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CONTENTS

Volume 16, Number 2

April-June 2022

1. Effectiveness of Aerobic Exercise Versus Pilates in Postmenopausal Women with Non-Specific Chronic Low Back Pain..... 1
Aiswarya K Ravindran, Jasrah Javed, R. Parthiban, Benazir Sherrif
2. Relationship between Handgrip Strength, Socioeconomic Status and Depressive Symptoms in Older Adults: A Correlation Study 9
Anisha Sharma, Samuel SE, Abhilash PV
3. Combination of Cervical Traction with Transcutaneous Electrical Nerve Stimulation on Patient with Cervical Radiculopathy:A Case Report..... 18
Aragya Khadka, Mohini Shah
4. Effect of Lower Trapezius, Middle Trapezius and Serratus Anterior Muscles Strengthening on Pain, Muscle Strength and Functional Status in individuals with Non-Specific Chronic Neck Pain 25
Ashly Jose, Rejimol Jos Pulicken, Remya N, Anumol C, Reethu Elsa Baby, Reeba Roy, Rakhi Balgopal
5. Physiotherapy Interventions in Stroke in COVID-19 – A Case Report 32
Babatunde G Ogundunmade
6. A Comparative Study on Effectiveness of Aerobic Exercise versus Resistance Exercise on Improving Cognitive Function in Older Adults 36
Baratam Santosh Kumar, Pappala Kiran Prakash, P.S.R. Thulasi, Patchava Apparao, Ganapati swamy
7. A Tele Rehabilitation Approach for the Treatment of Dyspareunia: Case Report..... 44
Borkar Sudini, Dave Binal
8. Correlation of Level of Physical Activity with Weight Perception, Body Mass Index and Body Image Dissatisfaction among Physiotherapy Students of Government Tertiary Care Hospital..... 49
Chhaya V. Verma, Soumyaa P. Gandhi
9. Relationship between Trunk Performance and the Stair Ascending and Descending in Post Stroke Subjects..... 56
Deepanjali Rai, S Devika Asst Prof, Sikkim Manipal College of Physiotherapy, Sikkim, Lecturer, Hosmat College of Physiotherapy, Bangalore
10. Effectiveness of Pursed Lip Breathing Exercise in Covid Patients..... 64
Dipesh R. Rathi, Rahul A. Maid, Suryakant Gadgerao
11. Contralateral Neurodynamic Technique Versus Passive Accessory Intervertebral Movements on Pain and Range of Motion in Subjects with Sciatica..... 69
J. M. Akila Gaweshika Rathnayake, S.Nagaraj

12. Effect of 1 Week Coherent Breathing Exercise Training on Cardiorespiratory Fitness in Healthy Young Adults: An Experimental Study 79
Jagruti K Patel, Sapariya Priya Rajeshkumar
13. Immediate Effect of Breathing Exercises and Prone Lying on Saturation of Peripheral Oxygen (SpO₂) in Covid Patients – A Pilot Study 91
Jyoti S. Jeevannavar, Anjana Gururaj M., Akshatha K. Shetty
14. Effectiveness of KIASTM in Post-surgical Wrist and Hand Rehabilitation following Spaghetti Wrist Injury- A Single Case Report 98
Lopa Das
15. Short Term Effects of Remote Myofascial Release versus Mulligan’s Bent Leg Raise on Hamstring and Lumbar Spine Flexibility in College Going Students: An Experimental Study 106
Mansi Dhingani, Vinit Mody
16. Treatment Preferences of Physical Therapists in Management of Carpal Tunnel Syndrome: A Cross Sectional Survey 114
Maryam Misal Khan, Muhammad Uzair Khan, Karishma Kumari, Felicianus Anthony Pereira
17. Efficacy of Tibialis Posterior Strengthening Exercise with Obesity Reduction Program in Flexible Flatfoot among Obese School Children..... 120
N Karthika, R Mukesh Kumar, R.V. Vijaya Kumar, Vasanthan
18. To Study the Conflict between three Generations of Men and Women 128
Nazia Ali, Aisha Faruqui
19. Children’s behaviour in Beginning Days of School: Occupational Therapy Intervention based Study 139
Neha Negi, Prameela Kandula
20. Supportive Care in Head and Neck Cancer Patients: The Role of Occupational Therapist. Review 145
Edna Lúcia Coutinho da Silva; Meire Coelho Ferreira; Camila de Carvalho Almança Lopes; Rafael Resende de Miranda; Veridiana Resende Novais Simamoto
21. A Systematic Review on the Effect of Physical Therapist Delivered Ergonomic Intervention on Workers in a Physically Taxing Workplace 153
Peter Leininger, Joshua Prall, Michael Ross
22. Validation and Cross Cultural Adaptation of the Marathi Version of Revised Urinary Incontinence Scale in Females with Urinary Incontinence(Ruis) 160
Ponde Ketki V, Agrawal Ronika S, Kamble Sayali K, Gilani Afrin Z
23. Evaluate Scapular Asymmetry among Office Workers Having Ergonomic Risk Due to Work From Home During Lockdown–Cross Sectional Study 166
Pracheta Raval; Bhavya Gandhi, Mansi Khalasi, Prachi Patel
24. Effect of Knowledge and Awareness Regarding Urinary Incontinence and Its Treatment Options in Female Dancers 174
Prajakta Chavan, Rima Musale, Vaibhavi Mahendrakar, Neha Bhosale

25.	Pulmonary Tele-Rehabilitation in Patients (Post Covid-19) With Respiratory Complications: A Randomized Controlled Trial	182
	<i>Pratibha Sharma, Sanjay Kumar Goswami</i>	
26.	Measurement of Baseline Physical Activity in Medical Students by Pedometer and its Correlation with BMI	190
	<i>Priya Suneja, Sumangala Patil, Manjunath Aithal</i>	
27.	Effect of Lumbopelvic Manipulation Versus Tibiofemoral Mobilization on Pain and Quality of Life in Patellofemoral Pain Syndrome	197
	<i>R Mukesh Kumar, Benazir Shereief, R Vasanthan</i>	
28.	A Study on the Effect of Functional Electrical Stimulation on Hand Function in Stroke Patients with Flexor Synergy in Upper Limb.....	208
	<i>Rambeer, Sharad Kumar Kedia, Satyasheel Singh Asthana, Minhaj Akhter, Ameer Equebal</i>	
29.	A Comparative Study on the Effects of Task Oriented Balance Training Program with or without Altered Sensory Input on Balance and Functional Performance in Older Adults : A Case Control Study... 216	
	<i>Rinku Roshan, Sam Thamburaj</i>	
30.	A Comparative Study of Incidence of Musculoskeletal Injuries in Amateur and Professional Boxers	222
	<i>Shibani Dixit, Shweta Naidu, Mugdha Joshi</i>	
31.	Association of Musculoskeletal Pain and Psychological Stress with the use of Personal Electronic Devices among College Going Students – A Virtual Cross-sectional Study	229
	<i>Vinit Mody, Amirhamza Chauhan, Jash Desai</i>	

Effectiveness of Aerobic Exercise Versus Pilates in Postmenopausal Women with Non-Specific Chronic Low Back Pain

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Abstract

Background: Several studies have been conducted to identify the effect of Aerobic Exercise in patients with non-specific chronic Low Back Pain and Pilates method in patients with non-specific chronic Low Back Pain. However, there is limited comparison available between Aerobic exercise and Pilates exercise methods in the postmenopausal women specifically. The aim of the current study is to compare Aerobic Exercise with Pilates method and find which is the most beneficial exercise to reduce pain in postmenopausal women with non-specific chronic low back pain.

Methods: A Randomized control trial (RCT) was conducted on 47 subjects having moderate nonspecific chronic low back pain. Subjects were randomly sampled and sequentially allocated to either Aerobic exercise group and Pilates method group. Changes were measured using Numerical Pain Rate Scale (NPRS) and Roland-Morris Disability Questionnaire (RM).

Conclusion: Pilates Training was found superior to Aerobic Exercise in improving pain and disability among post-menopausal women with non-specific chronic low back pain

Keywords: Pain, Disability, Aerobic exercise, Pilates exercise, Low back pain, Postmenopausal women

Introduction

Low Back Pain (LBP) is frequently defined as pain, increased muscle tension or stiffness below the costal margin and above the gluteal folds LBP. It is a major public health problem, worldwide, which causes pain, functional disability and poor quality of life. It is frequently cited as a significant economic burden and the cause of much personal hardship ⁽¹⁾. LBP not only leads to poor quality of life for individuals all over

the world but also leads to decreased productivity due to time off work, increased absenteeism and early retirement. Constant LBP affects physical, mental and emotional health. ⁽²⁾

In India, occurrence of LBP is alarming; nearly 60% of the people in India have significant back pain at some time or the other in lives ⁽³⁾. The complexity and multi factorial nature of LBP pose a significant challenge for its management. ⁽⁴⁾

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Patients with chronic low back pain tend to seek treatment more often than patients with acute pain because the prognosis of these patients is not favorable. The latest clinical practice guidelines recommend

that patients remain physically active, as inactivity contributes negatively to recovery⁽⁵⁾. Currently, it is known that general strength, conditioning, and resistance training programs for the spinal muscles, including aerobic exercises, are among the best treatment options for patients with chronic low back pain and it's been shown to reduce pain and disability in the short and long term⁽⁶⁾. Because of the pain, self-care, household, work, social and leisure activities can be affected or even impaired. Other variables involved in defining disability are anxiety, stress, and fear⁽⁷⁾.

In addition to households, the other time spends as energy-demanding activities like parenting, agriculture works, taking care of livestock, which is not only strenuous, but also repetitive and lead them a continuous health risk⁽⁸⁾.

Any backache which can be pointed with a finger, or associated with local tenderness, is usually not due to intrapelvic lesion⁽⁹⁾. LBP may also have correlations with reproductive factors, like age at marriage, marriage duration, past pregnancy, number of children or abortions, heightened pain sensitivity among women menstrual cycle fluctuations, biologic response to stress of pregnancy, childbearing and posture during working.⁽¹⁰⁾

The instantaneous or cumulative mechanical loads of lower back tissues has been suggested to initiate a first episode of LBP. Specifically, the mechanical risk factors (e.g., awkward posture, high loading manual tasks, exposure to vibration and specific sporting activities) can alter lower back mechanical loads beyond injury thresholds and initiate low back injury⁽¹¹⁾.

Female sex hormones play an important role in causing a variety of musculoskeletal disorders. Postmenopausal women are more prone to disc

degeneration because of relative estrogen deficiency, which may result in narrowing of inter-vertebral disc space, increase in number of spondylolistheses, and increased facet joint osteoarthritis prevalence.⁽¹²⁾

AEROBIC EXERCISE FOR LOW BACK PAIN:

Aerobic exercise is a form of exercise that depends upon the aerobic energy-generating process, consisting of various types of exercise, such as walking, running, treadmill, and cycling, which may provide general health benefits, including causing weight loss, increasing aerobic capacity, decreasing insulin resistance, and systolic blood pressure, as well as decreasing inflammation⁽¹³⁾. In general, the goal of the treatment of CLBP is to relieve pain, enhance mobility, prevent both physical and mental disability, and, thus, improve QOL.⁽¹⁴⁾

Chronic low back pain is associated with several changes in physical, emotional, and psychosocial dysfunctions that degrade quality of life. These patients commonly suffer from lack of physical conditioning and muscle disuse. Aerobic exercise stimulates the release of endorphins which inhibits the pain pathways and relieves pain. It reduces the fear of moving (kinesiophobia) and increases self-confidence of the patient by making him/her more active. These exercises also increase muscle blood flow and might reduce the stiffness commonly observed in patients with low back pain. To rehabilitate patients with LBP walking is highly recommended. It is highly cost-effective and is relatively easy to comply with.⁽¹⁵⁾⁽¹⁶⁾

PILATES TRAINING FOR LOW BACK PAIN:

Pilates exercises are used to enhance functional activity and core strength as well as stimulating neuromuscular re-education. This aims to increase spinal and muscular flexibility to enhance balance and stability. It also assists in preventing kyphotic posture

by improving tensor muscle stability⁽¹⁷⁾.

The goals are to improve muscle strength and endurance as well as flexibility and thereby to improve balance and posture. The mental element of Pilates gives an extra focus on breathing and concentration during the execution of these exercises.^{(18) (19)}

Methodology

Subjects were recruited from the apartment fitness centres by the researcher. And explained about the study and its usefulness in postmenopausal women. A Randomized control trial (RCT) was conducted on 47 subjects having moderate nonspecific chronic low back pain. Subjects were randomly sampled and sequentially allocated to either Aerobic exercise group or Pilates method group. Both the groups performed the exercises 40 minutes per day for 3 days a week for a period of 4 weeks. Changes were measured using Numerical Pain Rate Scale (NPRS) and Roland-Morris Disability Questionnaire (RM). Participants having Acute Fracture, Acute Cardiovascular Disease, Malignant Cancer, Recent surgery (6 months- 1 year), Other deformities which might disrupt intervention, Chronic Knee Joint Osteoarthritis, Mental disorders and cognitive impairment, Significant hearing and visual impairment, Subjects not willing to participate, Chronic Low Back Ache with Neurological deficit, Mental disorders and cognitive impairment, Significant hearing and visual impairment, Subjects not willing to participate, Chronic Low Back Ache with Neurological deficit were excluded from the study.

Participants were randomly assigned to either Aerobic exercise group or Pilates training exercise group, the sequence was generated using simple random sampling by lottery method.

All the subjects who gave consent for

participation and who fulfilled the selection criteria were randomized. Allocation was concealed till recruitment. Ethical Clearance was the study was obtained from the ethical committee of the Oxford College of Physiotherapy.

Procedure: All subjects had undergone two measurements, one on entry to the study (pre-test) and one after the 4 weeks of intervention period (post-test).

Procedure For Group A (Aerobic Exercise Protocol):

Group - A received Single variety of Aerobic Exercise, 20 minutes of brisk walking and 10 minutes of conventional physiotherapy 3 sessions in a week for 4 weeks. This exercise worked on improving endurance and it also helps to reduce osteoporosis in postmenopausal women. Before starting the exercise, warm up exercises of 5 min slow walking was given. The session ended with a cool down, of slow walking for 5 min.

Procedure For Group B (Pilates Training Protocol):

Group-B received 20 minutes of Pilates exercise on a Pilates mat, followed by 10 minutes of conventional physiotherapy, 3 days in a week for 4 weeks. The lumbar stretch exercise was used as the warm up as well as cool down exercises, 5 min each. Other exercises performed were neutral spine exercise, head nod, bridge, leg circle, side kick. Conventional exercises performed were; Bilateral knee to chest, Cat and Camel, bilateral straight leg raise and partial curls.

Statistical Analysis:

Baseline demographic and clinical characteristics was analyzed using median and Interquartile Range (IQR). The study difference between pre and post test scores of NPRS and RMDQ were analyzed using

Mann Whitney U-Test. Non-parametric statistical test are used here as both the scales give ordinal data. The Wilcoxon test was used to test the significance of pre and post outcome measures of RMDQ and NPRS in each group.

The data will be carefully analysed on baseline characteristics such as age and body mass index of the subjects. The data will be analysed through statistical software IBM SPSS version 20.0 Level of significance will be at 5% i.e., 0.05 level.

Results

Table 1. Baseline Characteristics of Study Participants

Characteristics	Aerobic exercise group (n = 24)	Pilates training group (n=23)
Age – median ± IQR	52.5 ± 8.75	53 ± 12
Gender - female (%)	24	23
B M I – median ± IQR	23.1 ± 2.45	24 ± 3.1
Pain – median ± IQR	5 ± 1.25	5 ± 1
Disability – median ± IQR	8.5 ± 3	9 ± 2

Table 2. Comparative Effectiveness of Aerobic exercises versus Pilates training on Pain

Outcome measure	Pre-test (mean ± SD)	Post-test (mean ± SD)	Pre & Post Difference
Numerical Pain Rate Scale			
Aerobic exercise group (n=24)	5.12 ± 0.79	4.2 ± 1.02	0.91 ± 0.65
Pilates training group (n=23)	5.26 ± 0.75	3.6 ± 0.94	1.65 ± 0.71
Statistical Significance			0.00374*

Significant *, Not Significant **, Abbreviations: SD – Standard deviation

Table 3. Effectiveness of Aerobic exercises and Pilates training on Pain

Outcome measure	Pre-test (mean ± SD)	Post-test (mean ± SD)	Pre & Post Difference	Statistical Significance
Numerical Pain Rate Scale				
Aerobic exercise group (n= 24)	5.12 ± 0.79	4.2 ± 1.02	0.91 ± 0.65	0.002*
Pilates training group (n=23)	5.26 ± 0.75	3.6 ± 0.94	1.65 ± 0.71	<0.00001*

Significant *, Not Significant **, Abbreviations: SD – Standard deviation

Table 4. Comparative Effectiveness of Aerobic exercises versus Pilates training on Disability

Outcome measure	Pre-test (mean ± SD)	Post-test (mean ± SD)	Pre & Post Difference (mean ± SD)
The Roland-Morris Questionnaire			
Aerobic exercise group (n= 24)	8.66 ± 2.42	7.08 ± 2.26	1.58 ± 1.01
Pilates taining group (n=23)	9.13 ± 2.2	6.43 ± 1.8	2.69 ± 0.97
Statistical Significance			0.00052*

Significant *, Not Significant **, Abbreviations: SD – Standard deviation

Discussion

The main objective of this Randomized control trial is to find out the effectiveness of Aerobic exercise versus Pilates training in improving pain and disability among postmenopausal women with non-specific chronic low back pain. The current study showed that there is significant improvement in disability and pain in post-menopausal women who received the intervention.

Changes in disability between Aerobic exercise and Pilates training:

The result of the current study showed improvement in disability for Pilates training group in comparison with Aerobics training group and in Pilates training group, the mean value after 1 month in RMDQ scores was significantly improved compared with the Aerobic exercise group. The results suggest that, difference in disability was there in both the groups as well as statistically significant difference between the two groups was also found. Here the Pilates exercise which includes the combination of breathing and body movements proved to be useful for various reasons like physical functioning and QOL.

Changes in pain between Aerobic exercise and Pilates training:

Pain was improved in both the groups. The mean value after 1 month in NPRS scores was significantly improved in Pilates training group compared to Aerobic exercise group. The results suggest that difference in pain was there in both the groups and statistically significant difference between the two groups was also found.

While compared with the study done by *Lee H et al, 2016* to investigate the effects of an 8-week Pilates exercise program on menopausal symptoms and lumbar strength and flexibility in postmenopausal women, the study concluded that Pilates exercise program is effective in decreasing pain and increasing lumbar strength and flexibility.

Pilates method trains the body as unsegregated, concentrating on core, upper body, and lower body strength as well as posture and flexibility. It promotes balanced musclebuilding, flexibility, and increased joint range of motion.

The core muscles that are deep at the abdomen, back and pelvic floor, support a strong back, good posture, and an efficient pattern of movement. When the core is strong, the frame of the body is well supported. The neck and shoulders can ease up, and the rest of the muscles and joints also will be free. A tight core can also help to learn how to tuck in the abs to get the best result out of many exercises.

Conclusion

This study hereby concludes that there is a difference between the effectiveness of Aerobic Exercise and Pilates on reducing pain and disability in postmenopausal women with non-specific chronic low back pain. In the current study, Pilates Training is superior to Aerobic Exercise in reducing the pain and

increasing functional ability.

Conflict of Interest: Nil.

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Ethical Clearance: Ethical committee of The Oxford College of Physiotherapy, Bangalore, Karnataka

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Relationship between Handgrip Strength, Socioeconomic Status and Depressive Symptoms in Older Adults: A Correlation Study

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Abstract

Objective: Dynapenia involves decline in a range of functional abilities and phenotypes, many of which are associated with socioeconomic status (SES) and depressive symptoms. Reduced handgrip strength (HGS) predicts disability, morbidity and mortality but it is unclear if it is influenced by socioeconomic factors and depression. This study therefore, aimed to assess SES, depressive symptoms and HGS among older adults.

Methods: A total of 33 community dwelling older adults aged 65 years and older were recruited in this cross-sectional study. Kuppaswamy socioeconomic scale, geriatric depression scale (GDS) and handheld dynamometer were used to assess socioeconomic status, depressive symptoms and handgrip strength respectively.

Results: The mean HGS was 22.8kg for men and 17.4kg for women. In adjusted linear regression analysis among both men and women SES has a significant association with HGS and depressive symptoms in older adults. Depressive symptoms were negatively associated with grip strength while positively associated with SES.

Conclusion: Our results suggest that lower HGS, using standardised age and gender is associated with depressive symptoms and SES. HGS can be a simple tool and guidelines for health workers and caregivers to identify and reduce clinical, functional, psychological, social and economic risk factors for disability.

Keywords : Hand-grip strength, Depression, Socioeconomic status, Elderly

Introduction

Biological, psychological and physiological

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changes occur gradually as people age, which can have an unfavourable impact on people's lives, where health complications may increase and self-sufficiency might decrease¹. Therefore, decline in objective performance in older adults is a common problem which increases the risk of falls, health care use, level of dependency, admissions to residential care and mortality².

Depression is one of the most common psychiatric disorders in the elderly population, with a prevalence of 10–38% in community-living older adults³. In this group of population, late life depression (LLD) has a detrimental impact on health outcomes including quality of life (QOL), disability, cardiovascular disease risk and mortality⁴. Depression in older adults is an important public health problem, particularly in low- and middle-income countries, where a demographic transition, with an increasing number of older people, is rapidly occurring⁵. There has been several risk factors identified for LLD, and a growing body of evidence has suggested a strong association between low physical performance and LLD⁶.

HGS in the other hand is a simple bedside measure, which has been shown to be an indicative of overall physical health and mobility in the elderly⁷. Most of the epidemiological data between handgrip strength and various health outcomes have been primarily assessed in the old age-group⁸. HGS is a simple yet valid assessment technique to measure muscle strength in clinical practice⁹. HGS is reported to reflect not only overall bodily muscle strength, but also comprehensive functional capabilities in older adults with excellent inter-rater and test-retest reliability¹⁰. Furthermore, HGS is associated with cardiovascular diseases, cognitive decline, mood disorders and all-cause death¹¹. Its prognostic value, the simplicity of measurement with minimal training, portability, and low cost could make HGS an effective and simple clinical test to evaluate an individual's health risk in low-income settings¹².

Similar to other health outcomes, HGS is influenced by socio-economic status (SES) which includes income of the family, education, wealth, and occupational class¹³. For example, Hairi FM et al, found that parameters like income, education, wealth, and occupation were associated with HGS in men, while

education and wealth were associated in women¹⁴. Furthermore, there is evidence of associations between SES and HGS¹⁴ and also between HGS and depressive symptoms⁶. However, limited studies have been conducted to investigate the possible mediation pathway between SES and depressive symptoms in older adults through HGS.

Thus, the aim of this present study was to investigate the association between HGS and depressive symptoms and evaluate whether socioeconomically deprived older adults have stronger association between low muscle strength and depressive symptoms than those with a higher symptoms. Despite many available studies, it is still not clear that if HGS highly correlates with socioeconomic status and depression. Reduced hand-grip strength predicts disability, morbidity and mortality, but whether it is shaped by socio-economic status is yet unclear. Therefore, there is an increasing need of study to find out any relationship between HGS, SES and depressive symptoms among selected urban and semi urban community living older adults in southern India. In addition, identifying the possible associations between HGS, SES and depression may enhance our understanding of such associations, which in turn may help us to care more specifically to fit individuals needs and preferences and help to improve the quality of healthcare and its outcome among older adults.

Methods

This cross-sectional study was conducted among community living elderly referred for Physiotherapy, at selected tertiary care hospital in Southern India. This study comprised 33 elderly people (18 male and 15 female) between the age group 65 and above. History of recurrent falls, visual and hearing impairments, severe systemic diseases, paresis or deformities in the upper limb and lower limb, surgeries of the upper limb or lower limbs during the last 6 months and any

vestibular and neurological disorders were excluded from the study. Cognitive function was assessed by Montreal Cognitive Assessment scale (MOCA). Participants with MOCA scores greater than 25 were recruited prior to the study. All participants were provided with written consent on a locally translated informed consent forms.

HGS measurements

The measurement was carried out by the use of a hand held dynamometer. The measurement was performed in a comfortable sitting position, on a chair, with the feet of the examined person resting flat on the floor, arms set along the torso, the elbow flexed at 90 degrees, the forearm in a neutral position, and the wrist in 0 degrees to 30 degrees extension following the recommendations of the American Society of Hand Therapists¹⁵. The subject was instructed to grasp the hand maximally onto the dynamometer. Dominant hand was taken as a reference. Then the procedure was repeated for three times, with a one-minute rest between the tests. The average of three assessments (in kilograms) was recorded. Various grip strength values were established according to the criteria proposed by the European Working Group on Sarcopenia in Older People (EWGSOP).¹⁶

Depressive symptoms

Depressive symptoms were evaluated using the GDS¹⁷. GDS has been tested and used extensively with the older population. A Short Form GDS consists of 15 questions which were developed in 1986. Questions from the Long Form GDS that had the highest correlation with depressive symptoms in validation studies were selected for the short version. Out of total 15 items, 10 indicated the presence of depression when answered positively, while the rest (question numbers 1,5,7,11,13) indicated depression when answered negatively. Depending on

age, education, and complaints; Scores of 0-4 were considered normal, 5-8 indicated mild depression; 9-11 indicated moderate depression; and 12-15 indicated severe depression.

Socioeconomic status

Kuppuswamy socio-economic scale is widely recognized and the most widely used scale for determining the socio-economic status and health condition of an individual or a family in urban and semi-urban areas of developing countries¹⁸. There were three parameters taken into account, namely education, occupation, and income of the individual. The total score was calculated by adding up all the education, occupation, and total family income scores. According to the total score thus calculated, the family was placed in the appropriate socioeconomic class. Score between 26 -29 fell under upper class; 16-25 indicated upper middle class whereas, 11-15 were on lower middle, 5-10 on upper lower class and below 5 indicated lower socioeconomic class.

Statistical Analyses

To analyse the relationships between HGS, SES and depressive symptoms among older adults, we performed descriptive analyses, including frequency reporting and correlational analyses among the variables of interest. Keeping HGS (kg) as a dependent variable and socioeconomic status and depressive symptoms as independent variables. Karl Pearson's correlation coefficient was used for the assessment of HGS, SES and depressive symptoms. Statistical package SPSS (IBM SPSS Statistics for Windows, ver. 21.0. Armonk, NY: IBM Corp.) was used to analyse the data. The level of significance was set at $p < 0.05$.

Results

Among 33 individuals included for the study 15

(45.45%) were women and 18 were (54.55%) men (Fig 1). The mean age of the study participants was 66.8±2.4 years. It was observed that 20 (60.6%) of the individuals are in the age group of 65 to 66 years which is maximum among the age group. Also it was noted that 1 (3.0 %) of the individual was in the age group 70-74 years which is the minimum among age group. Minimum BMI of the study population was 18.59 and the maximum was 23.99.

Using Karl Pearson’s correlation coefficient, weak positive correlation was observed between HGS and SES ($r = 0.39$) and was found to be statistically significant ($p < 0.05$). (Table 1 & Fig 2) Also, using Karl Pearson’s correlation coefficient, weak negative correlation was observed between HGS and GDS ($r = - 0.38$) and was found to be statistically significant ($p < 0.05$) as shown in Table 1 and Figure 3.

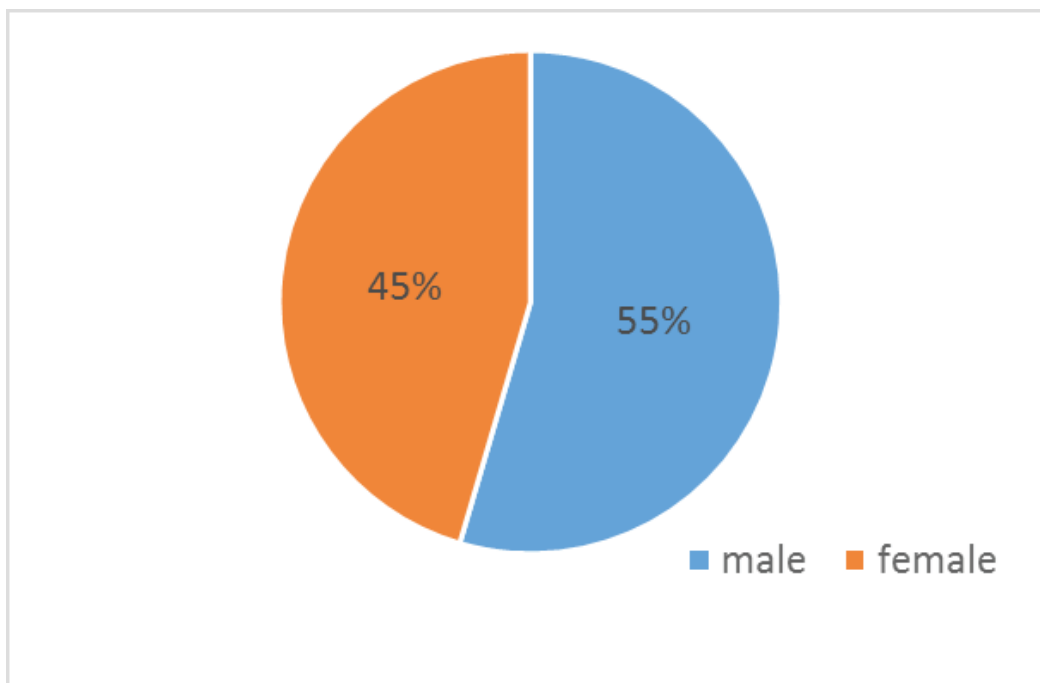


Fig 1: Gender wise distribution of participants

Handgrip strength	Geriatric Depression Scale (GDS)	Socioeconomic Scale (SES)
Pearson Correlation	-.381*	.395*
Sig. (2-tailed)	.028	.023
N	33	33

Table 1: Correlation of HGS with GDS and SES

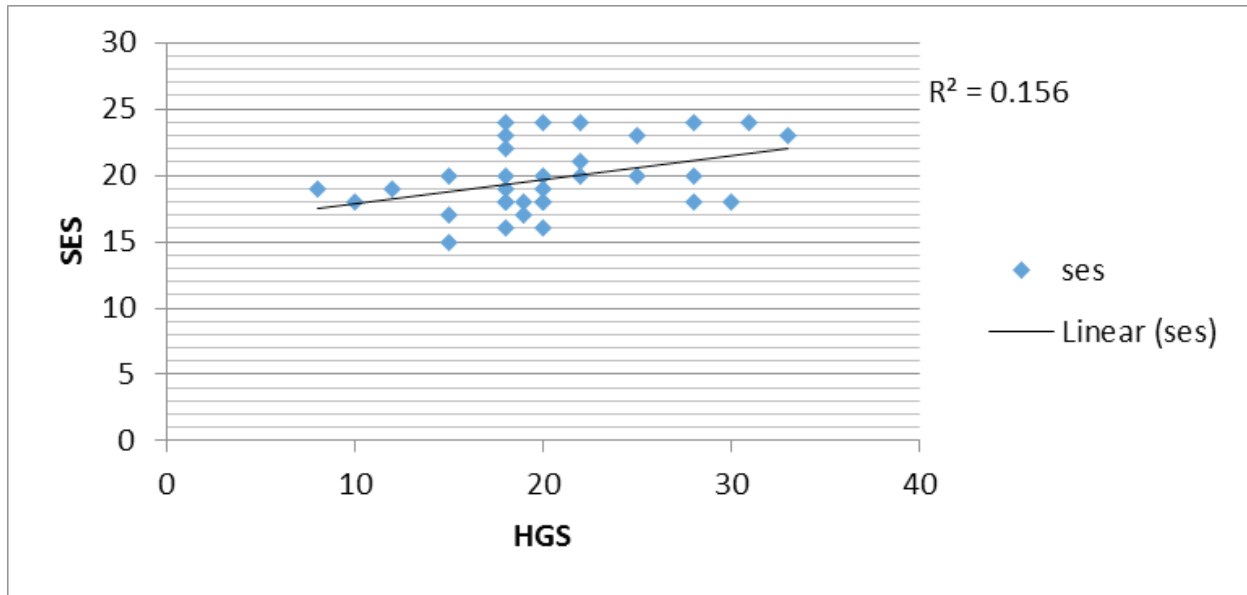


Fig 2: Correlation of HGS with SES

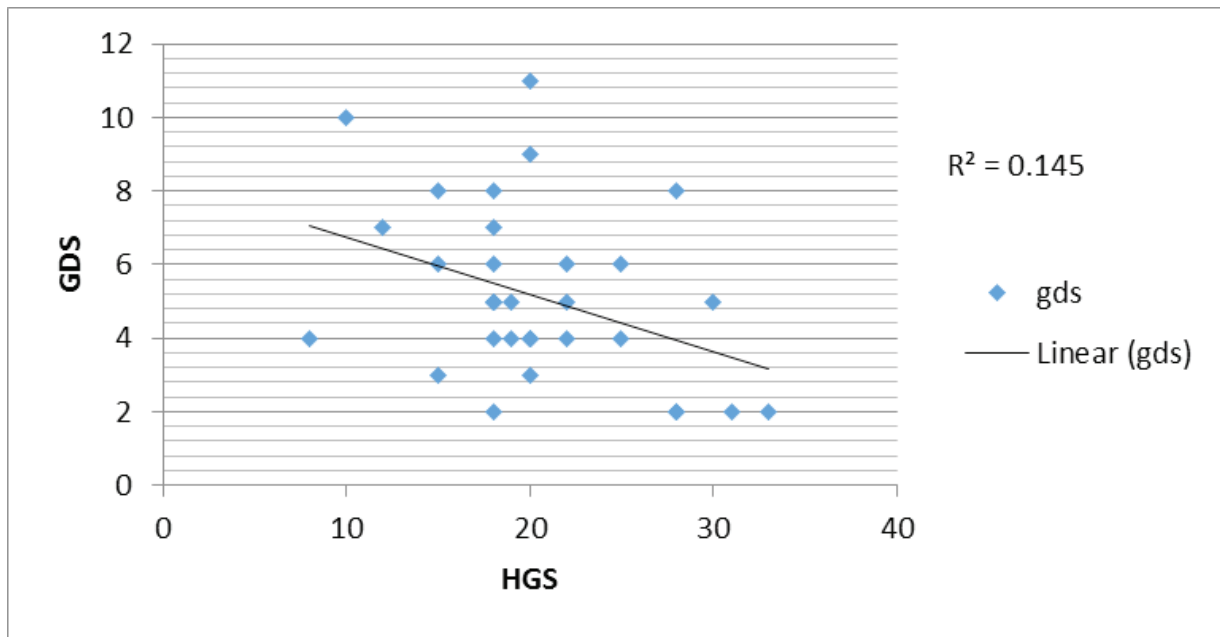


Fig 3: Correlation of HGS with GDS

Discussion

The present study investigated relationship between HGS, SES and depressive symptoms in older adults. Analysis of the data revealed that low HGS were associated with mild to moderate depressive symptoms and reduced socioeconomic status.

The mean HGS found in this study among men was 22.8kg and among women 17.4kg, which was similar to mean HGS of 28.2kg among men and 18.5kg in women among older adults in India¹⁹. The mean value of HGS in Singapore among 60 years and older adults were 28.3kg in men and 17.2kg among women²⁰. However, HGS was lower in China,

among 50 years and older Chinese older adults having 34.3 kg as mean value of HGS in men and 21.9 kg in women²¹. Similarly, among 50 to 62 years of older adults in South Africa, the mean maximum HGS was 37.9 kg for men and 31.5 kg for women²². In a study among older adults in 11 European countries, the mean maximum HGS was 41.3 kg for men and 24.9 kg for women²³ whereas, among older Japanese-American men, mean maximum HGS was reported as 36.7 kg²⁴. The result seems to confirm that developing world regions have lower HGS than developed world regions, which may be explained by differences in BMI value across the regions^{25,26}.

HGS has been related to depressive symptoms in older adults in several studies using different muscle strength indices. A cross-sectional study using data from the world health organization's global ageing and adult health study found that dynapenia was correlated with depression risk in middle-aged and elderly adults from six low and middle income countries²⁷. Our study ruled out lower HGS in those with mild to moderate depressive symptoms, which supports finding from previous cross-sectional work. Weaker HGS has been associated with lower physical quality of life²⁸ poor physical quality of life is likely to have a detrimental impact on mental health leading to depression²⁹. Furthermore, HGS has been significantly associated with depressive symptoms, among Asian populations. A Japanese study found that HGS was negatively associated with the GDS, while muscle mass was not associated with depression³⁰. Whereas, a Korean study found that the lowest HGS tertile was more associated with depressive symptoms than was the highest tertile³¹ however, a Chinese study found that AWGS (Asian Working Group for Sarcopenia) based sarcopenia was associated with depressive symptoms³².

We found that HGS had a substantial mediation influence on relationship between SES and depressive symptoms. This suggests that, low socioeconomic level may generate low HGS, which leads to depressive symptoms among older adults regardless of the direct effects of SES on depressive symptoms. Various studies suggest that SES to be a predictor of HGS in older adults²³, prior research reported that lower income was associated with low HGS³³. Poor socioeconomic status, low HGS and depressive symptoms are all correlated with one another due to which it may provide indirect evidence about mediation pathway. Nutritional status may be an underlying mechanism of this pathway. HGS in relation with income and depressive symptoms, nutritional status may represent an underlying mechanism in this pathway. Malnutrition is a serious public health concern among the elderly, and low SES is a major determinant of nutritional status, which is strongly associated with HGS³⁴. Although numerous hypotheses have been proposed, further impact of HGS on the relationship between SES and depressive symptoms has yet to be investigated, and further studies on these issues are needed.

This study has several limitations. First, the sample size was small and the interpretation of the results was limited because of the cross-sectional nature of this study. As a result, we were unable to establish a causal link between low HGS, depressive symptoms and SES in older adults. Second, GDS and Kuppuswamy SES are self-reported, which might preclude diagnosing the depression and social status of the elderly participants. Another drawback of this study could be sample limitation to those participants without cognitive decline.-

In summary, our findings indicate that HGS, regardless of gender, is associated with SES and depressive symptoms in elderly population. The older

adults with low SES showed a negative correlation between depressive symptoms and HGS compared to those with high income. This concluded that HGS mediated the relationship between socioeconomic status and depressive symptoms in older adults. Our results indicate that socioeconomic status and depressive symptoms is a significant predictor of grip strength. Therefore, when assessing the risk of depression in older adults, policy makers, physicians and health care workers should consider muscle strength and income level as primary evaluation making it easier to implement effective treatments in long term care facilities.

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Ethical Clearance

The study was approved by the Institutional Ethical Committee of A. J. Institute of Medical Sciences and Research Centre, Mangaluru, India.

Conflict of Interest : The authors declared no conflict of interest with respect to the authorship and/or publication of this article.

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Combination of Cervical Traction with Transcutaneous Electrical Nerve Stimulation on Patient with Cervical Radiculopathy: A Case Report

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Abstract

Cervical radiculopathy is the result of cervical nerve root pathology with the sensory, motor and reflexes changes that may lead to chronic pain and disability. Although, conservative interventions including cervical traction, TENS and exercises have been previously shown to be effective in reducing pain and disability caused by cervical radiculopathy, the combined effect of the same has not been documented. The purpose of this study is to present the effect of cervical traction combined with TENS followed by exercises on pain and disability in a patient with cervical radiculopathy. A 34-year-old man presented with an acute history of neurological cervicobrachial pain and whose diagnosis was confirmed with cervical radiculopathy as per the clinical prediction rule. Cervical traction and TENS was applied simultaneously followed by exercises to reduce the patient's pain and disability measured at baseline and after 1 week using the Numeric Pain Rating Scale, the Neck Disability Index and the Patient-Specific Functional Scale. Improvements in all outcome measures were noted over a period of one week. Results showed that the patient's pain had almost disappeared and he was able to return to job without difficulties and limitations. In conclusion, the findings of this study support that the application of cervical traction combined with TENS can produce significant improvements in terms of pain and disability in cervical radiculopathy.

