (P >0.05)
	Laser 808 nm Group	10.22 ± 4.72		
+Independent t test, *Significance Level was P <0.05 at 95% CI				

Discussion

The objective of this study was to compare the effectiveness of two different wavelength of low level laser in chronic low back pain. The results compared after 15 treatment sessions over a period of 3 weeks using 2 different wavelength namely 905 nm & 808 nm in the clinical population diagnosed with chronic Low back pain.

In this study 73% of the populations were females. This can be attributed to the fact that females are more affected with chronic low back pain in comparison to males. An Epidemiological study by Gunnar B J Anderson supports this finding's by reporting, back and spine impairments to be more common in women (70.3 per 1000 population) than in men (57.3 per 1000 population).[11]

The group treated with LLLT 905 nm showed a greater reduction in pain and improvement in the disability status compared to the group received LLLT 808 nm. Thus, leads to acceptance of reality that there is significant difference in the pain effect of low level laser therapy with 905 nm in chronic low back pain. The result of this study shows there is reduction in pain and disability level following treatment with 905 nm & 808 nm LLLT; But the major significance were produced by 905 nm LLLT.

The findings of this study supported the findings of Djavid G E et al in 2007, they proved that Low level laser therapy and exercise decreased pain, increased lumbar flexion and reduced disability more than exercise alone in the long term. Jeffrey R et al stated that low-energy laser therapy was capable of improving the function and lessening the discomfort of individuals with musculoskeletal low back pain and hence aids in decrement of disability status and intensity of pain.

Chung H et al. states that improvement in laser was attributed to the changes in the molecular, cellular and tissue levels.[9] Rationale to this therapy can be due to the induced photochemical reaction in the cell. The energy can be used by the system to perform various cellular tasks. Laser therapy causes excitation of the chromophobes in the mitochondria which Leads to an increase in the synthesis of ATP, protein and NADH.[12] This triggers increased cell migration and proliferation, modulation in the levels of cytokines, growth factors, inflammatory mediators and increased tissue oxygenation.

There is certain alternate evidence reported by Djavid G E et al.[4] which says that laser inhibit A delta and C fibre transmission and it is possible that laser induced neural blockade may then lead to long-term altered nociception. Hence, the repeated application of laser may reduce tonic peripheral nociceptive afferent input to the dorsal horn and facilitate reorganization of synaptic connections in the central nervous system producing pain modulation.[13] Low level laser therapy also induce vasodilation particularly of the micro circulation thus, accelerating tissue healing by increasing the availability of oxygen and other nutrients and speeding the removal of waste product from the treated area and thus leading to a decrease in pain and disability.

This study also had limitations in categorizing back pains, compound effect of anti-inflammatory drugs and long term effect also not evaluated. We recommend researchers to go with further studies without pharmacological intervention so as to determine the anti-inflammatory effects of LLLT.

Conclusion

The study shows that treatment of chronic low back pain by low level laser therapy with wavelength 905 nm & 808 nm resulted in a significant decrease in pain and disability. The average improvement in pain and disability was more observed in LLLT with 905 nm than 808 nm. So this concluded that 905 nm LLLT had a better clinical implication than 808 nm LLLT.

Conflict of Interest: Nil

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original study

Effect of Tilt Table Training on Balance among Subjects with Basal Ganglia Bleed: A Pilot Study

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Abstract

Background: Basal ganglia bleed is a major cause of disability with 40% subjects suffering from moderate to severe disability. Among different treatments, mobilization on a tilt-table and functional training, which consisted of strengthening and stretching exercises of the limbs, postural control training in sitting and standing positions, therapist-guided techniques for facilitating normal movement, and simple forward stepping might have effect on balance in subjects with Basal ganglia bleed.

Objective: To see the effect of tilt table mobilization and functional training on balance in subjects with basal ganglia bleed.

Methodology: 10 subjects within age group of 18-65 years diagnosed with Basal ganglia bleed were included in the study based on inclusion and exclusion criteria. After measuring the baseline data, subjects were given mobilization on tilt table and functional training 30 minutes per session 5 days a week for 6 weeks. Pre and post measures of balance were assessed using dynamic gait index (DGI).

Results: Mobilization on tilt table and functional training on balance in subjects with basal ganglia bleed showed statistically significant improvement in balance ($p<0.05$) on paired t test.

Conclusion: Tilt table training can be beneficial for improving balance in subjects with basal ganglia bleed.

***Keywords**: Basal ganglia bleed, Balance, Tilt table training, Functional training*

Introduction

Basal ganglia hematoma (BGH), one of the deadliest diseases, is generally caused by hypertension as well as rare abnormal vascular lesions, including arteriovenous malformations, moyamoya disease, and aneurysms. [1,2]

Basal ganglia bleed is a major cause of disability: 25% of basal ganglia bleed survivors live with minor disability, 40% with moderate to severe disability, and 10% require long-term care. Poor balance when walking is a common cause of disability after Basal ganglia bleed. [3]Gait and balance impairment owing to limb deficit after basal ganglia bleed is one of the main determinants associated with poorer functional recovery.[4]Falls occur in up to 70% of persons with stroke (PwS) during the first 6 months after discharge from hospital or rehabilitation.[5] Falls are major causes of functional decline, poor quality of life, dependency, and mortality [5,6] Fear of falling in PwS can lead to reduced physical activity levels [5] and deconditioning, creating a vicious circle that may result in greater inactivity and social isolation. [5,7]

The right side basal ganglia bleed affects the left side of the body and left side basal ganglia bleed affects the right side of the body but both the right and left hemiplegia improved equally in the outcome

variables after rehabilitation. Thus, both the right and left hemiplegic patients are should have effect from conventional physiotherapy or tilt table therapy in improving all the functional i.e. quality of life, muscle strength of upper and lower limb and neurological parameters. [8]

A tilt table consists of safety thoracic, pelvic and knee belts where belts are used to prevent forward tipping and to fix the patient's body while they are standing.[9] Rehabilitation on a tilt-table has been reported to be a useful way to mobilize severely impaired or non-cooperating patients, since it improves circulation, prevents contractures, [10] and increases pulmonary ventilation [11] and robotic tilt-tables [12] are effective in preventing blood pressure drops,[13,14]. One of study suggests that a reduction in motor impairments is greater after tilt-table exercises as it reduces long-term spasticity and improves strength[14].In stroke a tilt table is generally use to prevent muscle atrophy and weakness at an early stage of rehabilitation of stroke patients under supervision of physical therapists. The tilt table also has benefits in adapting the patient's body to get it ready for weight bearing and walking. [15]

Previous studies showed that tilt table and progressive task oriented training on tilt table increased muscle activity [14] which improved lower extremities functions of acute stroke[9] Task oriented training includes a wide range of interventions such as walking training on the ground treadmill training matches reaching and one leg standing training for improving balance[16] Mobilization into a standing position, with a tilt table, has been shown to improve arousal and awareness in small groups of vegetative state (VS) and minimally conscious state (MCS) patients .[17] Another study showed that progressive task oriented training on the supplementary tilt table on lower extremity muscle strength and gait velocity, cadence, stride length and single limb support period and increased double limbs support period and gait symmetry in patients with hemiplegic stroke.[18]

However, the effect of tilt table training on balance among subjects with Basal Ganglia Bleed has not been presented. Hence the present study aims to investigate the effects of Tilt Table Training on balance among subjects with Basal Ganglia Bleed.

Methodology

The study was carried out in Nobel Medical College and Teaching Hospital, Biratnagar, Nepal. 10 subjects with basal ganglia bleed referred by neuro surgery ward for physiotherapy were taken for the study and demographic variables such as age and gender were documented. The inclusion criteria were individuals with age group of 18-65 years diagnosed as basal ganglia bleed with both open and closed head injuries, who were haemodynamically stable, mild GCS level.Subjects with fracture to pelvic bone and lower limbs, wound and deep vein thrombosis to lower extremities were excluded from the study.

Procedure

Subjects were screened for their inclusion criteria and informed consent was obtained from their Caretakers. Their arousal level was assessed by GCS before any interventions. All patients received standard rehabilitation, which included mobilization on a tilt-table. Also all the subjects received functional training according to the daily routine schedule in the clinical setting, which consisted of strengthening and stretching exercises of the limbs, postural control training in sitting and standing positions, therapist-guided techniques for facilitating normal movement, and simple forward stepping(Fig 1). All treatment sessions were conducted in the neuro surgery ward to avoid unexpected study-related stimulation. The patient was placed in a lying position and other physical interventions were performed 30min before mobilization to tilt table. The patient was then moved to the tilt-table where baseline blood pressure, heart rate and breathing frequency were measured. This procedure was necessary to ensure the patient's comfort. Next, the patient was tilted head-up to 30° and the first measurements of blood pressure, heart rate and breathing frequency were performed. After 1 min., the patient was further tilted to 60°, measurements were repeated and followed by the last

tilt to 80° (Fig 2).Our clinical practice stipulates 80° as the maximum angle mobilization in most patients in order to maintain a comfortable position. If orthostatic hypotension, tachycardia, or tachypnea occurred, the patient was instantly returned to the supine position. After 6 weeks of intervention subjects were again assessed with DGI to assess the improvement in arousal level.

Fig1: Conventional Exercise Fig2:(Clockwise)Tilt table training at 0°, 30°, 60°, and 80°

Results

Data was analysed with SPSS version 20.0. As pre and post data both were normally distributed t test was used for statistical analysis t test was used for statistical analysis. Table 1 shows the characteristics of the participants and table 2 shows the results of t test scores of DGI between pre and posttest values after 6 weeks of intervention within the Group. It showed statistically significant improvement in balance with p value < 0.05

Table 1: Characteristics of Participants

Parameter	Values
Age(Mean ± SD)	58.2±15.7
Gender(Male/Female)	7/3
Side affected(Left/Right)	4/6

Table 2: Pre and Post Comparison of DGI Values

Sl.No.	Outcome measures	Pre test		Post test		Paired t-test	p-value
		Range	Mean ±SD	Range	Mean ±SD		
1	DGI	0-2	1.1±0.73	3-4	3.6±0.51	t=15	p<0.001*

* denotes –Significant

Discussion

The aim of this experiment was to improve balance and maintain strength in subjects with Basal ganglia bleed. Our study is in the agreement with the result seen in above mentioned studies showed statistically significant improvement within the group. Result of the present study demonstrate that the and mobilisation on a tilt-table and all of the subjects received functional training according to the daily routine schedule in the clinical setting, which consisted of strengthening and stretching exercises of the limbs, postural control training in sitting and standing positions, therapist-guided techniques for facilitating normal movement, and simple forward stepping have effect on the muscle and improved balance[4] on subject Basal ganglia bleed. Intervention rehabilitation is somehow simple easy and more effective because of its task oriented approach in terms of rehabilitation.