Keywords: Cervical radiculopathy, Cervical traction, TENS, Transcutaneous electrical nerve stimulation

Background and Purpose:

The prevalence of the cervical radiculopathy (CR) ranges from 3.5 per 1000 people and the annual

incidence from 83 cases to 210 cases per 100,000 people with a peak from 50 -59 years. . Gender preference for the cervical radiculopathy varies but the most commonly affected region is C6 and C7 on both the sexes.⁽¹⁾⁽²⁾

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Cervical Radiculopathy mostly occurs due to mechanical or inflammatory stimuli around the cervical nerve roots which is either due to disc herniation or osteophytes formation causing nerve root compression, inflammation or both but sometimes

it can also be caused due to tumors, trauma, synovial cysts, meningeal cysts, dural arteriovenous fistula or tortuous vertebral arteries.⁽¹⁾⁽²⁾ Herniated disc causes 21.9 % of CR cases. A herniated disc can cause nerve damage both by mechanical and chemical pathways. Mechanically, compression of the nerve with soft disc causes localized ischemia. Disc degeneration and local ischemia activates pro-inflammatory factors which are mediated by tumour necrosis factor- alpha, interleukin factor-6 and matrix metalloproteinases. This pro-inflammatory factor causes more sensitization and increases pain in the area.⁽²⁾⁽³⁾⁽⁴⁾

The clinical prediction rule (CPR) for CR proposed by Wainner et al consists of four tests: i) cervical spurling test ii) distraction test iii) ipsilateral cervical spine rotation less than 60 ° iv) Upper limb tension test which are the confirmatory diagnosis for the cervical radiculopathy.⁽⁵⁾ The CPR has 99% specificity when all four tests are positive and 94% specificity when three tests are positive. The diagnosis is then confirmed by various radiographs for which MRI remains the first choice. Therefore, physical findings and imaging studies are equally important for the confirmation of the diagnosis as radiograph findings may not necessarily correlate the signs and symptoms of the patient.⁽⁵⁾⁽⁶⁾

The main goal of treatment for the management of cervical radiculopathy is the pain management and to reduce pressure in the nerve root. Conservative treatment mostly includes mechanical or manual cervical traction, TENS, posture correction and strengthening of the deep cervical flexors.⁽⁷⁾

Transcutaneous electrical nerve stimulation (TENS) is a type of electrical stimulation which mostly aims for the symptomatic pain relief by stimulating the sensory nerve fibers either by pain gate mechanism or opioid system. As proposed by

gate control theory, TENS produces an activation of inhibitory interneurons in the substantia gelatinosa in the dorsal horn of the spinal cord by the electric stimulation of large diameter fibres (A-beta fibres), which inhibit the transmission of nociceptive signals from small diameter fibres (A delta and C) and as per opioid mechanism, it stimulates the release of endorphin, leading to vasodilation in the injured tissue.⁽⁸⁾

The use of cervical traction is useful for the distraction of the cervical segments, for enlarging the intervertebral foramen space as well as it reduces the pressure over the intervertebral disc causing decrease in the mechanical irritation over the nerve roots. Similarly, cervical traction reduces adhesions inside the dural sleeve and can ease the nerve root compression inside the central foramina. Traction can be given either manually or mechanically.⁽⁹⁾ Previously, Constantine et al concluded that intermittent cervical traction was equally beneficial while treating patients with cervical radiculopathy even if the cause was large volume herniated disc.⁽¹⁰⁾ Savva et al conducted a combined study among the subjects of Cervical Radiculopathy where neural mobilization was given which increased the nerve sliding as well as modulated the mechanosensitivity of the affected cervical nerve root while maintaining the cervical traction which had elongated the cervical neural foramina and had decreased the intradiscal pressure.⁽¹¹⁾

Although the effect of cervical traction and TENS has been recognized in many studies, the effect of both modalities applied simultaneously has not been previously investigated. Therefore, the objective of this case study is to present the effect of cervical traction combined with TENS on pain and disability in a patient experiencing CR.

Case Description:

A security guard aged 34 years visited physiotherapy department with a chief complain of neck pain radiating on lateral aspect till his right wrist 4 days prior to visiting the department. The initial symptom was cervical pain 6/10 Numerical pain rating scale NPRS, which presented suddenly while pulling a blanket which was underneath his back. The intensity increased to 7/10 NPRS and severity of symptoms increased significantly with pain radiating from the Occiput to his right lateral side of upper extremity up to the wrist next day with tingling sensation. The pain was progressive in nature which aggravated more during night time for which patient visited the doctor on the 3rd day where he was prescribed with Analgesics. On the 4th night patient pain exacerbated to 9/10 NPRS and patient had to visit the casualty where he

was given analgesic and was advised Physiotherapy. In addition, a clear medical history was provided with no evidence of previous neck pain, shoulder pain and tingling sensation or other associated symptoms. As per the NPRS score patient's pain was 8/10 where the severity and the irritability was severe even though he was on analgesics.

On Examination:

During the observation forward head posture and increased thoracic kyphosis was noted. On palpation, the patient had grade III tenderness over C5-C6 spinous process, paraspinal neck and scapular muscles. Spasm was present in bilateral upper trapezius muscles. During the initial assessment all the cervical movements were as follows:

Cervical movements:

Movements	Range		Pain
flexion	0-10o		Present
Extension	0-10 o		Present
Lateral flexion	Contralateral side 0-30 o	Ipsilateral side 0-10 o	Ipsilateral side: Pain present
Rotation	Contralateral side 0-30 o	Ipsilateral side 0-10 o	Ipsilateral side: Pain present

Bilateral upper extremity active ROM was assessed in supine lying to rule out shoulder component where all the movements were within functional limits and pain free. Maitland Grades III posterior-anterior passive accessory intervertebral movements were applied over all cervical spinous processes and identified the reduced mobility at C5-C6. Spurlings

test, distraction test both were positive. Upper limb tension tests were performed on the patient of which ULTT 1 was positive because they had reproduced or alleviated the patient's symptoms. Neurological tests were performed which included dermatome, myotome and deep tendon reflex testing. The patient had a decreased sensation over the dermatomal

distribution of C6 area and weakness while performing the movements supplied by C6 nerve root as well as decreased biceps reflex was noted when compared to contralateral side.

Diagnosis:

The Clinical prediction rule was used for the confirmation of the diagnosis, which included positive cervical spurling test, positive distraction test, ipsilateral rotation less than 60 degrees and positive ULTT which shows that the patient is having cervical radiculopathy. For the confirmation, patient was suggested for MRI.

Goal:

Patient perception was to decrease pain, increase cervical mobility, improve sleep and return to his job.

Intervention:

The patient was seen for a total of 7 sessions. Initially for 3 sessions patient was given 15 minutes of Moist Heat followed by cervical traction in a seated position manually followed by 20 minutes of TENS parameter 100Hz with the current set between 10-30 mA with pulse duration of 50 microseconds followed by nerve glides and Chin Tuck exercises. Since the pain did not subside he visit his primary physician and MRI was taken which showed diffuse disc protrusion at C5-C6 more in the sub foraminal zone (right> left), narrowing both neural foramina and compressing over the C6 nerve roots on both sides (right> left) and was advised to continue physiotherapy.

On the 4th session patient came for continuing the physiotherapy where Moist heat was given for 15 minutes followed by 20 minutes intermittent cervical traction of 10kg along with TENS of 100Hz with the current set between 10-30 mA together in a supine lying position followed by nerve glides and deep neck flexors strengthening exercises. Patient on the

5th session stated that pain was being centralized and his pain was being reduced NPRS 4/10 for which same treatment protocol was continued till 7th session and was advised for follow up after 2 days.

During the follow up, patient mentioned that his neck pain completely subsided 0/10 NPRS and he could perform all the cervical movements without any pain as well as he was able to go back to his work and his sleep was not disturbed at night as well.

Result

After the completion of the physiotherapy sessions, the patient demonstrated rapid improvements in pain and function. The patient rated his pain 0/10 with all activity which was 8/10 in the initial assessment and also scored 30% disability on the Neck Disability Index (NDI) which was 86% in the initial assessment. On Patient specific functional scale (PSFS) patient scored 31 out of 40 after end of last treatment session which was 1 out of 40 before treatment. Patient returned to his prior level of function and full-time work duties.

Discussion

The case study shows that the patient with CR caused due to herniated discs with severe pain and disability when treated with combination of cervical traction and TENS simultaneously along with exercise was effective in reducing the symptoms.

Various modalities like traction, TENS, manual therapy, multi modal approach is widely used which includes deep neck flexors strengthening, cervical collars and a postural correction to maintain the muscle strength and for maintaining the integrity of the widened intervertebral foramen.⁽¹²⁾⁽¹³⁾ The use of cervical traction is useful as it helps in opening of the intervertebral foramen space, and reduces the pressure over the intervertebral disc. Therefore, it can

be useful in patients with herniated discs as supported by Constanine et al and RR. Khan et al.⁽¹¹⁾⁽¹⁴⁾ Various studies by Ibrahim et al, Antonio et al, Cleland et al and Jellad et al Albaayrak et al Rabia et al shows that traction when combined with multimodal approaches can improve pain and level of disability among the patients of cervical radiculopathy whereas states even grip strength can be improved with the same approaches.⁽¹⁵⁻²⁰⁾ Julie et al found that addition of mechanical traction along with multimodal approaches can be beneficial for long term course whereas Adeselo et al and Colombo et al are in favour of beneficial for short term course.⁽²¹⁾⁽²²⁾⁽²³⁾

The commonly used TENS in the clinical practice is of high frequency and low intensity commonly called as Conventional Tens. This kind of Tens stimulate selectively large diameter fibres (A-beta) in dermatomes site which inhibits activity in second order nociceptive neurones in the Periaqueductal gray, rostral ventromedial medulla and spinal cord by the process called segmental mechanisms which helps in inhibiting pain. Similarly, it also activates endogenous inhibitory mechanisms in the CNS involving opioid GABA and muscarinic receptors. During the inflammation, Conventional Tens reduces central neuron sensitization and decreases the release of the excitatory neurotransmitters' glutamate and substance P in the spinal cord causing inhibition of pain.⁽²⁴⁾⁽²⁵⁾

In the present case, patient had severe pain radiating from the occiput to his right lateral side of upper extremity up to the wrist which aggravated with movements like the cervical flexion and extension. The pain could be due to hypersensitivity caused by disc herniation leading to local ischemia which had stimulated pro-inflammatory factors which had caused further sensitization and increase in pain.⁽²⁶⁾ Therefore cervical traction along with TENS was given

simultaneously where traction will reduce the pressure over the disc space and the TENS will stimulates the large diameter fibres which will inhibits the central neuron sensitization. Traction was given in supine lying as soft tissues and muscles are relaxed more in supine lying which increases posterior vertebral space in gravity eliminated position which helps to alleviate compression over the trapped nerve roots.⁽¹⁴⁾ After each session patient was asked to perform deep cervical flexors strengthening exercises as these exercises are effective for the postural correction as well for the reduction of pain in the long term as suggested by previous studies.^(27,28) Similarly, nerve glides technique was performed in order to improve nerve sliding as well to inhibit the mechanosensitivity of the affected cervical nerve root.⁽¹⁾

Sleijser-Koeharst et al proposed a five- variable model in order to identify the subjects with cervical radiculopathy who were most likely to achieve the poor recovery with conservative treatment. These variables included: a longer duration of the symptoms, absence of the paraesthesia, a higher neck pain intensity and disability score at baseline, a lower active rotation towards the affected side and it may take 6-12 months for the patients to be symptom free.⁽²⁹⁾ Since the patient falls under all these categories, we expect poor prognosis on him but his symptoms were resolved within a week as was acute in onset. Thus it can be said that when cervical traction combined with TENS can give better result in patient with CR. However the effect of cervical traction combined with TENS in CR has been reported the findings cannot be generalization future high quality RCT study with long term follow up is required.

Conclusion

The findings of this case study supports application of cervical traction combined with TENS followed exercises can produce significant improvements in

terms of pain and disability in CR. However Future studies using larger sample sizes and objective outcome measures are required to further enhance our knowledge on the effect of cervical traction combined TENS in cervical radiculopathy.

Conflict of Interest – None

Ethical Clearance- A written informed consent was obtained from the patient and the study was performed with the approval of the Institutional Review Board for studies involving human subjects.

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Effect of Lower Trapezius, Middle Trapezius and Serratus Anterior Muscles Strengthening on Pain, Muscle Strength and Functional Status in individuals with Non-Specific Chronic Neck Pain

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Abstract

Background: Chronic non-specific neck pain is the most common chronic musculoskeletal pain condition, causing significant pain, disability, and lost productivity. Non-specific neck pain is not just a clinical problem, it can develop into a complex disorder where physical, psychological, social compensation and other possible forces interact to cause and lead to maintained disability. Neck pain is present with weakness and muscular imbalance. It has a close relationship between muscle prone to tightness and those prone to inhibition. In the case of neck pain, there is tightness of upper trapezius (UT) muscle leading to middle trapezius (MT), lower trapezius (LT) and serratus anterior (SA) muscles weakness. There is evidence that scapulothoracic muscles weakness may also be associated with neck pain. Individuals with neck pain were having significantly weaker Lower Trapezius, Middle Trapezius and Serratus Anterior muscles strength than asymptomatic individuals.

Context and Purpose: There is emerging evidence that scapulothoracic muscles weakness often is associated with neck pain and it has a close relationship between muscle prone to tightness and those prone to inhibition. In the case of neck pain, prolonged tightness of upper trapezius muscle can lead to middle trapezius, lower trapezius, and serratus anterior muscles weakness. The purpose of the study is to find out the effect of LT, MT and SA muscles strengthening along with the conventional treatment on pain, muscle strength and functional status in non-specific chronic neck pain.

Results: There was significant effect on LT, MT and SA muscles strengthening in reducing pain, improving strength and functional status in individuals with non-specific chronic neck pain.

Conclusion: Strengthening exercises to LT, MT and SA muscles along with conventional therapy is effective in reducing pain, improving muscle strength and functional status in individuals with non-specific chronic neck pain.

Keywords: Non-Specific Chronic Neck Pain, Trapezius, muscle strengthening and functional status

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Background

Neck pain is becoming common throughout the world. It has a considerable impact on individuals,

families, communities, health care systems and business¹. Non specific neck pain is not just a clinical problem, it can develop into a complex disorder where physical, psychological, social, compensation and other possible forces interact to cause and lead to maintained disability². The overall prevalence of neck pain in the general population ranges between 0.4% and 86.8% and the estimated 1 year incidence of neck pain ranges between 10.4% and 21.3%¹. Neck pain is present with weakness and muscular imbalance. It has a close relationship between muscle prone to tightness and those prone to inhibition³. In the case of neck pain, there is tightness of upper trapezius muscle leading to MT, LT and SA muscles weakness^{3,4}. There is evidence that scapulothoracic muscles weakness may also be associated with neck pain. Individuals with neck pain were having significantly weaker LT, MT and SA muscles strength than asymptomatic individuals on their side of neck pain⁴.

Methods

This Pretest Posttest Experimental study design was conducted at Department of Physiotherapy, Little Flower Institute of Medical Sciences and Research Centre, Angamaly for duration of 6 months. Ethical clearance was obtained from the IEC. 30 Subjects, both male and female between the ages of 23-52 year were recruited for the study based on the inclusion and exclusion criteria by using simple random sampling technique⁵. We included patients diagnosed and referred by orthopedician as nonspecific unilateral neck pain with duration more than 3 months⁶, who have MT, LT and SA muscle power ranging from 4-6 according to MMT (Kendall 0-10 grade) and those with stable cardiovascular parameters. Subjects were excluded if they had any malignancy, pregnancy, fibromyalgia, recent surgeries, patients with pain on scapula and shoulder region, patients with unstable cardiovascular parameters, debilitating neurological

disorders, Recent injuries and deformities of upper limb and cervical spine, Degenerative or inflammatory disorders in upper limb and cervical spine etc.

A total of 42 subjects were assessed for eligibility. 32 subjects who fulfilled the inclusion criteria were randomly assigned into two groups: 16 in experimental group (A) and 16 in control group (B). Informed consent was obtained from the subjects. Group B received conventional therapy alone, whereas Group A received conventional therapy and strengthening exercises to MT, LT, and SA. For both groups, treatment was given for 3 days per week for 4 weeks. On all treatment days home exercises were given according to the exercise leaflet. Pain were assessed by Numeric Pain Rating Scale (NPRS 0-10 Grade), muscle strength were assessed by manual Muscle Strength (MMT, Kendall 0-10 Grade) and functional status were assessed by Neck Disability Index (NDI) on first day before the treatment and last day after the treatment. The collected data was subjected to statistical analysis.

GROUP A–Treatment Procedure

In addition to the conventional treatment the following strengthening exercises were given.

Specific strengthening exercise (Each exercise with 15 repetitions and total 15 min duration, one minute of rest time was given.)⁷

· First week half kg was given, then every week weight was increased by half kg for next 3 weeks.

Middle and Lower Trapezius exercises:

1. Wide grip rowing (prone position)
2. Horizontal extension /external rotation, (standing)
3. Prone extension
4. Prone arm rise overhead ⁸

Serratus anterior exercises:

1. Serratus anterior punch⁹ (supine lying)
2. Wall slide¹⁰ (standing)
3. Dynamic hug⁹ (standing)

GROUP B-Treatment Procedure

1. Hydrocollator pack (10 min).⁷
2. Isometric neck exercises- 10 repetitions with a holding time of 6 seconds (15 min, one minute of rest time was given).
 - Flexion
 - Extension
 - Side bending
 - Rotation
3. Stretching for Upper trapezius- 30 seconds, 5 repetitions (5 minutes), one
4. Minute of rest time was given.

TREATMENT PROTOCOL

1st week of treatment

- Pre assessments were taken before treatment
- Supervised exercise program was given for both groups
- 3 days treatment given for both Groups. Group A received conventional treatment and specific scapular strengthening with weight and Group B received conventional treatment alone.
- Weight given was ½ kg in starting.

2nd week

- Strengthening exercise for Group A with 1 kg and for Group B the same

- Conventional treatment was given for 3 days.¹¹
- 3rd week
- Strengthening exercise for Group A with 1½ kg and for Group B
- same conventional treatment was given for 3 days.
- 4th week
- Strengthening exercise for Group A with 2 kg and for Group B the
- same conventional treatment was given for 3 days.
- At the end of the 4th week post assessment were taken.

Results

30 subjects who fulfilled the inclusion criteria were included in the study. Pretest and post test scores of both groups were analyzed using Mann-Whitney U test. The characteristics of the subjects at baseline were normally distributed and are presented in Table 1.

In pretest scores, calculated value is greater than table value so there proved no significant difference between 2 groups. In post test scores, as the calculated value is greater than the table value, there proved a significant difference between 2 groups and alternate hypothesis is accepted that is, there is significant effect on lower trapezius, middle trapezius, and serratus anterior muscles strengthening in reducing pain, improving strength and functional status in individuals with non-specific chronic neck pain.

Table 1. Demographic presentation of subjects

GROUP	AGE IN YEARS(MEAN)	SD	DURATION IN MONTHS (MEAN)	SD
GROUP A	42.47	9.09	4.6	1.5
GROUP B	39.8	9.14	5.3	1.8

Table 2. Statistical results -NPRS scores

GROUP	Pre-Test Mean	U	P-Value	Post-Test Mean	U	P-Value	Critical Value
GROUP A	6.27	88	P>0.05	2.47	26	P<0.05	64
GROUP B	6.73			4.67			

Table 3. Statistical results -NDI scores

GROUP	Pre-Test Mean	U	P-Value	Post-Test Mean	U	P-Value	Critical Value
GROUP A	25.93	69	P>0.05	8.0	26	P<0.05	64
GROUP B	29.13			21.8			

Table 4. Statistical results -MMT scores of LT, MT and SA Muscles

MUSCLE	GROUP	Pre -Test Mean	U	P-Value	Post-Test Mean	U	P-Value	Critical Value
LOWER TRAPEZIUS	GROUP A	5.13	90.5	P>0.05	8.2	62	P<0.05	64
	GROUP B	4.87			7.4			
MIDDLE TRAPEZIUS	GROUP A	5.0	112.5	P>0.05	8.0	63	P<0.05	64
	GROUP B	5.0			7.33			
SERRATUS ANTERIOR	GROUP A	4.93	107	P>0.05	8.07	55	P<0.05	64
	GROUP B	4.87			7.2			

Discussion

The study was an experimental approach to find out the effectiveness of strengthening exercises to Lower Trapezius, Middle Trapezius and Serratus Anterior on pain, functional status and muscle strength in non-specific chronic neck pain.

The result showed that both groups had reduction in pain, improvement in functional status and muscle strength. Even though both groups showed improvement, the Group A showed more significant changes in NPRS, NDI and MMT values than the Group B. It indicates that LT, MT and SA muscles strengthening along with conventional treatment is more effective in reducing pain, improving in functional status and muscle strength in individuals with non-specific chronic neck pain.

Individuals with neck pain have significantly weaker LT, MT and SA muscles on their side of neck pain. Patients with neck pain often have subjective complaints of muscle stiffness, tension and upper

trapezius tightness. This in turn may cause LT, MT and SA weakness and muscle imbalances in the scapulothoracic region^{3, 4}. These imbalances disrupt normal scapular positioning and result in impaired biomechanics and pain³. Changes in the recruitment properties and pain may influence muscle stability function. Pain can also deteriorate the quality of life^{12,8}.

In patients with chronic neck pain, histopathologic investigations have detected muscular fatigue, pain and significantly low trapezius muscle blood flow at low contraction intensities on the more painful than the less painful side due to atrophic muscle fibers. It may cause the weakness of trapezius muscles. The adequacy of blood supply, which transports oxygen and nutrients to muscle and removes waste products, affect the tension producing capacity of a muscle and its resistance to fatigue.¹¹

Strengthening programs focusing on the cervical and scapulothoracic region give short and long-term benefit on pain and function in chronic mechanical

neck disorders². The stabilizations function of stability muscles is influenced by postural changes of muscles and changes in connective tissue may influence muscle function⁸. Proper firing patterns and recruitment of muscles require coupling of the serratus anterior muscle with the upper, middle, and lower trapezius muscles, consequently resulting in “force couples,” which are considered necessary for normal scapular orientation. Combining information from training physiology and clinical studies provides strong evidence for the effectiveness of exercise therapy for chronic neck pain, as well as the disability it causes.²

Hence, this study suggests that the strengthening LT, MT and SA along with conventional therapy is effective in reducing pain, improving muscle strength and functional status in individuals with non-specific chronic neck pain.

Conclusion

The study primarily tried to analyze the effect of strengthening exercises to lower trapezius, Middle Trapezius and Serratus Anterior along with conventional therapy on pain, muscle strength and functional status in individuals with non-specific chronic neck pain.

Statistical analysis of data collected by NPRS, NDI and MMT recommends that strengthening exercises to MT, LT and SA along with conventional therapy has significant effect in individuals with non-specific chronic neck pain than Conventional therapy alone. Hence, this study reveals that addition of strengthening exercises to MT, LT and SA to the regimen enhances faster recover in individuals with non-specific chronic neck pain. Hence, we concluded that strengthening exercises to middle trapezius, lower trapezius and serratus anterior muscles along with conventional therapy is effective in reducing pain, improving muscle strength and functional status in

individuals with non-specific chronic neck pain.

List of abbreviations

LT -Lower Trapezius

MT -Middle Trapezius

SA -Serratus Anterior

UT -Upper Trapezius

NPRS -Numerical Pain Rate Scale

MMT -Manual Muscle Test

NDI -Neck Disability Index

IEC-Institutional Ethics Committee

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Source Of Funding: There was no external source of funding received for this research work.

Ethical Clearance: This Pre-test Post-test Experimental study design was conducted at Department of Physiotherapy, Little Flower Institute of Medical Sciences and Research Centre, Angamaly for duration of 6 months. Ethical clearance was obtained from the IEC.

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Physiotherapy Interventions in Stroke in COVID-19 – A Case Report

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Summary

A 67year old known hypertensive and diabetic right handed man who was diagnosed of stroke post COVID-19 and presented with impaired motor functions essentially of right limbs; trunk impairment; impaired balance and loss of ambulatory function was daily managed with paced capacity based physiotherapy protocols which was gradually increased within tolerated levels until he became stable ambulatory wise without any respiratory distress, at which point he was discharged from physiotherapy, Katz Score being 6/6 and gait speed which was 0.18m/s at start of ambulation rose to 1.47m/s with maximum ambulatory distance of 103m at a stretch and SPO₂ at 95%. Peripheral Agraphia identified at 7weeks post physiotherapy intervention was productively managed with Recall and Copy Treatment, RACT, the writing became very legible. The adopted physiotherapy interventions ensured Physical Activity Reactivation (PAR) with the patient being able to ‘step out’ with reassured health life and integration into normal activities of daily living (ADL). The Functional Physical Activity Tempo (FPAT) can be sustained post COVID Rehabilitation once it’s well considered and integrated into rehabilitation protocols.

Key Words: *Paced Capacity, Physiotherapy Protocols, Gait Speed, Recall and Copy Treatment, Physical Activity Reactivation, Functional Physical Activity Tempo.*

Background

Coronavirus disease 2019 (COVID-19) was reported in December 2019 in Wuhan, Hubei province, China; the causative organism being a novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The incidence of COVID-19 is mostly in adult male with median age between 34 and 59years¹, ² and comorbidities³; the highest proportion of severe cases occurs in adults > 60years of age^{1,2}. The clinical presentations in COVID-19 include fever, dry cough, dyspnoea, chest pain, fatigue and myalgia while the less common symptoms are headache, abdominal pain, diarrhoea, sputum production, haemoptysis and diarrhoea⁴. Also reported were possible complications like hypoxaemia, arrhythmia, shock, acute cardiac

injury and acute renal injury^{4, 5}. Community transmission is a common mode of transmission and is usually interrupted by isolating infected people hence the emergence of isolation centers⁶. Acute ischaemic stroke may occur in patients with COVID-19 and usually in the presence of other cardiovascular risk factors. The risk of discharge to destination other than home or death increased 2-fold with occurrence of acute ischaemic stroke in patients with COVID-19⁷. A research work suggests pneumonia in COVID-19 patients is linked to viral-induced changes in the brain as MRI scans revealed 57.9% of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infected patients had recent brain lesions; focal neurological manifestations were seen in some and

non-focal neurological manifestations were seen in others but the most significant lesions came from territorial infarcts or cerebral haemorrhaging⁸. Daynes et al⁹ using aerobics (Walking/Treadmill based) with strengthening training reported that COVID-19 Rehabilitation appears feasible & significantly improves clinical outcomes with no adverse effects recorded & no drop outs related to symptom worsening.

Case Presentation

Patient was a 67year old known hypertensive and diabetic right handed man who had low grade intermittent fever and unproductive, non-paroxysmal cough one month prior to presentation. There was no history of difficulty in breathing/chest pain and no known contact with COVID-19. Hitherto he has had good BP & glycaemic control with good drug compliance. Patient tested positive to COVID-19 three days after onset of present condition and progressive generalised body weakness a day later with poor appetite. Partial loss of memory set in right from onset of this condition. Patient is not a known asthmatic and had no previous surgery or blood transfusion. There was no history of alcohol ingestion or cigarette smoking. On admission, SPO₂ was 90% (room air); BP 135/75mmHg; PR 94bpm; Body Temperature 36.5°C. He was placed on intra nasal oxygen (INO₂) upon admission, this was removed 3 days later by which time SPO₂ was 95% (room air); BP 119/77mmHg; PR 80bpm. Three weeks after onset of condition patient presented with Ischaemic left hemispheric CVD with reduced motor function of right limbs and loss of functional abilities – trunk control; balance; sitting; standing and walking. He tested negative to COVID-19 one month after initial positive result.

Physiotherapy intervention commenced three weeks post onset of condition. Upon assessment,

patient was conscious but not well oriented in time, place & position; the gross muscle power (GMP), right UL & LL = 1; Left UL & LL =3. Left power grip was poor while right power grip was good. Reflexes in right limbs were 1+ and normal in left limbs. The left limbs were hypotonic. There was reduced PROM at lumbosacral joints with difficulty in passively assuming sitting posture and attendant pain at L2-L5, no swelling and no tenderness. Chest was clinically clear with adequate air entry. Katz Score was 0/6. Physiotherapy impressions were impaired motor functions of all limbs right > left; impaired balance and reduced exercise tolerance.

Treatment

Initial treatment protocols were assisted breathing exercises; assisted active exercises to right limbs; free active exercises to left limbs; passive mobilization exercises to lumbosacral joints; gripping exercises and therapeutic position of right limbs. Vital Signs (BP, PR, Body Temperature, SPO₂) and auscultations were done, pre and post treatment intervention. Patient was treated daily throughout the week. 5days post assessment, patient made neurological improvements, the gross muscle power (GMP), right UL & LL = 2; Left UL & LL =4; power grip, left=fair & right=good; SPO₂ was 94% (room air). Improvised Spirometry (with balloon because the patient couldn't cope with spirometer); Strengthening exercises, Trunk Stability exercises & Sitting re-education started 8 days post assessment; these were added to initial treatment protocols. Standing and Ambulatory commenced 8 days post assessment. Ambulation was done with Physiotherapist's assistance, a distance of 4ft x 2reps was covered, pre SPO₂ and post SPO₂ were 95% & 97% (room air), respectively.

Outcome and Follow-up

5 days post assessment, patient made neurological

improvements, the gross muscle power (GMP), right UL & LL = 3; Left UL & LL = 5; good trunk balance and Katz Score 2/6 (feeding & transfer). Patient achieved unsupported standing for 5mins at 7¹/₂ weeks post commencement of Physiotherapy and unloaded bicycle ergometer (10mins) was included in the treatment protocol at this time. Peripheral Agraphia was observed when this intervention was 7 weeks old and patient was subsequently placed on writing skill exercise (to increase muscle strength, improve coordination and muscle memory) in a book. Patient had to recall and write events he went through each day (Recall and Copy Treatment, RACT). This is timed and dated in this book as it's done to monitor progress.

Gait Speed which was 0.18m/s at start of ambulation grew to 1.47m/s, patient being able to walk 103 m distance at a stretch with SPO₂ at 95% and 15 mins unsupported standing at 13 weeks post commencement of Physiotherapy. The final stage of ambulation was treadmill exercises which started at 14 weeks post initiation of this interventions. Initial protocol of 5mins, 0.0 incline, Speed 0.8 KPH was progressively increased to 10mins, 0.0 incline, Speed 1.6 KPH (after 8 days); 15mins, 0.0 incline, Speed 2.4 KPH (after another 7 days); 20mins, 0.0 incline, Speed 3.2 KPH (after another 7 days) and treatment intervention at 25 mins, 0.0 incline, Speed 4.8 KPH (after another 14 days), a protocol the patient was maintained on till discharge after being on treadmill for 46 days.

At point of discharge from Physiotherapy, patient had global GMP of 5; bilateral power grip –good; Katz Score 6/6. Writing skill which commenced when the intervention was 7 weeks old became very legible with average writing of 2-3 pages per day. Patient was discharged on walking exercises within his compound with monitoring of SPO₂, BP, PR&

Body Temperature.

Conclusion

Physiotherapy interventions have proven to be productively deployed in the management of neurological complications arising from COVID-19. Patient with post COVID -19 stroke can be rehabilitated to independent functional level with subsequent reintegration into the society having improved ADL; stable gait and reasonable gait speed and active participation in daily living while being breathlessness free without desaturation.

Ethical Clearance – Taken from Institutional Research Ethical Committee, JUTH, Nigeria (JUTH/DCS/IREC/127/XXXI/2715).

Source of Funding – Self

Conflict of Interest – Nil

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A Comparative Study on Effectiveness of Aerobic Exercise versus Resistance Exercise on Improving Cognitive Function in Older Adults

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Abstract

Background and Objective: Cognitive impairment is so common in older adults and prevalence is also increasing rapidly. Previous studies had found that aerobic and resistance exercises are effective in improving cognition, but we don't know the best form of exercise to improve cognition. The objective of this study is to compare the effects of Aerobic and Resistance exercises and to determine which one is effective approach for improving the cognitive function in older adults.

Methods : A total number of 50 subjects were taken,45 of them met the inclusion criteria and were divided into 2 groups by systematic random sampling, 23 in group A and 22 in group B. 41 subjects completed the study, where as Group A performs the Resistance exercise and Group B performs Aerobic exercise . These interventions are held for 8 weeks, 3 days in a week for 30 minutes. The assessment was taken at baseline ie, Prior to intervention (Pre test) and at the end of protocol i.e., Post intervention by using Mini -Mental State Examination scale as the outcome measure in this study.

Results: Statistical analysis of data revealed that both groups had shown improvements in cognitive function of older adults. But statistically aerobic exercise is more significant than resistance exercise.

Conclusion: This study concluded that Aerobic exercise is more effective when compared to Resistance exercise in improving Cognitive function in older adults.

Keywords: Cognition, Aerobic exercise, Resistance exercise, Mini -Mental State Examination scale.

Introduction

Cognitive function is the process of thought to

conceptualize, recognize and process stimuli is one of the most important factors that should be maintained and improved to assure healthy and disease free life style.

Aging is an progressive process and it results in decreased morphological and functional abilities and it further leads to reduced adaptive ability and quality of life and increased morbidity.¹ Studies are indicating

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that aging is negatively associated with volumes of white and gray matter in brain, hippocampus, amygdala and other brain regions, involvement of these cortical and subcortical structures leads to cognitive decline.¹

Aging is the main risk factor of cognitive impairment and dementia and Alzheimer's disease. Aging decreases multiple cognitive functions like reasoning, memory and attention, processing speed of information.¹⁻²

Small vascular disease (SVD), characterized by micro infarcts and lesions of subcortical areas and also elevated levels of homocysteine are the other risk factors leading to cognitive impairment and dementia.²⁻³

In 2011, 8% of Indian population and 11 % of world population are greater than 60 years and it will reach 19% by the end of 2050 (A.agarwal et al).⁴ The prevalence of cognitive impairment in India is 22.2%, with more rural prevalence in North India.

At present, 13 % of population who are over 65 years are suffering from some cognitive impairment and Alzheimer's disease is the most common cause and it leads to cognitive impairment in 1% of the older adult population and incidence will double for every 5 years and the prevalence of cognitive impairment is expected to triple by 2050.⁵

Studies on the benefits of physical exercise on cognitive function concluded that physically active individuals during adulthood shows decreased risk of cognitive impairment. Physical exercise also improves cognitive function in normal older adults with good cognitive function and it reduces the hippocampal atrophy and loss of brain tissue and also improvement in vascular function.⁵

In spite of research, there is no medicine which is proven to reduce age related cognitive impairment, although medications have proven no beneficial Neuro protective effect so the literature focuses on the benefits of regular exercise on cognition.⁶ Research suggests that exercise promotes neuroplasticity and recovers the brain from aging and neuro degeneration.⁶ The hippocampus is the most vulnerable structure to aging but it supports neurogenesis which is facilitated by exercise.⁶

Life style may modulate the effects of aging on cognitive function, so physical therapy is presently an appreciable body of research. Exercise training is having positive effects on health, physical, behavioural and cognitive components and it slows down effects of pathological aging.⁷ The mechanisms by which exercise improves cognition are increase in cerebral blood flow and more marked supply of oxygen, production of important neurotransmitters for brain function and positive role in brain angiogenesis, synaptogenesis and neurogenesis.⁸

Aerobic exercise refers to exercises in which the large muscles move in a rhythmic manner for sustained periods (Chodzko –Zajko 2009). Previous researchers had examined the effects of aerobic training on cognitive function and concluded that aerobic exercise improves overall cognitive function. Aerobic exercise training increases cerebral perfusion, brain derived neurotrophic factor (BDNF) and increases electrical activity of brain .⁹

Resistance exercise is a type of exercise that involves the voluntary activation of specific muscle groups against external resistance (Winnet & Carpinelli, 2001). Resistance training has reported an improvement in brain derived neurotrophic factor, epinephrine and nor epinephrine and it also improves cognitive function.⁹ A study conducted by kirk-sanchez and Mc Gough has showed strength

training has positive effects on cognitive function¹⁰ and positive results were also observed by Chang et al. who had proposed the effects of strength training on cognitive performance of elder women.^{11,12}

As compared to aerobic training there are lesser studies examined on effects of resistance training on cognitive function and literature suggested that exercise is having positive effect on cognition, but there is some contrast between aerobic and resistance exercise and their effects on cognition.

However till date studies have not focused between aerobic and resistance exercise on improving cognitive function in older adults. The purpose of this study was to compare the effects between aerobic and resistance exercise on improving cognitive function in older adults.

Materials and Methods

STUDY DESIGN : Prospective Cohort study

STUDY POPULATION : Older adults with cognitive impairment are recruited in this study

SAMPLE SIZE : 45

SAMPLING DESIGN : Systematic random sampling

TREATMENT DURATION : 30 minutes a day, for 8 weeks on alternate days.

MATERIALS USED : Chair, Dumbbells, Therabands, Static cycle ergometer, Yogamat

Inclusion Criteria:

1. Subjects who are 60 years old or more (male and female)
2. Subjects who complaints memory problems
3. MMSE score less than 26

4. Subjects who are willing to participate in an supervised exercise program

Exclusion Criteria:

1. Being bedbound
2. Visual or audio impairment.
3. Subjects having severe osteo arthritis.
4. Subjects suffering from Parkinsonism.
5. Post stroke patients and upper and lower limb paralysis.
6. Subjects having problems with communication.

OUTCOME MEASURES:

MMSE (MINI -MENTAL STATE EXAMINATION)

PROCEDURE:

PROTOCOL FOR RESISTANCE EXERCISE GROUP (GROUP -A):

The resistance training group will follow the described protocol 3 times a week on alternate days (Monday, Wednesday and Friday). The resistance exercise group followed a 8 week exercise program that involve dumbbells and therabands. Alternating biceps and shoulder lateral raise are performed for upper limbs by using dumbbells and knee flexors and extensor exercises are done by using therabands.¹⁷ In order to estimate the load volume the resistance training group was subjected to the 1 repetition maximum (RM) test. Once it was determined we fixed the appropriate load of resistance exercises to 60 % to 80% intensity of apparent 1 RM. The theraband was color coded and each subject began the program using the Red theraband first followed by green, blue and black.¹⁷ If the subject has shown the ability to complete repetitions without difficulty,

then they will be progressed to next theraband color. Three sets of 8 to 12 repetitions each ,with 2 minute interval of rest between sets for each exercise were performed(ACSM,2009).²⁷ After every 2 weeks of resistance exercise, we will measure 1 RM and intensity is reestablished. This resistance exercise program consisted of warm up exercises (active movements) for 5 minutes and also cool down exercises for 5 minutes (stretching's).

PROTOCOL FOR AEROBIC EXERCISE GROUP (GROUP –B):

This is an 8 week aerobic exercise program which was performed 3 days in a week on alternate days (Tuesday, Thursday and Saturday). Stretching's and active limb movements for 5 minutes were given before each session as warm-up before to training. Subjects were instructed to exercise at 60 to 70% of their maximum heart rate (Age – 226), their heart rates were measured. During each training session participants performed cycling on stationary ergometer. Initially subjects have given a goal of at least 23 minutes aerobic exercise per session and

increased duration gradually every 1 week up to 30 minutes. After the training session cooling down period was given by jogging for 5 minutes.¹⁶

Findings

Statistical Analysis

Statistical analysis was done by using the statistical software SPSS 20.0 version, for this purpose the data was entered into Microsoft Excel -2007 spreadsheet, tabulated and subjected into statistical analysis.

Descriptive statistical data was presented in the form of mean ± standard deviation; mean difference percentage (%) was calculated and graphically presented.

Within the group differences were checked with Paired student-T test and between the groups differences are checked using Independent student-T test.

For all statistical analysis, p<0.05 was considered as statistically significant.

Results

Table-1: Analysis of Post test means of MMSE Scores between Group A and Group B

GROUP	MEAN	SD	P -value	INFERENCE
GROUP – A	23.65	1.38	0.0349	SIGNIFICANT
GROUP – B	24.61	1.43		

Results

There is statistically significant difference between Post test means of MMSE in between Group A and Group B. Showing that Group B (Aerobic exercise

group) is more effective than Group A (Resistance exercise group).

Discussion

The Aim of this study was to compare the

effects of aerobic exercise and resistance exercise on improving cognitive function in older adults. Both aerobic and resistance exercise are evidently effective in addressing the cognitive function of older adults. But there are fewer studies who had compared these approaches on improving cognitive function.

In this study subjects are assessed for their cognitive function at the baseline and at the end of intervention by using MMSE. There were 4 dropouts, 3 from Group A (Resistance exercise group) i.e. 1 is due to stroke and 1 is due to fracture of Humerus resulting from road traffic accident and another one is due to acute gastritis. There is only 1 dropout from Group B (Aerobic exercise group) i.e. due to sudden natural death of the subject. There is significant difference between Pre and Post scores after the 8 weeks treatment in both Resistance exercise group and Aerobic exercise group and there was a statistically significant difference in between resistance and aerobic group.