The study was conducted to investigate the clinical benefits of using supplementary progressive task-oriented training on the tilt table on the muscle activation changes in the LE,[9,13] functional abilities, and degree of performing activities of daily living in patients with Basal ganglia bleed. Rehabilitation with the help of this effective and standardized application of the tilt table strongly influenced LE motor recovery in patients.[13, 19]. This application protocol with the possibility of progressive inclination towards vertical alignment prepared the patients for a smooth transition to the upright position, gradually increasing the load on the affected.[4,8]

The improvement could have been obtained as tilt-table rehabilitation offer standardized, intensive and repetitive exercises, a proper body weight support, with an appropriate sensory feedback amount and a controlled progressive verticalization.[10]It can also be correlated to ERIGO training as it is considered to be a valuable tool for the adaptation to the vertical position with a better global function improvement, as suggested by the sensory-motor and vestibular system plasticity induction in post-stroke patients.[20]

The tilt-table intervention followed by a home-exercise program proves to be much more beneficial in rehabilitation of stroke patients as it prevents the detoriation after hospital discharge and supports in sustaining the achieved improvement and help in further improvement of patients to gain most function and reduce dependency.[10]

In our study, the DGI values improved after mobilisation on the tilt-table and functional training when compared with other conventional physiotherapy which shows that tilt-table therapy could have improved balance with subjects This could be because of reduced extensor spasms reduced after tilt table standing.[21]

Conclusion

The study concludes that mobilizations on tilt table along with functional training according to the daily routine schedule in the clinical settinghas a

beneficial effect in improving balance among subjects with basal ganglia bleed.

Ethical Clearance- Taken from Institutional Ethical Committee of Nobel Medical College and Teaching Hospital

Source of Funding- Self.

Conflict of Interest - Nil

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Original Article

Correlation between Postural Stabilty and Functional Disabilty in Patients with Chronic Low Back Pain

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Abstract

Purpose: To investigate the relationship between static and dynamic postural stability and functional disability associated with chronic low back pain (CLBP).

Methods: A total of 80 patients (age 44.64 ± 1.27 years) were recruited in this cross sectional study using convenience sampling. The One Leg Stand Test (OLST) was used to assess static balance with eyes open and eyes closed; Y Balance Test- Lower Quarter (YBT-LQ) was used to assess dynamic balance in the anterior, posterolateral and posteromedial directions; and functional disability was assessed using modified Oswestry Disability Index (mODI). Karl Pearson correlation coefficient was used to estimate the relationship between the variables.

Results and Conclusion: mODI was negatively correlated to OLST with eyes closed (r= -0.721); YBT-LQ composite score (r= -0.865); and reach distances in the posterolateral (r= -0.815) and posteromedial (r= -0.832) directions suggesting that control of postural stability was reduced with an increase in disability in patients with CLBP.

Keywords: *low back pain, balance, chronic pain, disability, postural control.*

Introduction

Chronic low back pain (CLBP) is considered as one of the leading causes of disability in the modern world, causing tremendous societal and economic burden.[1,2]Stiffness of the lumbar spine, muscle weakness, reduced muscle length and endurance are some factors that are known to associate with the disabling condition.[3,4] In addition, several authors have indicated that postural instability is commonly manifested as balance impairments in patients with CLBP.[5,6]

Besides visual, vestibular and somatosensory inputs, a vital component of postural control is its ability to gate sensory input according to the internal representation of the current posture, in order to avoid undesired reactions that are triggered by internal or external perturbations.[7,8]

When balance is disrupted, a well-functioning neuromuscular system in conjunction with adequate muscle strength to return the centre of mass within the base of support is required to bring about an appropriate motor response.[9] Likewise, execution of equilibrium reactions is a complex interaction of the afferent carrying sensory stimuli and the efferent that is sent from the CNS to an intact musculoskeletal system.[10] Hence, it is comprehensible that a derangement to any system- sensory, motor or CNS, can have an undesirable effect on the overall functioning of the postural system.

It is known that the central processing of proprioceptive information may be altered in individuals with CLBP.[8,11] According to Popa et al., in contrast to healthy individuals, patients with CLBP adapted functionally to decrease postural instability.[12]

However, the theme is controversial, since the findings of some studies found no differences in postural control in individuals with presence or absence of CLBP related disability.[13,14] If postural impairments are identified at an early stage during the assessment of CLBP patients, it can provide important clinical information that could be incorporated into rehabilitation protocols. This may help to alleviate the disability associated with CLBP and also its recurrence. Therefore, the present study aimed to associate postural stability, both static and dynamic, to the disability associated with CLBP.

Materials and Methods

Patients visiting a tertiary hospital in Mangalore, Karnataka with a present condition of low back pain were recruited in this descriptive cross-sectional study. The study was undertaken from March 2017 to March 2018. An informed consent was obtained from all participants once they had been screened for suitability and any relevant questions were on the procedure were answered and data collection process.

Screening process protocol and rationale

At their first visit, 108 participants were screened for inclusion/exclusion criteria. Patients between ages 35 to 55 years irrespective of gender with low back pain for more than three months, which was nonspecific and mechanical in nature and BMI less than 30 kg/m^2 were included in the study. The exclusion criteria were acute low back pain, history of spine surgery, neural tissue involvement such as nerve root entrapment in the lumbar vertebrae, spinal cord compression, spinal canal stenosis, fracture of vertebral body, lumbar disc prolapse, malignancy; chronic alcoholics or use of alcohol in 24 hours preceding the test or use of drugs affecting balance;musculoskeletal disorders like osteoarthritis of hip or knee joint in the past 12 months, inflammatory disorders of hip, history of fracture in the hip joint and lower limbs, rheumatic diseases; vestibular dysfunctions and significant impairments in visual acuity; worsening of the symptoms or otherwise unwell at the time of test; those who did not give consent.

Procedure and key outcome measures

An initial examination including demographic data and anthropometric variables such as BMI, limb length and leg dominance was carried out prior to the study. They participated in assessment of static and dynamic stability using One Leg Stand Test (OLST) and Y Balance Test – Lower Quarter (YBT-LQ) respectively. In order to rule out the influence of shoes, the tests were performed barefoot. Functional disability was assessed using the modified Oswestry Disability Index (mODI).

One Leg Stand Test: The test was performed bilaterally on a flat surface with eyes open (EO) and eyes closed (EC). The participant was asked to stand unassisted on one leg with both hands held at the iliac crest.[15] Time was recorded in seconds (s) using a stopwatch from the time one foot was flexed off the floor to the time it touched the ground again or when the hands left the hips. Timing was stopped at 60s (EO) or 30s (EC). The test was performed with three trails on each side and the longest time in each condition was noted. An average of the right and left lower limbs in both conditions viz. EO and EC was used for further analysis.

The Y Balance Test – Lower Quarter: The participants performed the YBT-LQ in the anterior, posterolateral and posteromedial directions.[16-18]During the test, both hands were held at the iliac crest. One leg was used as the stance limb, with the distal most part of the great toe set at the intersection of the three measuring tapes taped to on the floor. While they maintained the single-leg stance, they were to use the opposite leg to reach on the line along the respective directions, touch the ground at the farthest point possible with the distal most part of the great toe and return to the starting position. After three practice trials, the subjects were asked to rest for two minutes and thereafter perform three test trials in each direction. At each test trial, the order of the reaching directions was randomized. If a subject failed to maintain the stance leg or in returning the reaching foot to the starting position, the test was discarded and

repeated over again. In each direction, the longest reach distance was noted and an average of the right and left lower limbs was used for further analysis. To exclude the influence of limb length, it was normalized with the reach distances of the subject.[19,20] The limb length was measured from the anterior superior iliac spine to the center of the ipsilateral medial malleolus.[20]The composite score was calculated using the formula: {sum of three directions/(limb length*3)*100}.[16]An average of the bilateral composite scores was used for analysis.

Modified Oswestry Disability Index: It is a self-administered questionnaire consisting of 10 items that was used to assess disability regarding daily activities related to: pain intensity, personal care, lifting, walking, travelling, sitting, standing, sleeping, social life and employment.[17,18] Each question was scored on a scale of 0-5 and the total score was expressed as percentage. A higher score indicated greater disability.

Sample size and Sampling

A sample size was estimated with 95% confidence level and 80% test power based on the parameters of Alemo et al.where the prevalence of CLBP was 25.16%.[23] This showed that the ideal sample size for the study would be 76. The study subjects were recruited using convenience sampling on the basis of the inclusion and exclusion criteria.

Data Analysis

Statistical package SPSS (IBM SPSS Statistics for Windows, ver. 21.0. Armonk, NY: IBM Corp.) was used to analyze the data. Demographic data and descriptive characteristics of the outcome measures were presented as Mean and Standard Deviation (SD). Correlation between mODI, two conditions of OLST (EO and EC), YBT-LQ composite scores and reach distance in each direction was analysed using the Karl Pearson correlation coefficient (r value). Statistical significance was inferred at $p < 0.05$.

Results and Discussion

Out of 108 subjects that were initially screened for the study, 24 subjects did not meet the inclusion criteria. Then, 84 subjects were recruited in the study, out of which 4 dropped out due to personal reasons. Finally, data collected from 80patients was subjected to statistical analysis. The mean age and BMI of the participants was 44.64 ± 1.27 years and 26.93 ± 1.48 kg/m^2 respectively. The descriptive statistics of the primary outcome measures are described in Table 1.

A negative correlation was found between mODI and OLST (EC) which was statistically significant ($p<0.05$; Table 2), suggesting that as the disability related to back pain increased the participant had increased difficulty in maintaining static posture with eyes closed. Fayez et al. reported similar findings stating that there was a significant decrease in postural stability in the absence of visual feedback in patients with back pain compared to that of normal subjects.[24]A few studies do not report notable impairments in static balance in individuals with CLBP, however, they suggest that the subject may present with greater sway when subjected to challenging postures such as standing with their eyes closed.[25,26] On the other hand, we found no statistical significance in the correlation between mODI and OLST (EO). These findings are consistent with those ofBrech et al. who did not present any relationship of Single-leg tests with pain or degree of disability.[27]This in general, may suggest that the maintenance of static posture may be automatic and may not require much attention in patients with CLBP.

The scores of mODI were found to have a significant negative correlation between YBT-LQ composite scores and reach distances in the posterolateral and posteromedial directions ($p<0.05$; Table 2). Similarly, Bouche et al.found significant increase in postural sway in patients with lumbar discectomycompared with healthy controls especially in unilateral stance.[28] Alternatively, in a systematic review, Ruhe et al. found that there was no correlation between pain intensity and the magnitude of excursion from the centre of pressure in back pain.[29]We also found a negative correlation between mODI and YBT-LQ anterior reach distance,

however, it was not statistically significant (p>0.05). As it is reported that dorsiflexion range influences the anterior direction to a greater extent than posterior directions, it is probable that the anterior direction is more sensitive to changes affected by distal segments rather than proximal segments such as the low back or hip.[20]On the other hand, trunk muscles are recruited and adjusted maintaining the trunk in position during the posterolateral and posteromedial directions.[30] Eccentric muscle contraction of the erector spinae, multifidus and hamstrings is essential to maintain balance as the trunk leans forward in the YBT-LQ position which may be deficient in individuals with CLBP.[31,32] Also, activity of the external oblique is crucial while performing trunk rotation in the posteromedial direction.[19]

There are few limitations of the present study, especially with regard to limited sample size and the outcome measures used. With regards to the limitations in sample size, although the incidence of chronic low back pain is high, its multifactorial nature makes it difficult to demarcate a homogenous group. The YBT-LQ is not considered to be the gold standard for assessing postural balance, but it is cost effective and can be easily replicated in a rural clinical set up. In addition, it is capable of assessing functional balance, thereby reproducing activities of daily living. Considering the results encountered, new studies should be performed using assessment methods of greater specificity, including the use of a force platform.