Exercise refers to planned, structured, and repetitive movement to improve or maintain one or more components of physical fitness (Chodzko – Zajko 2009). Exercise is thought to be neuroprotective through the mechanisms it acting on cardio vascular system and it also promotes neuroplasticity and it acts directly on neurocognitive systems. There is an proven support for exercise improving cognition in older adults with cognitive impairments.¹³⁻¹⁸

Studies are showing that physically active people in adulthood will have a lesser risk of developing cognitive impairment during late life.¹⁹⁻²³ Brain derived neurotrophic factor (BDNF) increases after acute exercise facilitates neuronal survival (Ferris et al., 2007). Exercise preserves the structure of neurons and it has positive role in brain angiogenesis, synaptogenesis, neurogenesis.^{24,25-28}

The dentate gyrus of hippocampus is most affected by aging process²⁹ and this is one of the few brain regions which supports neurogenesis by doing exercise.³⁰⁻³⁴ A study by Intlefocker 2013 had reported that exercise restores hippocampal function by increasing the BDNF levels and other growth factors which improve neurogenesis, angiogenesis and synaptic plasticity.

Following a regular exercise program, neurotrophic signals are released at central and peripheral level in bloodstream and these will influence neuroprotective responses and decreases neural apoptosis.³⁵ Neurotrophic factors (neurotrophins) are proteins that helps in neuronal existence, growth, division, and protection and also in repairing of damaged neurons (Connor and dragunow, 1998).

Resistance exercise is suitable for elderly population, but the benefits of resistance training beyond strength are poorly noticed and very little research was done regarding mechanisms by which it improves cognition. Resistance training result in improved vascularization throughout the body and enhances nutrient supply to brain (Gore lick et al). The mechanisms by which we acquire cognition by resistance training are; changes in blood flow and rebalance of steroid hormones and increase in neurotransmitter levels in brain and also release of neurotrophins.³⁶

According to Rao et al, by introducing strength training protocols to avoid neurodegenerative diseases, the patient and health care costs are positively affected. A study conducted by Perring chiello et al and lanchman et al. had found no significant difference in memory in elder persons after doing resistance training. A study conducted by cassilhas et al and Liu ambrose et al. has revealed positive effects on cognitive function in elderly.

Aerobic exercise improves overall cognitive function by increase in cerebral electrical activity , vascularization and neurotransmitter secretion and it also increases cerebral blood flow and brain derived neurotrophic factor (BDNF) and it reduces brain volume loss and neuronal apoptosis (Erickson et al.,2009, 2011).

Aerobic training shows an association with decreased brain tissue loss in aging humans, the change in aerobic fitness is positively associated with the hippocampus volume(Thomas et al.,2016) and this could explained through increased neurogenesis or angiogenesis as due to increase in aerobic fitness.

There is evidence which supports the hypothesis that cardiovascular health which including cardio respiratory fitness is linked to cognitive function (Gauthier 2015) and it is one of the factor that benefits cognition and also integrity of neurons in older adults. A 2008 Cochrane database states that there is evidence that aerobic physical exercise which improves cardio respiratory fitness will benefit the cognitive function in healthy older adults. And finally , Hawkes, manselle , wollacott (2014) had found that aerobic exercise training 30 minute per session, showed improvement in cognitive performance.

Some prospective studies of resistance exercise influence on plasma BDNF levels have revealed negative results and when compared to aerobic exercise, resistance training exercise did not increase circulating BDNF concentrations³⁷.

There are also numerous non cognitive and non vascular benefits which are additionally benefited from exercise, which are most useful in aging population. Some of them are decreases in fracture and osteoporosis risk and age related sarcopenia and lastly exercise has positive impact on depression and anxiety and psychological well being.

In this study aerobic exercise has proven to be more effective when compared with resistance exercise due to increase in cardio respiratory fitness and aerobic exercise decreases brain tissue loss and it promotes Angiogenesis , Neurogenesis in hippocampus and it also improves overall cognitive function . Above all factors are associated with good cognitive function in older adults. So aerobic exercise is shown to be more effective when compared to resistance exercise.

Conclusion

This study concluded that aerobic exercise is effective in improving cognitive function than resistance exercise in older adults

Conflict of Interest : Nil

Source of Funding : self

Ethical Clearance : The ethical clearance of this study protocol was approved by the Ethical committee of GSL medical college, the participants were requested to provide their consent to participate in the study.

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Case Report

A Tele Rehabilitation Approach for the Treatment of Dyspareunia: Case Report

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Abstract

Painful sexual intercourse, also called as Dyspareunia, may be due to a medical or psychological causes. Women with painful sexual intercourse may have pain in the Vagina, Clitoris or Labia. The pain would primarily be on the External surfaces or deeper in the pelvis. Medically, Dyspareunia is a pelvic floor dysfunction and affects up to 53% of adult women and remains underdiagnosed. A multidisciplinary approach is needed for a complete rehabilitation of the dysfunction. As a part of the rehabilitation team, A Pelvic floor therapist also plays a crucial role in treating the Tone and the Strength of the Pelvic floor muscles.

But during the COVID-19 pandemic and with the social distancing norms, the pelvic floor therapist faced a challenge in treating this concern. The current case report describes the Telerehabilitation approach and progressive intervention administered by the authors for Hypertonic pelvic floor dysfunction, to improve the quality of life and the strength of the pelvic floor of the women's during the lockdown or when reaching the therapist gets difficult.

Keywords: *hypertonic pelvic floor dysfunction, Telerehabilitation, Dyspareunia, non-relaxing pelvic floor muscles.*

Introduction

Dyspareunia in women is a recurrent or persistent pain with sexual activity that can cause marked distress or interpersonal conflict¹. It can lead to or be associated with other female sexual dysfunction disorder,

which includes decreased libido, decreased arousal and orgasm¹. Hypertonic pelvic floor muscles, is a dysfunction in which the pelvic floor gets tensed and unable to relax, and is considered as one of the causes for this condition. Women with such a dysfunction do complain of pelvic pain, painful sex and constipation². However, the symptoms of non-relaxing pelvic floor vary and often attributes to as pelvic floor myalgia, levator ani syndrome and perineum syndrome³. Pelvic floor neuromuscular reeducation exercises along with certain devices is the mainstream treatment for non-relaxing pelvic floor muscles however during the COVID- 19 pandemic lockdown, with the threatening

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virus and the spread, it was difficult for the pelvic floor therapist to treat such a concern over virtual online platform. Hence the current case report discusses a Tele rehab protocol used by the therapist to improve the quality of life and the pelvic floor strength of the client with dyspareunia.

Case Report

A 27 years adult female, unmarried and sexually active, Teacher by profession connected for a Tele rehab consultation of an advanced physiotherapy center at Mumbai, Maharashtra in March 2021 during the Lockdown, having complains of painful sex during coital activities since a year. A consent form clarifying the norms and the benefits of the therapy was shared over an email prior to the consultation. On the scheduled day and time, the therapist connected to the client over a virtual platform.

After discussing the Sexual history on Desire of having sex, arousal level, Lubrication, Orgasm, clients satisfaction after the intercourse and Coital pain, the client was taught Pelvic floor muscle strength testing method on a Pelvic model, following which she was advised to asses her own Pelvic floor strength and report it on a modified oxford scale. As a Subjective assessment, the client was told to administer a questionnaire, The Female Sexual Distress scale-Revised [FSDS- R] to assess the Quality of life. Both the outcomes, were used as a Baseline score for the therapy. Based on the clinical history and the outcome measure, the client was diagnosed with Vaginismus associated with hypertonic Pelvic floor muscles and was assigned for 20 Tele rehab sessions thrice a week, 45 minutes at a convenient time of the day.

Intervention:

1. Pelvic floor Relaxation: The session begun with Breathing and Pelvic floor relaxation coordinated for 5 minutes. With each deep inhale, the client was

asked to relax the vaginal opening completely and while she exhale, she was instructed to gradually close the vaginal opening which synched her breathing with the pelvic floor movements. She was instructed not to engage the accessory muscles- abdominals, gluteal and adductors.

2. Invasive technique: Once the client was aware of the Pelvic floor muscles in isolation, she was advised to gently insert her clean sanitized index finger in the vaginal opening while she continued with the Coordinated breathing pattern. The synchronized contraction and relaxation of the Pelvic floor muscles with breathing will guide the index finger slowly in the vagina without pain. Once the fingers could be inserted almost to 1/3rd, the client was taught to palpate for painful trigger points on the vaginal wall in the clockwise pattern.

3. Trigger point release: On locating the trigger points, she was advised to apply tolerable pressure over each points and maintain it for 30 sec coordinating it with the breathing. This was repeated 3-4 times. The above 2 techniques were first demonstrated on a pelvic model by the therapist.

4. Icing: Client was advised to keep a water filled hand gloves in the refrigerator and insert the iced gloved finger in the vagina post the trigger points release.

5. Dilator: As a progression, once the trigger points were released, the dilator was used in all the functional position. The dilator was inserted in the lying down position first and gradually progressed to side lying and quadruped position. The client was instructed to follow the same technique of breathing and pelvic floor coordination while inserting. Once the dilator could insert smoothly, the client was advised to move it in clockwise, anticlockwise and thrusting movement for 15 -20 min with rest of 2-3 minutes.

6. Perineal massage: As a home exercises program, the client was advised to massage the vaginal opening while she lied down on her back with the knees bent, rested on the sides on the pillow. With her clean gelled index finger, she had to give deep U slinged strokes at the vaginal opening.

7. Home exercise program (HEP): A regular HEP for strengthening the pelvic floor was given to the client which was assessed and monitored by the treating therapist on the mobile application.

The outcome measure and the Self testing was administered on the 10th session and at the end of 20th session.

Result: On the initial assessment, the client complained of pain while she inserted her index

finger 1/3rd in the vaginal opening. Also, there were 3 trigger points noted at the 4 clock, 7 clock and 9 clock pattern. The self-reported strength of the muscles was 3/5 on Modified oxford scale. The FSDS- R score was reported to be 39/52. By the 10th session, the client experienced a satisfactory sexual activity and could feel a less painful penetration. However, thrusting would aggravate the pain. Two trigger points were released (7 clock and 4 clock) and the outcome measure also showed an improvement. With the progression in the exercise regimen, by the 20th session, the client could insert her two fingers, pain-free in the vaginal orifice with no trigger points. The strength of the muscles is 4/5 on modified oxford scale. A significant improvement is seen on the questionnaire score (Table 1).

Table 1: Outcome measures

Sr. No	Outcome measure	Day 0	Session 10th	Session 20th
1.	Trigger points	Present at 4 clock, 7 clock and 9 clock	Present at 9 clock	Nil
2.	Modified Oxford Scale	3/5	3/5	4/5
3.	FSDS- R score	39/ 52	11/52	3/52

Discussion

The Tele rehab approach administered for rehabilitating the Hypertonic pelvic floor muscles has shown a significant improvement in the tone, the strength of the pelvic floor and the quality of life of the client suffering from Dyspareunia due to vaginismus. This supports the study done by Vermandel et al which reports increased knowledge

of pelvic floor has a positive association with reduced pelvic floor dysfunction⁴. The current protocol begins with understanding the pelvic floor muscles and its basic biomechanics with diaphragm while breathing. This helped in complete relaxation of the pelvic floor while the client focused on breathing⁵. An awareness of pelvic floor and the recruiting of the accessory muscles are a crucial step in the rehabilitation of the Hypertonic muscle which was well explained

to the client on the 1st session. Timely Revising the coordination of breathing pattern with pelvic floor enhanced the results. The self-invasive technique gave the client the confidence to penetrate which reduced the penetration fear and she started practicing the same while involved in the sexual activities which reduced her discomfort and pain which supports the case report of Eivazi et al on two cases of Vaginismus treated with self finger approach. ⁶. The ischemic compression technique applied to the trigger points helped to break the points, making the penetration and thrusting pain free and relaxing the pelvic floor. Icing post the trigger point release helped to reduce the pain and also increase the blood supply to the muscles helping to wash the toxic and also promote healing. Asian M et al in his study on treatment of Vaginismus, with Dilator training proved statically more significant than the finger training. Hence Dilators used for the therapy in the current report acted like a dummy penis and boosted the clients confidence, decreased the fear of penetration⁷. Practicing the dilators in different positions also added to the result.

Perineal massage functioned as a stretching to the vaginal opening, maintained the flexibility and helped relaxed the pelvic floor. It was advised to relax the Vaginal opening by the massage during the sexual activities as a part of the foreplay. This added to increased relaxation and also to lubricate the vaginal canal well. The compliance and effectiveness to the protocol was monitored by continuing the HEP on the other days of the week when the client didn't connect. This helped maintain the achieved outcome and enhance the results. Most important reason for the compliance to the whole program, was exercising from home environment, which added to the mental satisfaction of the client, reducing the embarrassment and the COVID 19 fear.

Conclusion

The Tele rehab approach administered for treating dyspareunia is effective in reducing the symptoms associated with vaginismus, mainly dyspareunia, the Strength and the Quality of sexual health of the women.

Conflict of Interest: Nil

Source of Funding: Funded by the organization.

Consent Form: A written consent form was taken from the client over a mail before participation.

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Correlation of Level of Physical Activity with Weight Perception, Body Mass Index and Body Image Dissatisfaction among Physiotherapy Students of Government Tertiary Care Hospital

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Abstract

Background- Obesity has been increasing steadily and is one of the major cause of many non-communicable diseases among young population. Physiotherapy profession revolves around health and fitness and thus physiotherapy students were chosen for the study. The aim of the study is to find correlation of levels of physical activity with weight perception, body mass index and body image dissatisfaction among physiotherapy students of government tertiary care hospital.

Method- It was an observational, cross sectional study of 68 physiotherapy students of either gender between the age of 18-25 years. Perceived weight was documented, body mass index calculated and questionnaires were used to score body image dissatisfaction and physical activity.

Conclusion- We found no correlation between level of physical activity and weight perception($p>0.05$) and between level of physical activity and Body Image Dissatisfaction ($p>0.05$). However, there was a correlation between level of physical activity and Body Mass Index with $p\leq 0.05$, $\rho=0.281$. The result highlights the importance of increasing awareness towards self-acceptance of body image and focus on physical activity.

Keywords: Body Image Dissatisfaction, Body Mass Index, Physical activity, Physiotherapy students, Weight perception.

Introduction

Obesity has been progressively increasing despite the increased frequency of weight concerns and weight management techniques among the youthful population. It is a substantial contributor to a variety of non-communicable diseases. Weight management practices are triggered by body weight perception, according to studies. Weight perception is a subjective assessment of one's weight, regardless of reality^[1] and depends on a variety of factors like gender, family,

society, etc. One of the tools to screen for weight categories is Body Mass Index. It may indicate a risk for health problems, calculated as weight / height².

Body image refers to how someone perceives, thinks and feels regarding their body and appearance. This perception could be positive or negative and is greatly influenced by sociodemographic and environmental factors. Studies have demonstrated that body image dissatisfaction occurring in late childhood and adolescence is associated with increased negative

obese II (BMI >30). It is calculated as Weight(kg)/Height(m)². The BMI scale for Asian population was used for the study.

Figure Rating Scale [11]: Stunkard Figure Rating Scale was used for the study. It consists of 9 silhouettes ranging from very thin (value of 1) to very obese (value of 9). The participant was asked to select a figure of how he/she perceived their current body shape and another figure as to how they desire to be. A difference of score between perceived body image and ideal body image gave us the value of dissatisfaction. If it was ≥1, the participant wanted to be thinner. If it was < 1, he desired to be heavier whereas a score of 0 indicated no dissatisfaction.

International Physical Activity Questionnaire (IPAQ) [12]: IPAQ is an international measure for

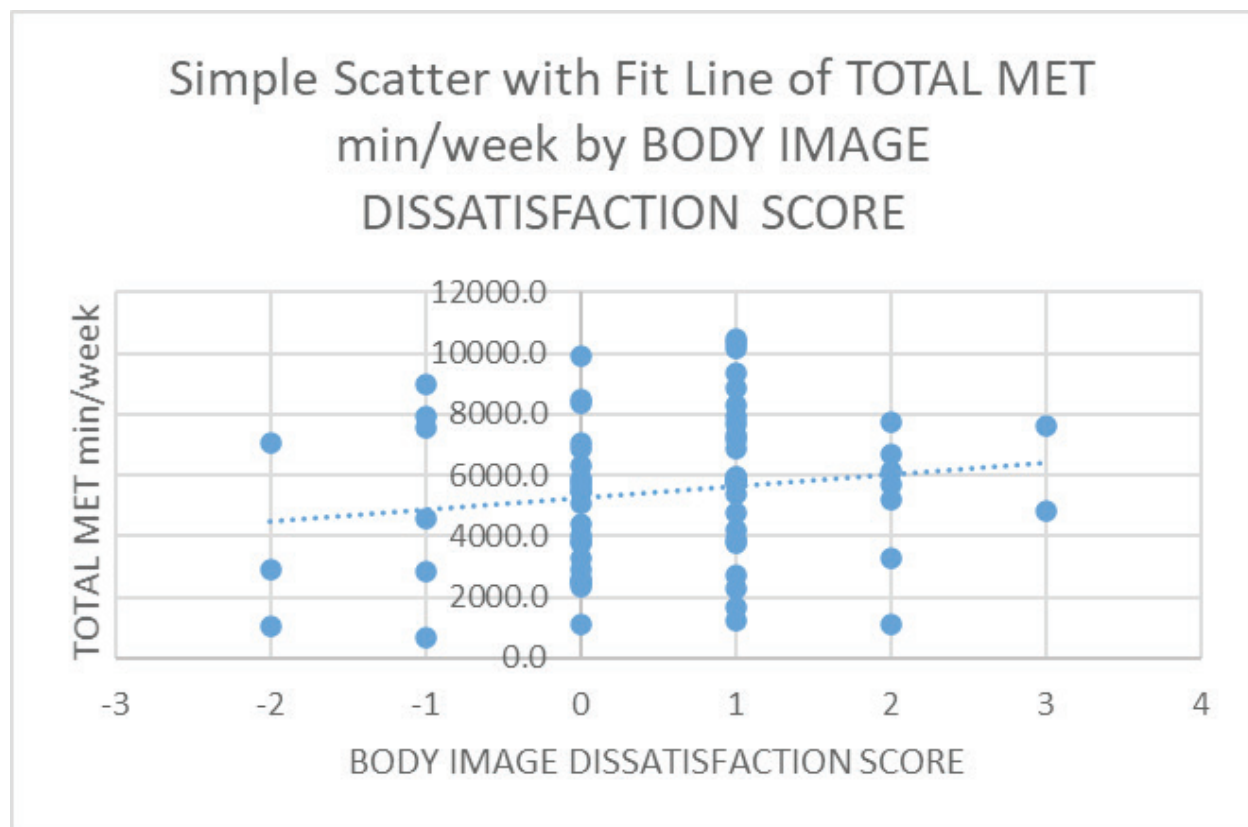
physical activity in the last 7 days. It consists of a set of 5 domains. These domains include job related physical activity, transportation physical activity, housework and caring for family, recreation and time spent sitting. The assessment was based on the intensity of physical activity categorized as vigorous, moderate and just normal walking. The level of physical activity is classified as low (MET 3.3), moderate (MET 4) and vigorous (MET 8).

The data was analyzed using Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics including frequency, percentage, mean and standard deviation was used to analyze the study population. Spearman’s Test was used to study the relationships between the variables. Differences were considered significant at p< 0.05

Result

TABLE 1: Correlation of Total MET min/week with weight perceived, Body Mass Index and Body Image Dissatisfaction:

		Weight perceived (kg)	Body Mass Index (kg/m ²)	Body Image Dissatisfaction
Total MET min/week	Correlation coefficient	0.088	0.281	0.163
	Sig.(2 tailed)	0.48	0.022	0.192
	N	66	66	66



The graph shows no correlation between level of physical activity and Body Image Dissatisfaction score ($p > 0.05$, $\rho = 0.163$)

Discussion

The students selected for our study were undergraduate and postgraduate students of a government tertiary care hospital. A total of 68 physiotherapy students aged 18-25 years (mean age 22 ± 1.62 years) participated in the study. 66 students have been included and 2 have been excluded from the study. This included 54 (81.8%) females and 12 (18.2%) males. 24 (35.29%) students overestimated their perceived weight, 37 (54.41%) students underestimated their perceived weight and 7 (10.29%) students perceived their weight accurately. 45 (66.17%) students of the 66 were dissatisfied with their body image: 9 (13.23%) desired to be heavier and 36 (52.94%) desired to be thinner. 30 (45.45%) students had normal BMI, 7 (10.60%) were underweight, 7 (10.60%) were overweight, 20 (30.30%) belonged to

Obese I category and 2 (03.03%) to Obese II category.

Almost all students (97.05%) were physically active with a mean MET min/week of 5444 ± 2543 . 60 (90.90%) students had moderate physical activity in their routine (mean total moderate MET min/week 2601 ± 2005.6) while 30 (45.45%) of these also had vigorous physical activity included. (mean total vigorous MET min/week 324 ± 610.25)

Majority of the participant's physical activity was contributed solely by walking, majorly contributed by work domain in the questionnaire.

We found no correlation between perceived weight and physical activity [Graph 1] like a previous study by Tawima Sirirassamee *et al* ^[13] that says the evidence for how weight perception relates to weight-related behavior is mixed. Some studies have

shown that adolescents who perceive themselves as overweight are more likely to report using exercise or diet as weight management ways than those who do not perceive themselves as overweight ^[14] A different study has shown that the perception of being overweight is related to lower physical activity or unhealthy food consumption ^[15] and a few have found no relationship.

There was a correlation between body mass index and physical activity [Graph 2] that was previously studied by Hadia Radwan *et al.* ^[4]

No correlation was found between Body image dissatisfaction and physical activity [Graph 3]. Caspersen *et al.* ^[16] defined physical activity as any bodily movement produced by skeletal muscles that results in energy expenditure. In daily life it is categorized into occupational, sports, conditioning, household, or other activities. On the other hand, exercise is a subcategory of physical activity. It is a physical activity that is planned, structured, repetitive, and intentional, in the sense that improvement or maintenance of one or more components of physical fitness is an objective. The IPAQ is a measure of total physical activity. In developing countries, occupational and transportation activities represent a considerable proportion of total physical activity. Thus, most of the participants possibly follow this sort of activity, and not specifically “exercise.” This might be one explanation for the lacking relationship between physical activity and body image disturbance.

The current study highlights the rate of body image dissatisfaction among young population of physiotherapy students. Dissatisfaction has been connected to negative effects according to a study. ^[2] There must be an increase in awareness towards self-acceptance of body image.

Conclusion

Our study did not show any correlation between level of physical activity and weight perception and between level of physical activity and body image dissatisfaction. However, there was a correlation between level of physical activity and Body Mass Index.

Limitation-Our study was done on a small sample size and was a single- centre study.

Conflict of Interest: The authors declare that there is no conflict of interest.

Source of Funding: Our research is self-funded.

Ethical Clearance: Ethical clearance has been taken from Department Review Board Committee. [DRB(PT)2021/16]

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Relationship between Trunk Performance and the Stair Ascending and Descending in Post Stroke Subjects

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Abstract

Purpose and Objective:- Trunk being the central keypoint of the body, good trunk stability is essential for reaching and grasping and proximal trunk control is a prerequisite for distal lower limb movement control in functional activities like walking and stair climbing. There are several clinical tools to measure trunk performance such as The sitting balance item of the Motor assessment scale, The trunk control test, leg and trunk scale of the Rivermead Motor Assessment Scale. The Trunk Impairment Scale (TIS) a new tool to measure motor impairment of trunk after stroke was developed in 2004 by G Verheyden et al. Studies were conducted to correlate the TIS with Tinetti, TUG test, 10 min walk test. However studies were not conducted to show the relationship between the trunk impairment and stair climbing in stroke subject. **Design:-** Correlational study **Settings:-** HOSMAT Hospital, Bangalore **Subjects:-** A total of 32 stroke subjects with a mean (SD) age of 53.90 ± 13.07 yrs. 21 males and 11 females participated. **Method:-** All the 32 subjects were administered with TIS and then followed by stair ascend and descend test. **Outcome measures:-** TIS, Stair ascend and descend test. **Results:-** The median scores of static, dynamic sitting balance and coordination (5, 6, 1) respectively. Mean score of stair ascend - 18.87 ± 11.05 and for stair descend - 20.60 ± 12.43 . There was a moderate negative correlation between TIS and stair ascend with $r_s = -0.54$ ($P=0.001$), moderate negative correlation between TIS and stair descend with $r_s = -0.63$ ($P=0.001$) and also moderate negative correlation between TIS and stair ascend + descend $r_s = 0.58$ ($P=0.001$). **Conclusion:-** The Trunk impairment scale shows moderate correlation with the stair ascend and descend test, which suggests that a person scoring less on the Trunk Impairment Scale (TIS) takes more time to ascend and descend the stairs.

Keywords:- Stroke, trunk impairments, trunk control, anticipatory postural adjustments, trunk scales, stair ascend and descend test.

Introduction

Trunk control is a crucial component to perform ADL.¹ Trunk muscles play an important role in the support of our bodies in antigravity postures such as

sitting and standing and in stabilization of proximal body parts during voluntary limb movements.² Unlike limb muscles, the abdominal muscles need a stable origin to act efficiently, that is the pelvis, the thorax or the central aponeurosis depending upon part of trunk that is moved. Trunk being the central keypoint of the body, good trunk stability is essential for reaching and grasping.^{3,4} and proximal trunk control is a prerequisite for lower limb movement control in functional activities like walking and stair climbing.⁵

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The sensory-motor impairment of trunk interferes with the functional performance after stroke. The trunk muscles are impaired on both the sides of the body in patients with stroke. Therefore, unilateral stroke could potentially deteriorate the function of trunk muscles on both the contralateral and ipsilateral sides of the body.⁶

Studies reported the weakness of trunk flexor-extensor and bilateral trunk rotator muscle by means of isokinetic dynamometer muscle strength testing in patients with chronic stroke.^{5, 7} Davies clearly states a loss of selective trunk control with limitation in breathing, speech, balance, gait, arm and hand function.⁸ To allow efficient walking and stair climbing, counter rotation between the shoulder and pelvic girdle is needed and also proximal stabilization of trunk is needed for distal movements of the extremities⁹. Therefore, in stroke subjects there is no efficient walking and stair climbing as that of a normal due to lack of proximal stabilization.¹⁰

There are several clinical tools to measure trunk performance such as The sitting balance item of the Motor assessment scale, the Postural control part of the Chedoke-McMaster stroke assessment and lying and sitting tests of The Postural assessment scale.¹¹ The Sitting balance scale for hemiplegia evaluated normal sitting, sitting with leg crossed, leaning sideways to both sides and leaning forwards, which showed poor reliability. The trunk control test consisted of four items which are rolling from supine to weak and strong side, sitting up from lying down and maintaining balance in the sitting position on the side of the bed and the most limiting aspect of the TCT is its ceiling effect. Similarly other existing scales too scored trunk activity as one component and was focused more for transitional movements.^{8,9,11}

The Trunk Impairment Scale (TIS) a new tool to measure motor impairment of trunk after stroke was

developed in 2004 by G Verheyden et al. The Trunk Impairment Scale comprises 17 items and evaluates static and dynamic sitting balance as well as coordination of trunk movement, which targets the body structure and function dimension according to ICF.^{11,12}

G Verheyden et al. conducted studies to correlate the trunk impairment scale (TIS) with Tinetti, Time up and go test (TUG) Test, and 10 min walk test.¹³ However studies were not conducted to show the relationship between the trunk impairment and stair climbing in stroke subjects. Objectives of the study: To assess the trunk performance using Trunk impairment scale and the stair climbing up and down in poststroke subjects. Thirdly to correlate the relationship between the trunk impairment and the climbing up and down the stairs in poststroke subjects.

Materials and Method

Trunk impairment scale, Chair/couch without arm and back rest, 1 flight of stairs, Stopwatch. Stroke subjects were scrutinised for inclusion criteria: Subjects with first time stroke, age 28 - 75yrs, minimum 3 to 4 weeks post stroke, unilateral involvement and who can walk with or without assistive aids and climb 1 flight of stairs. Exclusion Criteria: Age >75years, Subjects who cannot maintain sitting posture <10s, who cannot stand, cognitive and perceptual impairment and other neurological disease, Un-cooperative subjects, and subjects scoring <6 in FIM on component of stair climbing. Written informed consent taken. The anthropometric data, motor examination collected. All the participants were explained verbally and demonstrated all the components of TIS scale by the researcher. Before application of TIS scale no practice session were allowed. Head and trunk were maintained in neutral position. During the procedure rest period of 30 seconds were given between each components to the subjects. The total score of each

component ie static, dynamic, co- ordination and also total score of TIS scale were taken for data analysis. After administration of TIS, 10 minutes of rest period was given. Subjects stood facing the stairs with the feet, shoulder width apart. Researcher stood beside the subject. All the subjects used railing. The subjects were instructed to ascend 12 steps safely at their own pace.

Time taken to descend down was calculated. The mean of 2 trails was taken for data analysis. Data analysis: The static, dynamic, coordination components and total score of trunk impairment scale data was described by Median, Range. Stair ascending and descending scores was described by Mean, SD. The correlation between the TIS and stair ascending and descending was analysed by Spearman rank correlation coefficient .

Results

The descriptive of demographic data, TIS and stair ascend and descend test is tabulated in table 1, According to the age group and gender is shown in table 2. The spearman's correlation statistic shows a good negative correlation between TIS and stair ascend with $r_s = -.54$ ($P=0.001$), between TIS and stair descend with $r_s = -.63$ ($P=0.001$) and between TIS and stair ascend + descend with $r_s = -.58$ ($P=0.001$).

Discussion

The aim of this study was to examine trunk performance and to evaluate trunk control in relation to stair climbing functional ability. The results in this study demonstrated that the median scores of all the three subscales of the TIS were lower than the maximum value (23) and a borderline value (20) in stroke subjects as suggested by G. Verheyden (2005).¹⁷

The static sitting balance subscale measures the ability to remain in the sitting position as well as postural adjustments in sitting position. The median score of static sitting-balance scale was lower (5) than the maximum value (7). Most of the participants did not score the maximum value in the third subcomponent of the static sitting balance due to reduced anticipatory postural adjustments.

The dynamic sitting balance examines the ability to perform lateral flexion in stroke subjects. The median score of dynamic sitting-balance scale was lower (6) than the maximum value (10). This lower score could be attributed as most of the subjects performed compensatory mechanisms while performing the lateral flexion on both sides due to trunk muscle weakness. Stroke could potentially deteriorate the function of trunk muscle on both contralateral and ipsilateral sides of the body as the trunk muscle is supplied from both the cerebral hemisphere.

The Co-ordination subscale examines the ability to perform rotation of the upper and lower part of the trunk. The median score of co-ordination subscale was lower (1) than the maximum value (6). This may be attributed as rotation of the lower part of the trunk is more difficult for stroke subjects due to proximal hypertonia in lower extremities or paresis of the trunk muscles. In this study subjects were evaluated for stair ascend and descend time, for which the mean and standard deviation was calculated 18.87 ± 11.05 , 20.60 ± 12.43 respectively. The results showed that the subjects took more time while descending than ascending the stairs. This may be attributed to the decreased eccentric contraction of muscles towards gravity due to weakness on the affected side. This result is in accordance to the study conducted by Ulla Britt Flansbjer (2005).¹⁹

The median score of static sitting balance and dynamic sitting balance was higher in male subjects

than the female subjects and also less time was taken by the male subjects to ascend and descend the stairs. The reason could be attributed as male subjects were more active and community dwellers in comparison to the female subjects, who were physically inactive and home ambulatory. According to the age group, static sitting balance for the three groups was similar (5) except for the age group above 65 years, this could be attributed as more subjects showed good postural adjustments in this group than the other groups. Age group between 46 – 55 years scored the least score in dynamic sitting balance than the other groups, this could be due to presence of more physically inactive female subjects in this group. The age group between 56 – 65 years scored the maximum score as subjects in this group were having mild stroke and so are physically more active and community dwellers. The median score of coordination (1) was same for all the four groups. Subjects belonging to the age group between 56 - 65 years took least time to ascend and descend the stairs than the other age group as the number of subjects in this group had minimal tightness and were taking rehabilitation and practicing at home regularly. The age group between 46 – 55 years took the maximum time to ascend and descend the stairs, this could be presence of more physically inactive female subjects. In this study we observed that the subjects who scored less in Trunk Impairment Scale (TIS) took more time to ascend and descend the stairs and viceversa.

In our study we found that subjects above 65 years scored more in dynamic sitting balance and so took less time to ascend and descend the stairs than the other lower age groups, therefore it suggests that age is not the factor influencing the stair ascending and descending, but it is the dynamic sitting balance

component of Trunk Impairment Scale (TIS) subscale which was influencing the stair ascending and descending time.

Correlation between TIS and stair ascend and descend test and stair ascend + stair descend: Trunk impairment scale showed a negative correlation with the stair ascend test ($r_s = -0.54$), so more the score in trunk impairment scale lesser the time taken by the subject to ascend the stairs. Trunk impairment scale showed a negative correlation with the stair descend test ($r_s = -0.63$), so more the score in trunk impairment scale lesser the time taken by the subject to descend the stairs. Trunk impairment scale showed a negative correlation with the stair ascend + descend test ($r_s = -0.58$), so more the score in trunk impairment scale lesser the time taken by the subject to ascend and descend the stairs.

Conclusion: The Trunk impairment scale shows moderate correlation with the stair ascend and descend test, which suggests that a person scoring less on the Trunk Impairment Scale (TIS) takes more time to ascend and descend the stairs. With larger sample size we may obtain good to excellent correlation. Limitations of the study: Small sample size. The relationship between trunk performance and stair ascending and descending not done according to severity of stroke. Clinical implication: As a moderate negative correlation was recorded for Trunk Impairment Scale (TIS) with stair ascending and descending, rehabilitation of trunk should be prioritised to improve the functional ambulation.

Further recommendation: Further studies to have larger sample size to generate better data analysis.

Table 1: TIS- According to gender and age.

	N	Static		Dynamic		Co-ordination		TIS		Stair-ascend (mean±sd) sec	Stair-descend (mean±sd) sec	Stair ascend+descend (mean±sd) sec
		Median	Range	Median	range	Median	range	Median	Range			
Total	32	5	2-5	6	0-10	1	0-6	12	4-22	18.87± 11.05	20.60 ± 12.43	
According to Gender												
Males	21	6	2-5	7	0-10	1	0-6	13	4-22	14.19±6.66	15.76±9.17	29.98±15.22
Females	11	5	2-6	4	3-10	1	0-2	10	6-17	27.81±12.48	29.78±13.03	57.59±25.21
According to Age												
Below 45	8	5	2-7	3.5	0-10	1	1-4	11	4-21	18.80±7.77	21.54±10.42	40.35±17.52
46-55	9	5	2-6	3	1-8	1	0-4	8	6-18	23.09±15.56	25.51±17.79	48.60±33.16
56-65	7	5	2-7	10	6-10	1	1-4	16	12-21	12.12±7.19	13.09±8.85	25.22±15.45
Above 65	8	6	4-6	7	3-10	1	0-6	14	8-22	20.09±9.45	20.70±7.68	40.80±16.57

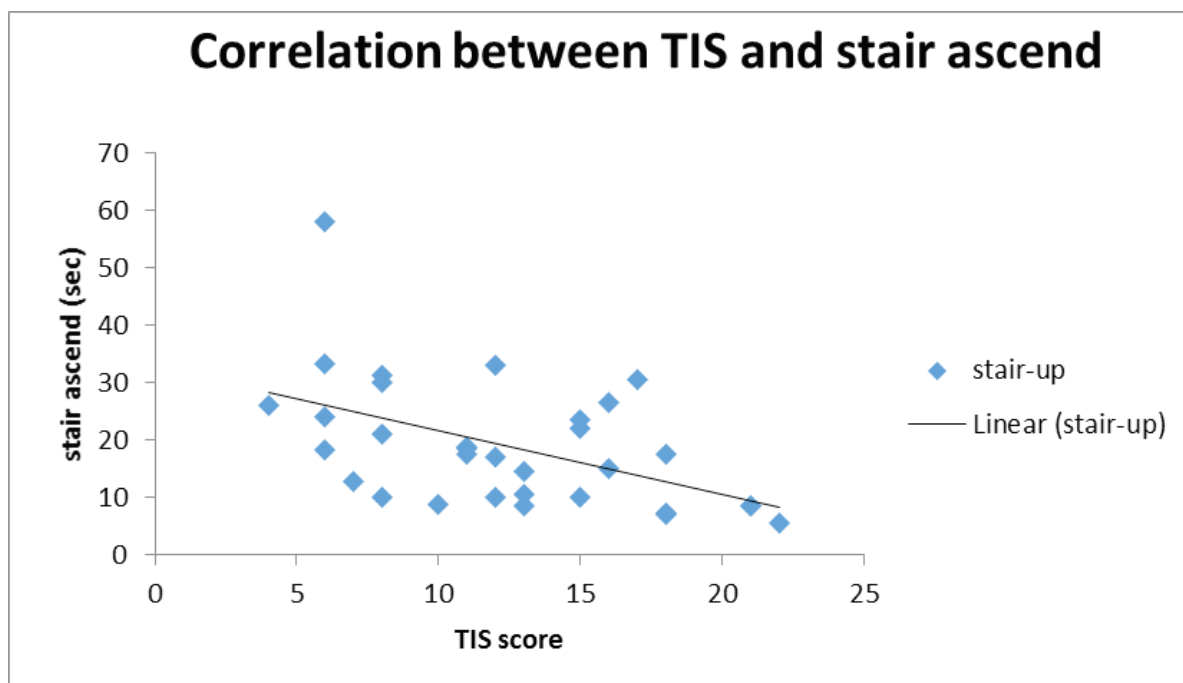


Fig.1 Showing correlation between trunk impairment scale and stair ascend.

The spearman's correlation statistic shows a moderate negative correlation between TIS and stair ascend with $r_s = -.54$ ($P = 0.001$).

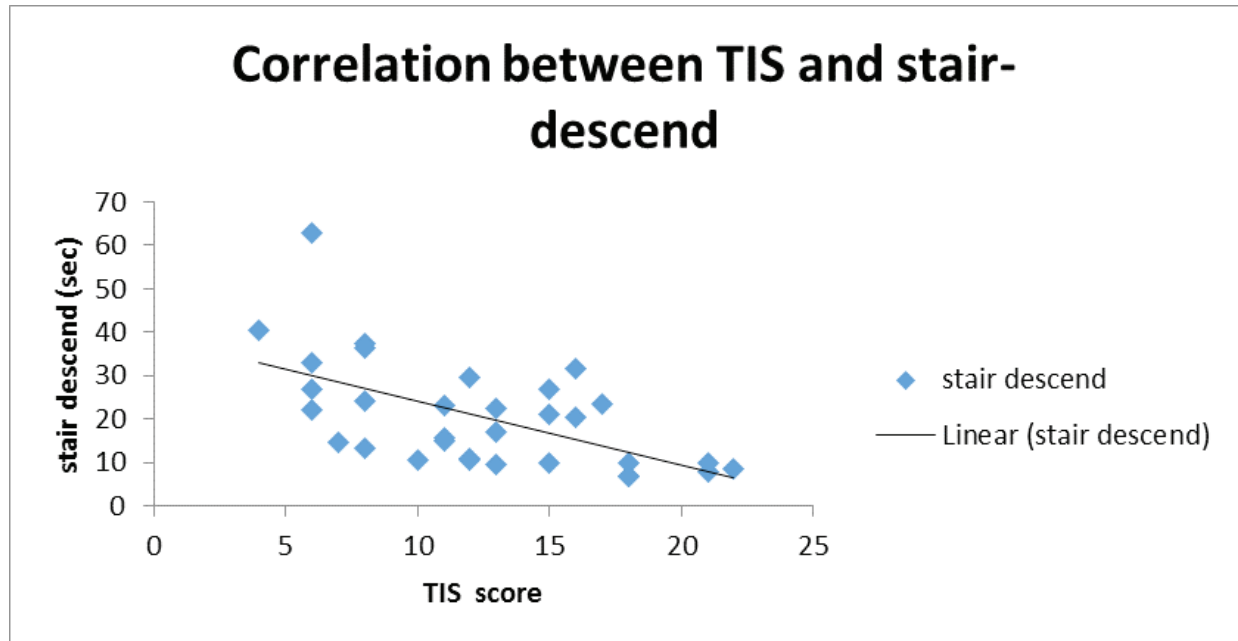


Fig. 2 Showing correlation between trunk impairment scale and stair descend.

The spearman's correlation statistic shows a moderate negative correlation between TIS and stair descend with $r_s = -.63$ ($P = 0.001$).

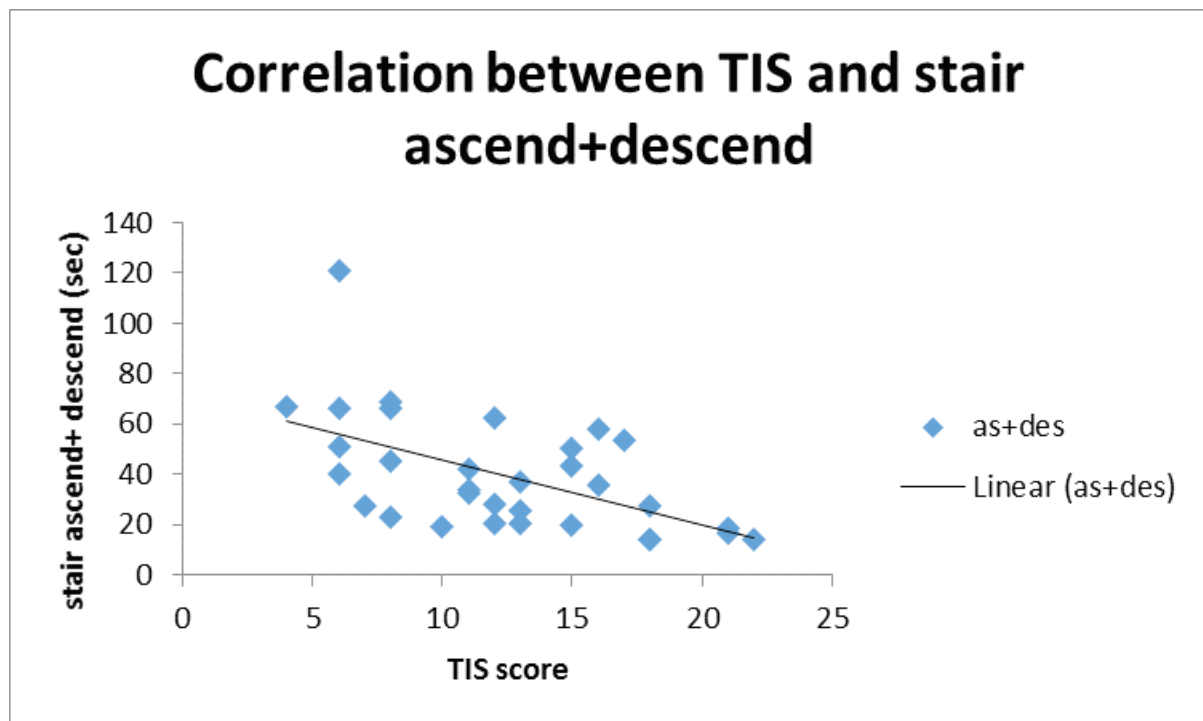


Fig.3 Showing correlation between trunk impairment scale and stair ascend + descend.

The spearman's correlation statistic shows a moderate negative correlation between TIS and stair ascend +

descend with $r_s = -0.58$ ($P = 0.001$).

Ethical Clearance- Taken from HOSMAT Educational Institute

Source of Funding- Self

Conflict of Interest – Nil

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Effectiveness of Pursed Lip Breathing Exercise in Covid Patients

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Abstract

Background- Urgent threat to global health occurred in the form of Novel Corona Virus. This virus is considered to be highly contagious Respiratory Disease which leads to severe effect on physical, cardiopulmonary and psychological activities. Physiotherapists are considered highly beneficial in treating respiratory complication and physical deconditioning. Respiratory Interventions for COVID pneumonia usually involve Active Cycle of Breathing technique, Relaxation Breathing technique, Huffing Coughing technique, resistive aerobic training, Incentive Spirometry.

Method- 25 patients of age group 10-75 years, with active COVID-19 infection were taken with CTSS 7/25-20/25. The patients were administered pursed lip breathing exercise 15 repetitions per set, 3sets, 3 times a day, for 10 days. Outcome measures were evaluated with BORG Scale and Respiratory Rate before and after treatment.

Result-Result of this study were analysed in terms of reduced RR and BORG Score. The pre and post data comparison was done using paired 't' test for RR and BORG Score. This showed extremely significant improvement in RR and BORG Score post-treatment.

Conclusion-As a result, we conclude that Pursed Lip Breathing Exercise is effective in improving RR and reducing dyspnoea in COVID patients.

Keyword- BORG, COVID, Pursed lip breathing, Respiratory Rate.

Introduction

In the end of 2019, urgent threat to global health occurred in the form of Novel Corona Virus.

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This virus is considered to be highly contagious Respiratory Disease which leads to severe effect on physical, cardiopulmonary and psychological status. Physiotherapists are considered highly beneficial in treating respiratory complication and physical deconditioning. Respiratory Interventions for COVID pneumonia usually involve Active Cycle of Breathing technique, Relaxation Breathing technique, Huffing Coughing technique, resistive aerobic training, Incentive Spirometry. The method to safely rehabilitate COVID-19 patients is an issue that has led

to concerns among physiotherapists at present ⁽¹⁾.

In addition, when the respiratory symptoms are severe, they may progress to respiratory failure (acute respiratory distress syndrome), which could lead to death unless it is managed promptly using invasive ventilation. However, for those with mild to moderate symptoms, non-invasive techniques such as chest physiotherapy, breathing exercise and incentive spirometry can be used.

Pulmonary rehabilitation's definition, as adapted from the American Thoracic Society/European Respiratory Society⁽²⁾, is comprehensive intervention based on a thorough patient assessment followed by patient tailored therapies that include, but are not limited to, exercise training, education, and behaviour change, designed to improve the physical condition of people with respiratory disease.

Pulmonary rehabilitation is a conservative treatment that includes several programs such as exercises, health education, and breathing techniques for patients who have lung conditions. It has been used in several studies and it showed to be effective in decreasing the symptoms and increase the efficacy of the lungs ⁽²⁾.

The respiratory rehabilitation might be helpful to lighten the burden on the respiratory ventilators. Therefore, in the current study will investigate the effect of respiratory rehabilitation on COVID-19 patients ⁽³⁾.

Pulmonary rehabilitation is a program designed to enhance lung efficacy and lung function by increasing lung volume. The normal lung volume of an adult human male is about 6 litres of air ⁽⁴⁾. The lung volume can be measure by Tidal volume (TV), expiratory reserve volume (ERV), Residual volume (RV), and Inspiratory reserve volume (IRV). It can be measured by a spirometer ⁽³⁾. The purpose of

pulmonary rehabilitation in COVID-19 patients is to improve symptoms of dyspnoea, reduce respiratory rate, relieve anxiety, reduce complications, minimize disability, preserve function and improve quality of life.

Pulmonary rehabilitation has been shown to be effective in managing symptoms of different lung problems and helped to increase the efficacy of the lungs ⁽²⁾. A systematic review by Santino et al found that breathing exercises for adults with asthma was improve the quality of life and decrease their symptoms ⁽⁵⁾. Bakry et al. studied the Pulmonary rehabilitation in chronic obstructive pulmonary disease (COPD) their result showed that short-term pulmonary rehabilitation program improves the lung volume and function. These findings showed that even if the program duration is short-term, it can help in recovering for patients with COPD ⁽⁶⁾. Weiliang et al. conducted a randomized controlled trial to assess the effects of daily breathing pattern changes on stable patients with COPD and that's led to improving degree of dyspnoea, and exercise capacity ⁽⁷⁾.

Pursed lip breathing is a simple technique for slowing down a person's breathing and getting more air into their lungs. With regular practice, it can help strengthen the lungs and make them work more efficiently. The technique involves breathing in through the nose and breathing out slowly through the mouth. Repeated pursed lip breathing should slow breathing and empty the lungs. Pursed lip breathing can form part of a pulmonary rehabilitation program.

Here is how to do pursed lip breathing: Breathe in through the nose for 2 seconds. Purse the lips as if about to blow out the candles on a cake. Breathe out very slowly through pursed lips for 4 to 6 seconds. Repeat.

A person can use pursed lip breathing during any activity that causes shortness of breath. Such activities can include exercise, standing up from a seat, or lifting something. More air can flow in and out of the lungs to help the body during these activities.

It may take some time before the technique feels natural, but with regular practice, it can become comfortable. Even 5 to 10 minutes' practice every day can be beneficial.

Methodology and Materials

The study was conducted in a tertiary care hospital. It was a randomized control trial, in which 25 patients were included, who had active COVID infection, with CTSS 7-20. The patients were selected by random sampling technique. The study was conducted in the duration of February 2021 to July 2021. **Materials used:** Chair or plinth, Pulse oximeter, Stethoscope, Sphygmomanometer, Paper, Pen.

The following steps were followed-

1. The assessment was taken with all the precautions for COVID-19.
2. Take pre-assessment of the patients, using BORG Scale and Respiratory Rate.
3. Administer pursed lip breathing exercise for 15 repetitions per set, 3sets, 3 times a day, for 10 days.
4. Take post-assessment of the patients after 10 days of treatment, using BORG Scale and Respiratory Rate.

Result

Result of this study were analysed in terms of reduced RR and BORG Score. Paired Sample 't' test was used to analyse the pre and post differences for RR. Pre and post BORG scores were compared using Wilcoxon ranks signed test. The level of significance was set at $p < 0.05$ for all tests. This showed extremely significant improvement in RR and BORG Score post-treatment.

Table1: Descriptive Statistics

Groups	Minimum	Maximum	Mean	Std. Deviation
RR				
Pre	18.00	42.00	29.44	5.14
Post	16.00	30.00	21.12	3.32
BORG				
Pre	4.00	9.00	6.44	1.58
Post	0.00	7.00	2.60	1.80

Table 2: Pre and Post comparison of RR

Site	Mean ± SD	Mean Difference	t Value	P value
RR				
Pre	29.44 ± 5.14	8.32	13.008	< 0.001*
Post	21.12 ± 3.32			

Paired Sample 't' Test: *P < 0.05 (significant), **p > 0.05 (Not significant)

Table 3: Pre and Post comparison of BORG

Groups	Mean ± SD	Median	Z Value	P value
BORG				
Pre	6.44 ± 1.58	7.00	4.411	< 0.001*
Post	2.60 ± 1.80	3.00		

Wilcoxon ranks signed test, P < 0.05 (significant), P > 0.05 (Not significant)

Discussion

The study was conducted to check effectiveness of pursed lip breathing exercise in COVID patients. COVID-19 was a worldwide pandemic during the recent past. Huge population was affected with the ARDS due to COVID-19 infection. This study was an attempt to check if we could relieve the symptoms with simple and non-invasive technique.

Pursed lip breathing is a simple technique for slowing down a person's breathing and getting more air into their lungs. With regular practice, it can help strengthen the lungs and make them work more efficiently. The technique involves breathing in through the nose and breathing out slowly through the mouth. Repeated pursed lip breathing should slow breathing and empty the lungs. Pursed lip breathing can form part of a pulmonary rehabilitation program.

A person can use pursed lip breathing during any activity that causes shortness of breath. Such activities can include exercise, standing up from a seat, or lifting something. More air can flow in and out of the lungs to help the body during these activities.

While carrying the study, sometimes the patient would become uncooperative. Also there was always the risk of getting infected by COVID-19. The patients would also cough heavily sometimes which created fear many times. It was also difficult to demonstrate the exercise to patients with donning PPE and all precautionary measures.

We took a sample size of 25 patients who had active COVID-19 infection with CTSS 7-20 and age group 10-75 years. These patients were administered pursed lip breathing exercise for 10 days with 15 repetitions per set, 3 sets, 3 times per day. The

Respiratory Rate and BORG Score were used as outcome measures. Pre and post measurements were taken and then analysed statistically.

The mean value for respiratory rate was, 29.44 pre-treatment and 21.12 post-treatment. The mean value for BORG Score was, 6.44 pre-treatment and 2.60 post-treatment. The standard deviation for respiratory rate pre-treatment was 5.14 and post-treatment was 3.32 and for BORG Score, pre-treatment was 1.58 and 1.80 post-treatment. The p value for both respiratory rate and BORG Score was less than 0.001, which shows the result was highly significant.

After comparison of the pre and post data, we got the result that pursed lip breathing exercise was effective in reducing the respiratory rate and dyspnoea.

Conclusion

The study concludes that pursed lip breathing exercise is effective in COVID-19 patients. The study showed significant improvement in the symptoms. There was noticeable difference in respiratory rate and dyspnoea. The pre and post results showed marked reduction in BORG Score and respiratory rate. Also we could conclude that not only COVID-19 patients, but pursed lip breathing exercise can be used to reduce dyspnoea and respiratory rate in any condition where the respiratory system is compromised.

Ethical Clearance - Taken from Ethical committee, Nanded Physiotherapy College &

Research Center, Nanded

Source of Funding – Self

Conflict of Interest - Nil

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Type of Article: Original Article

Contralateral Neurodynamic Technique Versus Passive Accessory Intervertebral Movements on Pain and Range of Motion in Subjects with Sciatica

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Abstract

Background: Low backache with sciatica is a highly prevalent disease among world population causing the high physical limitation and economic burden of low backache with sciatica. CND helps to mobilize the nerve and PAIVMs have an effect on tissue interface.

Methods: The study was conducted among 30 subjects Group A (n=15) was received the contralateral neurodynamic technique and therapeutic ultrasound. Group B (n=15) received passive accessory intervertebral movements and therapeutic ultrasound for continuous 6 days. After 6days the pain and the ROM were compared. In Group A the mean of the knee ROM improved from 67.20 to 82.90 and the mean VAS score improved from 5.66 to 4.00 which are statistically significant ($p<0.05$). In Group B the mean knee ROM improved from 71.40 to 77.06 and VAS score improved from 5.45 to 2.33($p<0.05$) which are statistically significant as well.

Conclusion: Both the treatment techniques are equally effective in improving the Knee ROM. However, CNDT has shown more significant results than the PAIVMs in increasing knee ROM in subjects with sciatica and Passive accessory intervertebral movement technique is more effective in reducing the pain.

Key words: *Sciatica, Contralateral Neurodynamic Technique, Passive Accessory Intervertebral Movements, Pain, Range of Motion*

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Introduction

Low back ache is an extremely frequent hassle that affecting up to 80% of the population at some point in their life.¹ Low returned pain is properly documented to be an extraordinarily frequent fitness problem. However, its burden is frequently viewed trivial. Low back pain is the main cause of exercise dilemma and work absence during a great deal of the

world, and it motives an widespread economic burden on individuals, families, communities, enterprise and governments.^{2,3}

Prevalence rates differ drastically across studies, with lifetime prevalence ranging from 12.2% to 43%, period occurrence from 2.2% to 34% and point occurrence from 1.5% to 13.4%. Although sciatica may also or might also now not be associated with low again pain (LBP), it is idea that 90% of instances of sciatica are precipitated through a lumbar herniated disc with subsequent nerve root compression. Even-though usually regarded to have a appropriate prognosis (often improving inside 2–4weeks with or barring treatment, sciatica is associated with a greater self-report of disability, loss of function and pain than LBP besides sciatica⁴. The entrapment might also result in similarly closure of the foramen by using activities like unexpected trunk forward bending and straighteningwithtwisting.⁵ According to T. Sturmer et al, the ache intensity throughout the preceding 24hours as assessed via VAS was independently associated with high degrees of High sensitivity C reactive proteins in sufferers with acute sciatic pain but now not in persistent low returned pain. Pain severity in sufferers with acute sciatic pain is more due to inflammatory changes⁶

This find out about focuses on the ST, which is less expensive and has been shown to be reliable.⁷The Seated Slump Test is thinking to examine the sensitivity of neural buildings which includes meningeal tissues, nerve roots and the sciatic and tibial nerves. The test involves the patient sitting on the side of the examination plinth in a slumped or slouched position, flexion of the thoracic and lumbar backbone and a posterior pelvic tilt, flexion of the cervical backbone with gentle guide overpressure, and passive extension of the subject's knee, while the ankle is dorsiflexed.⁸ During the hunch test, the change of regular evoked

sensations or medical symptoms with cervical actions does no longer differentiate normal from abnormal. Instead, in both situations, such as a exchange offers guide for a neuromechanical mechanism because, on account of anatomical connectivity, cervical flexion/extension produces anxiety changes in the lumbar neural tissues, which hyperlinks the exchange in evoked sensations or medical signs and symptoms to the neural system.⁹

Neurodynamic strategies can be categorized as methods that aim to mobilize the buildings that encompass the fearful system or strategies that goal to mobilize the anxious gadget itself. Tensioning and sliding techniques are techniques that aim to mobilize the apprehensive machine itself.¹⁰ According to Szlezak multi-level mobilisations expanded neurodynamics of the posterior decrease limb in the immediately term, compared to stretching and control groups.¹⁴ According to Perry and Green, grade III zygapophyseal mobilisations (large amplitude into resistance) at L4-L5 have been proven to induce sympathetic worried machine adjustments in the lower limb.¹⁵ According to Paul Chesterton et al, mobilizing the lumbar 4/5 zygapophyseal joint is tremendous on growing the hamstring extensibility.¹⁶

Numerous studies have proven the man or woman effectiveness of contralateral neurodynamic technique and PAIVMs in improving the extensibility of hamstring muscle and decreasing Pain in asymptomatics. But there is a dearth of literature that shows the superiority of one method with respect to the different in low returned ache with sciatica patients. Therefore, the need arises to find out the efficacy of contralateral neurodynamic technique versus passive accessory intervertebral moves on lowback ache and knee range of motion in subjects with sciatica.

Objectives of the Study

- To determine the effect of contralateral neurodynamic technique on pain and range of motion in subjects with sciatica.
- To determine the effect of passive accessory intervertebral movements on pain and range of motion in subjects with sciatica.
- To compare the effect of contralateral neurodynamic technique versus passive accessory intervertebral movements on pain and range of motion in subjects with sciatica

Methodology

7.1 Source of Data

- ESI Hospital, Rajajinagar, Bangalore.
- Padmashree Physiotherapy Clinic and Rehabilitation Centre. NGEF layout, Bangalore.
- Padmashree Diagnostic, Vijayanagar, Bangalore.

7.2 Method of collection of data:

- Population: Subjects with sciatica.
- Sampling Procedure: Simple Random Sampling
- Study Design: Experimental- pre to posttest design.
- Sample Size: 30
- Duration of Study: 6 months

Inclusion criteria:

- Age group is 24 – 55 years
- Subjects who are diagnosed with sciatica by an orthopedician

- MRI report which confirms disc prolapse and nerve compression at L4-L5 level

- Subjects with unilateral radiating pain below knee with less than 8 weeks

- Both gender will be included in the study

Exclusion criteria:

- Subjects with caudaequina syndrome, bilateral leg pain

- Subjects with previous surgery in the lumbar spine or in the symptomatic leg

- Subjects with other knee and hip pathology like tendinitis, bursitis, OA, fracture or malignancy

- Intra articular steroids therapy within last 6 months

- Any peripheral vascular disorders

Material used:

- Universal goniometer
- Ultrasound machine
- Aquasonic gel
- Treatment couch
- Pen and paper

Procedure:

Subjects fulfilling the inclusion and exclusion were enrolled in the study Informed consent was taken from the subjects and baseline data is recorded .Thirty symptomatic subjects (24-55 years of age, 14 men, 16 women) were included. Subjects were asked to indicate their position of pain and to rate their severity on a visual analogue scale (VAS) between 0 and 10.

Group A: contralateral neurodynamic technique + US CNDT.

Group B: Passive accessory intervertebral movements + US

Group A (n=15) CNDT

The subject was in a sitting position and the slump test was performed on the contralateral asymptomatic leg. The topic carried out a slumped examination with dorsiflexion on the ankle. The therapist passively extended the knee, preserving the ankle dorsiflexion. The knee was extended until the patient felt that the symptoms improved along the course of the nerve and were bearable. The therapist sat at the end spot for 30 seconds. Twelve repetitions were performed and were divided into three sets (4 repetitions per set). Each set was interspersed with 1 minute rest period for 6 days. After the 6days the pain using the VAS scale and the knee ROM using the goniometer were taken.

Therapeutic Ultrasound therapy was given in continuous mode 1 MHz, 1 W/cm² in a circular manner for 5 minutes at the L4-L5 level after the

Group B (N=15) PAIVMs

Group B obtained passive intervertebral accessory gestures and clinical ultrasound. Subjects were lying in a prone position. Therapist conducted Grade III passive intervertebral accessory movements (postero-anterior mobilisation) using thumbs at the L4 / L5 stage of the symptomatic side facet of radiating pain for 1 minute and repeated for 3 times each interspersed with 1 minute rest period between each set daily for 6 days. After 6 days, pain and ROM of the knee were assessed and compared.

Therapeutic Ultrasound therapy was given in continuous mode 1 MHz, 1 W/cm² in a circular manner for 5 minutes at the L4-L5 level after the PAIVMs.

Outcome measures:

Pain - Visual Analog Scale

Knee Range of Motion - Universal Goniometer



Fig: 1 Subject Performing Slump Test

3. Subject receiving PAIVMs

2. Subject receiving Ultrasonic Therapy



Results

Table-1: Range, mean and SD of age of the subjects with sciatica in both the groups

Sl.No	Variable	Group-A		Group-B		Unpaired t-test
		Range	Mean ± SD	Range	Mean ± SD	
1	Age in years	28-53	41.06±8.68	26-53	38.13±9.31	t=0.892, p>0.05, NS

In Group A, the mean age is 41.06 with SD of 8.68 and in Group B the mean age is 38.13 with the SD of 9.31. The difference in mean age of Group A and B was not significant. Thus the demographic variables are homogenous in both the groups i.e., p>0.05

Table-2: Range, mean and SD of pain and knee ROM of subjects with sciatica in Group A

S.No	Outcome measures	Group-A				t-test/ Wilcoxon	p-value
		Pre test		Post test			
		Range	Mean ±SD	Range	Mean ±SD		
1	Radiating pain	3-8	5.66±1.34	2-5	4.00±0.84	z=3.126*	p<0.001
2	Knee ROM	45-85	67.20±11.28	70-90	82.90±7.27	t=5.67*	p<0.001

Note; * denotes –Significant.

In Group A, pre score for mean of total knee ROM was 67.20 with SD of 11.28 and the post score for mean of total Knee ROM was 82.90 and SD of 7.27. The parametric test was performed to compare the pre and post score for Knee ROM and it showed significant improvement with p value.($p<0.001$).

The pre score for mean of total VAS was 5.66 with SD of 1.34 and the post score for mean of total VAS was 4 with the SD of 0.84. The non-parametric test was performed to compare the pre and post values and it showed significant improvement with p value. $p<0.001$.

Table-3: Range, mean and SD of pain and knee ROM scores among subjects with sciatica in Group B

S.No	Outcome measures	Group-B				t-test/ Wilcoxon	p-value
		Pre test		Post test			
		Range	Mean \pm SD	Range	Mean \pm SD		
1	Radiating pain	3-7	5.45 \pm 1.08	0-5	2.33 \pm 1.71	z=3.432	p<0.001
2	Knee ROM	50-85	71.40 \pm 9.44	50-90	77.06 \pm 10.67	t=4.690	p<0.001

In Group B, pre score for mean of total knee ROM was 71.40 with SD of 9.44 and the post score for mean of total Knee ROM was 77.06 and SD of 10.67. The parametric test was performed to compare the pre and post score for Knee ROM and it showed significant improvement with p value. ($p<0.001$).

The pre score for mean of total VAS was 5.45 with SD of 1.08 and the post score for mean of total VAS was 2.33 with the SD of 1.71. The non-parametric test was performed to compare the pre and post values and it showed significant improvement with p value. $p<0.001$

Table-4: Comparison of pre and Post test pain and knee ROM of subjects with sciatica in between the groups.

Sl.No.	Outcome measures	Pre test		Post test	
		Group-A	Group-B	Group-A	Group-B
		Mean \pm SD	Mean \pm SD	Mean \pm SD	Mean \pm SD
1	Pain (VAS)	5.66 \pm 1.34	5.45 \pm 1.08	4.00 \pm 0.84	2.33 \pm 1.71
2	Knee ROM	67.20 \pm 11.28	71.40 \pm 9.44	82.90 \pm 7.27	77.06 \pm 10.67
Between group comparison Mann-Whitney U test/ Unpaired t-test		Pain: z=0.324, $p>0.05$, NS ROM: t=1.22, $p>0.05$, NS		Pain: z=2.922, $p<0.05$, S ROM: t=2.578, $p<0.005$, S	

In Group A the mean of the pre-test score of the pain was 5.66 with the SD 1.34 and in group B the mean was 5.45 with the SD 1.08 for the same. In Group A the mean of the pre-test score of knee ROM was 67.20 with the SD of 11.28 and in Group B the mean score is 71.40 with the SD of 9.44. The data are statistically not significant in both the groups ($p > 0.05$). It is evident that before the intervention the subjects with sciatica were similar in pain and ROM in both groups.

The mean of the post test scores of pain in Group A is 4.00 with the SD of 0.84 and in Group B the mean is 2.33 with the SD of 1.71. In group A, the mean of the post test score of knee ROM was 82.90 with the SD of 7.27 and in Group B the mean was 77.06 with the SD of 10.67 for the same.

But, while comparing of the post test scores of knee ROM in between groups, at 0.05 level ($p < 0.05$) it is evident that there is a more significant improvement of ROM in Group A than the Group B.

Mann-Whitney U test was applied and it was statistically significant ($p < 0.05$) and it is evident that the reduction of pain in Group-B is more significant than the reduction of pain observed in Group-A.

Discussion

The purpose of the study is to compare the efficacy of contralateral neurodynamic technique and passive intervertebral accessory movements in subjects with low back pain with sciatica. In this study, we found that sciatica causes pain and disability, and this is consistent with the study that stated that the most common cause of sciatica is lumbar disc herniation, which is associated with severe pain and disability. Chronic low back pain (CLBP) can lead to severe disability.

In Group A, there were 6 male subjects and 9 female subjects. Similarly, there were 8 male subjects and 7 female subjects in group B. The mean age in Group A was 41.06 with SD 8.68 and the mean age in Group B with SD 8.68. and in group B the mean age was 38.13 with SD of 9.31.

In Group A, the mean ROM of the knee changed dramatically. In contrast to both groups, Group A demonstrated a large increase in versatility relative to Group B. In Group A, the mean pre-scoring score for the ROM knee is 67.20 with the SD of 11.28 and for Group B, the mean is 71.40 with the SD of 9.44. Post mean knee ROM for Group A was 82.90 with SD of 7.27 and in Group B was 77.06 with SD of 10.67 which was statistically important. The data in this analysis are consistent with a variety of other studies focused on NDT. There is excellent reliability with respect to the sensation of response to the slump test (Herrington 2008, Lew P 1997). All subjects reported sensations and symptoms (stretch in the posterior thigh and under the knee) (Herrington 2008) and all subjects reported changes in these reactions with cervical movements (Lew P 1997).

Neurodynamic techniques can be classified as techniques intended to mobilise systems that surround the nervous system or techniques intended to mobilise the nervous system itself. Tensioning and sliding techniques are techniques intended to mobilise the nervous system itself. By means of a tensioning procedure, nerve mobilisation is accomplished by rotating one or more joints to lengthen the nerve bed, forcing the nervous system to slide relative to its surrounding structures. As such, slipping and tensioning strategies can be indicated at various stages of the recovery programme (Coppieters 2015).

The lumbar nerve roots deviate from the spinal cord at an angle. This angle comprises two vector elements, horizontal and vertical. The vertical vector

is especially important because it is what causes the movements of the spinal cord that are required to minimise the stress in the contralateral nerve root. When the contralateral neurodynamic test is carried out, stresses penetrate the spinal cord through the contralateral nerve roots (M. Shacklock 2005).

However, when comparing the mean VAS scores, group B was more successful than group A in reducing the VAS score. In Group A, the mean for VAS pre-scoring was 5.66 with the SD of 1.34 and in Group B, the mean was 5.45 with the SD of 1.08. The post mean VAS score for Group A was 4.00 with SD of 0.84 and the post mean VAS score for Group B was 2.33 with SD of 1.71, which was statistically important. The data in this study showed that the unilaterally applied AP accessory mobilisation technique administered at a rate of 2 Hz to the L4-L5 segment resulted in a statistically significant reduction in the VAS score compared to the CNDT community. The results found in this study may be due to changes in the biomechanical or neurophysiological properties of the nervous tissue as a result of mobilisation of the I4-I5 zygapophyseal joint (Shacklock 2005).

There is an improvement in the neural examination of the upper limb with cervical mobilisation. The authors proposed that the change recorded may be due to mobilisation affecting the mechanical interface, thus increasing the movement of neural tissue. (Saranga 2003) Further clarification could be linked to participants altering perception by 'sensory theory' (Weppeler and Magnusson, 2010). Increases in neural extensibility can also be due to reduced neuromeningeal sensitivity. Without thrust mobilisation can attenuate alpha motoneuronal excitability leading to short-term inhibitory effects on the engine system (Dishman and Bulbulian, 2000). Side specific peripheral sympathetic nervous transition in the lower limb due to zygapophyseal mobilisation of L4-L5. They

concluded that there are neurophysiological and anatomical inter-relationships in the lumbar region and that control can be accomplished by mobilisation (Perry and Green 2008).

Limitations

- The mechanism of injury/ occupation is not considered
- BMI of the subjects were not considered

Recommendations:

- Future studies are required to determine the long-term effects of contralateral neurodynamics and passive intervertebral accessory movements.
- Dosimetry of action requires future studies to assess the potential of PAIVMs.

Conflict of Interest: None

Conclusion

Both treatment methods are equally successful in raising the Knee ROM. However, CNDT has shown more substantial results than PAIVMs in increasing the ROM of the knee in subjects with sciatica and the Passive accessory intervertebral movement technique is more effective in reducing pain.

Ethical Clearance: The Institutional Ethical Committee of Padmashree Institute of Physiotherapy has reviewed the research proposal of Ms. J. M. Akila Gaweshika Rathnayake, MPT student, Padmashree Institute of Physiotherapy, Kommaghatta, Bangalore-60 and certifies that the research proposal is ethically satisfactory. (*Ref- Ethical Guidelines for Biomedical Research on Human Subjects- Indian Council of Medical Research- New Delhi- 2000*)

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Effect of 1 Week Coherent Breathing Exercise Training on Cardiorespiratory Fitness in Healthy Young Adults: An Experimental Study

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Abstract

Background: CRF indicates the ability of the circulatory, respiratory and muscular systems to supply oxygen to body during sustained physical activity. Changes in physical activity levels results in changes in CRF. CRF includes the oxygen uptake, PR, RR, BP and exercise capacity. To improve CRF coherent breathing training can be performed because it has an effect on cardiovascular health. Coherent breathing exercise produce different types of physiological responses in healthy individuals. But to the best of my knowledge there is scarcity of literature which determines the material.

Aim & Objective: Aim of the study is to assess the effect of 1 week coherent breathing training on pulse rate, respiratory rate, vo2 max, FVC and Borg scale of perceived rate of exertion in healthy individual.

Material and Methods: An experimental study was conducted among 45 healthy young adults. Participants were included in study who were able to complete queen's college step test. All the subjects have performed coherent breathing training for a 1 week. Pre and post data were collected. The total duration of training was 30 minutes per day.

Results: Results of the study showed that mean value of the PR 82.84 ± 14.41 , RR 19.73 ± 3.94 , oxygen uptake capacity 47.69 ± 9.26 , and FVC 1.95 ± 0.54 and perceive rate of expectation 2.99 ± 1.52 . The study also showed that coherent breathing training had positive effect on CRF.

Conclusion: The study demonstrate that coherent breathing training is effective in improving CRF.

Key Words: Cardio respiratory fitness, physical activity, queen's college step test, forced vital capacity and coherent breathing exercise

Introduction

Physical activity (PA) is a bodily movement that

is produced by skeletal muscles and requires energy exposure (1, 2). PA is connected with positive health outcomes, such as lower risks of ischemic heart disease, stroke, diabetes, and depression (3).

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Cardiorespiratory fitness (CRF) is an alternative dimension of physical health connected to beneficial health outcomes. CRF defined as the ability of the

circulatory, respiratory, and muscular systems to supply oxygen while performing moderate to vigorous dynamic exercise (2, 3).

Among risk factors for cardiovascular disease (CVD), deficient CRF has been the powerful indicator of morbidity (4). A growing body of work associates CRF to factors such as age (5), gender (6), life style (7,8) body mass index (BMI) (9) and environment (10).

CRF was positively correlated to vital capacity (VC), forced expiratory volume (FEV) and negatively with BMI, weight, waist circumference, body fat, resting heart rate (RHR), blood pressure (BP) and C-reaction protein (CRP) (11).

The gold standard technique to measure CRF is maximal oxygen consumption (VO₂max) (12). Vo₂max relies on the body composition, age, gender ethnicity of individuals (13). Vo₂max is calculated by direct as well as indirect methods using exercise protocol (14).

The direct calculation of Vo₂max is gold standard technique where participants under goes maximal exercises test on cycle ergometer or treadmill and oxygen consumption measured directly (15,16,17) but it requires expensive, impractical in non-laboratory (18),

Pulmonary functional test (PFT) provides estimation of the mechanical function of the lungs (19). Spirometric tests are major measurements for assessing cardiovascular and respiratory functions. Spirometer is a device with mouthpiece hooked up to small electronic machine. An assessment of subjects involves number of tests that measure lung volumes and capacities, gas flow rates, gas diffusion and gas distribution (20).

Any physical activity will promote CRF in some of amount (21). Studies also showed that PA and exercise training resulted in significant CRF improvement (22, 23, 24). CRF works on the circulatory system, respiratory system and muscular system to supply oxygen to skeletal muscles during PA (25). There are some of techniques to improve CRF. Such as aerobic exercise, resistance exercise, walking, tai chi training, breathing exercise and yoga (26, 27, 28).

Coherent breathing also referred as “resonant breathing”. This technique involves slowing the breath-rate to relaxed breathing. The diaphragm functions as a pump, moving down on the inhale to pump food and blood through the digestive tract and moving up on the exhale, pumping blood through the heart and lungs. The autonomic nervous system controls the activity of the circulatory system, and the enteric nervous system conquers the digestive system. Both are innervated by the action of the diaphragm.

Coherent breathing is breathing slowly and deeply at the rate of five breaths a minute with conscious relaxation on the exhale. This self-regulatory technique may provide a state of mind/body balance, resulting in enhanced health and perceived wellness (29).

Gamma aminobutyric acid (GABA), an amino acid neurotransmitter, has connected as a contributing factor in mood disorders (30). The GABA deficit hypothesis of major depressive disorder (MDD) points to the correlation between depressive symptoms and deficits in the GABA system and GABA receptor (31, 32).

Methodology

STUDY DESIGN –Experimental design (Before-and- after without control group)

SAMPLE SIZE- 45 samples were included in the

study

SAMPLING METHOD- Convenient Sampling Method.

PLACE OF STUDY -S. S Agrawal Institute of Physiotherapy and Medical Care Education, Navsari

STUDY DURATION-6 Month

Inclusion Criteria

- Age (17-25) years.
- Both males and females.
- Subject should be able to complete queen's test.
- Subject should be able to perform spirometry test.
- Subject's willingness to participate.

Exclusion Criteria

- Cardiorespiratory diseases
- Any neurological diseases
- Any musculoskeletal disorders including chest and trunk muscles
- Acute injury
- Family history of asthma or other chronic lung diseases
- Recent surgery

TOOLS

- Step box –41.3cm height for male and female
- Metronome
- Spirometer-spiro tech
(version1.1.0.27software)

- Mouthpiece
- Electronic weighing scale
- Wall mounted height scale
- Pulse oximeter

Material

- Stop watch
- chair
- Cotton
- Isopropyl
- Consent form

Outcomes Measures

- Pulse rate
- Respiratory rate
- Queen's College step test
- Forced Vital Capacity (FVC)
- Borg Rating of Perceived Exertion Scale

Procedure

Evaluation of undergraduate physiotherapy students was done. I have purposely Selected Physiotherapy students. For adequate representation to sample, the sample size was 45 student's male and female between the age of 18-23 years were taken.

Purpose and objective of study was explained to them and written consent form was obtained prior to conducting the study. Each and every student of Physiotherapy was participated in the study voluntarily.

Demographic data of all 45 students was collected, that includes; name, age, gender, height, weight, BMI,

systolic BP, Diastolic BP, SPO₂. Ideally, subjects instructed to avoided exercise for the previous 24h, fasted for at least 2h and avoided the use of foods and drugs that alter heart rate.

The procedure of measuring oxygen consumption capacity (vo_{2max}) is described below:

STEP 1: The subject was lie down on the plinth and rest was given for 3 min, after which the radial pulse was palpated for 15s and resting HR was calculated. During this time the RR was also been calculated.

STEP 2: To get proper timing in step up and down the metronome was set at 88 beats/min during which the subjects were allowed to make contact with a foot on each beep in an up-up-down-down manner. This cadence results in the necessary 22 steps/min necessary for the test on women. For men, set the metronome at 96 beats/min and thus 24 steps/min.

STEP 3: when the subject is ready, begin the 3 min test and start the stopwatch.

STEP 4: during this to avoid muscle fatigue, the subject was switching the leading leg at least once during the rest.

STEP 5: after exactly 3 min of stepping, the subject was given instruction to stop. And the radial pulse was palpated and RR was taken.

STEP 6: After the performance of queen's college step test subjects were asked for their feeling about exertion on Borg rating scale.

STEP 7: calculate the predicted vo_{2max} by using the recovery HR in the equations below, where HR is beats/min.

Men: VO_{2max} (ml/kg/min) = 111.33 – (0.42 x HR)

Women: VO_{2max} (ml/kg/min) = 65.81 – (0.1847 x HR)

STEP 8: record data on individual record sheet.

The procedure of measuring forced vital capacity is described below:

- The whole procedure was explained to the subject about how to put the spirometer mouthpiece in mouth, inhale through nose, take a deep breath and slow breath in, place lips around the mouthpiece, exhale fully and with as much as force as possible.

- The subject in sitting position.

- The subject performed procedure for 3 trails and average value was noted.

The procedure of measuring perceived rate of exertion is described below:

STEP-1 After the performance of queen's step test subjects were asked for their feeling about exertion on Borg rating scale.

The same procedure was repeated in all 45 subjects.

DETAILS OF INTERVENTION

The main components of coherent breathing are: Relax the mind and body, regulate breathing rate to about 5 breaths per minute, i.e., inhale for about 6 seconds then exhale for about 6 seconds so that a single breath takes about 12 seconds and about 5 breaths per minute.

After the conducting assessment, subjects were given the intervention in form of coherent breathing training.

In which subjects were given relaxed upright position not reclining more than 45 degree and following instruction were given:

Ø Take three or four deep breathing using your diaphragm and primarily breathing into belly.

Ø Inhale fairly deeply and then exhale about 6seconds long.

Ø Stopwatch was used to check intervals.

v Continue session for 10minutes and 2 intervals is given so total duration of total duration of session was30 minutes. Total intervention was 6days/ week.

Ø Place your hand on belly and another on diaphragm to evaluate yourselves about performing shallow breathing.

Results

Table no.1: Demographic characteristics of study participants

Characteristic	Mean ± SD / N (%)
Age	19.58±1.51
BMI	18.15±3.06
Systolic BP	118.98±12.68
Diastolic BP	71.49±8.79

Table no.2: Summary of values on Pules rate, respiratory rate, Vo2 max, FVC and perceived rate of exertion(Borg scale)

Variables	Pre- test Mean ± SD	Post- test Mean ± SD	Z-value	p-Value
Pulse rate	86.04 ± 13.20	82.84 ± 14.41	-5.857	0.000
Respiratory rate	21.11 ± 3.94	19.73 ± 3.94	-5.866	0.000
Vo2 max	43.09 ± 9.69	47.69 ± 9.26	-4.124	0.000
FVC	1.76 ± 0.53	1.95 ± 0.54	-3.584	0.000
Perceived rate of exertion	3.77 ± 1.95	2.99 ± 1.52	-3.584	0.000

Table no3: Correlations between PR,RR,BORG SCALE,VO₂MAX and FVC

	Post_RR-Pre_RR	Post_PR-Pre_PR	Post_Vo2-Pre_Vo2	Post_Borg-Pre_Borg	Post_FVC-Pre_FVC
Z	-5.857	-5.866	-4.124	-3.584	-3.590
P	.000	.000	.000	.000	.000

Discussion

The primary aim of this study was to assess the effect of one-week coherent breathing exercise training on cardiorespiratory fitness in healthy young adults of 17-25 years of age using vo2 max and FVC. Total n=45 subjects were given coherent breathing training. Before and after a week of training pulse rate, respiratory rate, vo2 max, FVC and Borg scale of perceived rate of exertion were taken. The results of the present study indicates that after a week of training score of healthy young individuals had improved in all parameter and results were highly significant (p=0.001)

A normal resting heart rate for adults ranges from 60 to 100 beats per minute. Generally, a lower heart rate at rest implies more efficient heart function and better cardiovascular fitness.⁽³³⁾ There are various therapeutic interventions used to lower heart rate. One of the therapeutic interventions is coherent breathing which involves taking long slow breaths at a rate of about five per minute that helps to calm the body through its effect on the autonomic nervous system. which activate vagus nerve to put the neural brake on a racing heart is to slow down your breath.⁽³⁴⁾

The reduction in pulse rate and blood pressure in breathing group may be due to tonic and

phasic changes in cardiovascular system⁽³⁵⁾ and parasympathetic activity also increases with regular practice of breathing exercise.^(35,36) Previously it has been shown in various studies that breathing exercise can results in reduction in blood pressure and heart rate. **DP Deepak 2013** found reduction in blood pressure and heart rate with four weeks of anulom-vilom pranayama.⁽³⁷⁾ **AV Turnakar et al. 2013** also found reduction in pulse rate after breathing exercise, 20 minute per day for 7 days.⁽³⁶⁾

Normal Breathing is considered to be systematic with even chest expansion and deflation; Normal Breathing is moreover an unconscious process. The Primary Respiratory Center is situated in medulla oblongata and pons, which are responsible for controlling the rate and depth of breathing. Respiratory Rate or the number of breaths per minute is defined as one breath to each movement of an air in and out of the Lung. Universally the respiratory rate for an adult is between 12 and 20 breathes per minutes, but there will be some variation depending on age and medical condition.⁽³⁸⁾

Vidigal et al. conducted one study to find the effects of slow respiration (6 breaths/min) on autonomic response to postural maneuver. In which they concluded slow breathing improved cardiac sympathetic and parasympathetic responsiveness

to physical perturbations, possible reason may be a result of augmented baroreflex sensitivity due to increased parasympathetic tone, and synchronization of sympathetic and parasympathetic systems at 6 breaths per min⁽³⁹⁾.