Table 1: Descriptive characteristics of outcome measures

Outcome Measure	N	Minimum	Maximum	Mean ± SD
OLST - EO (s)	80	23.42	42.73	32.63 ± 6.58
OLST – EC(s)	80	13.13	30.00	17.81 ± 2.03
YBT-LQ Composite Score (cms)	80	54	93	79.65 ± 8.62
YBT-LQ Anterior (cms)	80	33	68	53.98 ± 3.37
YBT-LQ Posterolateral (cms)	80	36	84	62.19 ± 10.88
YBT-LQ Posteromedial (cms)	80	41	85	60.03 ± 11.18
mODI (%)	80	21.03	45.51	43.76 ± 5.05

N= Number of participants; SD= Standard Deviation; OLST= One Leg Stand Test; EO= Eyes Open; EC= Eyes Closed; YBT-LQ= Y Balance Test- Lower Quarter; mODI= modified Oswestry Disability Index

Table 2.Karl Pearson Correlation between outcome measures

Outcome Measures			r value	p value
mODI	OLST	EO	-0.532	0.161
		EC	-0.721	0.020*
	YBT-LQ	Composite score	-0.865	0.011*
		Anterior	-0.518	0.109
		Posterolateral	-0.815	0.021*
		Posteromedial	-0.832	0.022*

*Correlation significant at the 0.05 level (2 tailed); r value= Karl Pearson correlation coefficient; p value= Level of Significance;
OLST= One Leg Stand Test; EO= Eyes Open; EC= Eyes Closed; YBT-LQ= Y Balance Test- Lower Quarter; mODI= modified Oswestry Disability Index

Conclusion

Postural stability decreases with an increase in the disability associated with CLBP, especially static balance with eyes closed and dynamic balance in the posteromedial and posterolateral directions. Therefore, balance assessment and training should be made part of rehabilitation regimes in order to alleviate the disability associated with the CLBP.

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Conflict of Interest: None

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Original Study

Relationship between Core Strength, Core Endurance and Balance in Folk Dancers – A Pilot Study

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Abstract

Background: Dance performance requires lower extremity muscle strength and endurance, sufficient core stabilization, dynamic balance during dance movements. Diminished core strength and core endurance has been shown lead to a higher incidence of lower extremity injuries and to low back injuries. Greater core muscle strength, increased core endurance and good dynamic balance have been reported to be associated with reduced lower extremity injury risk. Still, the exact relationships among these factors remain unclear. Most of studies have examined ballet and modern dancers but folk dance is not studied adequately in the literature as different genres of dance have different physical demands, it is important to examine whether the relationships among Core stability, balance, injuries, and performance are similar across the various dance genres.

Objectives: Weak core and poor balance are said to be associated with lower limb and low back injuries. Thus the correlation between core stabilization and balance need to be evaluated in details to reduce the risk of injuries.

Methods: It is a cross-sectional observational study, with a total of 30 folk dancers. Core endurance was measured by using plank tests and core strength was measured by the Bent Knee Lowering Test (BKLT).Balance was measured via the Star Excursion Balance Test (SEBT) which was co-related with core strength and core endurance.

Conclusion: There is no correlation between core strength and balance in folk dancers. Core endurance is weakly correlated with balance.

Keywords: *Core strength, Bent knee lowering test, core endurance, plank test ,balance, Star excursion balance test*

Introduction

Folk dances are dances that are developed by people that reflect the life of the people of a certain country or region.[1] Among activities in the realm of sports, dance is typically not included. Nonetheless, dancers are clearly athletes in the degree to which they require sophisticated physical capacities to perform at a high level.[2].

In dance, as in any athletic activity, injuries are prevalent. However, as is also true in traditional sports, the prevention of injury is preferable to the management of injury.[2]Dancers reportedly have a 90% lifetime injury incidence rate with around 70%

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of all dance-related injuries occurring in the lower extremity (LE).[3-5]

Dancers are expected to perform a diverse repertoire of techniques. Each technical skill requires significant motor control, particularly of the extremities, but also spinal stability provided by the trunk musculature hereafter referred to as the core.[6]

The core has been described as a box with the abdominals in the front, paraspinals and gluteus in the back, the diaphragm as the roof, and the pelvic floor and hip girdle musculature as the bottom (Richardson et al., 1999).[7]The term of core strength refers to the strength of these muscles; Core strength (CS) is considered important because it provides proximal stability for distal mobility during athletic tasks.[8] Core endurance is the ability of these muscles to perform repeated contractions over a prolonged time. The core musculature is important for stabilizing the spine during movement, and can influence lower extremity injury risk.[9,10]

The trunk muscles appear to fire in anticipation of lower extremity muscle contraction this suggests the importance of optimal core function as the aesthetics of dance are intimately dependent on precise control of both the trunk and extremities.[10]

With respect to the relationship between core stability and injury, several studies have found an association between a decreased stability and a higher risk of sustaining a low back or knee injury. Subjects with such injuries have been shown to demonstrate impaired postural control, delayed muscle reflex responses following sudden trunk unloading and abnormal trunk muscle recruitment patterns. In addition, various relationships have been demonstrated between core stability, balance performance and activation characteristics of the trunk muscles. Most importantly, a significant correlation was found between poor balance performance in a sitting balance task and delayed firing of the trunk muscles during sudden perturbation.[11]

Balance and neuromuscular stability deficits also increase lower extremity injury risk.[9]. Balance is the ability to maintain postural stability while standing on one leg and performing a reach with the other leg as described when performing the Star Excursion Balance Test (SEBT).[12,13]The Star Excursion Balance Tests (SEBTs) may offer a simple, reliable, low-cost alternative to more sophisticated instrumented methods that are currently available. Poor SEBT performance can predict increased lower extremity injury risk.[14]

Generally, previous researchers note that individuals with worse balance have a greater lower extremity injury risk than those with better balance, and that improved balance decreases lower extremity injury risk. In general, greater core muscle strength, core endurance and better balance is related to decreased lower extremity injury risk.[14, 15]

Materials and Methods

Study design: Cross-sectional observational study

Participants:

The approval of the institutional ethics committee was taken for carrying out the study.

The participants were screened based on the inclusion and exclusion criteria and then included in the study. A written informed consent was taken from all the participants.

Inclusion criteria:	Exclusion criteria:
Voluntary consent to participate. Both male and female dancers ages between 18-30 years. Dancers with dancing experience of more than 10 years	Lower extremity injury Any neurological or musculoskeletal condition affecting their mobility or balance Hypermobility

Outcome Measures

1. Core strength was assessed by using pressure biofeedback unit.

2. Plank test was used to assess core endurance.

3. Star excursion balance test was used for assessing balance.

Assessment:

Balance

Balance was measured via the Star Excursion Balance Test (SEBT) – and specifically – the Y-balance components of the test using previously published methods.[16] The test required participants to first assume a single-leg stance, and then maximally reach along marked lines using the other leg while keeping the stance leg stable at the center of a grid, and then return the reach leg back to the center without losing balance.[13,17]For this study, participants performed reaches in three reach directions: (a) anterior (b) posterolateral, and (c) posteromedial (Figure 1a, 1b and and1c) in that order. The same investigator taught all participants to perform the test using both verbal instruction and demonstration, and participants were allowed three practice trials in each direction before actual test performance.[16] Participants first performed right leg and then left leg reaches, three times each. Participants took a 15-second rest interval between each trial in the same direction and on the same leg, and a one-minute rest interval when changing feet and among different directions.[16] .A trial was not counted and asked the participant to repeat it if: (a) the participant was unable to maintain single leg stance, (b) the heel of the participants' stance foot did not remain in contact with the floor, (c) the participants' weight shifted onto the reach foot, or (d) the participant did not maintain start and return positions each for one second. The reach distances for the three trials in each direction were averaged and normalized to % leg length (LL). LL was measured from the anterior superior iliac spine to the medial malleolus.[18] SEBT scores were combined across all directions bilaterally and this composite score was used for analyses.

Figure 1a. Anterior Reach

Figure 1b. Posterolateral Reach

Cont... Figure 1

Figure 1c Posteromedial Reach

Core Endurance

Core endurance was measured using plank tests in three positions: anterior , right and left lateral using procedures described in prior literature. [16,19] Participants first performed a single practice trial for a few seconds to confirm that they were able to successfully attain the test position. Then participants performed one recorded test trial. The maximum time (seconds) that the participants were able to hold and maintain the correct test position was recorded. The same examiner visually determined the end of all tests. The average score of three tests was used for analyses.

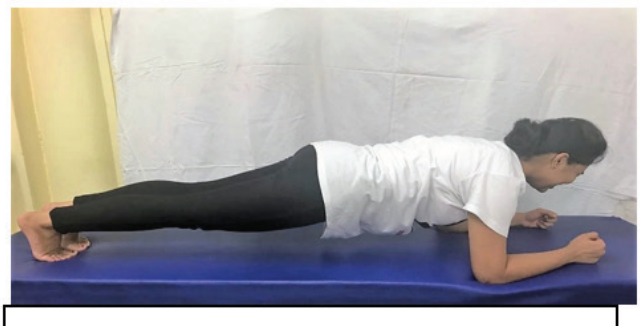


Figure 2a. Anterior plank test: Participants assumed a push-up posture in the down position: legs together, lower leg in contact with a mat with ankles plantar-flexed, back straight, hands shoulder width apart, head up. Time recording was stopped when any segment of the participants' body did not remain parallel to the floor.[24]

Figure 2b. Left lateral plank test: Participants placed their feet one on top of the other, their right arm perpendicular to the floor, with the elbow resting on the mat and the left arm across the chest with the left hand on the right shoulder. The time point when the participants could not maintain a straight line between the trunk or lower body (thigh or shank) segments on visual observation was recorded by the investigator. [21]

Figure 2c. Right lateral plank test: Participants used a similar position like left lateral plank with the left arm perpendicular to the floor.

The Bent Knee Lowering Test (BKLT)

Participants were positioned supine with the knees and hips flexed to 90 degrees, as measured by a goniometer .[20] A pressure biofeedback cuff was inflated to 40 mm Hg, and the center of the device was placed under the (Lumbar) L4–L5 segment. [20] Participants performed an abdominal hollowing maneuver while maintaining consistent 40 mm Hg pressure. To perform abdominal hollowing portion of the test, participants were positioned supine with knees bent to 45 degrees (Figure 3a). The center of the pressure cuff was placed under the lumbar lordosis at the L 4/5 segment and inflated to 40 mm Hg. Participants were instructed to draw the lower abdomen towards the spine, so as to hollow the abdomen.[20] If performed correctly, the pressure stayed at 40 mm Hg and the same examiner could felt tension at a point 2 cm medial and inferior to the anterior superior iliac spine (ASIS). Participants were then recued on how to properly perform the hallowing technique. Once participants were able to perform the abdominal hollowing maneuver, they were then instructed in the bent knee-lowering portion of the test (Figure 3b). In the bent knee lowering portion of the test, participants lowered their legs toward the bed until the investigator noted a visual change on the pressure cuff monitor indicating a change in pelvic position.[21]The hip angle (in degrees) was measured at this point. The strength scoring scale for the BKLT is presented in Table 1. Participants were given two practice trials prior to the three test trials. The best score from the three test trials was recorded for data analyses. A single examiner gave all participants verbal and visual instruction on the BKLT prior to testing.

Table 1: Strength Scoring Scale for the Bent Knee Lowering Test.

Grade	Description
Normal (5)	Able to reach 0-15 degrees from table before pelvis tilts
Good (4)	Able to reach 16-45 degrees from table before pelvis tilts
Fair (3)	Able to reach 46-75 degrees from table before pelvis tilts
Poor (2)	Able to reach 76-90 degrees from table before pelvis tilts
Trace (1)	Unable to hold the pelvis in neutral

Data Analysis:

1. Data was analyzed using the Graph pad prism 7 software.

2. Descriptive analysis of the data was done.

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

4. Correlation of core strength and core endurance with balance was found out by using Spearman correlation test.

Findings:

1. The total number of subjects that participated in the study was 30. Out of which 53% subjects were males and 47% subjects were females.

2. The participants' age group was between 18-30 years old and mean age was 25.7 ± 3.5.

3. Descriptive analysis for all the tested outcome variables was done.

4. The core strength was measured by using BKLT and the mean found out was 57.23 ±15.8

5. The core endurance was measured by using plank test which has 3 components: anterior, right lateral, left lateral.

6. The mean of anterior plank was 28.7 ±13, right lateral was 18.3 ±12.9, left lateral was 17.1 ±13. the average of all the three components was found to be 21.3 ±11.8.

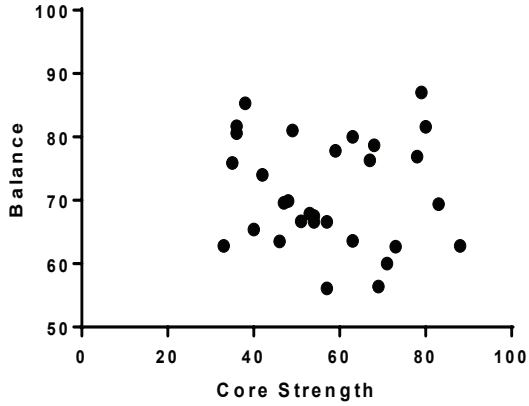
7. Balance was assessed using Y component of SEBT. It has three reaches: anterior, posteromedial and posterolateral.

8. The mean of right side anterior reach was 74.1 ±8.8, left anterior was 71.6 ±10.5. The mean of right side posteromedial reach was 69.2 ±9.1, left posteromedial was 68 ±11.2. The mean of right side posterolateral reach was 71.4 ±10.3, left posterolateral was 71.1 ±9.6.

9. The composite mean of right side was 71.2 ±8.2 and left side was 70.1 ±8.6. The mean of overall SEBT found was 71.1 ±8.6.

10. Spearman correlation test was used to analysis the correlation of core strength with balance. The result showed that there is no correlation between core strength and balance. r value was -0.1180 and p value (0.5346) is not significant at 95% confidence interval.

11. The correlation between core endurance with balance was analysed by using Spearman correlation test. The result showed weak positive correlation between core endurance and balance. r value was 0.3136 and p value (0.0915) is not significant.



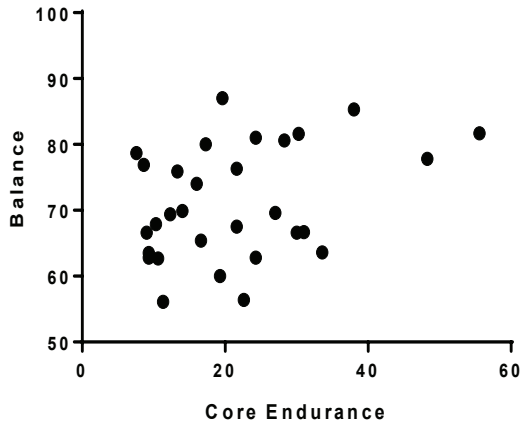


Figure 4 **Figure 5**

Discussion

Core Strength and Balance:

Theoretically, the greater the core musculature

strength and endurance, the less the body has to compensate to maintain stability during perturbations and movement.[11] In this study, no correlation between core strength and balance were found. The study findings are in agreement with study done by Gordon et al. which found that there is no correlation between CS and balance. Nesser and Lee (2009) did not identify a significant relationship between core strength and explosive performance tests such as agility or sprinting. Agility has been defined as the ability to maintain a controlled body position and rapidly change directions without loss of balance (Raya et al., 2013; Young and Farrow, 2006).One possible explanation is the actual role and contribution of TA as part of the CS.

The BKLT incorporates the abdominal hollowing maneuver in order to measure core strength using the lower abdominal musculature. [20] Specifically, and as utilized during the BKLT, the abdominal hollowing maneuver is the most typical maneuver used to activate the TA muscle.[22,23] Alternatively, abdominal bracing and pelvic tilt activates the rectus abdominis and external oblique muscles in conjunction with the TA.[21]Further, abdominal hollowing has been shown to demonstrate the least amount of global muscle involvement, as compared to bracing and pelvic tilt.[21] Involvement of other core muscles (external oblique, internal oblique, rectus abdominis muscles) may have influences on BKLT scores. It appears that future research is needed to specifically delineate the roles of TA and its contribution to core strength and lower extremity mechanics.

Core Muscle Endurance and Balance

The study participants' side plank core endurance scores were right= 18.3 ± 12.9, left = 17.1± 13.The anterior core endurance scores were 28.7± 13 s. The dance participants core endurance scores had large standard deviations, possibly due to the nature of the tests that allowed participants to use different strategies to maintain test positions. In current study, weak correlation (r= 0.3136) was seen between core muscle endurance and balance. Sandrey et al. (2013) found that 6-week core stabilization training resulted in significant increase in three directions of the SEBT (approximately PM 6%, M 12%, and AM 5%) in high school track and field athletes. Type I fibers (slow twitch) are slow to contract and can sustain muscular contraction for longer time.[24] This factor makes them ideal for endurance type of events. All four muscle layers of the anterior abdominal wall contained a mosaic of Type I and Type II fibers. The proportion of Type I and Type II I1 fibers are about equal in all muscle layers. The even distribution of fiber types indicates a functional capacity for both fast contractions and endurance in each muscle layer. There are large differences in fiber type distribution between individuals which indicate differences in performance capacities.(T. Haggmark et al.).

Regardless of the classification scheme used to group muscle fibers, there is overwhelming evidence that muscle fibers and therefore motor units not only change in size in response to demands, but they can also convert from one type to another. This plasticity in contractile and metabolic properties in response to stimuli (eg, training and rehabilitation) allows for adaptation to different functional demands.[24] Dancers have a significantly higher percentage of type I fibers. They have a significantly lower percentage of both type IIA arid IIB fibers than sedentary untrained or moderately trained women. They are similar to endurance-trained female runners also in this respect. Current study showed the positive correlation between core endurance and balance this could be because endurance in dancers can be attributed to conversion of type II (fast) fibers to type I (slow) muscle fibers, slow fibers have less fatigability compared with fast fibers. The correlation was weak this might due to small sample. Further research can be done with a large sample size.

Conculsion

1. The findings suggest that a Transversus abdominis specific core strength measure do not relate to performance on the SEBT in folk dancers.

2. Subjects demonstrated weak positive

correlations between core endurance and SEBT performance.

3. These investigations will help elucidate the interactions between core strength, core endurance, and lower extremity balance, as well as their potential combined effects on lower extremity injury risk.

Conflict of Interest: None

Source of Funding: None

Ethical Clearance:

Ethical Clearance: Taken from Institutional ethics committee, Ethicscommittee for Academic Research Project.(ECARP)

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Original Article

Comparison of Single Task and Dual Task Balance Training on the Quality of Life of Elderly with Balance Impairment

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Abstract

Background: Aging is the decline in efficiency of various physiological processes which is continues and irreversible. The age related changes affect maintenance of balance control in steady state balance, reactive balance and anticipatory balance. The purpose of the study was to find out the effectiveness of single task and dual task balance training in improving the quality of life among elderly with impaired balance.

Objectives: To compare the effectiveness of single and dual task training in improving the quality of life of elderly with balance impairment and to compare the single and dual task balance training in elderly with impaired balance

Study Design: Pre-post experimental study design

Method Thirty-four elderly adults with impaired balance were assigned into two groups, one group underwent single task training and other dual task training of about 4 weeks. Baseline measurement were taken pre and post training by using TUG, BBS and SF-36.

Results: Dual task training was more effective in improving quality of life and balance in elder adults with impaired balance than the single task training. The TUG scores showed improvement in both the groups. The group which performed dual task training showed significant difference from pre to post measure that with mean 0.51(p=0.005). The single task training group showed an improvement of mean 0.337(p=0.069). The SF-36 score showed significant improvement in both the groups except certain components.

Conclusion: Dual task training improves quality of life and balance in elderly adults with impaired balance than single task training.

Key Words : *Elderly, Single Task, Dual Task, Tug, Bbs, Sf-36, Impaired Balance.*

Introduction

Aging can be defined as a biological reality, which has its own dynamic, beyond human control. In the developed world, chorological age plays a chief role where the age of 60 and above are roughly considered equivalent to the age of retirement as well called as the beginning of old age. [1]

Other social defined aging considered accompanying the loss of roles and physical decline in an individual. Thus many developing countries termed old age as the point when active contribution is no longer possible. Classification of aging varied

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between countries and overtime. [1]

Aging affects all physiological processes which are usually irreversible changes over by 3rd and 4th decades of life.[2] The physiological changes in avoidance with aging shows changes in different organ systems.[3] Thus the process of aging is associated with a decline in the integrity of many physiological systems. When comparing with young healthy subjects there will be age related neurodegenerative changes within neuromuscular control and reduced resolution of sensory inputs resulting in sensory signals which are contaminated with greater noise and physiological delays. Thus due to aging there will be decline in postural stability as well, which is due to the increasing deficits in the control system including lower sensitivity of sensory inputs central processing will be slow and decreased motor control output power. These lead to compensatory modification of the control like functional adaptations to somatosensory and vestibular loss. [3]

Thus the selection of a balance recovery program depends on many factors such as the availability of sensory information as well as environmental and physiological context. Approximately 30% of elderly people sustain a fall each year.

As being 60years of age or older is defined as elderly[2] where geriatrics were specially focused on elderly people's health care.

India is the second most populous country in the world which has 76.6 million people at or over the age 60, which constitutes above 7.7% of total population. Thus India has second largest number of elderly in the world. In India the elderly population is expected to increase from 77 million in 2001 to 179 million in 2031 and further to 301million in 2051. Thus proportions are to reach 12% in 2031 and at 2051 it will be 17%. It is estimated that the prevalence of fall in India is 14-53%, which is a common cause of morbidity and mortality among the elderly. About 20% have risk of fall at age of 60 and above in a year and 35% per year among those 75 and older.[1]

Falls are considered one of the major problems among all the age groups considering the medical and psychological problems. Falls is defined as the inadvertently coming to rest on the ground, the floor or other lower level excluding intentional change to rest in furniture, wall or other objects.