Cardiorespiratory fitness is an important indicator of cardiovascular health and thus an important factor in the prevention of non-communicable diseases. CRF, defined as the capacity of circulatory, respiratory and muscular systems to supply oxygen during prolonged physical exercise⁽⁴⁰⁾, has a strong inverse relation to the incidence cardiovascular diseases⁽⁴¹⁾, cancer⁽⁴²⁾, diabetes mellitus, depression⁽⁴³⁾ and all-cause mortality⁽⁴¹⁾.

VO₂ max is the best physiological indicator of a person's capacity to continue severe work. It has been used to indicate cardio respiratory fitness. VO₂ max can be measured using variety of exercises that activate the body's large muscle groups. Most of the exercise modes include treadmill running, bench stepping and stationary cycling⁽⁴⁴⁾.

One study done by **Johannes Zeiher's** find the well-established relationships in the literature between anthropometric measures (BMI and WC), total PA and physical exercise, and estimated VO₂max using data from a nation-wide, population-based cross-sectional health examination survey among adults in Germany⁽⁴⁵⁾.

The Forced Vital Capacity is a good predictor of mortality and morbidity. It is correlated to causes of mortality in general population.^(46,47) Some studies shows that the developed world has also shown significant association of FVC with cardiovascular diseases^(48,49), Cardio vascular events⁽⁵⁰⁾, sudden cardiac death⁽⁵¹⁾, metabolic syndrome⁽⁵²⁾, Diabetes^(53,54) and the progression of chronic kidney disease⁽⁵⁵⁾. Low FVC associate with vascular disease. Age,

Gender, Height, Height - Squared are strong predictors of lung function.⁽⁵⁶⁾ BMI and waist circumference associated with low FVC.⁽⁵⁷⁾

Yoga breathing exercise increases compliance of lungs and thorax, airway resistance and strength of respiratory muscle. There was significant improvement in FVC. Some of the study shows breathing exercises are feasible and can improve lung function. It seems to be beneficial on respiratory efficiency.⁽⁵⁸⁻⁶²⁾

Slow, deep breathing also resets the autonomic nervous system through stretch-induced inhibitory signals and hyperpolarization currents propagated through both neural and non-neural tissue which synchronizes neural elements in the heart, lungs, limbic system, and cortex. It is thought that voluntary deep breathing dynamically modulates the autonomic nervous system by generation of physiologic signals.⁽⁶³⁾ Most of the study results are based on the practice of slow deep breathing for a few weeks to months but the immediate effect of it is less studied.⁽⁶⁴⁾

The Borg Rating of Perceived Exertion (RPE) scale is a tool for measuring an individual's effort and exertion, breathlessness and fatigue during physical work and so is highly relevant for occupational health and safety practice.⁽⁶⁵⁾

Coherent breathing and meditation are each associated with psychological benefits such as enhanced coping, self-efficacy, and positive mood. In addition, they provide spiritual benefits of compassionate understanding and mindful awareness (Evans, 2009). The combination of awareness in the mind/body and awareness of breath associated with coherent breathing and meditation practices is believed to have a positive impact on psychophysiological function (Evans, 2009). The autonomic nervous system benefits are associated with short- and long-term parasympathetic nervous system dominance⁽²⁹⁾.

Conclusion

The results of the study prove that coherent breathing training is effective in improving cardiorespiratory fitness in healthy adults. Coherent breathing training is effective in maintenance of normal range of PR, RR and BORG SCORE and increasing VO₂MAX and FVC

Conflict of Interest-Nil

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Ethical Clearance –Taken from institutional advisory board.

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Immediate Effect of Breathing Exercises and Prone Lying on Saturation of Peripheral Oxygen (SpO₂) in Covid Patients – A Pilot Study

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Abstract

Background and Objective: Coronavirus disease 2019, also known as Covid-19, is an infectious disease. It is caused by a novel virus from the family of Coronaviridae, called the SARS-CoV-2 virus. According to studies, the possible modes of transmission include contact, droplet, airborne, fomite, feco-oral, blood-borne, mother-to-child, and animal-to-human.¹ It has been reported that the crude mortality ratio is between 3-4%.²

The clinical management of Covid-19 is dependent on the severity of the disease. It may vary from symptomatic management to supplementary oxygen and ventilation.³ Review of literature has shown that physiotherapy interventions like breathing exercises, positioning, range of motion exercises, respiratory hygiene, etc. help in reducing morbidity and mortality in these patients.⁴

The objective of this study was to identify the immediate effects of breathing exercises and prone lying on the Saturation of Peripheral Oxygen (SpO₂) in Covid patients.

Method: 5 out of the 10 patients randomly selected from the Covid ward of the institute agreed to participate in the study. They were asked to perform a set of breathing exercises, thoracic mobility exercises, and prone lying. The SpO₂ levels of these participants were monitored and recorded at regular intervals.

Result: The SpO₂ levels of all 5 participants significantly improved post-physiotherapy intervention irrespective of age and gender. Only breathing exercises did not show major difference in the SpO₂ level of the participants, but when it was combined with prone lying, the SpO₂ levels significantly improved. It was also noted that SpO₂ levels 30 minutes post prone lying and 60 minutes post prone lying were the same.

Conclusion: Breathing exercises and prone lying are simple and effective ways to improve the SpO₂ levels in the Covid-19 patients. These two interventions done together, under supervision improved the SpO₂ levels significantly. The results suggest that prone lying after 30 minutes did not further improve the SpO₂ levels significantly. Thus, we would like to suggest inclusion of prone lying in the management of Covid for short durations and multiple repetitions throughout the day for better rehabilitation outcomes.

Keywords: Covid-19; Prone lying; Physiotherapy; Breathing exercises; Rehabilitation; Covid-19 management; Oxygen saturation (SpO₂)

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Introduction

Most studies on Covid-19 focus on the medical management and less on the rehabilitation part of it. During the search for review of literature, studies

suggested that awake early self-prone demonstrated improved oxygen saturation (SpO₂) in Covid-19 positive patients.⁵ It was also found that patients were usually being advised for prone lying and breathing exercises, but there was a lack of enough data published regarding the same. Also, we came across numerous videos circulating on social media platforms, in which the breathing exercises and prone lying were done incorrectly without any scientific basis. Thus, this study aimed at identifying the immediate effects of proper and supervised breathing exercises and prone lying on the SpO₂ levels of patients.

SAMPLE SIZE: Convenient sample.

Methods and Methodology

Inclusion Criteria: Patients diagnosed with Covid-19 above the age of 18 years of either gender who were hospitalised and were on oxygen therapy were included in the study.

Exclusion Criteria: Covid patients who were on ventilatory support, medically unstable, and those who were unable to follow the commands were excluded from the study.

Ethical permission was obtained from the institutional ethical committee prior to the study. 10 patients with Covid-19 were randomly selected from the general Covid ward of the institute, based on the inclusion and exclusion criteria. The patients were explained the method of exercise along with the need for the study. Five patients approved to participate in the study.

Procedure: The demographic data of the patients were collected prior to enrolment in the study. Vitals were recorded pre and post exercise to identify the medical stability of patients. SpO₂ was separately recorded at regular intervals, i.e., before the breathing exercise, after the breathing exercise, post 15 minutes prone lying, post 30 minutes prone lying, and at the end of 1 hour of prone lying.

Protocol for performing thoracic mobility exercise, abdominal breathing exercise and prone lying.

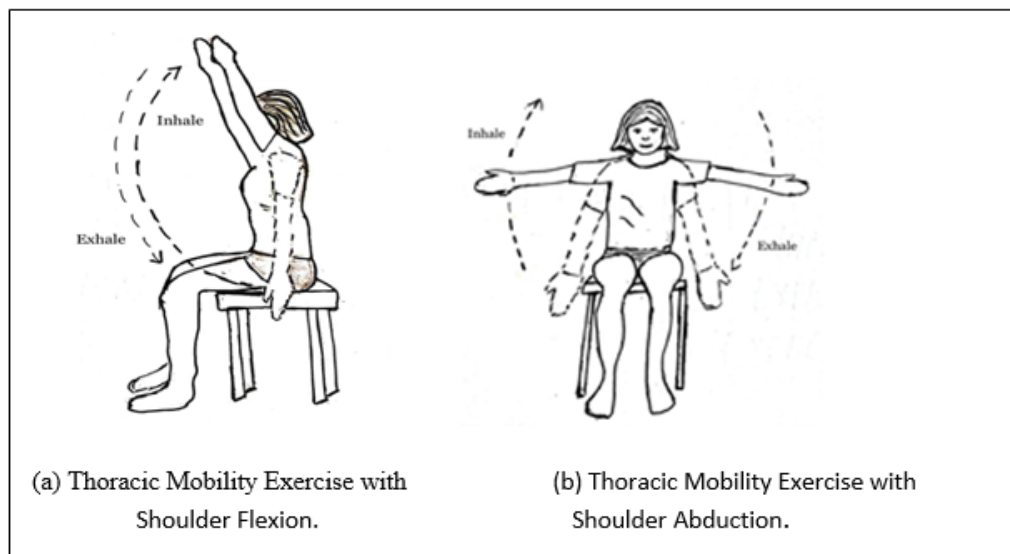


Figure 1: Thoracic Mobility Exercises

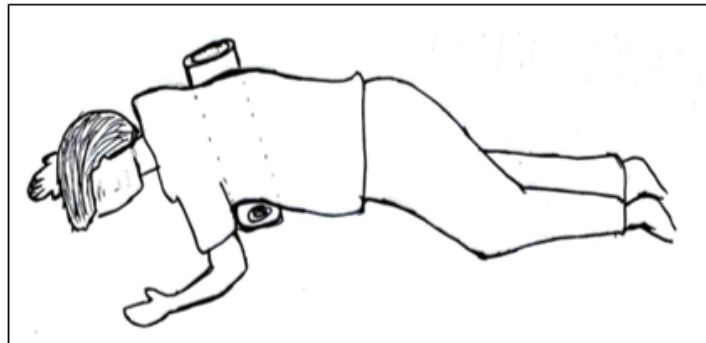


Figure 2: Abdominal Breathing Exercise. Figure 3: Awake Prone Lying with Towel Roll below the Lower Ribs

Thoracic mobility exercise: The patients were asked to sit in a comfortable position with arms by the side of their body and forearm in mid-prone position. They were instructed to breathe in deeply through the nose while simultaneously performing overhead shoulder flexion. Then breathe out completely through pursed lip while bringing their hand to the neutral position (Figure 1a). This was done for 5 repetitions. Similar exercise was instructed to be done by abducting the shoulders and facing their thumbs toward the direction of the movement (Figure 1b). This was done for 5 repetitions.

Abdominal breathing exercise: The patients were asked to sit in a comfortable position and place one hand on the abdomen, just below the ribs, and the other hand on the chest to get the feedback of the abdomen and chest movements respectively. They were told to take in a deep breath through nose, and let the abdomen push the hand out and not let the chest move. Then, they had to breathe out through pursed lips and feel the hand on the abdomen go in, and push all the air out (Figure 2). This was done for 5 repetitions.

Awake prone lying: The patients were made to lie prone with the shoulder in abduction and external

rotation, elbow in flexion, forearm in mid prone (palms facing down), and head turned to either side. They were asked to be in this position for one hour while being awake. A towel roll was placed below the lower ribs to avoid sternal pain and discomfort (Figure 3). In female patients, the roll was placed avoiding the pressure over the breast tissue. The roll was placed in order to maintain the lower thoracic cage higher and relieve the resistance to diaphragmatic descent as the abdominal organs would rest on the pelvic floor muscles.

Prone position improves oxygenation and reduces work of breathing. It increases arterial oxygen tension, tidal volume, and lung compliance.⁶

Results

The data of the five participating patients were subjected to the Kolmogorov-Smirnov test for normality and found to be normally distributed. It was further subjected to parametric tests.

The mean age of the 5 patients who agreed for participation was 54 years with the youngest being 23 years and the eldest being 75 years. The participants included 3 women and 2 men with a mean age of

55(\pm 28) years and 60 (\pm 7) years respectively. The number of women and men were not significantly different at a Z-score for a population proportion of 0.63 with a p-value of 0.52.

Table1: List of COVID-19 participants

Participants	Gender	Age in Years
Participant 1	Female	23
Participant 2	Female	69
Participant 3	Female	75
Participant 4	Male	55
Participant 5	Male	65

Table 2: Descriptive statistics of k=5 independent treatments:

	SpO ₂					
	A	B	C	D	E	Total
N	5	5	5	5	5	25
Mean	89.8	92.0	95.6	97.4	97.4	94.4
SD	1.6	1.8	0.8	0.6	0.6	0.8

A= SpO₂ pre-breathing exercise; B=SpO₂ post-breathing exercise; C=SpO₂ post 15 minutes of prone lying; D=SpO₂ post 30 minutes of prone lying; E=SpO₂ post 60 minutes of prone lying.

The mean SpO₂ of all the participants (Table 2) were 89.8% pre-physiotherapy intervention, 92% post breathing exercise, 95.6% 15 minutes post prone lying, 97.4% 30 minutes post prone lying, and 97.4% 60 minutes post prone lying. The SpO₂ values were subjected to one-way ANOVA analysis, which derived a p-value corresponding to the F-statistic of

one-way ANOVA lower than 0.05, suggesting that the one or more treatments were significantly different. Post-hoc tests were performed to identify which of the treatments were significantly different from the other. The SpO₂ of patients post prone lying for 15 minutes was significantly higher than the patients SpO₂ pre-breathing exercises.

Table 3: Bonferroni and Holm results: all pairs simultaneously compared

Treatment pairs	Bonferroni and Holm TT-statistic	Bonferroni p-value	Holm p-value
A vs B	1.25	2.25	0.90
A vs C	3.30	0.03*	0.028*
A vs D	4.32	0.003*	0.003*
A vs E	4.32	0.003*	0.002*
B vs C	2.04	0.53	0.26
B vs D	3.07	0.06	0.04*
B vs E	3.07	0.06	0.03*
C vs D	1.02	3.17	0.95
C vs E	1.02	3.17	0.63
D vs E	0.00	10.0	1.0

* p-value<0.05 was statistically significant. A= SpO₂ pre-breathing exercise; B=SpO₂ post-breathing exercise; C=SpO₂ post 15 minutes of prone lying; D=SpO₂ post 30 minutes of prone lying; E=SpO₂ post 60 minutes of prone lying.

Table 4: Effect Size

Treatment pairs	Effect Size: Cohen's d	Interpretation
A vs B	1.29	Very Large
A vs C	4.98	Huge
A vs D	6.28	Huge
A vs E	6.28	Huge
B vs C	2.58	Huge
B vs D	4.02	Huge
B vs E	4.02	Huge
C vs D	2.54	Huge
C vs E	2.54	Huge
D vs E	0	Nil

A= SpO₂ pre-breathing exercise; B=SpO₂ post-breathing exercise; C=SpO₂ post 15 minutes of prone lying; D=SpO₂ post 30 minutes of prone lying; E=SpO₂ post 60 minutes of prone lying.

Table 4 shows the group-wise effect size. The effect size of the data was calculated and reported as follows, $d = 0.01$ as very small, $d = 0.2$ as small, $d = 0.5$ as medium, $d = 0.8$ as large, $d = 1.2$ is very large, and $d = 2.0$ is huge.⁷ It showed that Cohen's d for pre-physiotherapy intervention and post-breathing exercises was very large with $d = 1.29$. Whereas, the Cohen's d for pre-physiotherapy intervention and post 15 minutes, 30 minutes, 60 minutes prone lying was huge with $d > 2$. The effect size for difference between post 15 minutes prone lying versus post 30 minutes and 60 minutes prone lying was also huge with $d > 2$. The mean values post 30 minutes and 60 minutes prone lying were similar with no variations, hence $d = 0$.

Discussion

The data of the five participants were collected and analysed.

The mean age of the participants was 54 years. Studies show that population groups of 20 to 49 years of age and 50-years above were highly vulnerable to infection⁸ which is similar to our study.

The results showed that the SpO_2 post-breathing exercises were better than that at baseline. The improvements were not however statistically significant. Prone lying for 15 minutes post-breathing exercise improved the SpO_2 levels significantly from the baseline. Further continuation of prone lying up to the 30 minutes led to a significant increment in the SpO_2 . However continuing the positioning up to 60 minutes did not greatly increase the SpO_2 from that which was achieved after 30 minutes.

Conclusion

Appropriate breathing exercises with correct technique and awake prone positioning for 30 minutes done under supervision improves SpO_2

levels significantly. We would like to suggest that prone lying may be advised for short durations and multiple repetitions throughout the day instead of long uncomfortable hours. Such studies may be undertaken in the future including a larger sample size to evaluate the long-term effects of the same. The generalisability of the protocol for the whole population may not be possible as the sample in this study was very small.

Conflict of Interest – The authors have no conflicts of interests to disclose.

Source of Funding – Self

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Effectiveness of KIASTM in Post-surgical Wrist and Hand Rehabilitation following Spaghetti Wrist Injury- A Single Case Report

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Abstract

Background and Objectives: The deep laceration of the distal volar forearm is referred as “Spaghetti wrist”. As the structures at the wrist are tightly packed and thinly covered, lacerations of tendons, nerves, and arteries are likely. The injury of exposed tendons on a red background resemble pasta noodles in a bed of tomato sauce. Flexor tendon injuries along with median nerve injuries are very common following accidental cut injuries at wrist. Most commonly injured tendons include FDS, FDP, FPL, FCU and FCR. There are associated nerve and arterial damage also might prevail which includes median, radial and ulnar nerve. These kind of injuries are quite complex and are managed by specifically Hand Surgeons. Following post-surgical repair the Physiotherapists and occupational therapists plays a key role during rehabilitation . There are various standard protocols available to treat such cases. IASTM(Instrument Assisted Soft Tissue Mobilization) is one of the effective innovative tool in treating various conditions related to tissue tightness following nonsurgical and post-surgical management .Physiotherapy has diversified its treatment methods over a period of time with the use of various modalities and instruments. Instrument assisted soft tissue mobilization (IASTM) is one of the tool that has gained popularity with its use in treating various pathologies.This case study was done check the effect of KIASTM(Kinesio Instrument Assisted Soft Tissue Mobilization)in treating a post-surgical repair of FDP,FDS and FPL tendons along with median nerve injury following a glass cut penetrating injury on volar surface of right wrist.

Case Description: A 34 year old male patient reported for Post-operative rehabilitation of Median nerve injury along with FDP,FDS and FPL tendon repair and also radial and ulnar artery repair. The surgery was performed 20 days prior to start with the physiotherapy treatment. The physical therapy protocol included KIASTM by using the Acceltool, electrical muscle stimulation, exercise therapy including passive stretching and active exercises. The case was evaluated using outcome measures VAS for pain,Goniometry for wrist joint ROM and DASH questionnaire for assessing the upper extremity function pre-treatment and post treatment.

Results: It is seen that there were prognosis in overall hand function following Spaghetti wrist injury in terms of pain, AROM and functional ability in post-operative hand rehabilitation.

Conclusion: Considerable improvement was seen with the use of KIASTM along with other therapeutic interventions following Spaghetti wrist injury in reducing pain, increasing AROM and improving hand function during rehabilitation in post-operative phase of management.

Key words: *Spaghetti wrist injury , KIASTM,Physiotherapy*

Introduction

The Spaghetti wrist injuries are defined as those occurring between the distal wrist crease and the flexor musculotendinous junctions involving at least three completely lacerated structures, which involves at least one blood vessel and often a nerve.¹ Hand injuries are common and account for 5-10% of emergency department (ED) injuries and all trauma patients upto 4.7%.² 'Spaghetti wrist' is an extensive laceration that involves multiple structures in the volar wrist, including tendons, nerves and arteries. This type of injury is frequently encountered in trauma units, but inspite of its complicated nature, the management is often handled by inexperienced surgeons. As the position of the tendons, radial nerve, ulnar nerve and blood vessels in the volar wrist are superficial, so places them at a high risk of direct injury. This type of injury has been coined as 'spaghetti wrist' or 'full-house syndrome'; however, there is no clear consensus on what constitutes a spaghetti wrist injury, with authors defining division of as few as three structures with either tendon, nerve or artery to up to at least ten such involvement.³ A spaghetti wrist injury commonly occurs when a patient punches a glass window. The similar pattern of injury may result from an accident with sheet metal, from an assault with a knife, or may be self-inflicted.

A short laceration of the skin may produce the damage beneath. Unless intact antebrachial fascia is clearly visible throughout the depth of the wound, major injury can be predicted. When such injury is clearly visible, arterial bleeding makes deeper injury more obvious. Bleeding from such wound should be stopped with direct pressure over the laceration, and if still uncontrolled, with a temporary tourniquet. Clamping or tying vessels without clear visualization should be avoided completely. The patient should be immediately evaluated for haemorrhagic shock and

resuscitation should begin accordingly.⁴ The radial and ulnar arteries are framed by their respective nerves at the wrist, that is, the vessels are on the inside and the nerves are on the outside.⁵ The median nerve is sandwiched between the FDS and FDP muscle-tendon units in the forearm. Adequate surgical technique and early physiotherapy plays a vital role in managing these cases.

The physiotherapy management gives a wide range of techniques and methods to combat the complications following the post-surgical period. The hands and wrists are extremely important for performing the activities of daily life independently. The spaghetti wrist may involve major nerves and arteries, as well as the wrist and finger flexors.⁶ Flexor tendon injuries along with nerve and arterial injury makes the rehabilitation challenging in this condition. Immediate rehabilitation following surgery would fasten the improvement and helps the patient to regain normal hand function back within a short period of time. Patients are commonly presented to physiotherapist with soft tissue contracture specifically the flexor compartment involvement, with hand deformities like claw hand, and loss of sensations in some areas of the upper extremity.

Physiotherapy management to variety of complaints need multiple techniques and rehabilitation protocols to implement strategically to resolve all the post-operative complications.

Electrical muscle stimulation plays important role in rehabilitation following surgeries. Electrical muscle stimulation is a method of physical therapy and it has been used for many years as a method of rehabilitation of muscles after injury or surgery. It was often used in the early part of 1960s as an attempt to prevent the atrophy of skeletal muscle that occurred as a result of weakened or interrupted innervations. With the advanced technology and the development

of stimulation devices the EMS has become a popular method for the treatment of patients who have suffered damage to the central nervous system, most often due to stroke or spinal cord injury (Scremin, Kurta, Gentili, et al., 1999; Wheeler, Andrews, Lederer, et al. 2002).⁷

KIASTM is a procedure where soft tissue structures are mechanically stimulated with the use of instruments to relieve musculoskeletal pain and discomfort and improve overall mobility and functional ability. Commonly it describes the use of an Accel tool which is ergonomically designed to enable clinicians to detect and treat soft tissue pain, injury and dysfunction.⁸

Exercises pertaining to gain maximum joint range of motion has significant impact in any post-operative rehabilitation. Active range of motion exercises in the early post-operative period is preferred followed by passive stretching and ROM exercises over the course of rehabilitation. This sequence of exercises followed to prevent any undue stress over the incision site. Range of motion exercises are beneficial in healing and in recovery from soft tissue and joint lesions, maintaining existing joint and soft tissue mobility, minimizing the effects of developing contracture, assisting neuromuscular re-education, and enhancing synovial movement.⁹

Objectives:

The objective of this study was to evaluate the efficacy of KIASTM technique in post-surgical recovery of wrist and hand function following Spaghetti wrist injury.

Case Description: Patient History

A 34 year male patient reported for post-operative rehabilitation following Spaghetti wrist injury at right wrist involving median nerve, radial artery, ulnar

artery, tendons of Flexor digitorum Superficialis (FDS) and Flexor digitorum profundus (FDP) muscles. The patient had sustained a traumatic glass cut injury at right wrist and was taken to emergency care in a local hospital, where the immediate measures were taken to repair the damaged blood vessels. After a month the patient got operated with repair surgery done for the multiple structures which involved corresponding nerves, tendons and blood vessels at right wrist which were injured due to penetrating glass cut trauma.

Physical Examination:

The physiotherapy assessment and examination included measurement of level of pain, active range of motions (AROM) at wrist joint and Hand function assessment pre interventions. At the time of examination patient revealed pain on movement, there were restrictions of movements in all the ranges of wrist joint. The hand mobility was affected due to contracture of flexor compartment of wrist and forearm along with weakness in extensor compartment of the same. The patient also had loss of sensations along the course of median nerve distribution. At the time of PT evaluation, the patient reported perceived pain while moving the joint reported 8/10 on VAS score. Patient complained of severe pain while performing all the movements and moderate pain at rest.

Study Design: The study design used for this research was a case study.

Apparatus and Equipment:

1. Goniometer
2. Electrical Muscle Stimulator (EMS)
3. KIASTM tool (Accel Tool)

Main Outcome Measures:

- a. Visual analogue scale: A horizontal visual analogue scale was used. A 10 cm line was drawn on a

paper and participant was asked to mark a point on the line that best defined the present pain level, where 0 indicated no pain and 10 indicated excruciating pain. Visual analogue scale was taken pre-interventional and immediately post-interventional.

b. Range of Motion (ROM): Active ROM of the Right Wrist Joint was taken by using an universal goniometer for wrist flexion, wrist extension, radial and ulnar deviation pre and post intervention.

c. DASH(Disability Arm Shoulder Hand Questionnaire): DASH was used to assess the right upper extremity function pre-treatment and post treatment.

Procedure:

The purpose of the study was explained to the patient and an informed consent was obtained for the same. The patient was assessed with a specific proforma, the pain intensity was measured by Visual Analogue scale, functional ability was measured by DASH questionnaire and active range of motion was measured by using universal goniometer pre intervention and post intervention.

The patient was treated with electrical muscle stimulator using faradic current on the extensor

compartment of wrist and hand initially for 15minutes duration. This was followed by release of contracture of flexor compartment of forearm fascia along with the release of fascia on ventral surface of right hand buy using KIASTM tool.

KIASTM was incorporated by using Accel tool on the ventral aspect of the forearm to release the contracture of flexor compartment of the forearm along with release of fascia of the palmar surface of right hand and finger web spaces. The standard protocol was used in three steps to apply this tool. It involves -*Scanning technique* to check the restrictions over the affected area ,followed by this the *Combing technique* with multidirectional deeper strokes and finally *Gliding technique* or cool down phase given by gliding strokes over the affected area. The whole technique was applied for around 90 seconds.

The patient was also treated with active wrist joint ROM exercises along with the modalities and tools used. Initially upto 2weeks only active ROM exercises were given as instructed by the surgeon to prevent undue stress over the incision site. After 2 weeks the passive mobilization of the wrist and fingers were introduced along with the previous protocol .The patient was given 3 sessions per week for a period of 8 weeks with a total number of 24 sessions.



Fig1: Application Of Ems



Fig 2: Kiastm Accel Tool Application

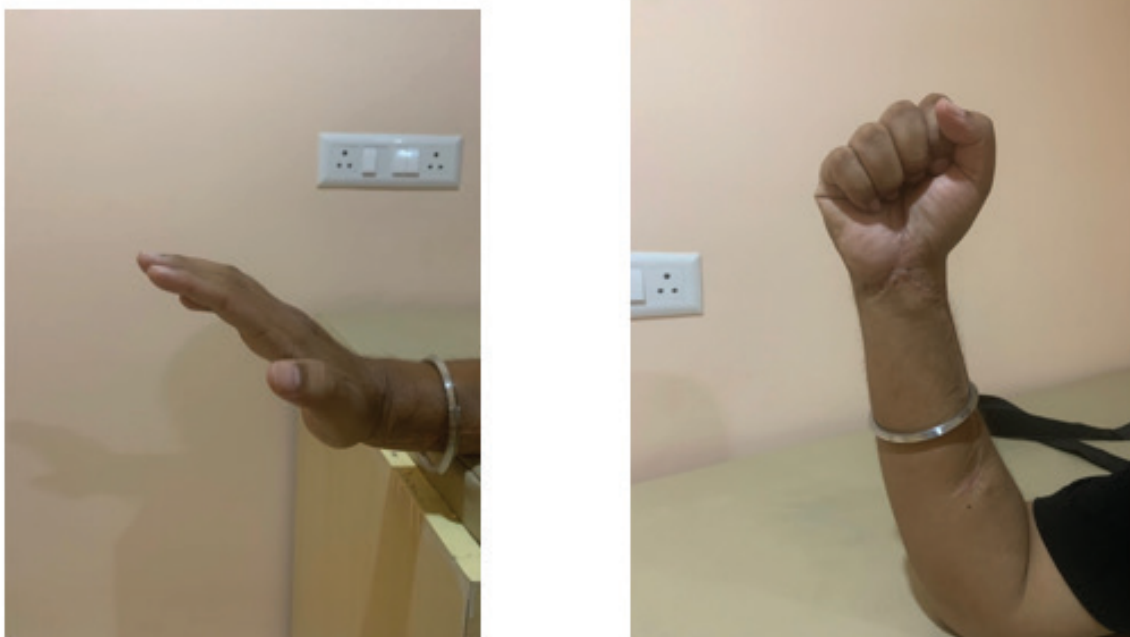


FIG 3: AROM EXERCISES WRIST AND HAND



Fig4: Progression Presurgery , Post Surgery and Post Rehabiliattion

Results

The results of the present study showed significant improvement in terms of reduction of pain ,improvement in AROM in all the ranges and disability level. The AROM of wrist extension was improved significantly post intervention. The level

of disability in terms of hand function was assessed using DASH questionnaire which showed significant improvement from a score of 86.66 pre-treatment to 26.66 post-treatment. The following table depicts the detail results of pre-treatment and post-treatment values of all the outcome measures used for the study.

OUTCOME MEASURES	PRE TREATMENT	POST TREATMENT(4WEEKS)	POST TREATMENT (8WEEKS)	PERCANTAGE (IMPROVEMENT)
1.VAS	8/10	5/10	3/10	62.5%
2.(a)WRIST FLEXION	45 DEGREE	59 DEGREE	70 DEGREE	55.5%
(b)WRIST EXTENSION	32 DEGREE	54 DEGREE	63 DEGREE	96.8%
(c)RADIAL DEVIATION	11 DEGREE	14 DEGREE	20 DEGREE	81.8%
(d)ULNAR DEVIATION	25 DEGREE	29 DEGREE	32 DEGREE	28%
3.DASH SCORE	86.66	54.66	26.66	69.2%

Discussion

Hand injuries are common and account for 5-10% of emergency department (Allen et al.,2008) and 4.7% of all trauma patient (Makobore et al.,2015). The hand is one of the most complex parts of the body.¹⁰ The movement of the tendons, bones, tissues and nerves allows us to grip and do a wide variety of complex jobs. The present case report had sustained an extensive glass laceration of right volar wrist which is one of the most common cause of this category of Hand injury. This patient had undergone two major hand repair surgery ,one immediately following the injury for the damaged radial and ulnar arteries. After a month another extensive repair surgery performed for the damaged tendons of FDS,FDP,FPL muscles along with median nerve repair.

Various previous studies have shown that immediate wrist mobilization following surgery gives better outcomes of rehabilitation. The results

of the present case report showed improvements in terms of reduction in pain , improvement in active wrist joint range of movements with goniometer and hand function using DASH questionnaires were appreciable.

The KinesioInstrument Assisted Soft Tissue Mobilization (KIASTM) technique is one of the unique treatment technique to reduce pain, help to improve functional range of motion, and corresponding functional task completion. It has been reported both anecdotally and through controlled-clinical trials to evoke acute changes in skeletal muscle physiology through a variety of proposed theory.

The effects of IASTM in reduction of pain have already been proven in some studies of musculoskeletal diseases. Lee et al. (2016) reported that there was significant reduction in pain when IASTM was applied for 4 weeks in 30 patients with chronic lumbar pain.¹¹ Previously Howitt et al. (2006) have

demonstrated that applying eight treatment sessions of IASTM over 4 weeks on trigger thumb patients was found to be effective in reducing pain.¹² IASTM improves the extensibility of soft tissues by treating their restrictions (Heinecke et al., 2014), and when heat is generated from friction by the instrument, the viscosity of the tissue decreases, making it softer (Markovic, 2015).¹³

There has been a wide implications of electrical muscle stimulation (EMS) in preserving the muscle strength and also in improvement of muscle atrophy of the affected musculatures. EMS applied during the early rehabilitation stage is found to be effective in maintaining and increasing muscle thickness and strength in the operated limb (Satoshi et al 2011).¹⁴ The present case study showed visible changes in terms of improvement of muscle atrophy and strength.

Active range of motion exercises (AROM) exercises after surgical repair of flexor tendon injuries at wrist have shown significant improvement in various studies. After any flexor tendon surgery early motion protocols have shown greatly improved outcomes. There has been considerable debate regarding the optimal postoperative rehabilitation strategy for zone II flexor tendon repairs. Early motion post flexor tendon repair has resulted in dramatically improved overall motion of the fingers compared to immobilization (Matthew Macrae MD et al. July 2021).¹⁵

Conclusion

An immediate extensive rehabilitation program with use of KIASTM and other therapeutic interventions have shown significant impact in recovery of hand function post operatively following “Spaghetti wrist injury” repair.

Conflict of Interest: None.

Source of Funding : Self.

Ethical Clearance: Ethical clearance was obtained from Institutional ethical committee.

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Short Term Effects of Remote Myofascial Release versus Mulligan's Bent Leg Raise on Hamstring and Lumbar Spine Flexibility in College Going Students: An Experimental Study

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Abstract

Background: Hamstring flexibility is an important factor because reduced flexibility is being considered as a predisposing factor for idiopathic low back pain. Considering the pelvis to be base of the spine, its orientation affects the lumbar lordotic curvature. Hence, it can be postulated that hamstring flexibility is influenced by pelvic posture. The aim of the study was to evaluate and compare the short term effects of Remote myofascial release (bilateral plantar fascia) and Mulligan's bent leg raise on hamstring and lumbar spine flexibility in college going students.

Method: Total 78 students were recruited for the study as per selection criteria and were divided into two groups (39 in each group). Group A was treated with Remote myofascial release (bilateral plantar fascia) and group B was treated with Mulligan's bent leg raise for 6 days (daily 1 session of 3 repetitions). Inter-group analysis by unpaired t-test showed statistically significant improvement on knee extension angle test, sit and reach test and lumbar lordosis index (P value ≤ 0.05).

Conclusion: Remote myofascial release as well as Mulligan's bent leg raise were beneficial in improving hamstring and lumbar spine flexibility. However, Mulligan's bent leg raise was found to be more effective in hamstring and lumbar spine flexibility.

Keywords: Hamstring flexibility, Remote myofascial release, Mulligan's bent leg raise

Introduction

Muscular flexibility is an important factor of normal human function.¹ Flexibility is the ability to move a single joint or series of joints through an

unrestricted pain free range of motion (ROM) and it relies upon the extensibility of the muscle.² Flexibility is essential for all movements and changes in flexibility may cause abnormal loading of the musculoskeletal system which has been proposed as a predisposing factor for injuries, idiopathic low back pain, thoracic hyperkyphosis, spondylosis, disc herniation and changes in lumbopelvic rhythm.³⁻⁴

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Hamstring group of muscles are postural muscles and as they are biarticular,⁵ under normal conditions, two joint muscles are always used to move both joints

simultaneously and very often the action of two joint muscles is prevented at one joint by resistance from gravity or continuation of other muscle.⁶ So, they have the tendency to shorten even under normal circumstances because it is constantly under different levels of tensile forces.⁵ According to literature, normal hamstring length will prevent excessive lumbar flexion during postures that place the hamstrings in a lengthened position such as forward flexion.⁷

Prevalence of hamstring tightness is very high in college going students of age group of 18-25 years where 68% of students are affected. Hence, hamstring stretching is essential to prevent musculoskeletal problems of lower quadrant.⁸ Maintenance of initial muscle length requires regular stretching to prevent muscle tightness, decreases risk of musculoskeletal injuries and enhance physical performance.⁹

A “schematic map” of the body’s fascia connections, namely “anatomy trains” has been suggested and proposed that any tension at a particular part of an “anatomy train” may have harmful effects resulting in global decreased flexibility. For example, problems related to the plantar fascia may be associated with tight hamstrings and lumbar lordosis. The “anatomy train” suggested to be quite related to lumbar spine and hamstrings is the superficial back line (SBL) through which muscles are connected by one neural system which passes through duramater.¹⁰

Remote myofascial release (MFR) is a treatment approach, a therapy and a rehabilitation tool. It is a hands-on therapy, meaning that the therapist applies pressure with the hands onto and into the client’s body. The therapist addresses the tissue barrier of resistance by feeling for tightness, restrictions and adhesions in any plane that may be causing pain or dysfunction.¹¹

Mulligan’s bent leg raise (BLR) is a stretching technique which is a recent advancement in the

management of hamstring tightness. It is a painless and advantageous technique, which is indicated to hamstring tightness, with the patients who have a low back pain with limited or painful straight leg raise (SLR), leg pain above knee and it is extremely useful in the patients who have gross bilateral limitations of straight leg raise.¹²

Materials and Method

Study Design: An Experimental Study

Study Population: College going students with bilateral hamstring tightness

Study Setting: Pioneer Physiotherapy College, Vadodara

Sampling Design: Convenience sampling method

Sample size: 78 students

Inclusion criteria:

- Both male and female in age group of 18-25 years
- Students with bilateral hamstring tightness more than 20 degrees in passive knee extension angle test
- Willingness to participate in the study

Exclusion criteria:

- Any musculoskeletal and neurological disorders related to hip, knee, ankle, foot and spine less than 6 months
- Hypersensitive skin and any skin disease over treatment area
- Malignancy
- Joint hypermobility (Beighton score > 4)
- Students involved in regular flexibility or

yoga program

- Myofascial trigger point (MTrP) therapy / Myofascial release in the last 3 months

Materials Used:

- Treatment table
- Stabilizing belts
- 360 degree universal goniometer

- Measure tape
- Adhesive tape
- Sit and reach box
- Stopwatch
- Flexible ruler
- Graph paper
- Pen, pencil



Figure 1. Materials Used

Outcome Measures:

- 1) Knee Extension Angle (KEA):

Knee extension angle test (KEA) measurement is passively recorded by goniometer. KEA which is the degree of knee flexion from terminal knee extension.¹³

The hip and knee joints are kept at 90-90 position. From this angle of knee, the knee is passively extended as far as resistance is felt.¹⁴ Kuo et al. called this angle, the popliteal angle; the angle between two lines- one line along the shaft of femur and one line along the line of the tibia.¹⁵ The sum of the KEA and the PA

is 180.¹⁶ A KEA >20 indicated hamstring muscle tightness.¹⁷

2) Modified sit and reach test (SRT):

Baseline and post intervention flexibility is assessed by modified sit and reach test (SRT) by using sit-and-reach box for hamstring and lumbar spine and hamstring flexibility. It is selected for use in the current study due to the unique ability to incorporate lumbar spine and hamstring flexibility simultaneously whilst tensioning the SBL.¹⁸

The students were asked to sit on the floor with the head, back and hips against the wall and the soles of the feet against the sit-and-reach box. The students were then instructed to reach forward with the arms with both hands parallel and to hold the head and back against the wall. They were instructed to overlap the fingertips and keep in contact with the measuring portion or yardstick of the sit-and-reach box. A sliding measurement scale was then moved to the fingertips.

This finger to box distance was the new relative zero point. From this new position, the students were asked to slowly reach forward with both hands as far as possible, holding this position approximately 2 seconds.¹⁹

3) Lumbar lordosis index (LLI):

The lumbar lordosis index (LLI) measurement by

a flexible ruler is a noninvasive, quick, user-friendly and harmless method and it can also be used to measure curvature of any body part. For measurement of lumbar lordosis, the flexible ruler is placed on the lumbar spinous process of T12 as the beginning point and S2 as the ending point of the curvature, and then therapist carefully mould the flexible ruler to get the ruler in the shape of the student's lumbar spine. Then the ruler is placed and copied on the paper by pencil. And angle, theta (θ) is then determined by using the equation.^{20,21}

$$\theta = 4 \text{Arc tan } 2H/L$$

Where, Theta (θ) = magnitude of the lordotic curve

H = height L = length

Group A: Remote Myofascial Release (bilateral plantar fascia)

The students were asked to lie in a prone position with feet off the edge of the couch. The technique was applied in standing at the foot end of the couch with knuckles engaging the soft tissues at the calcaneal attachment of the plantar fascia, applying a deep pressure in the downward direction of the ball of the foot with pressure maintained throughout the end of the technique. This release sequence was carried out for 2 minutes and the same release sequence was repeated for the contralateral foot.²²



Figure 2. Remote Myofascial Release

Group B: Mulligan's Bent Leg Raise

The students were asked to lie in supine position at the edge of the couch with hip & knee in flexion (90 degree) and heel off the plinth, holding the plinth with contralateral hand and placing the hand of treatment side under his/her head and neck.

On the treatment side, grasping the lower extremity and student's flexed knee (popliteal fossa), the lower extremity was flexed at the hip undergoing treatment in the direction of the same sided shoulder, gradually

increasing the flexion range until the first resistance is felt or once the student started experiencing stretch pain, he/she was asked to push the therapist away with the same leg while the therapist was matching the student's force, resisting it (hold for five seconds). With the bent knee over the therapist's shoulder, traction component was included with this technique. At the end, therapist held the end range (possible range attained where student experienced no pain at all) for 20 seconds, and then the lower extremity was lowered down to the couch.^{23,24}

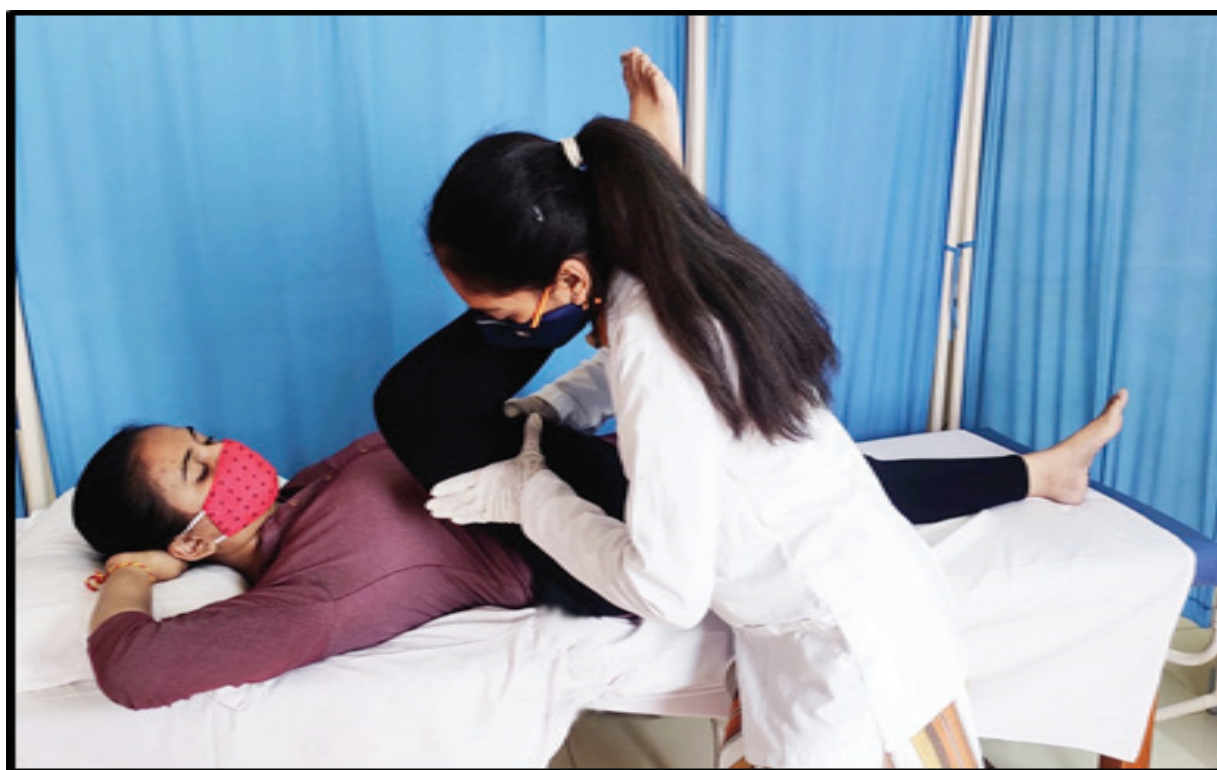


Figure 3. Mulligan's BLR

Results and Discussion

Data was analysed by SPSS software version 20.0 and Microsoft Excel 2010. Prior to the statistical test,

data was screened for normal distribution by Shapiro-Wilk test. According to normal distribution, tests were applied for within group and between group analysis.

Table 1. Results of Unpaired t- test For Remote MFR and Mulligan's BLR Analysis (Between Group A& B)

Outcome Measures	MFR Intervention Group A (Mean \pm SD)	BLR Intervention Group B (Mean \pm SD)	P value	Remarks
PKE(Rt)	5.97 \pm 2.45	10.38 \pm 5.62	<0.001	Significant
PKE(Lt)	6.74 \pm 3.338	9.26 \pm 4.98	0.011	Significant
SRT	3.18 \pm 1.23	5.74 \pm 2.02	<0.001	Significant
LLI	1.33 \pm 1.951	4.77 \pm 3.312	<0.001	Significant

Here the difference of pre test and post test was taken and between group comparison of KEA(Rt), KEA(Lt), SRT and LLI showed statistically significant difference i.e. short term effects of both the techniques are not equally effective as shown in the graph. Mulligan's bent leg raise is found to be more effective than Remote myofascial release.

In this study, short term effects of Remote myofascial release versus Mulligan's bent leg raise on hamstring and lumbar spine flexibility in college going students were examined. Hamstring and lumbar flexibility was assessed by Knee Extension Angle Test (KEA), Sit and Reach Test (SRT) and Lumbar Lordosis Index (LLI).

The first objective of the study was to find out the short term effects of remote myofascial release on hamstring and lumbar spine flexibility in college going students.

The second objective of the study was to find out the short term effects of mulligan's bent leg raise

on hamstring and lumbar spine flexibility in college going students.

The third objective of the study was to compare the short term effects of remote myofascial release versus mulligan's bent leg raise on hamstring and lumbar spine flexibility in college going students.

The results of this study showed statistically significant improvement in knee extension angle test, sit and reach test and lumbar lordosis index for hamstring and lumbar spine flexibility with the use of Remote myofascial release technique and Mulligan's bent leg raise technique (within groups comparison). However, in between groups comparison, Mulligan's bent leg raise technique was found to be more effective than Remote myofascial release technique.

Thus, both techniques (Remote myofascial release as well as Mulligan's bent leg raise) can be further implemented in clinical practice for improving the hamstring and lumbar spine flexibility according to the availability of the clinical set up and the trained

physiotherapists.

Conclusion

The results of this study support the alternative hypothesis and showed statistically significant improvement in knee extension angle test, sit and reach test and lumbar lordosis index for hamstring and lumbar spine flexibility with the use of Remote myofascial release technique and Mulligan's bent leg raise technique (within groups comparison). However, in the inter- group comparison, Mulligan's bent leg raise technique was found to be more effective than Remote myofascial release technique. All findings support the idea and concluded that Mulligan's bent leg raise was found to be more effective than Remote myofascial release.

Limitations

- This was a short term study of 6 days and no further follow up of students were carried out.
- No control group was used in the present study, and also variation of level of treatment area in both the groups might have affected the result showing bias towards the Mulligan's BLR group in reducing lumbar lordosis.
- The students in this study were recruited without the radiological diagnosis.
- No electrical modalities were used in the study for improving hamstring and lumbar flexibility.
- Gender distribution was unequal.

Ethical Clearance – Ethical clearance was obtained from The Institutional Review Board (PPC/OW/1676E/2020) from Pioneer Physiotherapy College, Vadodara.

Source of Funding – Self

Conflict of Interest – Nil

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Treatment Preferences of Physical Therapists in Management of Carpal Tunnel Syndrome: A Cross Sectional Survey

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Abstract

Background: Carpal tunnel syndrome affects one out of ten people throughout their lives, and repetitive work related conditions affecting wrist and hand are the most common cause of prolonged absenteeism from work and limited functional ability. Multiple physical therapy interventions have been used by physical therapists for reducing pain severity, increasing range of motion and decreasing functional limitations in carpal tunnel syndrome.

Methods: A cross-sectional survey was conducted among 196 physical therapists in Karachi, Pakistan. Demographic data of physical therapists was obtained, as well as information regarding carpal tunnel syndrome and its intervention techniques used.

Conclusion: There existed variability among the treatment preferences of physical therapists regarding the management of carpal tunnel syndrome. A majority of respondents (72.4%) used nerve mobilization techniques, and therapeutic ultrasound was given by 66.3%. The least common intervention used was myofascial release (28.1%). Different approaches had been given in combination as well, which showed that physical therapists are also aware about the recent approaches and their effects for the management of CTS.

Keywords: Carpal Tunnel Syndrome, Physical Therapist; Splint, Therapeutic Ultrasound

Introduction

Carpal tunnel syndrome (CTS), a disorder in which there is entrapment of median nerve, is estimated to influence one out of ten people¹. Most medical conditions affecting office workers are related to ergonomic etiologies that affect muscles, tendons and nerves, and are termed as musculoskeletal disorders². In a survey of occupation related complains, illnesses related to repetitive work were 65%; and repetitive work related musculoskeletal conditions affecting wrist and hand were found to be the most common

cause of prolonged leave from work³.

Females are affected more commonly than males, particularly those consuming contraception pills, experiencing menopause, or undergoing estrogen therapy⁴. A retrospective cohort study conducted in Denmark among workers in slaughter houses, and on technicians who were exposed to high forces; concluded that carpal tunnel syndrome risks have increased due to repeated forces on both the hands after several years in the occupation⁴.

As CTS is highly prevalent among all compression neuropathies⁵, treatment guidelines suggest that management should be based on the duration and severity of the CTS⁶. Patients who do not experience severe symptoms and only mild to moderate functional limitations are managed through physical therapy treatment that includes cryotherapy, nerve mobilization, therapeutic ultrasound, bracing, education and home exercise plans^{4,6,7}. Conservative treatment was recommended initially by the American Academy of Neurology. This comprises of bracing over wrist, and adjustment of daily activities⁸. Some hand exercises, therapeutic ultrasound and yoga have profound benefits supported by evidence, but they are not being administered widely⁹.

Several studies have compared different treatment techniques for resolving CTS. A randomized trial found ultrasound-guided pulsed radiofrequency effective for resolving symptoms of median nerve entrapment¹⁰. A study conducted in Pakistan concluded that nerve mobilization treatment yields superior results in reducing pain severity as compared to therapeutic ultrasound¹¹.

Literature on the use of ultrasound as a treatment modality in CTS presents a conflicting view. Few articles advocate the use of ultrasound as an effective treatment modality⁷. The main objective of management is to reduce pressure, swelling and obstruction of blood flow in the carpal tunnel. A systematic review performed by the American Academy of Surgeons stated that in order to increase the quality of medical treatments, interventions should be based upon the recovery and improvement from the disease at moderate and suitable cost. Additionally, approaches directed towards patients' interests, demands and preferences are important and essential in the management of patients' condition¹⁵.

The purpose of this study was to identify the most used approaches for the treatment of median nerve compression. This research not only highlighted the frequency of particular treatment but also focused on the physical therapist's opinions and relationships of their expertise, experience and gender with the use of specific modality and technique. This study also emphasized on physical therapists' awareness about current home management programs and patient-centered approaches that are vital in order to reduce the increasing severity of CTS.

Materials and Methods

Approval for this study was given by Institute of Physical Medicine & Rehabilitation, Dow University of Health Sciences. A cross sectional survey was conducted among physical therapists working in public/private sector hospitals and clinical settings in Karachi, Pakistan. At least one year of clinical experience was required in order to be included in the study. Exclusion criteria included therapists working in academic settings, and never having treated a patient of CTS. A sample size of 196 was calculated using OpenEpi version 3, with hypothesized frequency of 85% (for the intervention, physical therapists implement home exercise) and design effect of 1% at 95% confidence interval¹⁹. A self-designed questionnaire was used to collect data. Participants were explained the aim of the study, after which an informed consent form was obtained. The questionnaire was self-designed mixed structured, which consisted open and close-ended questions and was divided into two parts; first that required the demographic details of the physical therapists and second part was comprised of sixteen subjective questions. Data was entered and analyzed using SPSS v21 and descriptive variables were reported using frequencies and percentages. For association, Pearson's chi-squared test was applied, and p- value

less than 0.05 was considered significant.

Results and Discussion

A majority of participants (57.7%) were practicing in private sector, and average age of physical therapists was 30.02 ± 6.90 years, with average clinical experience 6.77 ± 5.32 years. Gender was distributed almost equally (47.4% males and 52.6% females). Regarding different therapeutic interventions given by physical therapists for CTS, nerve mobilization technique was used by 72.4% (n=142), therapeutic ultrasound was given by 66.3% (n=130), and myofascial release was given by only 28.1% (n=55) of respondents. Qualifications of the physical therapists are highlighted in Figure 1.

Our research found that qualification is statically significant with splinting as a treatment regimen ($p=0.021$), as well as an association between specialty of physical therapists and the treatment intervention preferred for the management of CTS ($p=0.03$), as well as myofascial release ($p=0.015$). Nerve mobilization did not have a significant relationship with clinical settings of physical therapists ($p=0.60$). Similarly, no association was found between clinical experiences of physical therapists with management technique of CTS (nerve mobilization $p=0.270$, therapeutic ultrasound $p=0.968$, and cryotherapy and ergonomic modification were $p=0.539$ and $p=0.271$ respectively).

The purpose of this study was to find the treatment preferences for the management of CTS among physical therapists of Karachi, Pakistan. The results of this study highlighted that nerve mobilization was the only treatment which was given by a majority of physical therapists, with therapeutic ultrasound the next most preferred intervention. Splinting and cryotherapy were utilized to some extent, but ergonomic modification and myofascial release were

least likely to be used. As compared to neurological and orthopedic, physiotherapists were significant in number who had specialty in MSK and most of them did not have any specific training for the management of CTS. In addition to the treatment strategies, this study had also highlighted the opinion of physiotherapists regarding the gender and age group who was more affected by this complication. Scott Blumenthal et al proved that older adults having CTS showed more severe median nerve compression as compared to younger adults confirmed by diagnostic testing, concerning muscle wasting and weakness but there was no significant difference related to physical symptoms¹⁷. In our current practice survey, we discovered that responders have treated the majority of patients from the age group of 30-39 years and least were reported from 50-59 years.

Vikranth G. R. et al compared the effect of carpal bone mobilization versus neural mobilization in improving pain, functional status and symptoms severity in patients with CTS and according to the author, both treatments are effective in improving pain and decreasing functional limitation, and there is no noticeable difference among the intervention regimen¹⁸. In our survey, nerve mobilization was applied by more than half of responders and none of them reported carpal bone mobilization. Similarly, Cantero-Tellez R, et al reported that majority of therapists advised home exercise program in CTS¹⁸ but our study identified avoidance of prolonged and repetitive movements as the major method of home management program.

Dincer et al evaluated and confirmed the efficacy of ultrasound, splinting and low-level laser therapies for the management of carpal tunnel syndrome, and reported that low-level laser therapy with splinting was more efficient than therapeutic ultrasound, for the alleviation of symptoms and pain associated with

CTS²⁰. However, in our survey responders preferred therapeutic ultrasound over splinting. No participant

reported low-level laser therapy as their choice of treatment technique.

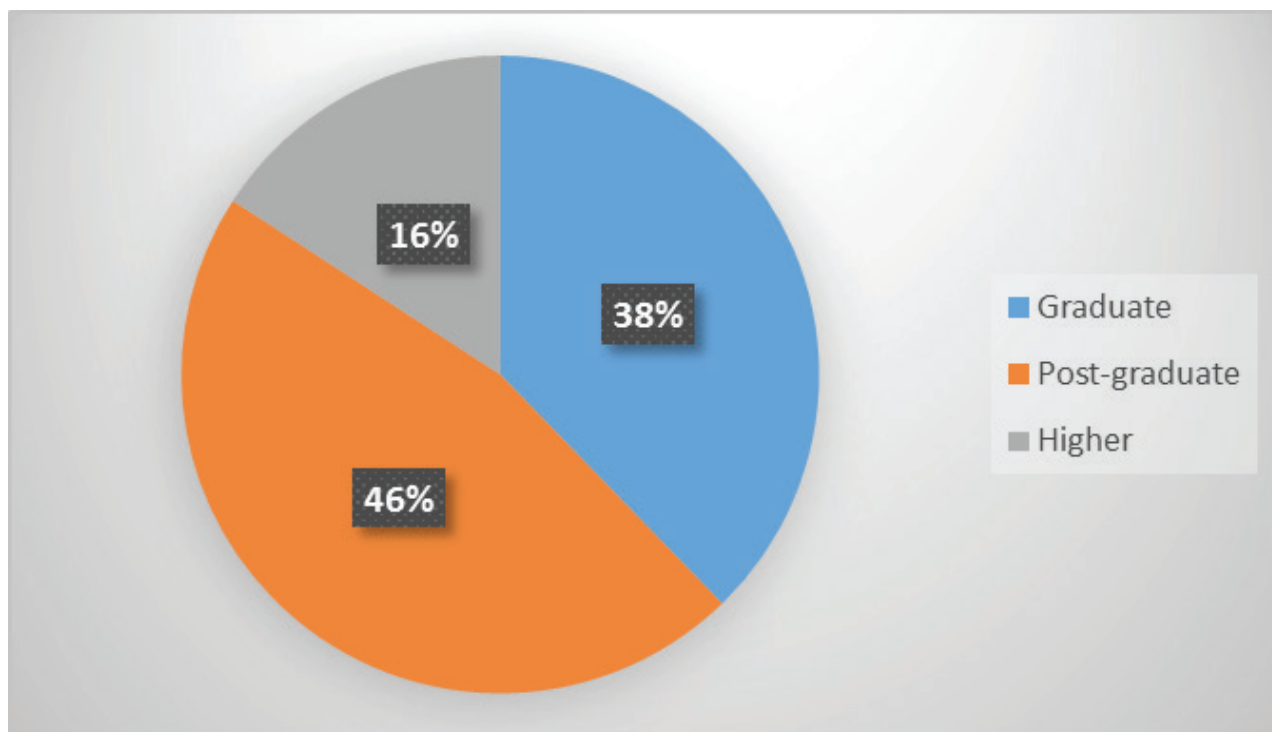


Figure 1: qualifications of physical therapists

Conclusion

Physical therapists in Karachi have a preference for nerve mobilization and therapeutic ultrasound for the management of CTS. There is an association between the qualification (postgraduates) of physical therapists, and splinting. It was also found that there is some relationship between specialty of physical therapists i.e. musculoskeletal with splinting and musculoskeletal with myofascial release. This study had also revealed that age, gender, clinical setting, and clinical experience do not have any significant effect on preference of treatment for CTS.

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Efficacy of Tibialis Posterior Strengthening Exercise with Obesity Reduction Program in Flexible Flatfoot among Obese School Children

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Abstract

Background: Flat foot (Pes Planus), is characterized by a reduced or absent medial longitudinal arch. Flat foot can be caused by many factors, including obesity, wearing shoes, weakness of muscles. Flat foot in obese children is mainly caused by the presence of a plantar fatty pad under the medial longitudinal arch of the foot.

Objective: To compare the Efficacy of Tibialis Posterior Strengthening Exercise with Obesity reduction program In Flexible Flatfoot among Obese School Children.

Methodology: A Randomized control trial (RCT) was conducted on 50 obese subjects with flexible flat foot. Experimental group received both the intervention, and control group received only obesity reduction programme. The tibialis posterior strengthening exercise is performed for 30 minutes per day for 5 days a week for a period of 6 weeks. Obesity reduction programme performed for 30 minutes for 5 days a week for a period of 6 weeks.

Result: There was a significant difference was noted within the Group- A and Group B. Hence, TPSE with ORP was found to be more effective compared to ORP to improve foot arch and physical activity level among obese school children with flexible flat foot.

Conclusion: Tibialis posterior strengthening exercise with obesity reduction program was found superior to only obesity reduction program in improving foot arch height and physical activity level among obese school children with flexible flat foot.

Key words: Flexible flat foot, obesity, medial longitudinal arch, foot posture index-6, children physical activity questioner.

Introduction

Flat foot (Pes Planus), is characterized by a reduced or absent medial longitudinal arch. In this condition the entire foot sole comes in complete or near – complete contact with the floor or ground surface during all weight-bearing activities.¹ Normally foot arch formation begins with a range of 2 to 5 years and is commonly addressed in the children.^{2,3}

There are two types of Flat foot. One is flexible flatfoot and other is stiff flatfoot. During non-weight bearing medial arch will be present in the flexible flat foot, but the medial arch disappears when standing. The medial longitudinal arch is absent during weight bearing and non-weight bearing in stiff Flatfoot.⁴ The Medial Longitudinal Arch is supported by both Dynamic and Static Stabilizer ^{1,4}. The arch of the foot is maintained by shape of the bones, ligaments,

muscles, tendons that play a major role in supporting arch.

There are many kinetic and kinematic changes in flat foot compared to normal foot. Among these pathomechanic alterations, forefoot adduction, major forefoot plantarflexion, hind foot eversion, peak forefoot plantarflexion, tibial internal rotation, major rear foot eversion excursion, major rear foot eversion velocity, sub-talar joint eversion and less abduction of the forefoot during toe-off phase are prominent.^{6,8}

Tibialis posterior tendon: the key dynamic support of the medial longitudinal arch of the foot. Dysfunctional tibialis posterior contributes in the development of an acquired flatfoot. Tibialis posterior tendon courses just posterior to the medial malleolus inserting into the navicular tuberosity (on the medial aspect of the foot). The tibialis posterior tendon is the primary dynamic stabiliser of the medial longitudinal arch, and its contraction results in inversion and plantar flexion of the foot and serves to elevate the medial longitudinal arch.⁽⁸⁾

According to exercise prescription program recommended by American college of sports medicine (ACSM) for children and adolescents the physical activity intervention focused on at least 60-minute moderate/vigorous physical activity per week. The intervention program included physical activity components; physical exercise improvement, extracurricular physical activity for obese/overweight students. Aerobic exercise (FITT) - frequency-5 days per week, intensity- moderate, time = 30-minute, type = walking and cycling.¹²

The weight gain affects foot structure and function, this can be explained by the changed foot structure and decreased foot and ankle muscle strength in obese individuals. For obese individuals, weight reduction or increasing weight physical activity

could be an effective approach, not only to decrease the risk of health-related diseases, but also to affect positively the foot structure and function. Therefore, the aims of our study were to determine the efficacy of tibialis posterior strengthening exercise with obesity reduction program in flexible flatfoot among obese school children.

Method

Research design

Randomized controlled trial, with two parallel group of allocation ratio 1:1.

Participants

Inclusion Criteria: Age between 7 to 14 years of age. Both male and female subjects with flexible flat foot, BMI between 25 to 30 and Grade 2 and 3 in foot structure assessment.

Exclusion Criteria: Presence of foot pain at the time of examination. History of lower limb injury (i.e., musculoskeletal injuries during the previous 6 month). Congenital foot or leg abnormalities. Unequal lower limb and Rigid pes planus.

Sampling: Simple random sampling method

Blinding: Assessment regarding outcome measure was conducted by assessor blind to exercise allocation.

Study duration: 6 weeks

Study setting: Higher secondary schools.

Sample size: 50

Experimental procedure:

Ethical clearance was obtained from the concerned ethical committee. Informed consent was taken from 50 participants who fulfilled the inclusion criteria. Baseline assessment was done at the commencement

of the protocol. Criteria. Baseline assessment was done at the commencement of the protocol. Then the participants were allocated to one of the two groups according to the inclusion criteria.

All subjects had undergone two measurements: one on entry to the study (pre-test) and one after the 6 weeks of intervention period (post-test).

Procedure

The experimental group (Group A) has participated in the tibialis posterior strengthening exercise program five days in a week for 6 weeks, each session for 30 minutes and then obesity reduction program which includes 30 minutes moderate intensity aerobic training exercise explained to the subjects & home-based program sheet/booklet given to them.

The control group (Group B) has received only obesity reduction program which includes 30 minutes moderate intensity aerobic training exercise program five days in a week for 6 weeks and provided with home-based program sheet/booklet.

Exercise protocol:

Tibialis posterior strengthening exercise

Tibialis posterior strengthening exercise Subjects performed all the exercises in barefoot and each exercise have concentric and eccentric phase.

1) Closed chain resisted foot adduction

- Subjects should be seated with their knees maintained at a forearm's apart and flexed approximately 80 degrees with feet on the ground.

- The subject was asked to stabilize their leg by placing the contralateral forearm between the knees and reinforcing it with the ipsilateral hand.

- An elastic band of silver colour is looped

around the distal and medial foot being evaluated.

- The elastic band is stretched laterally to full tension, while maintaining a 45-degree angle of inclination with the floor.

- The therapist has to hold the elastic band and maintain the same tension

- From the abducted position, the subject has to slide their forefoot into adduction and then slowly returned to the starting position.

2) Unilateral heel raise (heel raise)

- Starting position of patient: standing with single leg and knee extension

- To procedure; slowly raise their toes and after 30 second return back to normal position.

3) Open chain resisted (foot supination)

- Starting position: sitting – knee extension and foot placed over the stool

- Subject has to place a sliver colour elastic band around the foot at the level of the metatarsal heads and slowly pulled over the band in their opposite shoulder.

- The other leg is used for balance opposite leg and remained on the floor.

- The subjects to performed foot plantar flexion and inversion against the resistance band and after which they slowly returned to the starting position.

- Treatment plan: 30 minutes per time, 5 times per week for 6 weeks.

Obesity reduction Program

- The ORP which includes 30 minutes moderate intensity aerobic exercise program five days in a week for 6 weeks and provided with home-based program pamphlet

· Pamphlet as follows:

A. School- based interventions

1) High importance on physical activity

• Daily 60 minutes of physical activity important in children health.

• This type of exercise should be followed; vigorous intensity exercise-daily/weekly 3 times, moderate intensity exercise-daily and activities of bone and muscle strengthening exercise-daily/weekly 3 times.

2) Making healthy choice available and banning un- healthy food

· Avoid junk food and un -healthy food

· Reduce sedentary time

· Encourage physical activity

3) Education about nutrition

· Encourage healthy eating habits

· Add plenty of vegetables, fruits, and low-fat or non-fat milk and whole-grain products.

· Encourage family members to drink lots of water

· Consumption of sugar and saturated fat should be restricted.

B. Home- advice for obesity reduction program

· Limits on television time

· Improve habits of frequent physical activity

· TV/computer time should be restricted to maximum 2hours per day.

Statistical Analysis

Baseline demographic and clinical characteristics were analysed using median and interquartile range. In this study the Wilcoxon signed rank test, Mann Whitney U test were used as a statistically tool for detecting the significant difference within and between the group A (TPSE with ORP) and group B (ORP). Descriptive statistics (mean and standard deviation) were also calculated for all the measurements consideration for the study.

Table: 1 Baseline characteristics of participants: (Mean ± Standard deviation (M ± SD))

Characteristic	Group A (TPSE+ORP) *	Group B (ORP)*
Male	7	6
Female	5	6
Age	11.52±0.89	11.64±1.38
BMI* ((M ± SD	27.6±1.9	28±1
Navicular drop (M ± SD)	1.5±0.75	1.1±0.9
Foot Posture Index (M ± SD)	8±0.5	7±1.5
CPA-Questionnaire*(M ± SD)	2.4±0.35	2.5±0.4

*Abbreviation used: TPSE+ORP-tibialis posterior strengthening exercise and obesity reduction programme, ORP-obesity reduction programme, BMI-body mass index, CPA-Q- children physical activity questionnaire.

Table: 2 Comparative effectiveness of Group A (TPSE+ORP) versus Group B (ORP) on Flexible Flat Foot using Foot Posture Index-6 score.

Outcome measure (FPI-6)	Pre-test (mean± SD)	Post-test (mean ± SD)	Difference (mean± SD)	P value
Group A (TPSE + ORP)	7.88±0.58	6.12±0.71	1.76±0.58	.00001
Group B (ORP)	7.4±1.01	6.48±1.44	0.72±0.44	

The above table 2 shows that pre -test and post -test difference value of foot posture index-6 scale from baseline to post test for both the Group A (TPSE+ORP) and Group B (ORP). Mann Whitney U test was done to calculate the statistical significance and found to be .00001 which is significant $P < .05$.

Table:3 Comparative effectiveness of Group A (TPSE+ORP) versus Group B (ORP) on physical activity using children physical activity questioner.

Outcome measure CPA-Q	pre test (mean ± SD)	post test (mean ± SD)	Difference (mean± SD)	P value
Group A (TPSE+ORP)	2.48±0.2	3.44±0.26	0.99±0.262	.0278
Group B (ORP)	2.6±0.37	3.36±0.34	0.77±0.23	

The above table 3 shows that pre -test and post -test difference value of CPA-Q score from baseline to post test for both the Group A (TPSE+ORP) and Group B (ORP). Mann Whitney U test was done to calculate the statistical significance and found to be .0278, which is significant $P < .05$.

Table 4: FPI-6 and CPA-Q scores at pre and post -test changes within Group A (TPSE+ORP)

S.NO	Variables	Pre-test	Post-test	Difference	p-value
1	FPI-6	7.88± 0.58	6.12±0.71	1.76±0.58	.00001
2	CPA-Q	2.48±0.2	3.44± 0.26	0.95±0.26	.00001

The above table 4 shows that pre -test and post -test difference value of Group A (TPSE+ORP) Wilcoxon signed- rank test was done to calculate the statistical significance and found to be FPI-6 and CPA-Q score as p- value is .00001, which is significant $p < .05$.

Results

50 subjects were included in this study. The result suggests that there is difference in FPI-6 when compared between the Groups, and it is also found to be statistically significant $p = .00001$ ($P < .05$) and when compared between pre -test and post-test difference in Group A (TPSE+ORP) and Group B (ORP) for CPA-Q score was 0.99 and 0.77 respectively, at the duration of 6 weeks. The result suggests that there is difference in CPA-Q when compared between the Group, and it is also found to be statistically significant $p = .0278$ ($P < .05$) Hence, it proved that both the intervention was effective to improve arch height and physical activity level among obese school children with flexible flat foot. But, TPSE with ORP was found to be more superior in comparison.

Discussion

In this present study, main objective of the study was to find out the efficacy of tibialis posterior strengthening exercise with obesity reduction program in flexible flatfoot among obese school children. The study was interpreted based on the outcome measure used in this study. According to the result, when compared between the Group A (TPSE+ORP) and Group B (ORP) there was significant improvement in foot arch and physical activity level among Group A. But when compared within the Group A and Group B there was statistically significant difference in both the group.

Changes in foot arch height between the tibialis posterior strengthening exercise versus obesity reduction program

The result of the present study showed improvement in FPI-6 score between and within the Group A (TPSE+ORP) and Group B (ORP) at the duration of 6 weeks. When compared between pre -test and post-test difference in Group A (TPSE+ORP) and Group B (ORP) for FPI-6 score, both the groups showed statistically significant difference. The mean difference between both the groups shows that Group A (TPSE with ORP) difference in pre and post-test value is higher when compared with Group B (ORP).

The tibialis posterior tendon is the primary dynamic stabilizer of the medial longitudinal arch, and its contraction results in inversion and plantar flexion of the foot and serves to elevate the medial longitudinal arch, which locks the mid-tarsal bones, making the hind foot and midfoot rigid.

Thus, strengthening tibialis posterior muscle during sensory receptor activities and neuromuscular functions improves dynamic balance due to dynamic support of the foot medial area and static support of the intrinsic foot muscle³.

In this current study there is improvement in medial longitudinal arch, muscular strength and function of the lower extremity. The intervention group required subjects were asked to do adduction, abduction of the foot and after that the subjects were asked to raise their heel and maintain in that position for 30 seconds, which may have contributed in improving the muscle strength of ankle plantar flexors.

Changes in physical activity level between the tibialis posterior strengthening exercise along with obesity reduction program versus obesity reduction program

The result of the present study showed improvement in CPA-Q between and within the Group A (TPSE+ORP) and Group B (ORP) at the duration of 6 weeks. When compared between pre -test and post-

test difference in Group A (TPSE+ORP) and Group B (ORP) for CPA-Q score was found to be statistically significant.

Price and Nester et al reported that obesity had an influence on foot morphology.¹¹ **Cimolin et al** reported that foot types were markedly different between obese and nonobese adolescents.¹² **Shultz et al**, investigating foot structure and functional characteristics in obese and nonobese individuals, reported finding a more flexible foot in obese individuals. Thus, it has been suggested that body weight plays an important role in foot flexibility and relationship has been found between the presence of a lower arch and increased body weight (**Butterworth Pa et al**)¹³. In this current study there is improvement in foot muscle strength and mild improvement in arch height and also found relationship between increasing body weight may influence negativity arch height. The previous study co-relates current study. Both weight reduction and increasing physical activity have been reported to be effective at improving foot structure and function. (**song .j.kane et al**)¹⁴

Conclusion

The study concludes that, the tibialis posterior strengthening exercise along with obesity reduction programme was found to be more superior in comparison to obesity reduction programme alone in improving foot arch and physical activity level among obese school children with flexible flat foot.

Limitations

It was school based intervention programme; certain difficulties were encountered like implementing exercise programme in school busy schedule during the pandemic year was restrictive. Due to the difficulties and the limited duration of the study the long-term follow up was not done.

Conflict of Interest: Nil

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To Study the Conflict between three Generations of Men and Women

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Abstract

Background: Relevant literature had found that older people are consistently more opposed than younger people to change and to nonconformity, unless their own economic well-being is involved. However, differences in values between generations, looked at globally, and may be considerably greater than when differences between parent and child in the same family are examined. Student share many values with their parents, but differ considerably from the moral values of their parents' generation. Thus, a generation gap or at least a substantial generational difference can exist without assuming discontinuity of values between parents and their children.

Thus, the purpose of the present study was to measure perception about the causes and probable solutions to generation gap.

Methods: The sample consisted of 15 girls, aged 10 to 20 years, their mothers, and their maternal grandmothers (nani). 15 boys aged 10 to 20 years, their fathers and paternal grandfathers (dada). Questionnaire on Generation Gap was used to measure the generation gap among the sample.

Conclusion: The results of the study indicated that 47% of women sample (girls, mothers, and grandmothers) and 42% of male sample (boys, fathers, grandfathers) showed the generational conflict. Thus the problem of generation gap exists and can be solved in a wide variety of ways. Occupational therapists role is to resolve conflicts, improve relationships and Building peace in relationships.

Keywords: Conflict, Generation Gap, Generations, Occupational Therapy.

Introduction

Throughout history when aberrant social phenomena are observed, a variety of explanations

are proposed. For example, in the 1960s, social, behavioral, and political generational differences were used to explain the presumed incongruence in values and attitudes between parents and their adolescent children. This "generation gap" was heavily researched in the 1960s and 1970s¹. Generation differences were observable in societal movements or changes².

The post-World War II "Baby Boom" resulted in large numbers of adolescents and young adults in the 1960s and 1970s³. Youth in the 1950s generally conformed to social expectations. Few differences

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in expectations between parents and children were readily evident during this time period. Early in the 1960s parent and adolescent beliefs were relatively similar concerning social behavior and expectations.

These shared views did not last and a gap developed between the older and younger generation as time progressed into the 1970s. Coincidentally, society made dramatic shifts during the 1960s. During this decade segregation was abolished and the feminist movement produced more equal rights for women. Social awareness led to changes in political ideology. More liberal political views led to legislation concerning health, safety, and environmentalism³. Televisions became more accessible and youth culture thrived with rock and roll music and drive in movies.

The generation gap was manifest in the movement away from rigid societal rules⁴. Youth during the 1960s and 1970s participated in movements for free speech on college campuses and were active in war protests.

These emerging youth phenomena during the 1960s and 1970s were explained academically by the concept of the “generation gap.” However, research seeking to increase our understanding of these generational differences waned following the 1970s because many research studies indicated that the gap was small or insignificant⁴. For example, Jacobsen and colleagues’ (1975) results indicated much more agreement between parents and adolescents than expected in their generation gap research. They concluded that the generation gap may not be a universal phenomenon. However, Acock and Bengston (1980) proposed that the wrong questions were being asked about the generation gap, “Rather than ask, ‘To what extent is the generation gap real?’ we ask, ‘Where is the reality of the generation gap?’⁵.

Age & differences of age are among the most basic and crucial aspects of human life and human destiny. The differences of age termed as generation plays a crucial role in human life as it leads to generation gap or *generational gap* which is a difference of opinions between one generation and another regarding beliefs, politics, or values. This was noticed way back in the 1960s leading to the beginning of its study in the form of a sociological theory of generation gap⁶.

According to sociological theory, each generation faces different historical events, culture, economic challenges and exposure, which shape their perception and mind set. Therefore when two different generations interact there is bound to be arguments and difference of opinion termed as generation gap⁷.

Thus whenever there is a contrast in the exposure and experiences of generations more so in the 21st century where because of the technological revolution the younger generation is exposed to a globalized world they are prone to challenging their own traditional lifestyle, culture, value systems etc which is not appreciated by the older generation further aggravating the conflict within generations. Further these conflicts are the consequence of urbanization, industrialization and family mobility which is more prevalent in the current century³.

Another explanation is the one given by Erickson who stated that the older generation is in the generativity stage where they want to propagate their value system to the newer generation who are seeking independence and autonomy leading to a clash⁸. To aggravate the situation when any of these age groups is engaged in its primary activity, the individual members are physically isolated from people of other generations, with little interaction across age barriers except at the nuclear family level. This physical separation of the young and old has resulted in a lack of consistent intergenerational contact and growth

of misperceptions and misunderstandings between the young and old⁹ which is further accentuated by technological development specially the Internet age.

Thus the rapidly changing world, technological and scientific discoveries impact the lifestyle and thought processes of different generations thereby increasing the chasm between generations never seen in the past. Thus the problem of generation gap is here to stay leading to severe consequences therefore probable solutions need to be ascertained.

The area of generation gap has received wide spread curiosity leading to a lot of research in this area bringing out its possible causes and solutions. A study conducted on a sample consisting of both adolescents and elder generation found the existence of generation gap with the main reasons being lack of understanding and communication between them. In today's world technology hampers the interactions between generations¹⁰. In a research conducted on 1000 people belonging to four different generations it was found that each generation differed on the quality and quantity of technology use which effected their experiences and expectations leading to generation gap¹¹. This view was endorsed by an American study which found 79% of the sample agreed to the existence of generation gap and the main difference was with regards to use of technology, value system and type of music¹². Another study identified several areas where there was a difference of opinion among generations namely opinion on global warming, offshore drilling, nuclear power, childhood vaccines, untested medicine use laboratory test on animals and evolution¹³. Thus there seems to be enough evidence for the existence of generation gap, which needs to be resolved.

When this question was pursued through research, perceptions of parental attitudes (not actual parent attitudes) were surprisingly strong predictors of late-adolescents' self reported attitudes. Acock and

Bengston (1980) concluded that the generation gap is real when perceived differences exist.

The relationship quality of individuation is negotiated by parents and adolescents even into young adulthood. This framework fits nicely with the extension of adolescent perspective¹⁴. Many of the developmental tasks that were thought to be accomplished in the teenage years are not being accomplished until late adolescence (18-25 years old)¹⁵.