The major cause of morbidity and mortality in elderly are the recurrent falls and are features of poor physical and cognitive status. Intrinsic factors including medication use, postural instability neuro cardio vascular instability and dementia are the cause of increased fall risk in elderly. Several studies have been done on both home living and institutionalised population to define risk factors associated with falls. The extrinsic factors were poor lighting, slippery surface and inappropriate furniture.[4]

Balance control is the foundation of a person's ability to move and function independently. Balance control has been defined as the ability to maintain the body's centre of mass within the base of support. Maintaining balance involves sensory detections of positional changes through sensory inputs, integration of sensory motor information within the central nervous system and execution of appropriate musculoskeletal responses. The deterioration of their systems with aging can lead to balance impairment and falls.[5]

The age related changes affect maintenance of balance control in steady state balance [i.e. the ability to provide background postural tone and remain balanced during quiet stance], reactive balance [i.e. the ability to recover from an unexpected perturbation to balance] and anticipatory balance [i.e. the ability to anticipate and minimize instability associated with performance of tasks].[5]

It has been suggested that age related impairment of different sensory systems and an impaired ability to detriation of the proprioceptive system and ankle muscles weakness can delay the reactive postural responses. In addition, age related changes in the visual system leads to a reduced ability to use visual information to alter gait patterns in anticipating of

upcoming obstacles in the walking path.[5]

The control of balance, whether in static or dynamic conditions, is an essential requirement for daily activity. It has been long known that postural control is sub served by neural pathways of spinal and supra spinal levels that constitutes reflexes and synergies. These reflexes and synergies form the basis for a fast response to body perturbations generate hip abductors and hip adductors torque are responsible for the observed lateral sway during quiet stance.[5]

Health issues of older people have recently been emphasized owing to the rapid aging of society. Limited exercise capacity, reduced vital capacity, poor muscular strength, restricted flexibility, decreased bone mass and glucose intolerance manifest during the aging process. These physiological changes lead to loss of physical function and dependence on assistance in performing activities of daily living, requiring hospitalization or extended hospital stays and reducing longevity. This transitional state is called frailty and may negatively impact physical, psychological and social functions. The complex interactions between the dimensions of frailty cause poor quality of life.[6,7]

Exercise is a key intervention for improving physical functions in older adults. Exercise slows down the physiological changes associated with aging, promotes cognitive health and complements the management of chronic disease in the older adults. Exercise is beneficial in improving physical functions. Exercise not only reduces fall rate but also slows down deterioration in the ability to perform ADLs and maintain QOL.[7]

Single task training involves practicing functional tasks requiring balance (example: standing, walking, transfer) in isolation. In previous researches, the therapist may vhary the condition to increase the challenge to balance during performance under which the subject practices for example: changing the availability of sensory cues [reduce visual cues by asking the participants to close your eyes] or support surface conditions [example: walking on a flat surface versus an inclined surface].[8]

In dual task method, the individuals have to perform two tasks simultaneously, which includes cognitive task and postural control and vice versa. It has been shown that the ability to maintain postural stability is reduced when performing two or more task and thus deficits is increased in elderly population with balance impairment.[8] Dual-task experiments show alterations in the performance of the postural task, the cognitive task, or both tasks. In other words, the demands of controlling postural tasks can lead to a reduction in the capacity to perform a concurrent attention ally demanding cognitive task. Reciprocal effects of cognitive tasks on the postural tasks have also been observed. For example, a significant change in gait parameters (e.g. a significant increase of double-support time) was seen when a memory task and a fine motor task were executed concurrently during walking.[5]

The BBS is a widely used clinical test of a person's static and dynamic abilities. For functional balance test, the BBS is generally considered to be gold standard. The TUG is used to measure the mobility, balance to evaluate functional walking ability. Three studies have reported there is excellent inter rater reliability for TUG.[5,9]

The Mini Mental State Examination (MMSE) is a tool that can be used to systematically and thoroughly assess mental status. The MMSE is effective as a screening tool for cognitive impairment with older, community dwelling, hospitalized and institutionalized adults.[6]

The SF-36 is a widely used questionnaire for measuring self-reported physical and mental health status. The item and scale-level statistical analyses supported that SF-36 has validity and reliability to use in India.[9,10]

Earlier studies have shown that there is significant improvement in balance after the single task balance training. According to the task automatization hypothesis, practicing only one task at a time (single

task training) allows participants to automatize the performance of individual tasks. As a result, the processing demand required to perform the tasks is decreased, leading to more rapid development of skills.

The previous studies about dual task training reports that there is significant change in balance from pre to post intervention. The dual task balance condition training program was found to be more effective in improving balance in older adults with balance impairment. It could be based on task co-ordination and management theory proposed by Kramer et al. According to this theory practicing two tasks together (not a single task practice) allows participants to develop task co-ordination skills.[8,11]and possible explanation of this outcome is that the efficient integration and co-ordination between the two tasks acquired during dual task training is crucial for improving dual task performance.

Even though both the single task and dual task training programs were equally effective at improving balance and walking performance under single task conditions, dual task training programs were superior to single task training in improving walking under dual task contexts. However, a study by Patima et al suggest that only the participants in single task balance training group increased their self-reported confidence when performing ADLs. One possible explanation for their finding is that the activities (balance +cognitive) given to the participants in dual task training groups were much more difficult than the tasks (only balance tasks) given to the participants in the single task training group.[8,11]

As a result, the balance skills of participants in the dual task training groups were continually challenged and this may have resulted in a reduced confidence in performing daily tasks. Balance improvement is a major contributor to falls in adults and a growing body of evidence has confirmed the importance of cognitive factor impaired balance among older adults. Many reports have shown that some form of physical training is associated with greater functional independence and fewer falls.[12]

Balance training is an essential part of any fitness plan. Balance training makes the body aware of its orientation in a given space. Training also allows the body to move more fluidly and reduce the risk of falling significantly. When training for balance, the whole body must work together which will improve coordination, stability of joints and also improve the reaction time which prevents injuries.

There was a study done in India to find out the effectiveness of single and dual task balance training to improve the balance, but there is no study conducted to find out the effect of single task and dual task training in improving the quality of life. The result of this study would implicate a better exercise programs for the elderly population and can help the older adults to age gracefully and enjoy a fall free excellent quality of life and thereby reduce the morbidity rate in elderly. Therefore, the purpose of the study was to find out the effectiveness of single task and dual task balance training in improving the quality of life among elderly with impaired balance.

METHODOLOGY

STUDY DESIGN: This study was pre-post experimental study design which intends to find the effect of dual task and single task training on balance and quality of life in elderly.

Source of Data: Geriatric centre

Sample Method: Convenience sampling

Sample Size: Based on SD in group 1 (1.88)4 and SD in group 3 (1.74)4 with mean difference 2. If its size is 1.104, α error 5%, power 90%, for 2 sided hypothesis sample size per group is 17 (in each group), that is the total sample size is 34. 15

Method of Data Collection: Participants were recruited from various home care facilities, those who having balance impairments. Participants who fulfilled the inclusion criteria and were ready to attend exercise programs regularly were selected.

Intervention

A consent form was given to all the participants who fulfilled the inclusion criteria. All the participants were assessed with:

1. BBS to measure balance
2. TUG to measure the mobility and balance
3. SF-36 to measure the quality of life

The pre and post assessment of the above scales was taken, and then all participants received 45minute individualized training sessions, 3 times a week for 4 weeks.

The participants were divided into two groups A and B. Group A received single task balance training and Group B received dual task balance training (with fixed priority). The single task involves practicing functional tasks requiring balance such as standing with the eyes opened or closed simultaneously, walking in straight line and in uneven surface, transferring from bed to chair simultaneously.

The dual task training group received the same set of balance task as single task training group, while simultaneously performed cognitive tasks. The dual task involves reading while standing on single leg, carrying a cup of water while walking, calculating while walking, recollecting the words while walking and complete the proverbs while walking. The cognitive tasks included were calculation, recollecting the words, making of sentences etc. The participants in this group were instructed to maintain attention on both postural and cognitive task at all times.

Procedure

The study was conducted among the healthy elder adults in the Ollavanahalli, old age home, Mangalore. Prior to participation, the participants were explained about the study and an informed consent was taken from the participant. Participant were screened for the inclusion and exclusion criteria and those who fulfilled the criteria were included in the study.

The participants were divided into two equal groups. First group (group A) was trained with the single task balance programs and the second group (group B) was trained with the fixed priority dual task balance training program.

The single task balance training included

1.Tandem standing with eyes open and closed simultaneously for about 10 minutes.

2.Transfering from one chair to another chair simultaneously.

3.Walking with a reduced base of support.

4.Single leg standing on alternate legs for about 8 minutes.

The dual task within fixed priority training included

1.Semi tandem standing with eyes open and arm alteration along with spelling out words of object in front.

2.Semi tandem standing with eyes closed and arm alteration commented by the trainer.

3.Semi tandem walking with counting the numbers backward from 10 to 1

4.Single leg standing with counting the numbers backward from 10 to 1

5.Backward walking along with counting the numbers backward.

Figure 1: The single task, transferring from one chair to another chair simultaneously.

Figure 3 Semi standing with eyes open

Figure 3 Semi standing with eyes open

Outcome Measures

BBS to measure the balance

TUG to measure the mobility and balance

SF-36 to measure the quality of life

Inclusion Criteria

1. Subjects with age of 60 years or above

2. Subjects with history of one fall within the previous year

3. Independent ambulatory with ability to walk 10m without assistance

4. Subject who scored greater 24 on MMSE

5. Subject with score less than 52 on BBS

6. Subjects willingness to do physical exercise in 4 weeks with regular attendance

Exclusion Criteria

1. History of any other severe neurological, musculoskeletal and cardiovascular conditions that affect balance

2. Any history of dizziness, depression

3. Any uncorrected severe visual and hearing impairment which will affect balance

Materials and Tools

Stop watch, chair [with and without arm rest], paper and pencil, certain familiar objects

Results

Statistical analysis was done using SPSS IBM version 22. The descriptive statistics were reported as mean (SD) for continuous variables and frequency (%) for categorical variables.

The paired t test (unpaired and paired) was used to analyse the data. A 'P- value' ≤ 0.05 was considered statistically significant.