More people between the ages of 18-25 are living at home or moving home after moving out, remaining financially dependent on parents, and marrying at older ages than in earlier decades¹⁶. It is also true that more people in this age group are enrolling in higher education. The percentage of high school graduates who immediately enroll in two- or four-year educational institutions has increased between the years 1975 (51%) and 2009 (70%). However, today's parents are taking a more active role in their children's education than previous generations^{17,18}. Parents are involved in their children's decision process in choosing an institution, paying for tuition, providing a support system, and parents continue to be an active influence in their child's decision-making while attending school¹⁸. It appears that late adolescents are becoming independent in some areas of their lives, but are continuing to rely on their parents for a variety of resources¹⁶.

Aims and Objectives

The aim of the present study is to find the conflict between three Generations of men and women.

The objective are:-

Ø To determine the existence of generation gap between three Generations of adolescent girls & boys and their parents and grandparents.

Ø To measure perception about the causes and probable solutions to generation gap.

Methodology

• **STUDY DESIGN** – Survey

• **SAMPLE SIZE** – The sample consisted of 15 girls, aged 10 to 20 years, their mothers, and their maternal grandmothers (nani). 15 boys aged 10 to 20 years, their fathers and paternal grandfathers (dada).

• **SOURCE OF STUDY** –Community

• **POPULATION** – Indian Population

• **SAMPLING METHOD** –Convenience

• **INCLUSION CRITERIA** – Adolescent girls having their mothers and their maternal grandmothers (nani) alive will only be a part of the study. Similarly, boys having their fathers and paternal grandfathers (dada) alive will only be a part of the study.

• **EXCLUSION CRITERIA** –

4. Adolescent diagnosed with any psychiatric condition.

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

• **WITHDRAWAL CRITERIA** –

1. Adolescents and /or their parents or grandparents not willing to participate.

OUTCOME MEASURES

Ø Questionnaire on Generation Gap.

The questionnaire is related to the study of the conflict between generations.

It consists of 19 Questions in total. Q1 to Q14 were Questions related to Conflict among Generations and Generation Gap. Q15 to Q19 were Questions related

to social and demographic data. The respondents were asked to give an answer to each question by circling the number that fits their choice. When multiple answers are allowed, please make it clear to them. When three answers were required, respondents were asked to choose three such possibilities. Researcher was asked to make oneself clear enough to the respondents when they are required to give Yes/No answers and ask them to expand in case of a Yes answer.

• **ENVIRONMENT** –A disturbance free environment for the participants while filling the questionnaire.

• **PARTICIPANTS** –

The study was carried out in the South District Community of Delhi. The objectives of study were explained to all the girls and boys and their mothers, fathers, grandmothers and grandfathers. All of them were requested to participate. A brief introduction about the objectives of the study was given to all the participants. Confidentiality was assured. A total of 15 girls and 15 boys participated in the study.

The participants in this study were a sample of convenience, predominantly recruited through personal and professional networks. The sample included a total of 90 participants which included 30 adolescents (15 girls along with their mothers and grandmothers, 15 boys along with their fathers and grandfathers). All the participants were of Indian origin. The participants were selected on the basis of an inclusion criterion.

Prior to data collection, the purpose of the study was described, and consent was obtained. Participants were assured of anonymity and confidentiality.

• **PROCEDURE**–

The study was presented to the participants as an investigation of conflicts and generation gap among

the three generation population. Consent forms were distributed. Questionnaire was distributed. All respondents completed the questionnaire on an anonymous and voluntary basis. All questionnaires took approximately 10 minutes to complete.

Questionnaire was administered by the researcher. Researcher selected respondents by means of personal contacts, but were instructed to exclude members of their own families. All respondents were given written and verbal instructions and were asked to answer all items as they felt, without regard to what they believed a socially approved response would be. Respondents remained anonymous, except to the person administering the questionnaire; each person completed her/his questionnaire before having the

opportunity to discuss the nature of the survey or any specific items with other family members.

Data Analysis

1. Complete data was gathered in the form of a master chart on Microsoft Excel 2010.
2. Descriptive analysis included percentages, Graphs and Pie Charts.

Percentage Analysis

A total of 15 girls along with their mother and maternal grandmother (nani) and 15 boys along with their father and paternal grandfather (dada) participated in the study.

1. PARTICIPANT CHARACTERISTICS

Table 1: Table showing participants Characteristics

Demographics	Age (in yrs)	Frequency	Percentage%
Boys(15) & Girls(15)	10-15 yrs	13	43%
	16-20 yrs	17	57%
Mothers	33-40 yrs	06	40%
	41-46 yrs	09	60%
Fathers	36-40 yrs	05	33%
	41-50 yrs	06	40%
	51-55 yrs	04	27%
Maternal Grandmother	60-65 yrs	07	47%
	66-70 yrs	08	53%
Parental Grandfather	60-65 yrs	09	60%
	66-70 yrs	06	40%

2. RESIDENTIAL BACKGROUND

Out of 30 families in total, 87% of the families were living in urban areas and only 13% were living in rural areas.

3. EDUCATIONAL STATUS/ OCCUPATION

Most of the mothers were employed (N = 10) 66% and have done the university education. The educational status of most of the maternal grandmother were till secondary school (N =11) and most of them were unemployed.

All the fathers of teenagers were employed and most of them had pursued university education (N =12). Most of the grandfathers were retired and pursued university education (N =9).

4. CONFLICTS BETWEEN GENERATIONS

Our result indicated that 47% of women sample (girls, mothers, and grandmothers) and 42% of male sample (boys, fathers, grandfathers) showed the generational conflict.

5. REASONS FOR GENERAL DISPUTES

Table 2: Table showing Reasons for general disputes in Men and Women sample

	Boys	Fathers	Grand Fathers
Lack of respect	05(33%)	05(33%)	06(41%)
Intolerance	04(27%)	03(20%)	05(33%)
Abuse	03(20%)	02(34%)	02(13%)
Different perspective	03(20%)	05(33%)	02(13%)

	Girls	Mothers	Grand Mothers
Lack of respect	03(20%)	06(40%)	07(47%)
Intolerance	05(33%)	02(13%)	04(27%)
Abuse	02(13%)	03(20%)	03(20%)
Different perspective	05(33%)	04(27%)	01(6%)

For most of the girl’s intolerance (33%) and for most of the mothers (40%) and grandmothers (47%) lack of respect was the main reason for conflict. Among men sample lack of respect (41%) and intolerance (33%) was the main reason for disputes.

6. REASONS FOR CONFLICTS

Among the men and women samples values (47%) and rejecting the old ways of life (60%) found to be the major reason for conflicts.

7. GENERATION GAP IS MOSTLY FOUND BETWEEN

Table 3: Table showing presence of generation gap in Women and Men sample

	Women	Men
Teenagers and their parents	23%	28%
Teenagers and grandparents	47%	31%
Parents and Grandparents	30%	41%

8. AREAS WHERE GENERATION GAP IS EXPERIENCED

For women samples generation gap is mostly experienced during cultural events, life style, fashion and personal values. For men samples mostly generation gap was found at work place, life style pattern and economic.

9. HOW GENERATION GAP CAN BE LOWERED/ LESSEND/ DIMINISHED

For girls (80%) generation gap can be lowered

by discussing problems in schools and for mothers (47%) and grandmothers (47%) it can be resolved by Meeting/ Assemblies/ Advice/ Models and dialogues between generations. For most of the men samples, fathers and grandfathers generation gap can be lowered by dialogues between generations (53%) and for boys (60%) generation gap can be lowered by problems to be discussed in schools.

10. HOW DIFFICULT IS TO WORK IN TEAM WITH YOUNGSTERS/ ELDERLY

Table 4: Table showing how difficult is to work in team with youngsters/elderly in Men and Women sample

Girls	Mothers	Grand Mothers
To great extent N = 8 (53%)	To small extent N = 7 (47%)	To small extent N = 9 (60%)

Boys	Fathers	Grand Fathers
To great extent N = 7 (47%)	To small extent N = 7 (47%)	To small extent N = 6 (40%)

11. HOW DIFFICULT IT IS FOR YOU TO ACCEPT YOUNG PEOPLE/ ELDERLY PEOPLE IDEAS.

For most of the grandfathers and grandmothers it was easy to accept the ideas (47%) as compared to girls (40%), boys (40%), Fathers (40%) and mothers (33%).

12. WHO SUFFERS THE MOST FROM A CONFLICT BETWEEN GENERATIONS?

For most of the teenagers (60%) believed that young are suffered most from conflicts and according to parents & grandparents both generations (80%) suffer the most from conflicts between generations.

Discussion

This study was set out to find the conflict between three Generations of men and women. The sample included a total of 90 participants which included 30 adolescents in the age group of 10-20 years (15 girls along with their mothers and grandmothers, 15 boys along with their fathers and grandfathers). All the participants were of Indian origin.

Questionnaire on Generation Gap was used to measure perception about the causes and probable solutions to generation gap. The study was done to determine the existence of generation gap between three Generations of adolescent girls & boys and their parents and grandparents.

Indian culture is collectivistic culture where family ties are very important as in majority of the cases people of different generations live together under the same roof giving the problem of generation gap high significance. Therefore the findings of this study are very crucial for understanding the intricacies of interaction between generations.

The results of the study indicated that 47% of women sample (girls, mothers, and grandmothers) and 42% of male sample (boys, fathers, grandfathers) showed the generational conflict. For most of the girl's intolerance (33%) and for most of the mothers (40%) and grandmothers (47%) lack of respect was the main reason for conflict. Among men sample lack of respect (41%) and intolerance (33%) were the main reason for disputes.

Most of the Men and Women (80%) agreed that it was a social problem. The positive aspect was that 90% agreed that problems due to generation gap could be lessened.

The main reasons for generation gap were the rejection of old ways by younger generation (60%), Intolerance to each other's ideas (33%), older values replacing newer values (47%) and differences in perception (33%). Majority of the respondents (90%) agreed that problems arising from generation gap could be lessened.

For girls (80%) generation gap can be lowered by discussing problems in schools and for mothers (47%) and grandmothers (47%), it can be resolved by Meeting/ Assemblies/ Advice/ Models and dialogues between generations. For most of the men samples, fathers and grandfathers generation gap can be lowered by dialogues between generations (53%) and for boys (60%) generation gap can be lowered by problems to be discussed in schools.

Most of the mothers were employed (N = 10) 66% and have done the university education. The educational status of most of the maternal grandmother were till secondary school (N =11) and most of them were unemployed. All the fathers of teenagers were employed and most of them had pursued university education (N =12). Most of the grandfathers were retired and pursued university education (N =9).

The higher the educational level, the more liberal an individual is in political views and in attitudes towards Children and the more secular he/she is in his/her orientation^{10,19}.

The main reason for generations drawing further apart is technological inventions because of which there is lack of face-to-face communication within the generations so the highest rated solution is a dialogue between generations²⁰⁻²³. Also when it comes to generation gap there are very few role models therefore small movies or anecdotes can prove very helpful this highlights the role of mass media in solving social problems. Educational institutes should encourage discussion and dialogue where the younger generation can air their concerns and be advised on how to respect and gel well with the elder generation²⁴⁻²⁵.

Generation gap is here to stay and as the world undergoes tremendous upheavals and scientific discoveries the chasm between generations is going to widen further therefore the need of the hour is to formulate probable solutions to tackle the same.

Limitation

4. Sample was taken from only one specific area which cannot be generalized to other settings.
5. Sample size was small, therefore results could not be generalised to masses.
6. No Intervention was given.

Recommendations

5. Further studies with a larger sample size (people from all over the country).
6. Scales with more reliability can be used for better results.
7. Study was a survey. The design can be changed

to pre-post experimental design or comparative so that results can be seen with distinction.

8. A module for tackling generation gap based upon the findings of the study should be devised.
9. Further studies are needed to give intervention to these subjects.

FURTHER IMPLICATIONS

Relationships are an important aspect of our well being and who we are. OT is also concerned with the well being of others, social participation, self-esteem, sense of belonging, safety, and opportunities for self-determination. Hence, Occupational therapy should be used to resolve conflicts, improve relationships and Building peace in relationships.

Occupational therapy seeks to improve

- The well being of others
- Social Participation
- Self Esteem
- Sense of belonging
- Meaningful occupations
- Mental and emotional health

Many of the challenges people face stem from relationships with others. Without meaningful and harmonious relationships, it can be challenging for people to improve their quality of life.

The very nature of occupational therapy is being client centred and holistic. This may include our values, beliefs, spirituality, physical functions, and physical structures. This may include assisting others with compensatory strategies or environmental modifications to overcome depression or treatment plans to increase social participation. Occupational

Therapist's ultimate goal is to meet other's individualized needs and makes life more purposeful.

Conclusion

The results indicated that 47% of women sample (girls, mothers, and grandmothers) and 42% of male sample (boys, fathers, grandfathers) showed the generational conflict. Thus the problem of generation gap exists and can be solved in a wide variety of ways. Occupational therapists role is to resolve conflicts, improve relationships and Building peace in relationships. This will help all the three generations understand each other.

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

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

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Children's behaviour in Beginning Days of School: Occupational Therapy Intervention based Study

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Abstract

Background: For some children, transits may be frustrating or may provoke anxiety, and it may lead to challenging behaviours.

Objective: The aim of this study was to assess the influence of occupational therapy intervention on gradual change in behaviour of a child in preschool, while transit.

Methods: Eighteen pre-schoolers in control and eighteen pre-schoolers in experimental group were assigned (12 females and 24 males). Based on randomized controlled study design Preschool Behaviour Questionnaire (PBQ) was used to assess the pre-schoolers behaviour.

Result: According to the result the experimental pre-post analysis ($P=0.00$; 95%CI: 18.96, 22.90) were statistically lower than the control group pre-post analysis ($P=0.201$; 95%CI: -8.23,35.98) and showed a significant improvement in behaviour of a pre-schooler while transit from home to school which was the principal focus area of occupational therapy.

Conclusion: The study reflected significant improvement in certain behavioural areas like command following, sitting tolerance and peer interaction in pre-schoolers with occupational therapy early intervention program.

Key Words: Behaviour, Occupational Therapy, Preschool, Transit

Introduction

The preschool years refer to the period of life between the ages of 3 to 5 years of age where child starts building up his developmental skills. The transit from home to school environment in initial phase makes the child worried and this enhances his/her emotional and behaviour issues like restlessness, irritability, fussy nature and a lot. Transit planning makes these changes narrow and child adaptability to unfamiliar environment. Children under 6 years of age attend preschools, with a daily average stay

of 9 hours. For this reason, child care centres are no longer paternalistic and are committed to educating children, having as one of its actions the promotion of health through physical activity. Several studies describe the factors that increase the likelihood of pre-schoolers to engage in physical activity at school: playing in open spaces and playgrounds, engage in individual or in pairs activities, without the presence of adults, have toys and stuff to play with, promote opportunities for physical activity and instruct teachers in relation to physical activity. Environment Room with appliances such as TVs and video games,

higher teacher---student relationship score, and no use of internal spaces for motor activities¹⁰ are associated with sedentary behaviour.¹ The Canadian Sedentary Behaviour Guidelines for the Early Years (ages 0–4 years) [9], and guidelines in other countries around the world (e.g., Australia and USA), recommend that children <2 years of age have no exposure to screens, and that those aged 2 to 4 years have <1 h/day of screen time. In addition, guidelines (e.g., in Canada, Australia, and the United Kingdom) recommend that parents and caregivers minimize the time that children spend sitting or being restrained (e.g., in a stroller or high chair) while awake². The study was to assess the impact of occupational therapy intervention on child's behaviour in beginning days of school and how it is correlated with transition. Moreover, this work will also help the parents and teacher to guide their kids or students appropriately as they are very small and still need to explore the world full of beautiful colours.

Method

Firstly, the PTM was conducted and procedure was explained to all the student's parents. There were many queries regarding the risk but was explained thoroughly. Written permission was obtained from the head of the primary school to conduct convenient randomized intervention study. Verbal consent and written informed consent were obtained from all pre-schooler's guardians and teachers, who were picked up to participate in the study based on inclusion criteria. The study was conducted adhering to the principles of 'Declaration of Helsinki'. First, teacher rated the children using the PBQ after a minimum contact of 3 months secondly, the questionnaire was randomly ordered to control for response bias regarding the expected development of behavioral issues. Third, children aged 5 and above were not included as per exclusion criteria.

. As per the responses received, the pre-schoolers who scored more than 17 percentile ranks in scale, were considered to participate in the study³.

Sample

Thirty-six pre-schoolers were selected for the study based on the randomised control trial. Of the total participants, 24 were males and 12 were females. The mean age of the participants was 4.6±2.3

Subject Screening

The Preschool Behavior Questionnaire (PBQ)³ is a short screening instrument designed to identify preschoolers who show symptoms of emotional and behavioral issues. This instrument not only shows validity in discriminating between normal and deviant populations, but also both inter-rater and test-retest reliability. To be applicable to all preschoolers, it seemed the scale should be standardized across a range of preschoolers, age 3-6 years. The PBQ is a modification of items in the Children's Behavior Questionnaire. The scale has four dimensions of emotional and behavior disturbances; total 'behavior disturbed', scale 1 'hostile- aggression', scale 2 'anxious' and scale 3 'hyperactive- distractible'. It has 30 items rating scale, using 3-point scaling system. Doesn't apply scored as '0', applies sometimes scored as '1' and certainly applies scored as '2'. Usually, the PBQ is used by professionals who observe a child for a period ranging from 1-2 months.

Procedure

Pre-schoolers were recruited for the study as per the inclusion criteria (pre-schoolers (age 3-5 years with high behavioural issues documented in school files and who scored more than 17 percentile rank) and exclusion criteria (pre-schoolers with visual or hearing loss and mentally retarded due to less percentile rank). They were divided into two groups experimental

group (n=18) and control group (n=18). Experimental group was given early intervention protocol such as Cognitive Interventions, Conductive Education, Early Intervention, including a Developmental Approach, Neurodevelopmental Therapy (NDT) and Goals Activity and Motor Enrichment (GAME), Therapeutic Listening and Visual Motor Interventions⁴ whereas control group continued with the same services provided by the school. Total 15 sessions were offered for 45 minutes/session. After completion of 12 sessions, data were analysed of both the groups, based on PBQ scores.

Data Analysis

SPSS statistical software was used of 14.0 version and paired *t*-test was used for analysing within group analysis for control and experimental behaviour scores and unpaired *t*-test was used for analysis of behaviour scores between the groups. Significance level value was set at $P < 0.05$ at the outset of the study and 95%

CI values were computed.

Results

Children in the experimental group were predicted to have significantly higher levels of aggressiveness and distractibility than children in the control group. Mean scores and standard deviations for the PBQ are presented in Table 1 and Table 2. The PBQ scores in the domains of total behaviour disturbed, hostile aggressive, anxious and hyperactive distractible were compared using a paired *t*-test to determine group differences. Results indicated significant differences within group analysis ($p \leq .000$, 95% CI= 18.96, 22.90) in all domains of the PBQ (Table 1). Secondary analysis comparing between the groups indicated that children in the experimental group had significantly higher levels of total behaviour disturbed and significantly higher scores on all subscales of the PBQ than control group ($p \leq 0.791$) (Table 2).

Table 1: Comparison of Pre and Post Intervention PBQ Score Analysis in Experimental and Control Group (Within Group Analysis)

Total behavior disturbed	N	PBQ Score Mean ± SD	t	P (2-tailed)	95%CI Lower Limit	95%CI Upper Limit
Experimental group (pre) Experimental group (post)	16	20.9±0.9	22.65	0.000	18.96	22.90
Control group (pre) Control group (post)	16	31.8 ± 41.4	35.98	0.201	-8.23	35.988

PBQ: Preschool behaviour questionnaire

SD: Standard deviation

CI: Confidence interval

Table 2: Comparison of Pre and Post Intervention PBQ Scores in Experimental versus Control Group (Between the Group Analysis)

Total behavior disturbed	N	PBQ Score Mean \pm SD	t	P (2-tailed)	95% CI Lower Upper	95%CI Upper Limit
Experimental group (pre) Control group (pre)	16	-2.93 \pm 43.48	-2.70	0.791	26.11, 20.23	20.23
Experimental group (post) Control group (post)	16	-10 \pm 4.81	-8.30	0.000	-12.56, -7.43	-7.43

Discussion

There is substantial knowledge is required to understand the internal individual needs and external environmental motives to thoroughly understands the child's behaviour while transition. Behaviour competencies may sometimes contribute to the collective group of early identifiable indicators, both within the child and within his environment, which could also be predict a future development of certain behavioural disorders related to anxiousness, hostile aggressive and distractibility across many other identifiable groups of disorder. This could be the first study to gain the predisposing factors affecting child's behaviour in early developmental life when he has to explore the world and achieve the milestones. It also demonstrates the physiological factors to react to sensations in a certain way like overresponding to sensation, it will eventually be a combination of their inherent genetic predisposition and their environmental experiences that determine functional outcomes and potential manifestation of adult and adolescent psychopathology (Kendler and Prescott, 2006)⁵. There is still much to learn about intervention for the birth to 3 age group. Social stories were effective in improving coping skills as well as in enabling the strategies application of learned coping

skills (performance) during bullying situation. Myers (2006)⁶ possible interventions to support families and children during the transition process were illustrated with an emphasis on occupational therapists' unique contribution to transition planning. The results of this study suggest the efficacy of occupational therapy intervention in reducing children's behavioural competencies in starting days of school and also providing an empirical support for the critical role of the family environment in children's behavioural and emotional functioning. In addition, sensory integration theory suggests that the neural mechanisms of sensory modulation are adaptable (Lane, 2002)⁷, so that with direct treatment of the child, sensory reactivity may be diminished, potentially blocking causal pathways leading to the development of more severe psychiatric disorders. Among children there is substantially reduced physical activity and increased daily hours of screen time: suggesting that restrictive mobility which plays an important role in these lifestyle behaviours worsening. With reduced outdoor games, it can be expected that screen time could reach higher levels⁸, hence we also need certain more work to explore and gather the solution for it.

Despite these limitations, group differences were found. In addition, *p* values for mean group

differences were generally moderate. This finding suggests that the groups identified in this study differed meaningfully on parameters of interest. Thus, although these results must be considered preliminary, they warrant additional investigation.

Conclusion

Intervention was given to experimental group and analysis of the result reflected improvement in experimental group as compared to control group which reflects decrease in behavioural and emotional issues. The study carried out, can be considered a boon from the perspective of occupational therapy. The results show a significant improvement in behaviour of a child which is the principal focus area of occupational therapy. Hence occupational therapy intervention has proved in creating a positive experience for children while transition to school from home and setting them up for high.

In the end, the more we understand the complexity of children involved in treatment, the more effective treatment can be. Consequently, future research should assess both the effectiveness of and client satisfaction with occupational therapy interventions for children with behavioural competencies. Such studies should further consider the impact of total behaviour disturbed in moderating treatment outcomes.

Conflict of Interest- No conflicts in this work.

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Ethical Clearance- This article does not contain any experimental studies with human participants or animals performed by any of the authors. Ethical approval was exempted.

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Supportive Care in Head and Neck Cancer Patients: The Role of Occupational Therapist. Review

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Abstract

Background: Patients diagnosed with malignant head and neck cancer undergoing radiotherapy have negative impacts on oral health and, consequently, on quality of life, especially in older patients who already have peculiar age changes and altered physiological conditions. Radiotherapy in the head and neck region can cause some side effects, such as hyposalivation, xerostomia, mucositis, dysgeusia, dysphagia, trismus, candidiasis, osteoradionecrosis and radiation-related caries. Thus, a multidisciplinary approach is needed to increase the chances of successful treatment of side effects. This review focused on the role of the occupational therapist in the care of patients with head and neck cancer.

Methods: A literature search was carried out in the MEDLINE database from the year 2010 to 2021.

Conclusion: The multidisciplinary approach provides improvements in oral functions, directly affecting the quality of life and survival of cancer patients. Therefore, it is extremely important to aggregate occupational therapy actions in multidisciplinary care involving other professionals, such as dentists in order to promote an adequate treatment for this category of patients.

Keywords: *Adverse effects, Dentistry, Head and neck cancer, Occupational therapy, Radiotherapy.*

Introduction

Head and neck cancer (HNC) remains a major public health concern worldwide. This type of cancer

includes malignant lesions that occur in the oral cavity, pharynx, larynx and salivary glands and is mainly associated with primary risk factors including smoking, alcohol consumption, virus infections such as human papilloma virus and Epstein-Barr virus) and genetic predisposition^[1].

Radiotherapy (RT) is the most common therapeutic modality of treatment for HNC, alone or in association with surgery or chemotherapy^[2]. Most patients are subjected to daily fractionated x-ray radiation of 1.8 to 2 Gy until reaching on a total dose of 60 to 72 Gy. These fractions are given during a 6-7 weeks period, 5 days per week. Despite the technological evolution

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of radiation methods, structures located in the head and neck are commonly affected by the adverse effects of RT [2]. The adverse effects can be separated into two categories: acute side effects, which has its occurrence during or immediately after treatment, and late side effects, those observed months or years after end of RT [2, 3].

Oral complications of RT in the head and neck region arise as a result of radiation effects affecting salivary glands, oral mucosa, bones, dentition, masticatory muscles and temporomandibular joints^[4] and include mucositis, hyposalivation, xerostomia, secondary infections, dysgeusia, dysphagia, trismus, radiation-related caries, and osteoradionecrosis [2]. These complications affect basic human activities, such as eating and communicating, impacting patients' quality of life^[3]. Thus, patients can isolate themselves from interpersonal contact and social relationships and present clinical depression as a result of these difficulties and frustrations they encounter in their daily lives^[5].

In this sense, a multidisciplinary approach is needed to improve treatment management. Therefore, the aim of this review was to discuss the role of the occupational therapist together with the dentist in the care of HNC patients.

Material and Methods

Literature search

A literature search was carried out in the MEDLINE database. The selection criteria were articles published in English from 2010 to 2021. The keywords were: "head and neck cancer", "radiotherapy", "adverse effects", "interdisciplinary health teams", "occupational therapists", "dentistry", "deglutition disorders", "speech disorders" and "sleep disorders" and the Boolean operators "AND" and "OR" for association between them.

Management of RT side effects

Trismus or joint pain

Trismus is a common complication in HNC patients that results in limited mouth opening^[6]. It most often affects patients with tumors of the pharynx, retromolar areas and posterior palate^[7]. This condition can be caused by tumor infiltration into muscles or can be related to radiation-induced fibrosis involving the jaw muscles, including medial and lateral pterygoids, masseter and temporal, and temporomandibular joint^[8]. The development mechanisms and factors related to severity, propagation speed and extension of radiotherapy-induced trismus are still not fully understood. Three stages are involved in the development of this complication: an initial nonspecific inflammatory stage, a fibrotic cellular stage, and a matrix densification and remodeling stage^[9]. The entire process can lead to fibrosis, losing flexibility and muscle extension^[3].

There is no defined measurement for trismus in clinical practice, but most studies define it as a mouth opening of 35 mm or less^[2, 8]. Trismus has a negative impact on the patient's quality of life and interferes with essential activities such as oral hygiene, feeding, swallowing and speaking, which can inhibit the patient socially^[2, 6, 8]. The most desirable is the prevention of trismus, rather than its treatment^[10]. However, when this occurs, it is very important to identify the signs early, as an early therapeutic approach can significantly affect the progression of this complication^[7].

During RT, the patient should be instructed by the occupational therapist and the dentist to exercise mandibular mobility and maintain maximum mouth opening and, if necessary, be associated with physical therapy^[8]. Such exercises include those that promote relaxation and joint range of motion through various therapeutic resources that vary according

to the particularities and needs of each patient^[11]. Some examples of movement exercises are the use of stacked tongue spatulas and taped together or TheraBite device^[3, 6, 9].

For pain relief, occupational therapists should use activities that stimulate changes in joint movement patterns, in addition to respecting pain, offering joint rest and performing exercises to maintain range of motion and muscle strength. Such activities include protective measures of behaviors that involve changes in habits such as the principles of joint protection and power conservation. Joint protection is a strategy by which the individual manages not only to reduce pain, but also to reduce fatigue and maintain joint integrity and function. This involves concepts that encompass energy conservation, use of assistive technology, and change in joint movement patterns, in addition to respecting pain, offering rest to the joints and performing exercises to maintain range^[12].

Dysphagia

Dysphagia is the dysfunction at any stage of swallowing process. It includes any adversity in passing food, liquid or medication during any phase of swallowing^[13], arising from a variety of disorders that affect the neural, motor and/or sensory systems that support the swallowing function. Dysphagia impairs the patient's ability to swallow harmlessly and independently^[13], affecting quality of life^[14]. Swallowing disorders, regardless of etiology, can lead to an increased likelihood of weight loss, malnutrition, lung infection and death^[15].

Dysphagia is a common effect of RT in HNC patients. Radiation treatment can reach anatomical structures adjacent to the tumor such as cartilage, bones and muscles, teeth and salivary glands that are related to the swallowing function^[14]. The presence of edema and later fibrosis in the muscles as an initial

process of acute inflammation can result in swallowing disorders^[1]. Several factors are associated with the development of dysphagia in HNC patients, such as hyposalivation and changes in saliva composition, sticky mucosa, pain, neurological changes and muscle damage, impaired tongue movements and changes in the reduction of pharyngeal peristalsis^[1, 14].

The dentist can help the multidisciplinary team in the detection and diagnosis of dysphagia^[16]. Patients undergoing surgical removal of structures related to swallowing may show signs of propensity to develop dysphagia^[17]. In addition, several functional characteristics can be clinically perceived as reduced retraction of the base of the tongue and deficient activity of the swallowing muscles, often associated with various signs in the oral cavity such as inflammation, edema, mucositis, pain and hyposalivation, accompanied by feeding difficulties and weight loss^[17].

Dysphagia can be a short-term or long-term problem. A multidisciplinary team is needed to treat this complication. Nutritional and occupational therapists may prescribe a high intake of pasty and cariogenic foods. Therefore, constant vigilance must be carried out by a dentist regarding oral hygiene^[3]. For relief of dysphagia, an aspirin-mucaine mouthwash may be prescribed, ideally used before meals^[18]. In some cases, dysphagia symptoms decrease in the post-treatment period and patients are able to ingest more solid foods and beverages orally. It is advisable to have smaller, more frequent meals throughout the day^[3].

Dysphagia is one of the subjects that are part of the occupational therapy educational curriculum, with an extensive report of application in practice (Avery et al. 2010). Among the interventions, we can mention^[13, 19]:

- perform preparatory exercises prior to meals and individualized techniques for compensatory swallowing,

- modification of food texture in order to ensure safe swallowing and eliminate or minimize its aspiration,

- make the presentation of the meal aesthetically pleasing to encourage their ingestion,

- strive for the patient to create independence to eat, providing adequate and adapted utensils

- position the patient's body in such a way as to facilitate the realization of the ideal meal and digestion,

- training of caregivers regarding individualized feeding and swallowing strategies to improve eating performance.

Occupational therapeutic action aims to normalize sensitivity, improve blood supply and lymphatic drainage, as well as muscle rehabilitation in order to minimize motor deficit ^[20]. The complete rehabilitation of the psychomotor functions that affect the functions of daily life tasks should always be the main objective of the occupational therapist. When performing activities that are meaningful to the patients, the idea is to motivate them to return to valuing and recognizing their abilities ^[21].

At this point, the occupational therapist must redouble his efforts to adapt the patient to the new situation and encourage him to recover in the best possible way his daily functions, such as swallowing, even within his limitations. In addition, the occupational therapist must be concerned with the patient's self-esteem, as this element can always interfere and is closely related to the individual's independence or dependence on activities of daily living ^[19]. It is noteworthy that the treatment must be started early,

with a wide variety of activities to be performed, depending on the need and degree of dysphagia of each patient. Muscle rehabilitation is a rebalancing of the motor function of the face and understood as an attempt to improve expressive quality. It is performed through activities that involve facial mimicry, tactile stimulation and neck mobilization ^[22].

Further, occupational therapists can cooperate with other team members who deal with cancer patients with dysphagia, helping with mealtimes and meeting goals.

Environmental resources, behavioral strategies and individualized interventions are used by occupational therapists to optimize swallowing for dysphagic patients. Occupational therapists play an important role in meeting the needs of dysphagia, from mild cases to the complete impossibility of oral feeding ^[19].

Speech disorders

Speech is a fundamental function for the patient's social interaction ^[23]. Tumors located in the aerodigestive tract can affect speech-related structures that result in significant effects on patient communication ^[24]. Furthermore, RT alone or associated with surgery also affects this function^[23, 24].

Other effects of RT can affect the patient's ability to speak. Salivary gland hypofunction and xerostomia are often associated with speech impairment. In addition, dysphagia is another effect of RT in the head and neck region that interferes with speech ability.

The occupational therapist in conjunction with the speech therapist can estimate the sequelae and possible repercussions of a communication disorder in HNC patients. This integration between professionals is crucial for planning adequate speech rehabilitation ^[3]. The occupational therapist must identify disorders

that result in changes in communication, chewing and swallowing, as a result of oral changes due to decreased salivary flow, triggering hyposalivation, xerostomia, trismus, among other problems that interfere with the good performance of daily activities of cancer patients. After treatment, patients expect to regain autonomy and independence in daily activities, which will result in improved self-esteem and social interaction [25].

Sleep disorders

Sleep disturbances can cause fatigue and anguish in patients undergoing treatment with HNC, aggravating their symptoms, including affecting their families and caregivers. Some patients, taking short naps during the day, may have altered sleep patterns. A good night's sleep can bring relief and comfort to cancer patients and help with their treatment [26]. Planning and monitoring sleep routines are interventions that occupational therapists should not forget in patients with HNC [27]. An occupational therapist can perform in cases of sleep disorder:

- Make sure that during the day the patient remained awake and active
- Advise on sleeping positions and use of equipment
- Perform relaxation techniques
- Advise family members and caregivers about the importance of a good night's sleep
- Inform about environmental issues that may be interfering with or preventing quality sleep.

Actions such as those mentioned above are intended to improve quality of life, avoiding or reducing stress, anxiety, depression and low self-esteem linked to sleep deprivation. In addition, reducing the risk of falls due to night walking or sleep

restriction in HNC patients.

In the end, occupational therapy as a holistic approach confronts patients' weakness with the belief that doing should be purposeful and meaningful, involving the mind and spirit [28].

Conclusion

HNC patients may have several side effects resulting from cancer treatment that need to be managed. Knowing the patient's routine, considering their peculiarities and devising a treatment plan aimed at improving the patient's quality of life in line with a multidisciplinary team is essential for an effective and promising treatment. The intervention of the team benefits the patient, mainly because it allows them to be evaluated in terms of their different needs, always aiming at their well-being and health. Psychological aspects are also extremely relevant, and the role of the occupational therapist helps in the patient's adherence to the established therapeutic conduct.

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A Systematic Review on the Effect of Physical Therapist Delivered Ergonomic Intervention on Workers in a Physically Taxing Workplace

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Abstract

Background: Musculoskeletal injuries have increased in the past decade, and this has caused a sequela of pain and missed work time due to injuries. The aim of this study was to determine the effect of physical therapist delivered ergonomic intervention on workers in a physically taxing workplace. A systematic review was performed, which evaluated changes in pain and functional status of injured workers when ergonomic interventions were delivered by physical therapists. **Methods:** A literature search of ProQuest Central, Science Direct, PubMed, Taylor and Francis and EbscoHost was conducted using PEDro guidelines. The search limits and selection criteria were employed. A systematic review of literature using PEDro guidelines was used. In total, six RCTs met the selection criteria. **Conclusion:** Moderate to strong mixed evidence exists to show the effect physical therapist can have on providing workplace solutions to improve function and decreases pain with employees in a physically taxing workplace.

Keywords: ergonomics, work-related musculoskeletal injuries, injury prevention, risk management.

Introduction

A work-related musculoskeletal disorder (WMSD) is an injury that occurs during work-related tasks, usually in the form of repetitive motion. These repetitive motions include lifting, bending, twisting,

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pushing, pulling, and sustained standing postures^[1-3] Work-related musculoskeletal disorders are among the most common causes of occupational illness^[4,5] This leads to employee health decline, increased need for health care services, increased time off for injured employees, and productivity loss.^[1] In 2018, the Bureau of Labor Statistics calculated that workplace injuries involved 2.8 cases per 100 full-time equivalent workers for musculoskeletal injuries.^[6-8] In 2018, workers in private industries sustained a total of 2.8 million work-related injuries or illnesses.^[9] Therefore, it is in the employers' best interest to minimize the detrimental financial impact

from workplace injuries.^[10] Occupational Safety and Health Administration (OSHA) defines ergonomic interventions as *designing the job to fit the worker*.^[11] Numerous countries employ ergonomic interventions to decrease the frequency of work-related health injuries as their gold standard in reducing injuries in the workplace.^[9] Due to the high cost associated with work injuries, it is imperative to choose an effective healthcare professional to lead the way in combating work-related musculoskeletal injuries.

Recently, a portion of the physical therapy community has begun to target occupational health through injury prevention programs and worker health programs. Physical therapists, due to their extensive background and training in musculoskeletal orthopedic care, are one of the most qualified professions to deliver an ergonomic assessment and intervention, yet they are infrequently utilized.^[5] Less recent systematic reviews have examined ergonomic interventions performed by other disciplines, including occupational therapists, exercise specialists, and ergonomic specialists and the resultant effect on the rate of injuries. Ergonomic interventions can include, but are not limited to, workplace modification, resistance training, stretching, postural training, education concerning rest breaks, body mechanics, and home exercises.^[10] There have been numerous studies showing that when general ergonomic interventions were applied, employers experienced decreased injuries, increased productivity, decreased costs associated with direct and indirect costs of

work-related injuries, improvements in return-to-work performance, and decreased absenteeism in employees.^[12-16] However, the major limitation in these studies is that they do not identify a primary healthcare provider to take the lead concerning this growing problem. The purpose of this systematic review was to determine the effect of physical therapist delivered ergonomic intervention on workers in a physically taxing workplace.

Materials and Methods

Four databases through the PEDro scoring system were used: ProQuest Central, Science Direct, PubMed, Taylor and Francis and EbscoHost was conducted using the search terms including physical therapy, physiotherapy, and rehab as the health professional delivering ergonomic services. The outcome search terms included “work related musculoskeletal disorder” and “work-related injury”. Intervention search terms included “ergonomics” and “ergonomic interventions”. The search limits included randomized controlled trials (RCTs) from 2009-2020, published in English, and published in a peer-reviewed journal. The selection criteria included adults aged 18+, a physical therapy delivered ergonomic intervention (PEI) in a physically taxing workplace (PTW). PTW was defined as an occupation that entails repetitive trauma or strain on the musculoskeletal system. Each study was independently reviewed by two reviewers using PEDro guidelines for methodological quality. Table 1 below is a summary of the findings.

Table 1: Summary Table

Study	Interventions Provided	Functional Outcome Measures	PEDro Score
Pillastrini P et al.	Spinal stabilization and strengthening of core and hip musculature Ergo education	Function: Oswestry Disability Index Pain: Visual Analog Scale	8/10
Welch A et al.	Assessing workstation set-ups and the workstation modification Cervical and shoulder musculature strengthening	Function: None Pain: Subjective Pain Scale	7/10

Table 1: Summary Table

Munoz-Poblete C et al.	Theraband stabilization program of the shoulder and strengthening of the upper extremity	Function: Disabilities of the Arm, Shoulder and Hand Pain: Visual Analog Scale	7/10
Tsang SMH et al.	Assessing workstation and the modifications Electromyography biofeedback system Re-education of Motor Control Modalities including Transcutaneous Electrical Nerve Stimulation and Ultrasound	Function: Neck Disability Index and Disabilities of the Arm, Shoulder and Hand Pain: Numeric Pain Rating Scale	6/10
Bultmann et al.	Assessing workstation and the modifications	Function: Oswestry Disability Index Pain: Verbal	6/10
Figl-Hertlein A et al.	Assessing workstation and the modifications Strengthening and individualized strengthening programs	Function: Short Form-36 Pain: None	5/10

Preceding systematic reviews have explored the impact of ergonomic interventions delivered by disciplines other than physical therapists.^[4,6,8,9] This systematic review determined PEI to be efficient in pain reduction and functional improvements amongst employees in a PTW. Of the six studies, four examined the effect of workstation modifications for reducing pain and improving function in the workplace.^[4-7,11]

Workstation Modification

Welch et al. studied the effectiveness of workstation modifications and exercise on neck pain in office workers. Participants (n = 763) were randomly assigned to a control group or an intervention group at the start of the study. The group that was randomly selected to receive the intervention completed 12 weeks of physical activity, workstation modifications, and strength training. The control group received education concerning healthy lifestyle modifications. The outcome measure used in this study was the

Subjective Scale, which was measured pre-post intervention. The results indicated that participants who were involved in the intervention group reduced their neck pain at 12 weeks, although the results were not statistically significant. The authors concluded that workplace modification and increased physical activity can reduce neck pain in the workplace, however, more research needs to be conducted to include statistically significant results.^[4]

Tsang et al. compared the effectiveness of workstation modifications, muscle activation and relaxation techniques, motor control re-education, and modalities on work-related neck and shoulder pain (WRNSP). Participants (n = 101) were randomly assigned to either the workplace modification intervention (n = 51) or assigned to the group receiving the control (n = 50). The intervention group received workstation modifications and motor control training based on their specific job function. The control group

received physical therapy at an off-site facility of their choice. The outcome measures included the NPRS for pain, the NDI, and the DASH. The results of the study noted that both groups reported a reduction in pain with no significant differences between groups at the one-year follow up ($p < 0.05$). However, at the one-year follow up, the on-site intervention group had statistically significant improvements in global recovery in people with WRNSP. The authors concluded that integrated on-site interventions could provide reduction in pain for employees who are experiencing WRNSP.^[9]

Bultmann et al. investigated the effects of tailored workstation modifications on pain and sick leave due to low back pain occurring at work. The random assignment of participants ($n = 119$) included an allocation to the control ($n = 51$) or an allocation to the intervention ($n = 68$). Participants were included if they had put in a request for sick leave due to low back pain that occurred at the work site. The control group received conventional case management care, while the intervention group received tailored work rehabilitation including workstation modification and return-to-work programs. Outcome measures included the ODI and 0-10 rating for pain, taken at six months and 12 months following an injury. The results demonstrated a significant decrease in pain, with improved function in the intervention group at six and 12 months compared to the control group that received traditional case management. The intervention group had a lower number of sick times documented compared to the control group. The authors concluded that workstation modifications and return-to-work programs may be beneficial in reducing pain and sick leave among injured workers.