Table 1 data of participants mean age and gender details

	Group	N	Mean	Std. Deviation
AGE	Dual task (GROUP B)	17	65.88	3.887
	Single task (GROUP A)	17	68.47	6.053

Table 2 group A and B sex cross tabulation

			SEX			Total
			F		M	
Group	Dual task (GROUP B)	Count % within group	11 64.7%		6 35.3%	17 100.0%
	Single task (GROUP A)	Count % within group	13 76.5%		4 23.5%	17 100.0%
Total		Count	24		10	34
		% within group	70.6%		29.4%	100.0%

Pre and post intervention of TUG scores:

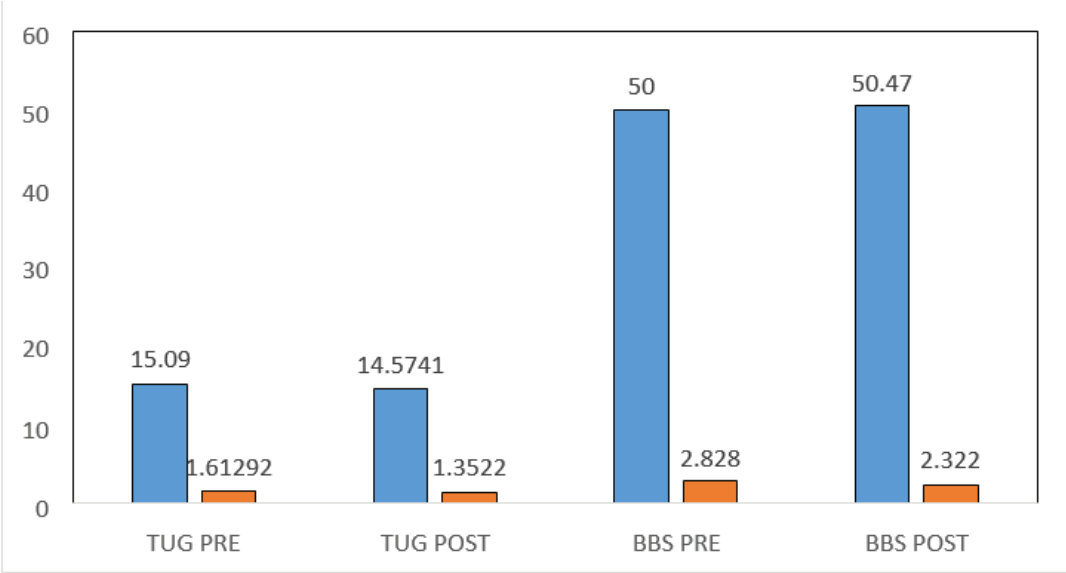


Figure 1: data of pre and post TUG and BBS of dual task

The TUG scores showed improvement in both the groups. In which the group performed dual task [figure 4] programme showed significant difference from pre to post measure that about mean 0.51(p=0.005). The single task [figure 5] training group showed an improvement of mean 0.337(p=0.069).

Pre and post intervention of BBS:

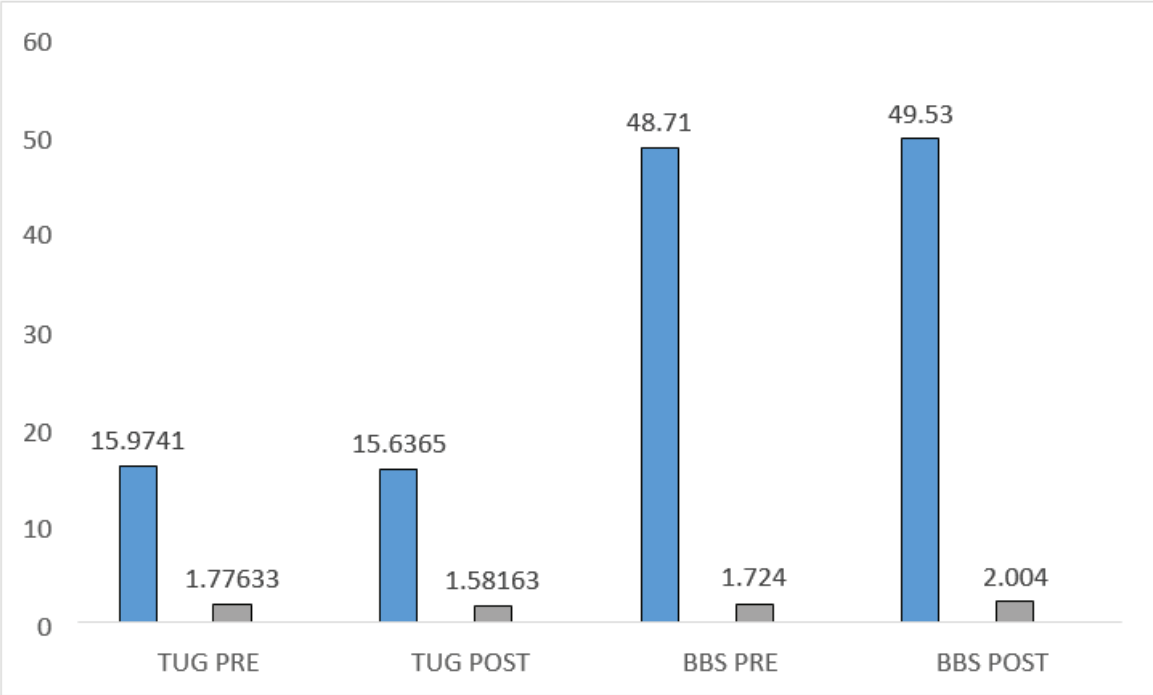


Figure 2: data of pre and post of TUG and BBS of single task group

The results of BBS showed that there is improvement in balance under both training groups in which single task training group showed significant improvement after the training. The dual task programme group showed an improvement of mean 0.47(p=0.149), whereas the single task group showed significant improvement in balance from pre to post intervention, the mean of BBS pre to post was 0.82(p=0.001).

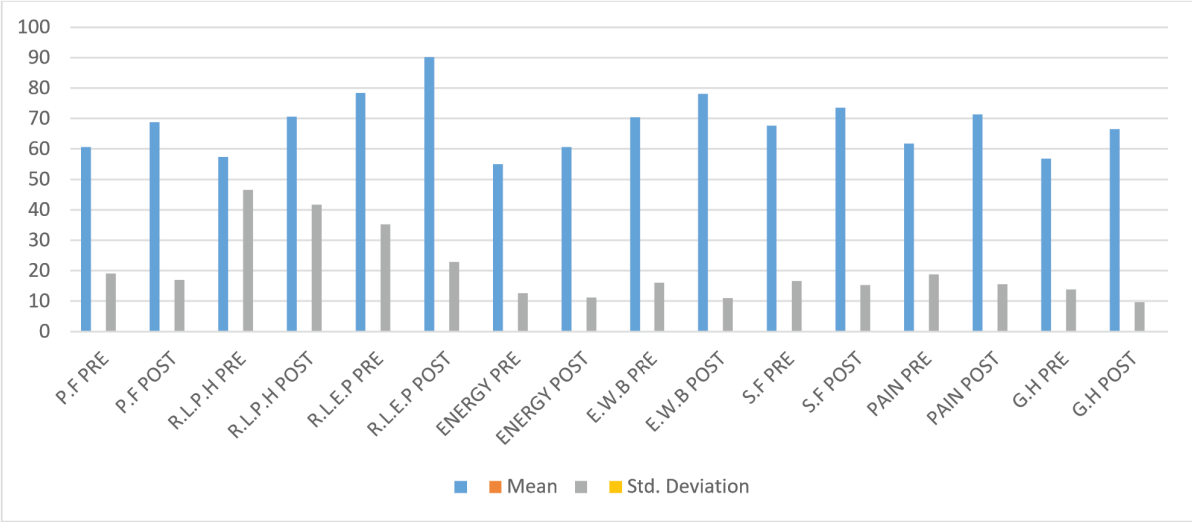
Pre and post intervention scores of SF-36

Both the group showed significant improvement after the intervention. The 8 components of SF-36 were:

1. Physical functioning (P.F)
2. Role of limitation due to physical health (R.L.P.H)
3. Role of limitation due to emotional health (R.L.E.P)
4. Energy/ vitality (ENERGY)
5. General health perception (E.W.B)
6. Socail functioning (S.F)
7. Pain (PAIN)
8. General mental health (G.H) *functioning, PAIN, G.H= general mental health*.]

Figure 3 data of pre and post of SF 36 under dual task training

In which the dual task group [figure 6] showed significant difference in 7 components except 1. The physical functioning improved from pre to post intervention with mean 16.176 (p=0.000). The role of limitation due to physical health also showed significant difference from to pre to post intervention. The other components such as vitality [mean



9.11, p=0.001], social functioning (mean 9.5, p=0.001), pain (mean 7.05, p=0.004), general health (mean 13.5, p=0.000) also showed significant improvement after the intervention. Were the role of limitation in emotional health did not show any significant difference (mean 13.7, p=0.110). Thusas per the results the physical functioning and general health of the older adults had showed better improvement after the dual task training.

Figure 4 data of pre and post of SF 36 under single task training

[PRE=Pre value (before the training), POST=Post value (after the training) P.F=Physical functioning, R.L.P.H=Role of limitation due to physical health, R.L.E.P=Role of imitation due to emotional health, ENERGY=Vitality, E.W.B=General health perception, S.F=Social functioning, PAIN, G.H= general mental health.]

The quality of life of single task training group [figure 7] also showed significant difference after the intervention. The physical functioning (mean 8.2, p=0.000), role of limitation due to physical health (mean 13.3. p=0.024), vitality (mean 5.58, p=0.004), general health perception (mean 7.76, p=0.000), social functioning (mean 5.8, p=0.041), pain (mean 9.5, p=0.000), general health (mean 9.7, p=0.001) showed significant difference after the training. But the role of limitation in emotional health did not show any significant difference(p=0.083).

The result showed that both the groups had significant improvement after the intervention program. Both the groups had improved their quality of life and balance. In which dual task group showed faster improvement than the single task group within the 4week training programme

Discussion

This experimental study provides the evidence that an individualized training program is effective in improving quality of life and balance under dual and single task context in older adults with balance impairment. After a 4-week intervention program participants in both the training groups significantly improved performance on TUG and BBS.

Overall the quality of life of both the groups improved in much better way. According to Patima et al there was effective improvement in balance under dual task condition[8] and Syamala et al also states

that the dual task training is more effective in older adults.[14] The overall TUG scores reduced after the intervention in dual task group (15.69 to 14.57) and in single task group (15.97 to 15.63), were dual task training had showed significant improvement in TUG.

The BBS results shows that there was improvement in balance after the training in both the groups in which dual task group had a change from 50 to 50.4 and single task group had a change of about 48.7 to 49.5, even though single task and dual task training program were equally effective at improving balance and quality of life. Whereas single task group showed significant improvement in balance in BBS results. In which the quality of life scores by SF-36 were also showed improvement in older adults after the training in both the groups.

In fact, in this study the participants who received dual task training and single training showed significantly better QOL after the training, whereas dual task group showed much better improvement than single task group. This finding suggest that older adults are able to improve their QOL under dual task conditions only after specific types of training and that training balance under single task conditions may not generalize to balance control during dual task context. The results provide empirical evidence to support other dual-task training studies that have focused on healthy young adults and patients with stroke. Research by Pellecchia et al demonstrated that dual-task training was superior to single-task training in improving dual-task balance performance in healthy young adults (aged 18-46 years).[19] In Pellecchia's study, participants in the single-task training group practiced the balance task (quiet standing on the foam pad) and the cognitive task (counting backward by threes) separately whereas participants in the dual-task training group were required to perform both tasks concurrently. The results showed that postural sway under dual-task conditions (as measured by the total distance travelled by the centre of pressure) decreased after dual-task training. Similarly, work by Yang et al has also shown the positive effect of dual-task training program on balance performance in patients with chronic stroke (aged 45-80years). However, in this current study result and in the Pellecchia's study, the group A received the single-task training but the participants in Yang etaI's group A did not receive any training.

In addition, only motor tasks, not cognitive tasks, were used during training in their study. Participants in the dual-task training group in their study received ball exercise training such as walking while holding a ball, walking while kicking a ball, and walking while bouncing a ball. Thus, it is still unclear whether the type of task (motor vs. cognitive) that is performed concurrently with the balance tasks in the exercise programs affects the type and magnitude of training benefits on dual-task balance performance. None of the studies have examined the effect of dual-task training or the effect of instructional set on dual-task balance performance in the elderly population.

Alternatively, according to the task automatizationhypothesis practicing one task at a time allows individual to automatize the performance of such individualized tasks. Kramer et al also states that efficient improvement on dual-task performance was the result of both automatization of an individual task and the development of task coordination skills.

This study found that it was feasible to implement individualized dual task training combining with a variety of cognitive tasks in community dwelling older adult's people with impaired balance.

We also found that the older adults could in fact adhere to the instructional sets regarding attentional focus. They successfully allocated their attention to the task in which they were instructed. Thus results may generalize to similar older adults with impaired balance, excepting those who with significant neurological and musculoskeletal problems.

Conclusion

The present study concluded that dual task training is more effective in improving quality of life and balance under dual task context in older adults with balance impairment than single task training.

Although in our results we could found that both the training groups showed significant improvement in quality of life, in which dual task with fixed priority showed much improvement than single task training.

Thus, the alternate hypothesis stated in the beginning of the study, that is, Dual task condition balance training acts as better technique from single task balance training in older adults with balance impairment, have been proved.

Ethical Clearance: Taken from Yenepoya University ethics committee

Source of Funding: Self

Conflict of Interest - Nil.

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original article

Efficacy of Physiotherapy on Spinal Mobility Parameters and Pain in Persons with Adolescent and Adult Idiopathic Structural Scoliosis

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Abstract

Background: Scoliosis cause changes in spinal alignment, mobility, flexibility rrecruitment of Para spinal muscles and postural reflex mechanism. Ssubjects might have hump on one side of spine, functional difficulties, and pain in multiple regions of body, change in lung function, nerve compression, dysmenorrhea and constipation in severe curves. Some studies shows mood changes, depression, handicap and social involvement. Gradually it is becoming clear that if good non operative treatment is given, only 1 in 25, or 0.1% cases may require surgery. Hence this study is aimed at effectiveness of physiotherapy on spinal mobility parameters.

Methods: Study was conducted at Nizam's institute of Medical sciences, department of Physiotherapy. 13 adolescent idiopathic scoliotic subjects aged between 12 to 40 years were taken into the study. Subjects had curve specific exercise for 25 weeks. Outcomes measures include 1.spinal mobility (flexion, extension, left bending right bending), 2. Flexibility of pectorals, Iliopsoas and hamstrings on both sides, 3. VAS (Visual analog scale) for pain, 4. Cobb angle for curve measurement.Change in VAS scores were significant (P <0.0001) and mean changes from 5.23 ±1.64 to 1.384 ±0.65 with IQR was from 6-4 to 2-1. Spinal flexion (p value: 0.003) and extension (P-Value: 0.007) showed significant results on Wilcoxon signed rank test. The improvements in Cobb angle was were more at lumbar region than the other areas in this study.

Conclusion: Though there is less curve correction may be up to 2 degrees, rate of progression was reduced. Pain levels reduced along with improvements in flexibility and mobility with exercise program. In conclusion results of this study shows scope for consideration exercise program to improve pain, spinal mobility, Flexibility along with a Cobb angle improvement.

Key words: *Idiopathic Scoliosis, Scoliosis specific exercises, Spinal mobility and flexibility, Spinal curves.*

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Introduction

Hippocrates was the first person to use the term "Spina Luxate" to denote all spinal changes. Galen defined scoliosis ("skolios" means crooked or curved) [1].Scoliosis research society (SRS) defined as"Scoliosis is lateral deviation of the normal vertical line of the spine which, when measured by x-ray, is greater

than 10°. Scoliosis consists of a lateral curvature of the spine with rotation of the vertebrae within the curve. Rotation of the vertebrae also occurs which produces the rib cage and flank muscle asymmetry" HYPERLINK \l "Sco18" [2,3]. The term Idiopathic scoliosis is used to signify a spinal deformity not caused by a specific disease[4]. This condition may not result from lifting and carrying heavy objects, sports, postural deviations or small leg length discrepancies. It is considered as multifactorial, because of changes in balance, functional symmetry along with vertebral changes[5].80% of scoliosis cases are Idiopathic and 20% are secondary to pathological causes. Prevalence of scoliosis is more in girls than boys, it may be because of growth spurt before skeletal maturity and anterior spinal overgrowth[6]. Prevalence of adolescent idiopathic scoliosis with Cobb angle above 10° in general population is 0.93 to 12% depending on reference Cobb angle.

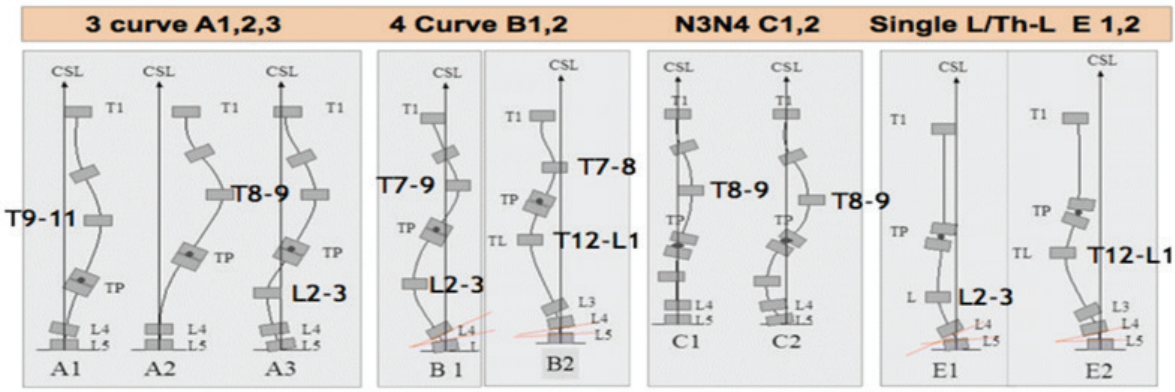
Scoliosis changes spinal alignment, mobility, flexibility, recruitment of Para spinal muscles and postural reflex mechanism. It is considered that if the cobb angle exceeds the critical threshold (30° to 50°) before the completion of growth , subjects might have high risk of developing health issues related to breathing, cosmetic changes, pain, disability and changes in quality of life[7]. If untreated subjects may experience one or more of following symptoms like hump on one side of spine, functional difficulties, pain in multiple regions of body (example: back, shoulders, neck), nerve compression, dysmenorrhea and constipationsevere curves. Persons with severe curve, hump and pain might experience altered states of mood, depression, handicap and social involvement.

Gradually it is becoming clear that if good non operative treatment is given, only 1 in 25, or 0.1% cases may require surgery[8] . As the underlying mechanisms are becoming clearer this study might add further evidence in support of conservative treatment for AIS[9,10,11]. Though many countriespracticing physiotherapy and bracing as conservative mode of management, there is a need for objective evidence of effectiveness of physiotherapy on spinal mobility and pain in persons with structural spinal curves[12]. As spinal mobility and flexibility plays important role in functional activities it is necessary look at the mobility parameters like spinal flexion, extension, left bending, right bending and flexibility parameters like pectorals, Iliopsoas, Hamstrings on both sides. Studies measured spinal posture and mobility using inclinometers and compass showed that thoracic forward flexion was smaller whereas sagittal mobility was greater[13], mobility above and below the apex of the curve is greater because of compensation and thoracic rotation most clearly decreased with increased curves[14],

Objective evidence for physiotherapy as conservative management and its effectiveness on spinal mobility and flexibility for persons with scoliosis is still a question. Hence this study was aimed at objective evaluation of efficacy of Physiotherapy treatment onspinal mobility parameters and pain in persons with Adolescent and adult idiopathic Structural scoliosis

Methodology

Study was conducted at Nizam's institute of Medical sciences, department of Physiotherapy. After Institutional ethical committee approval, 13 adolescent idiopathic scoliotic subjects aged between 12 to 40 years who met inclusion criteria were taken into the study with written informed consent. Each subject was explained about the purpose of study and explained about methodology prior to enrolment. Subjects were categorised based on Dr. Manuel Rigo classification of scoliosis (Figure 1). Each subject was stratified into Rigo classification categories and subjected to curve specific exercise program for the period of 25 weeks.Subjects enrolled into study were subjected to curve specific exercise program for the period of 25 weeks. Baseline evaluation was done after the enrolment, prior to exercise program and at the end of 25 weeks. Evaluation parameters includes age, gender, BMI (body mass index), spinal mobility and flexibility parameters, Cobb angle, VAS (visual analog scale) for pain,



Rigo and Weiss. Conservative Scoiosis Treatment. IOS press. 2008 page 303-319. Rigo et al. Scoliosis 2010, 5:1 http://www.scoliosisjournal.com/content/5/1/1.

Inclusion criteria:

1. Person with spinal curve with at least 10degrees or more.

2. Male and female, Adolescents & adults (12- 40 years),

3. Subjects diagnosed with Idiopathic scoliosis (adult and adolescent)-(G2, N3N4 & G 1-2)

4. Physician or surgeon referral for conservative management.

5. Subjects willing to provide written informed consent.

Exclusion criteria: Subjects with G1 category spine, Post-surgical, Congenital scoliosis, Inflammatory, Neoplastic, metabolic, Infectious, Developmental, Traumatic conditions, Psychological, psychiatric problems,Ehlers – Danlos syndrome, Mesenchymal disorders, Neurofibromatosis and Neuro muscular diseases are excluded. Subjects with any other disorders which lead to changes in spinal curves are excluded.

Efficacy parameters: Following outcomes were used for the documentation,

1. Spinal mobility (flexion, extension, left bending right bending),

2. Flexibility of pectorals, Iliopsoas and hamstrings on both sides,

3. VAS (Visual analog scale) for pain,

4. Cobb angle for curve measurement.

Spinal mobility measurement:

Spinal flexion measurement: individual was asked to keep feet at shoulder width and advised to bend forward while keeping their two palmar surfaces together. The distance from middle finger to the ground is taken in centimeters (Figure 2a)

Spinal extension measurement (Figure 2b):subject was advised to be in prone lying position and advised to lift the upper body off the couch while supporting at the feet by assistant. Measurement was taken from the couch to Xiphi sternum.

Spinal lateral bending measurement (Figure 2c): subject was asked to stand against wall without any contact and advised to bend laterally to left and measurement was taken from left side middle finger to the ground on left side, for measurement on right side bending subject was asked to bend on right side, measurement was taken for the right middle finger to the ground on right side.

Flexibility measurement:

Pectoral flexibility: In supine position subject is asked to perform upper limb elevation with thumb directed downwards at the end of movement. The distance between elbow lateral epicondyle and the couch is measured in centimeters (Figure 3a).

Iliopsoas tightness is tested and measured in supine lying position, subject is asked to take the knee to chest and the distance between couch and opposite knee joint is measured with measuring tape. For left side measurement Right knee is taken to the chest and for right side iliopsoas left knee is taken to the chest (Figure 3b). Hamstrings measurement is done while the person is in supine position. Examination side knee is kept in 90 –90 position, opposite lower limb is relaxed and kept as straight as possible and stabilized by an assistant. Subject was advised to perform knee extension from 90-90 position and the angle between longitudinal axis of Tibia and longitudinal axis of femur (universal perpendicular axis) was measured by goniometer. Similar recording is done for both sides (Figure 3c).

Visual analog scale (VAS): Visual analog scale tool was used for subjective assessment of pain, where subject documents their level of pain on a straight line of 10 to 15 cm length[15]. Extreme end points of this line corresponds to "no pain at all" and "pain as bad as it could be". Subject was explained about the line and meaning of end points and asked to mark on the line with pencil or pen. Subject gave rating of their own perception of pain without any input from others. (Figure 4).

Cobb angle measurement:

This is a standard way of measuring spinal column deviation[16]. Perpendicular lines are drawn from upper border of upper end vertebra and lower border of lower end vertebra till they intersect. The angle between these perpendicular lines was taken as Cobb angle or angle of curvature in the study (Figure 5).

Exercise program: Depending on curve categories subjects were categorized and subjected to scoliosis curve specific individualized program. Exercise program includes passive correction positioning, spinal mobility, flexibility, core stability, Taping, para spinal stimulation.

Passive correction positioning: Based on category of spine, subjects were kept in three basic positions 1. Supine, 2. Side lying, 3. Prone. In order to achieve best possible spinal alignment in each position wedges and pads were kept on concave and convex side of spine as per the body passive positioning schema diagrams. Each color indicate wedges and pads placement in one basic position (blue=supine,red=prone, green=side lying): (Figure: 7). these passive positions were superimposed with active muscular work (concentric and eccentric) to open the concave sides and activate the convex sides of the curve.

Spinal mobility and flexibility:10 minutes of warming up session followed by passive and active spinal mobility exercise in specific direction was given with aim of axial elongation, deflexion and de rotation of spinal segments. Mirror feedback was used during training of shift correction. Wall ladder was used for active elongation of spine and activation of specific muscle groups on either side of spine. Total duration of exercise was 25 to 30 minutes. Mobilization and manual release of tightened soft tissues was also part of flexibility exercises.

Core stability: Exercises for stabilization of core muscles was given following spinal mobility and flexibility. This include slight modification of general core stabilization exercises. Exercises include keeping pelvis in best possible alignment, activation of oblique, quadratus Lumborum, and latissimus dorsi muscles on elongated side with integration of breathing to facilitate optimal diaphragm function.

Kinesiological taping: Taping was used for neurological facilitation of corrected positions. Facilitation on convex side of curve and mechanical correction on rib cage to help the individual for derotation and deflexion[17,18,19.]

Taping for C shape curve

Posterior convex side: Facilitation of Iliocostalis was done with Y strip, 15 -35 % tension, ends with no tension. Taping applied with lateral flexion and

rotation to opposite side. Mechanical correction was given with Y strap, tension 50 -75%, just below the level of convexity during forward flexion, lateral flexion, horizontal abduction of arm and inhalation (figure: 6a)

Anterior side of convexity. Facilitation of external oblique was done with Y strip, 15 -35 % tension, ends with no tension. Taping applied with thoracic spine extension. Mechanical correction was given with Y strap, tension applied was 50 -75%. Downward and inward at the costal ridge on the level of convexity while subject was asked to do shoulder external rotation and trunk lateral flexion to the opposite side and inhalation. (Figure: 8a)

Taping for S shape curve:

Posterior side Taping lumbar region: Facilitation of Longissimus on lumbar region was done with Y strip, 15 -35 % tension, ends with no tension. Tape was applied with forward flexion of spine. Mechanical correction was given with Y strap, tension 50 -75%, at the level of convexity during forward flexion with inhalation (figure: 8b).

Posterior side Taping thoracic region: Facilitation of Longissimus thoraces was done with Y strip, 15 -35 % tension, ends with no tension, anchor at 2 to 3 vertebrae below the level of convexity opposite side, arm abduction and trunk lateral flexion to opposite side. Mechanical correction was given with Y strap, tension 50 -75%, anchor at the spinous process at level of convexity during lateral flexion to opposite side with inhalation (figure: 8b).

Anterior side Taping lumbar region: Facilitation of rectus abdominus was done with Y strip, 15 -35 % tension, no tension at ends and below the umbilicus along linea Alba. Mechanical correction was given with Y strap, tension applied was 50 -75%. Downward and inward pressure, subject was asked to do trunk lateral flexion and rotation to opposite side and inhalation (figure: 8c).

Anterior side Taping thoracic region: Facilitation of intercostals Fascia correction was done with application of Y strip, with no tension at anchor 2-3 vertebra below convexity, subject asked to neck extension, tape applied with 10 to 25% tension, no tension at ends of tails. Mechanical correction was given with Y strap anchor at the manubrium sternum (no tension), subject asked to do thoracic extension with inhalation. Tape applied with Downward and inward pressure and tension 50 -75% (figure: 6c).

Results and Discussion: Total of 13 adolescent and adult idiopathic scoliosis subjects (10 female, 3 male) were taken into study after screening of 20 persons (7 subjects excluded). Female subjects (77%) are more in total population than male (23%) in this study. Mean age of is 21.92±6.78 years, ranging from 12 to 34years (BMI 20.27±2.6 kg/M^2, Risser ranging from 1 to 5). Prevalence in girls is more than boys. As the Cobb angle increases the prevalence ratio between boys and girls increases[20]. Subjects were categorized basedon Dr. Manuel Rigo classification of scoliosis. Number of subjects in 3C (three curve), 4C (four curve),N3N4 (Non three non-four) and G1-2 (Group one- two) curve patterns are 2, 2, 5 & 4 respectively (Table1: demographic data description).

Table 1 Demographic data description:

Parameter	N	Minimum	Maximum	Mean	SD
Age (in years)	13	12	34	21.92	6.78
Height (in cm)		143	175	159.30	10.77
Weight (in kg)		39.0	72.0	51.54	8.88
BMI (in kg/m2)		17.20	25.30	20.28	2.67
Risser		1	5	3 to 5 (IQR)	
Gender		10 Female (77%)		3 Male (23%)	
No. of cases category wise		3C (2cases), 4C(2 cases), N3N4(5 cases) & G1-2(4cases)			

Subjects showed good results on pain scores (VAS) with physiotherapy exercises (Table 2: pain scores on visual analog scale). Initial average VAS scores was 5.23 ±1.64 with minimum score 3 to maximum score of 8 and IQR was 6 to 4, at the end of exercise program score change to 1.384 ±0.65 with no pain to maximum of 2 and IQR was 2 to 1. The difference was significant on paired test with P value of <0.0001.

Table 2 pain scores on visual analog scale

VAS	N	Minimum	Median	Maximum	Mean ±SD	IQR	P-value	test
pre	13	3	5	8	5.23 ±1.64	6 to 4	<0.0001	"Paired t test"
post		0	1	2	1.384 ±0.65	2 to 1		

Results of Spinal mobility parameters are shown below (Table 3: spinal mobility parameters).Spinal flexion (p value: 0.003) and extension (P-Value: 0.007) results were significant on Wilcoxon signed rank test. Level of significance of spinal bending to left (p value: <0.0001) and right (p value: <0.0001) was tested with paired t test and the result was significant. Spinal Flexion improved more than extension and bending was almost similar in improvement

Flexibility results at the end of exercise program was significant. Measurement of right and left sides of Pectoral region on arm elevation was done in centimeters, Iliopsoas on Thomas position in centimeters and Hamstring 90-90 position to extension was measured in degrees. Significance of Results of pectoral and Iliopsoas on left and right side was analyzed using Wilcoxon signed rank test and Hamstrings was tested using Paired t test. The results were significant (Table 4: Flexibility parameters).

Table 3 spinal mobility parameters

Spinal mobility (in cm)		N	Mini-mum	Median	Maxi-mum	Mean ±SD	IQR	P-value	test
flexion	pre	13	0	21	43	18.69 ±11.97	26 to 7	0.003	Wilcoxon signed rank test
	post		0	14	32	11.23 ±9.4	16 to 0		
extension	pre	13	0	2	4.5	1.769 ±1.37	2 to 0.5	0.007	
	post		2	3	4	3 ±0.577	3.5 to 2.5		
left bend	pre	13	18	45	58	44.12 ±10.27	49 to 40	<0.0001	Paired t test
	post		8	41	43	36 ±9.806	43 to 34		
right bend	pre	13	16	45	62	45.81 ±11.38	45 to 41	<0.0001	
	post		6	37	46	36.15 ±10.25	42 to 34		

Table 4 Flexibility parameters

flexibility			N	Minimum	Med ian	Maximum	Mean	IQR	P-value	test
pectoral	Left	pre	13	0	2	5	1.53 ± 1.45	2 to 0	0.008	Wilcoxon signed rank test
		post		0	0	1	0.076 ±0.277	0 to 0		
	Right	pre		0	2	4	1.923 ±1.32	3 to 0	NE	
		post		0	0	0	NE	0 to 0		
Iliopsoas	Left	pre	13	2	5	9	5.276 ±2.46	7.5 to 3	0.002	
		post		0	1	5	1.076 ±1.382	1.5 to 0		
	Right	pre		2	6	14	6.269 ±3.166	8 to 4.25	0.002	
		post		0	1	8	1.461 ±2.25	2.5 to 0		
ham strings	Left	pre	13	45	70	81	65.38 ±11.56	75 to 55	<0.0001	"Paired t test"
		post		65	80	90	79.08 ±7.342	83 to 73		
	Right	pre		40	65	80	65.92 ±11.21	75 to 64	<0.0001	
		post		63	78	90	79.38 ±7.366	83 to 76		

There were 2cases of 3C (3CA1-1, 3CA2-0, 3CA3-1), 2 cases of 4C (4CB1-1, 4CB2-1), 5 cases of N3N4 (N3N4 C1-3, N3N4C2-2) and 4cases of G1-2 (G1-2E1-3, G1-2-E2-1). Out of all those categories 9 caseshadRt. thoracic curves(including single thoracic and double curves), 2 cases has Lt Thoraco lumbar, 7 cases has Lt Lumbar(including single lumbar and double curves) and 1 case had Rt. lumbar region.. The improvements with exercise programme showed varied level of significance as shown below (Table 5: Cobb angle details).All types of curves are showing slowing of progression of curve or some improvement in the curve up to 1.6 to 2 degrees overall. The improvements in Cobb angle was were more at lumbar region than the other areas in this study.

Table 5 Cobb angle details

cobb angle		N	Minimum	Maximum	Mean±SD	P-Value	test
Rt thoracic	pre	9	28.4	40	35.16±3.91	0.000	Paired t test
	post	9	27	39	33.56±3.94		
Lt thoraco lumbar	pre	2	21	26	23.50±3.54	NE	
	post	2	20	25	22.50±3.54		
Lt lumbar	pre	7	18	39	27.30±7.71	0.008	Paired t test
	post	7	17	37	25.86±7.86		
Rt Lumbar	pre	1	20	20	20± NE	NE	
	post	1	21	21	21±NE		

Conclusion

Spinal mobility is the pre requisite for all functional activities. Though there is less curve correction may between 1.6 to 2 degrees, rate of progression was reduced. Pain levels reduced along with improvements in flexibility and mobility with exercise program. In conclusion results of this study shows scope for consideration of exercise program to improve pain, spinal mobility, Flexibility along with a Cobb angle improvement in adolescent and adult idiopathic structural scoliosis.

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