[14]

Figl-Hertlein et al. examined the effects of workstation modification and exercise interventions

on overall health via the SF-36 questionnaire, with secondary school teachers in Austria. The cluster randomized pilot study used a convenience sample. The authors randomly assigned participants ($n = 69$) into two groups: intervention ($n = 26$) and control ($n = 43$). The intervention group received six, 30-minute sessions with a physical therapist, including education concerning ergonomics, workstation modifications, and stress management over a five-month semester. The control group received one verbal education session on stress management. The results demonstrated that there was a non-statistically significant positive change in the SF-36 questionnaires in the intervention group after a five-month semester, while the control group did not show a change in SF-36 questionnaire scores. The authors concluded that physical therapist led direct occupational health programs may decrease deteriorating health versus education only in Austrian secondary school teachers. More research needs to be performed to improve external validity of physical therapy delivered ergonomic interventions in the workplace.^[10]

Strengthening and Education

Two out of the six studies included strengthening programs as part of their intervention group versus the control groups. The control groups for all six studies included ergonomic education, indicating that education alone is not sufficient in reducing pain and improving function with employees in a physically taxing work environment. Pillastrini et al. conducted a cluster randomized controlled trial among nursery school-teachers ($n = 71$) who experienced low back pain. Participants were randomized into a control group receiving educational brochures on exercise ($n = 35$) and an intervention group ($n = 36$) who were provided a spinal stabilization, and hip and trunk strengthening program conducted by a physical therapist. The Roland Morris Disability Questionnaire and ODI

were used as primary outcome measures and the Visual Analog Scale (VAS) was used as a secondary measure. All outcome measures were completed at baseline and at two-month post interventions. At month two, there was a significant improvement in the Roland Morris Disability Questionnaire, ODI, and VAS compared to the control group. The authors concluded that strengthening interventions may be beneficial at reducing low back pain among nursery school-teachers compared to education only.^[15]

An additional study on exercise interventions for preventing injuries in the workplace was performed by Munoz-Poblete et al. The participants (n = 109) at a manufacturing plant who performed repetitive upper extremity activities in the workplace were randomly assigned to either the intervention or control group (n = 56 and 53, respectively). The participants selected to receive the intervention performed strengthening exercises which focused on shoulder stabilization as well as strengthening of the distal aspect of the upper extremity. The control group only received stretching of the upper extremity. The outcome measures included the DASH and VAS. The results showed a significant improvement in DASH and VAS scores in the intervention group versus the control group. The authors concluded that that resistance training is an effective intervention to decrease the likelihood of upper extremity injuries in the industrial workplace.^[6]

Numerous limitations were listed for all studies included in this systematic review. All six studies were unable to blind participants in their respective studies. An additional limitation was the relatively small sample sizes used. The inability to blind participants and using a small sample size, diminishes the external validity of the studies and decreased the generalizability. Future studies that include the ability to blind the participants, including larger sample sizes, would improve the external validity and

generalizability of the results.

Conclusion and Acknowledgements

The authors concluded that the most effective interventions for pain reduction with employees in a physically taxing workplace included worksite modifications, exercise training and education. It was determined that the most effective interventions to increase functional improvements amongst workers included the modification of employee's workstations and education on ergonomics. It is important to note that the Tsang et al. and Figl-Hertlein et al. studies exceeded the minimal clinically important difference for both pain (NPRS 1.8; VAS 1.7) and function (ODI 16.23; SF-36 5), respectively.^[4,5] However, a clinically significant improvement was not reached in all studies. Most of the studies included in this review showed improvements that were statistically significant. Based on our findings, employers should consider hiring or utilizing physical therapists to implement ergonomic interventions to reduce injuries in the workplace. These improvements could contribute to a reduction in overall costs of injuries and increased productivity by employees. This can be accomplished by reducing injuries and lost work time. There is moderate to strong mixed evidence from the results that highlight the effectiveness of physical therapy delivered ergonomic interventions to improve function and decrease pain with employees in a physically taxing workplace. Future research should examine the potential benefits of physical therapist driven ergonomic intervention on reducing company costs, improving productivity, and decreasing absenteeism in this select population of workers. Lastly, future systematic reviews should include a more homogenous outcome measures for all studies reviewed, to provide greater external validity.

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Type of Article: *Original Article*

Validation and Cross Cultural Adaptation of the Marathi Version of Revised Urinary Incontinence Scale in Females with Urinary Incontinence(Ruis)

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Abstract

Purpose: To validate the Revised Urinary Incontinence Scale (RUIS) in Marathi language and find its reliability in females of Pune

Methodology: A pilot study was done on 30 subjects who were given RUIS in English and Marathi language and were asked to fill the questionnaire. After the completion of this, the marathi scale was given to 101 subjects for cross cultural adaptation into Marathi language. Along with the translated version, subjects were also given the International Consultation on Incontinence Questionnaire – Urinary Incontinence Short Form (ICIQ-UI SF).

Result: The translated version of RUIS showed a good internal consistency($r=0.88$) and good test re-test reliability($r=0.86$). The construct validity of Marathi RUIS was seen to be (Cronbach's alpha) 0.882 and the convergent validity was calculated by correlating the Marathi RUIS with ICIQ-UI SF, which was found to be $p= 0.756$.

Conclusion: The translated version of RUIS show good validity and reliability.

Keywords: validation, cross cultural adaptation, urinary incontinence, marathi language

Introduction

Urinary incontinence (UI) is defined by the International Continence Society as “the complaint of

involuntary loss of urine which is social or hygiene problem”⁽¹⁾. UI and associated lower urinary tract symptoms are widespread and troubling conditions affecting 11- 57.0% of the adult women worldwide and it can severely compromise their social life.⁽¹⁾UI is more common among women than men.⁽²⁾ According to Uma Singh et. al the prevalence of UI in Indian females is lowest till age 20 (7.6%), and between 21 to 30 years of age it is 19.1%. In women above 30 years of age, the prevalence ranged from 27.8% to

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42.8% with maximum prevalence in the age group of 61-70 years of age is seen.⁽³⁾

There are three main types of urinary incontinence stress, urge and mixed. UI is not only a serious medical condition but is also an undeniable social problem, creating embarrassment and negative self-perception, it leads to perineal rash, pressure ulcers and urinary tract infection (UTI).⁽⁴⁾

Potential risk factors for UI include increasing age, parity, vaginal deliveries, obesity, surgery, constipation, family history, smoking and genitourinary prolapse and chronic respiratory problems such as cough.^(1,5) Vaginal deliveries seem to be the most important risk specific to women. Obesity is a well-established risk factor, probably because raised intra-abdominal pressure associated with obesity exacerbates urinary incontinence.⁽⁵⁾

Person born with congenital problems such as injury to the spinal cord or urinary system or fistula between the bladder and the vagina also leads to UI. The inability to control urine causes embarrassment, discomfort, and sometimes other physical problems such as skin problems- a person with urinary incontinence is most likely to have skin sores, rashes and infections, because the place is wet most of the times and can also lead to fungal infections.⁽²⁾

UI is not a static condition. The rate of remission is equal to the rate of incidence, this is because of the ever-changing nature, and patients move back and forth from continence to incontinence.⁽⁶⁾

Many patients hesitate to seek medical advice due to embarrassment and they attempt to manage the problem by using incontinence pads, restricting their fluid intake or adjusting their lifestyle, even though many cases of UI can be cured or significantly improved with appropriate treatment. Patients with signs and symptoms of UI should undergo a complete

medical evaluation to rule out reversible causes of the disorder. The high prevalence of UI among women in general practice has been known in recent years. Most studies on UI have been carried out in developed countries and affluent populations.⁽¹⁾

Many outcome measures were available to detect UI and its severity; RUIS is one of them and is easily administered to the patients. RUIS contains 5 items drawn from the Urogenital Distress Inventory-6 (UDI-6) and the Incontinence Severity Index (ISI). It is a short, reliable and valid scale for measuring the severity of urinary incontinence and its response to treatment.⁽⁷⁾

The national language of India is Hindi but each state has its own regional language. Maharashtra is the second largest state in India both in terms of population (11.24 million) and geographical area. Marathi is the regional language of Maharashtra state in India among the other languages spoken in the state.⁽⁹⁾

The study aimed to translate the Revised Urinary Incontinence Scale in Marathi for easy administration in the local population.

Methodology

Institutional ethics committee clearance was taken before the commencement of the study . written informed consent was taken from the subjects.it was observational study with non randomized purposive sampling of 101 subjects calculated according to sample size calculation . Females suffering from UI with age group of 20 and above and who could speak English and marathi were included in the study. Written informed consent was taken from the subjects .Standard steps for translation and its validation were followed according to guidelines of American Association of Orthopedic Surgeons(AAOS).

Translation and Cross cultural adaptation: the original scale was translated in marathi language i.e forward translation was done by two translators who were bilingual, one of the translator was a Marathi post graduate subject teacher with non-medical background and the other was a General Physician whose mother tongue was marathi

After the translation was done, the scale was shown to the expert committee in which the two translated scales were compared to get a final version of marathi scale. For back translation both the translators were bilingual too, one of the translator was an English post graduate subject teacher with non-medical background and the other was an Occupational therapist. From these two translated versions a final version was selected by the experts committee. This was done to make sure the meaning of the scale remains unchanged. Once the final translation process was completed 30 subjects from different setups like urology clinics and hospitals were selected for the pilot study. They were given the translated version of RUIS along with the original one in a form of online forms. Formal consent was acquired from the participants before the commencement of the study. These responses were then checked by the committee of experts to ensure that there was no discrepancy

between the two scales. No change of meaning was noticed by the experts committee, a final translated version of Marathi RUIS was prepared. The scale was given to 101 subjects who suffered from urinary incontinence. For the assessment of test re-test reliability, the Marathi RUIS was given to 50 subjects amongst those 101 subjects after the gap of 48 hours of filling the previous questionnaire. The authors confirm the availability of, and access to, all original data reported in this study.

Statistical Analysis and Results

Statistical analysis was done by using SPSS 17 version. Confidence interval was set at 95% with level of significance set at $p \leq 0.05$. Internal consistency of the scale was calculated with the Cronbach alpha. Test and retest reliability was assessed by calculating ICCs. Pearson correlation coefficients were used to evaluate construct validity. This was used to assess correlation between RUIS and International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI SF). The marathi version of RUIS showed internal consistency i.e Cronbach's alpha ($\alpha = 0.88$). the test retest reliability was 0.86 and Intra-class Correlation Coefficient (ICC) for RUIS and ICIQ-UI SF was 0.75

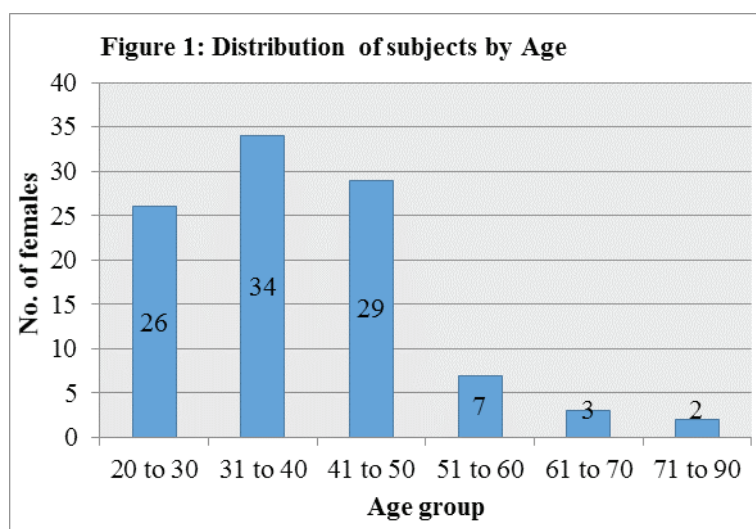


Figure 1: Age distribution of the subjects

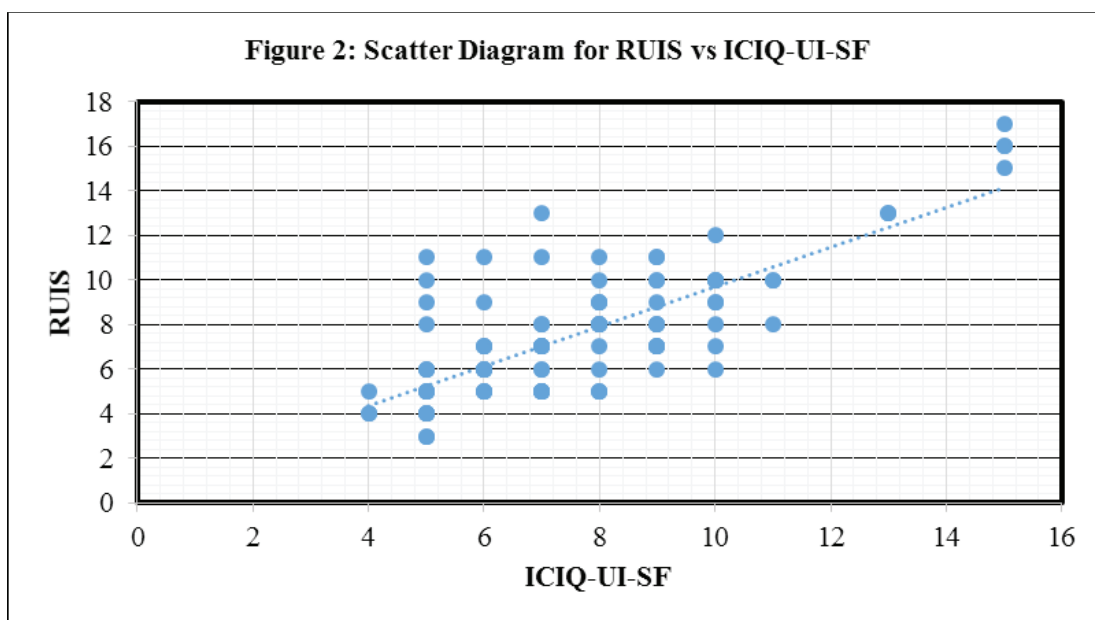


Figure 2, Scatter diagram we can observe that p-value is 0.001 that is less than 0.05. Hence, we can conclude that there is significant positive correlation observed between RUIS and ICIQ-UI SF. Correlation coefficient (P) is 0.756.

Discussion

The original RUIS was created by Janet E. Sansoni to measure the severity of urinary incontinence (UI). As per the study done by her RUIS is a short, reliable and valid scale for measuring the severity of UI when compared to other scales like ICIQ-UI SF, Incontinence Severity Index and Urogenital Distress Inventory-6. The correlations between RUIS and other outcome measures were adequate, including ICIQ-UI SF which we used as a gold standard in our study.⁽⁷⁾ Silvia N. Toos also used RUIS to check the severity of UI pre and post after giving the pelvic floor muscle exercises in females with stress urinary incontinence.⁽¹¹⁾

The studies have shown that if the subjects are not able to understand the scale, the severity of the disease cannot be evaluated and thus proper treatment cannot be given.⁽¹²⁾ Marathi is one of the most commonly spoken languages in Maharashtra (68.93%).⁽⁹⁾ Thus,

translating it into Marathi language is important to help the females in the local areas to understand the severity of UI better and to receive treatment accordingly.

So, the purpose of our study was to translate and cross culturally adapt RUIS into Marathi and then to find its reliability and validity. The cross-cultural adaptation of RUIS confirmed that the meaning of the original items was not changed during the translation.

The translated Marathi version of RUIS demonstrated good reliability ($r=0.862$) and validity ($\alpha=0.88$) Thus, this study showed that the scale had fewer errors after subsequent testing. The original English version of RUIS demonstrated acceptable reliability in patients with urinary incontinence.

According to the studies available the time gap between two consecutive form filling by the subjects should range between 20-30 minutes to 7 days to prevent any clinical changes.⁽¹³⁾ The reliability of

original RUIS is 0.77 & that of the translated version is 0.86. The translated Marathi version was given after 48hrs, it demonstrated good reliability. The higher value of Cronbach's alpha of Marathi version of RUIS could be related to homogeneity in subject selection.⁽¹⁰⁾

The translated Marathi version of RUIS showed that there is significant positive correlation observed between RUIS and ICIQ-UI SF, as the p-value is 0.001.

Results showed that the Marathi RUIS was easy to understand and was quickly completed by the subjects.

It can, therefore, be suitably included as an instrument with good reliability for patients with UI. Marathi RUIS showed good internal consistency ($r=0.88$) and test-retest reliability ($r=0.86$). We suggest that Marathi RUIS is an adequate and useful instrument to understand the severity of UI and for improved management of UI in Marathi speaking population.

Therefore, the scale was translated successfully without losing the authenticity of the original English version.

Conclusion

The Marathi RUIS showed a good internal consistency of $r = 0.88$ and good test re-test reliability of $r = 0.86$. Therefore, the translated scale has a good validity - reliability and can be used for understanding the severity of UI in the local population who can read and understand Marathi language.

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Evaluate Scapular Asymmetry among Office Workers Having Ergonomic Risk Due to Work From Home During Lockdown— Cross Sectional Study

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Abstract

Unprecedented movement restrictions have been imposed due to Covid19 Pandemic induced shutdowns. The situation had triggered organization encouraging workforce to work remotely entirely or partially. The situation has implied prolonged stays at home and radical lifestyle changes including alterations in aspects like physical activity (PA), eating habits, mental health, and quality of sleep. Prolonged working hours and faulty sitting posture has accelerated onset of work related musculoskeletal disorders (WMSDs). Scapular Asymmetry (Scapular Dyskinesia) is one of common problems, which is directly or indirectly associated with poor ergonomics.

Aim of the study is to evaluate scapular asymmetry contributed due to ergonomic risk among office workers practicing sedentary lifestyle in work from home environment during lockdown.

Target group of this study was persons who had been assigned remote work (Most subjects from MNCs and IT Sector) in Surat, of which total 100 subjects, 67 males and 33 females, participated and were of 25 to 55 years of age-group. The scapular asymmetry was assessed by using Lateral Scapular Slide Test (LSST) and Rapid Upper Limb Assessment (RULA) scale.

Results analyzed with SPSS statistical software (version 21), showed 58% prevalence of scapular asymmetry. Correlation analysis between RULA scores and LSST average of all three position of both right and left side was $r = 0.243$, which indicates positive correlation between RULA and LSST.

Hence, the results conclusively establish that the prevalence of scapular asymmetry is higher among office workers working remotely having ergonomic risk in lockdown.

Keywords: Ergonomic risk, LSST, RULA, Scapular asymmetry, Work from Home

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Introduction

Scapulohumeral rhythm (glenohumeral rhythm) is the kinematic interaction between the scapula and the humerus and this interaction is important for the optimal and efficient function of the shoulder. [1] Scapulohumeral rhythm serves two purposes:- (1) It preserves the length-tension relationship of the glenohumeral muscles. Muscles do not shorten as

much as they would without the scapula's upward rotation, and so can sustain their force production through a larger portion of the range of motion. (2) It prevents impingement between the humerus and the acromion. Subacromial impingement can occur unless relative movement between the humerus and scapula is limited because of the difference in size between the glenoid fossa and the humeral head. Simultaneous movement of the humerus and scapula during shoulder elevation limits relative (arthrokinematic) movement between the two bones. In the literature Scapulohumeral rhythm is described like a ratio of humeral elevation: scapulothoracic rotation. The overall ratio of 2:1 during arm elevation is commonly used. Ratios are often described as nonlinear indicating changing ratios during ROM. The 2 to 1 ratio substantially varies in scapular and humeral contributions at different points in the ROM and among individuals during different movements. When there is a change of the normal position of the scapula in relation to the humerus, this can lead to dysfunction of the scapulohumeral rhythm.^[2] An alteration or deviation in the normal resting or active position of the scapula during shoulder movement leads to scapular asymmetry and it is referred as scapular dyskinesia. Scapular dyskinesia is a non-specific response to a painful condition in the shoulder rather than a specific response to certain glenohumeral pathology.^[3] The unprecedented worldwide confinement due to COVID 19 pandemic with severe rules governing confinement may have changed physical activity and sedentary habits due to prolonged stays at home. Due to these circumstances, the sudden and stressful situation in addition to prolonged stays at home may imply a radical change in lifestyle behavior such as physical activity (PA), eating habits, mental health, quality of sleep, etc. This changed lifestyle behavior is associated with work related musculoskeletal disorders (WMSDs) especially

office workers due to prolonged desk job (especially computer work) for many hours sitting in faulty positions. One of the common problems observed is Scapular Asymmetry (Scapular Dyskinesia) which is directly or indirectly related with poor ergonomics. For most people, the scapula moves in abnormal ways due to the repetitive use of the shoulder which occurs mainly due to muscular weakness or sitting in faulty position (sitting without proper support, sitting with neck flex more than normal, sitting at desk for long period of time without arm support, etc.). According to government regulation such as the Occupational Safety and Health Administration (OSHA) standards, an ergonomically fit workstation required to (a) Decrease Injury risk (b) Increased Productivity (c) Healthier vision and joints (d) Reduce tension, headaches (e) Improved job satisfaction, work quality and improved morale of workers.^[4] Hence, the main objective of this study is to check the hypothesis that work from home in lockdown leads to risk affecting positions of scapula at rest and different anatomical planes and leads to discomfort to the office workers increasing ergonomic risk and to evaluate scapular asymmetry among office workers having ergonomic risk due to work from home during lockdown.

Materials and Methods

STUDY DESIGN

A cross-sectional study

STUDY POPULATION

Desk workers of MNCs majorly focusing on IT sector.

DURATION OF THE STUDY

Total duration of the study was six months (Dec 2020 to May 2021).

SAMPLE SIZE

Sample size of 100 was taken in which office worker of age 25-55 years old working at least for 6-7 hours per day were included.

INCLUSION CRITERIA:

- Working age persons who are allowed to work remotely (majorly from MNCs and IT sector)
- Subjects who have normal joint movement without any pain in Upper Limb.
- Age group of 25-55 including males and females.
- Subjects who volunteer themselves in this research work by signing consent form

EXCLUSION CRITERIA:

- Subject with existing shoulder injury or have been undergone recent surgical procedure for the same.
- Subject with any neurological condition (depression, anxiety, etc.)
- Subject having undergone any physiotherapy or rehabilitation treatment since last 6 months.

MATERIALS USED IN STUDY

- Pen
- Pencil
- Measure tape
- Camera

DATA COLLECTION PROCEDURE AND METHODOLOGY

- All subjects have undergone to a standardized interview including details regarding the study before

data collection.

- A written and informed consent about enrolment in the study and maintaining adequate privacy and confidentiality was taken from all subjects included in the study.

- Subjects fulfilling the criteria of the study were selected and evaluated by following two outcome measures.

· **Outcome measures:**

1. Lateral scapular slide test (LSST)
2. RULA

Lateral scapular slide test ^[5, 6] - The position of the scapula is detected by measuring the distance between the inferior angles of the scapula to the spinous process of the thoracic vertebra bilaterally in all 3 ways. If the bilateral distance is more than 1.5 cm it indicates the scapular asymmetry. **RULA** ^[7] - The method uses body diagrams and scores to classify the exposure to MSDs risk factors. The grand score ranges from 1 to 7 in which a score of 1 or 2 is acceptable, a score of 3 or 4 needs further investigation, 5 or 6 needs investigation and changes sooner and a score of 7 needs immediate investigation and change.



Figure 1- Work from home posture (M)



Figure 2- Work from home posture (F)

Results

Statistics for data analysis were performed by using SPSS statistical software (version 21). Of the 100 study subjects, 67 (67%) subjects were male and 33 (33%) subjects were female.

Table 1 – Descriptive Statistics

PARAMETER	MEAN ± SD (N= 100)
Age (years)	35.97 ± 9.55
Daily working time (hours)	6.98 ± 0.85

Table 2 - Average LSST value

Sr. No.	LSST POSITION	MEAN ± SD (N= 100)
LSST-1	Shoulder at 0 degree	1.731 ± 0.49
LSST-2	Shoulder at 45 degree	1.662 ± 0.91
LSST-3	Shoulder at 90 degree	1.477 ± 0.46

From the evaluation of scapular asymmetry done in this study out of total 100 subjects, 58% subjects showed scapular asymmetry and remaining 42% were not having scapular asymmetry.

Table 3- Distribution of scapular asymmetry

	Frequency	Percentage (%)
Scapular Asymmetry	58	58
Scapular Symmetry	42	42
Total	100	100

Of 58 subjects having scapular asymmetry, 42 subjects were male and 16 subjects were female which is represented in table 4.

Table 4 – Distribution of subjects evaluated with Scapular Asymmetry

Gender	Male	Female	Total
Scapular Asymmetry	42	16	58

Scapular asymmetry in LSST-1 position was detected in 81% subjects, in LSST-2 position it was detected in 53% subjects, and in LSST-3 position it was detected in 46% subjects. Results of the Spearman correlation analysis between the RULA scores and LSST average of all three position of both right and left side is $r = 0.243$, which indicates positive correlation between RULA and LSST. Also

correlation was analyzed in between RULA scores and LSST-1, LSST-2 and LSST-3 positions respectively. Results of the Spearman correlation analysis between the RULA scores and LSST-1, LSST-2 and LSST-3 respective values, with correlation coefficients are $r = -0.46$, $r = 0.425$, and $r = 0.372$ respectively, which indicates negative correlation of RULA and LSST-1 while positive correlation between RULA and LSST-2, LSST-3.

Table 5- Correlation between LSST & RULA

		LSST	RULA
Spearman's rho	LSST	Correlation Coefficient	1.000
		Sig. (2-tailed)	.
		N	100
	RULA	Correlation Coefficient	.243*
		Sig. (2-tailed)	.015
		N	100

*Correlation is significant at the 0.05 level (2-tailed).

Discussion

Scapular kinematics and associated muscle activation patterns are thought to influence various shoulder conditions and outcomes such as pain, restricted range of motion, and functional disability.^[8]

As hours of working are increasing day by day, posture of office worker is affected and leads to cause various WRMSD. Work related musculoskeletal disorder is the most common health problems that affect millions of office workers. In the literature, the lifetime prevalence of WRMSD among office workers was reported to vary between 38-56%.^[3]

So our study aimed for determining the relationship between level scapular asymmetry and ergonomic risk among office workers who were forced to work due to unprecedented confinement in Covid lockdown with improper ergonomic environment.

The development of WRMSD among office workers especially IT professionals may be due to the awkward posture adopted by them during work from home for long hours. Because studies have reported that use of computers for more than three hours a day is hazardous.^[9,10] In present study, the mean working hours of all the subjects was 6.98, which can be the contributing factor for scapular asymmetry and increasing ergonomic risk level.

Scapula works as a bridge between the shoulder joint and the cervical spine which affects upper extremity functionality. Any changes in the normal scapular position and movement during prolonged improper sitting posture lead to scapular asymmetry. So the damage to scapular movement is one of the factors that cause disability to take place in upper extremity and the neck of office workers. Also, the control and movement of scapula is damaged as kinematics of the body segments is changed.^[11]

From the study of Depreli et al it was evaluated and concluded that scapular dyskinesia among office workers was significantly high that is 41.7% in which 36 office workers yielded positive results for LSST^[12]. Similar results were found in present study that 58% office workers out of total 100 were evaluated positive for LSST. Also high incidence was seen in scapular asymmetry individually in all three positions of LSST and it was 81% in LSST-1, 53% in LSST-2 and 46% in LSST-3. Hence, the prevalence of scapular asymmetry was found high, similar to those reported in literature^[13].

Posture is referred as harmony of body segments with each other in certain time period and it is known as an important sign of health. Some studies conclude that work posture causes changes in musculoskeletal system^[14] and therefore better ergonomic environment should be provided to office workers.

The ergonomic risk analysis methods serve as a guide for the prevention and promotion of health of office workers and RULA was developed to be used for evaluation and classification of risk levels of WRMSD. It is a valid and reliable measurement instrument for preventing WRMSD that are liable to develop due to manner of work and also for determining risky body postures^[15], which have been increased due to poor working environment for work from home scenario due to Covid lockdown. In our study, mean for RULA is 4.78 with standard deviation of 1.02 which concludes that majority of subjects is exposed to ergonomic risks which can increase the incidence of WRMSD.

As the objective of our study was to determine correlation between scapular asymmetry and ergonomic risk so the correlation between RULA and average values of LSST was calculated and the correlation coefficient R was 0.243 at 0.05 level, which concludes that correlation is significant. Therefore it

is concluded that scapular asymmetry and ergonomic risk are those factors which are related to each other.

Hence, based on our results of present study we reject null hypothesis that there will no significant scapular asymmetry be found among office workers due to work from home and we accept the alternative hypothesis that there will be difference in scapular asymmetry among office workers with ergonomic risk due to work from home.

Many studies including our study have reflected that it is beneficial to change the ergonomics of workplace characteristics at the proper level for reducing discomfort in the musculoskeletal system and this shows that proper guidance is needed to the office worker working for many hours on how to improve posture and what position should they work to avoid scapular asymmetry.

Conclusion

The result conclusively establishes that the prevalence of scapular asymmetry is higher among office workers working remotely having ergonomic risk in lockdown.

Limitations of Study

- Sample size was small.
- As sample group was distributed over wider age band, measurement may vary due to age and age related muscle weakness.

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Conflict of Interest: None

Source of Funding: Self

Ethical Clearance: It was obtained from

Vidhyadeep Institute of Physiotherapy prior to the study.

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Effect of Knowledge and Awareness Regarding Urinary Incontinence and Its Treatment Options in Female Dancers

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Abstract

Background: Urinary incontinence is involuntary loss of urine so as to cause hygiene and/or social inconvenience for day-to-day activities. Urinary incontinence is a common problem in females. As dancers begin training at young age there is potential for great impact on their future health, secondly the interplay of physical and aesthetic demands in dance may lead to various health issues including Urinary Incontinence. Objective of this study is to find out the effect of knowledge and awareness regarding urinary incontinence in female dancers.

Methods: Permission was taken from institutional level ethical committee and from dancers. In this analytical type of study, 50 dancers between 18-35 years of age were selected according to convenient sampling method. Dancers who have chronic asthma, undergone any abdominal surgery, not willing to participate were excluded from the study. Knowledge and awareness were checked pre and post intervention by Urinary incontinence quiz and urinary incontinence knowledge scale.

Results: Data was statistically analysed using Wilcoxon test. Incontinence quiz score pre intervention mean 6.48 ± 2.01 was and post intervention mean was 11.32 ± 1.71 with $p < 0.0001$ which is extremely significant, For incontinence knowledge scale the pre intervention mean was 15.72 ± 3.32 and post intervention mean was 24.2 ± 2.81 with $p < 0.0001$ which is extremely significant.

Key words: Urinary incontinence, female dancers, knowledge, awareness, Urinary incontinence knowledge scale, urinary incontinence quiz.

Introduction

More than 200 million people in the world live with urinary incontinence. There are two main types of incontinence in females, stress urinary incontinence and urge urinary incontinence, can be evaluated by history taking and simple clinical assessment available to most primary care physicians.^[1] It is objectively demonstrable involuntary loss of urine so as to cause hygiene and/or social inconvenience for day-to-day activities.^[2] There are many methods available for treating urinary incontinence. The treatment options of

urinary incontinence in women is an interdisciplinary problem. Physiotherapeutic methods that are highly effective are recommended as first choice of therapy.

Dances which consist of steady postures for long duration while dance practice which can ultimately cause increase in intra-abdominal pressure and causes pressure on pelvic floor which can lead to stress incontinence. Dancers have to perform moderate as well as high impact activities in the form of dance. Strengthening of pelvic floor muscle can minimize

the severity of stress urinary incontinence in high impact activities.^[3] Different Studies have shown a relationship between Stress Urinary incontinence symptoms and the performance of high-impact physical activities. There have been a large number of surveys done where questionnaires are the primary tool for evaluating the presence of incontinence.^[3]

Urinary stress incontinence is a serious medical condition that it can lead to urinary tract infections, pressure ulcers, perineal rash or any social problem creating embarrassment and negative self-perception. Urinary stress incontinence reduces both social interactions and also physical activities and it is also associated with poor self-related problem.^[4]

It is important to have concern about Urinary incontinence in female dancers, as there are various dance forms like western (hip-hop, ballet, contemporary, etc.) as well as classical (Kathak, Bharatanatyam,) which involve moderate to high impact activities as well as steady postures required for long period of the time. To stabilize different postures while dancing it involves both the activation of abdominal pressure and pelvic floor muscles, which give rise to increase in intra-abdominal pressure and due to practicing dance over long time of period there might be increase in the flexibility of lower extremity which may be the another cause for urinary incontinence.^[5] UI is one of the most widespread chronic diseases which poses a serious social problem. Epidemiological data has suggested that UI symptoms occur worldwide in 4–10% of women in their twenties, in as many as 60% of women in their sixties, and in 70–80% of women above 65.

Knowledge of the condition involves a range of beliefs based on the information about various aspects of the disease that the patient has collected over his/her life, both before and after the diagnosis^[6]. Such beliefs usually pertain to the causes of the disease and

exacerbating factors, identification of symptoms, and available methods of treatments and consequences. These beliefs are collected from different sources, such as stereotypes concerning a given disease, previous personal experiences, medical staff, books, or the Internet. The accuracy of these beliefs may vary and some of them may actually not be true. The extent of their correctness can be objectively verified against the current state of medical knowledge about the condition. Knowledge of one's own disease has often been emphasized as an important cognitive factor that can have a considerable impact on the patient's adaptation to the disease and on the course of the disease and its treatment. However, complete mechanisms through which knowledge of the disease can affect adaptation to the disease are not fully understood. It is possible that there are several pathways on which knowledge of one's own disease can influence psychological adaptation and other health outcomes.

People with urinary incontinence are more likely to contact a healthcare provider if they use pads and if daily activities are impaired. As stress urinary incontinence usually results in only small amounts of urinary leakage, none of these triggers for seeking care may exist. In addition, men are more likely to seek medical care than women. Instead of seeking treatment, many individuals with urinary incontinence practice behavioural modifications such as limiting trips, fluids, and routine activities.^[7]

Materials and Methodology

- Study design- Analytical
- Sampling method- convenient sampling
- Sample size-50
- Study setup- Dance institute in and around Pune city

• Sampling population – Female dancers practicing since 1 year

• Materials used- Consent Form, pen, audio-visual tools,

Handouts, Data collection sheet.

• Inclusion criteria:

1. Female dancers between age group 18-35 years

2. Practicing dance from 1 years

3. Only female dancers.

4. Nulliparous and parous dancers

• **Exclusion Criteria:**

1. Dancers having Urge incontinence

2. Dancers with behavioural abnormality

3. Dancers who aren't willing to participate

• **Outcome measures:**

1. Urinary Incontinence Knowledge Scale. (UIKS)

2. Urinary Incontinence Quiz. (IQ)

Results

TABLE 1: DISTRIBUTION OF SUBJECTS ACCORDING TO URINARY INCONTINECE QUIZ SCORE.

Incontinence Quiz	PRE	POST	Wilcox on test p VALUE
SCORE	6.48±2.01	11.32±1.71	<0.0001

INTERPRETATION Table 1. Distribution of participants according to knowledge and awareness pre and post intervention which showed that knowledge and awareness before was 6.48 and post intervention was 11.32 with a p-value <0.0001 which is statistically signific

TABLE 2. RESPONSES OF PARTICIPANTS TO THE INCONTINENCE QUIZ ACCORDING TO THEIR COMPONENTS

SR.NO	COMPONENTS OF INCONTINENCE QUIZ	PERCENTAGE
1	Causes	53.2%
2	Treatment	51.2%
3	Effect of aging on UI	32%
4	Patient-physician response to UI	43%

INTERPRETATION TABLE 2. Responses of participants to Urinary Incontinence Quiz component with 53.2% correct response to the causes, 51.2% correct response to treatment and 32% correct response in the effect of aging, the correct response for Physician-patient response to Urinary Incontinence was 43%.

TABLE 3: DISTRIBUTION OF SUBJECTS ACCORDING TO URINARY INCONTINENCE KNOWLEDGE SCALE SCORE.

URINARY INCONTINENCE KNOWLEDGE SCALE	PRE	POST	p-VALUE
SCORE	15.72±3.32	24.2±2.81	<0.0001

INTERPRETATION TABLE 3: According to urinary incontinence knowledge and its different treatment options pre and post intervention along with their mean and standard deviation which showed that urinary incontinence knowledge and its different treatment options before was 15.72±3.32 and post intervention was 24.2±2.81 and p-value being extremely significant that is <0.0001

TABLE 4: RESPONSE TO URINARY INCONTINENCE KNOWLEDGE SCALE.

No	Components	Percentage Response
1	Risks	52.80%
2	Symptoms	63%
3	Impact	57.20%
4	Prevention	44.80%
5	Treatment	64%
6	Management	41.60%

INTERPRETATION TABLE 4: Urinary incontinence knowledge scale components with 52.80% correct response to the Risk, 63% correct response to symptoms and 57.20% correct response in the Impact, the correct response for prevention was 44.80% and 64% correct response was seen in treatment and 41.60% correct response in management.

Discussion

The study investigated the effect of knowledge and awareness regarding Urinary Incontinence in female dancers with the help of counselling, audio-visual tools methods and providing handouts over a period of one week.

Dance is an art where human movements are strictly selected in particular sequence, which is based on aesthetic and symbolic value. Koutedakis et al. underwent study on the dancer as a performing athlete, suggested that dancers also have specific conditions like disordered eating, osteoporosis, amenorrhea and urinary incontinence.^[10]

In this study, the outcome measures used are Urinary Incontinence Quiz (UIQ) and Urinary Incontinence Knowledge Scale (UIKS). The Urinary Incontinence Quiz is a 14-item UI quiz that was developed by Branch et al. (1994) on their own experience with UI, data that is been published and their own research. Participants answered 14 UI related quiz statements with either “agree”, “disagree”, or “don’t know”. Among the 14 statements, 6 of the statement in the quiz were true, so the correct answer would be “agree”, 8 statements were false, so the correct answer would be “disagree”.

The Urinary Incontinence Knowledge scale is a 30-item scale which consists of knowledge of risk factors (items 1 to 5), symptoms (items 6 to 10), impacts) items 11-15), prevention (items 16-20),

treatment (items 21-25), management (items 26-30). In UKIS the score ranges from 0 to 30, where a rate of less than 60 %correct (sum score less than 18) indicates poor knowledge, rate of 60-80% correct (18-24) indicates moderate knowledge and a rate more than 80% correct (sum score more than 24%) indicates good knowledge. The choice of responses were true equal to 1 point and false and don’t know is equal to 0.

Comparison between pre intervention scores and post intervention score for both the scales were taken. Comparison between pre intervention score and post intervention score for Urinary Incontinence Quiz showed the p value is extremely significant i.e. <0.0001 with mean value of 6.48±2.04 and 11.32±1.71 respectively.

Comparison between pre intervention scores and post intervention score for Urinary incontinence knowledge scale showed p value is extremely significant i.e.,

<0.0001 with mean value of 15.72±3.32 and 24.2±2.81 respectively.

This study is important because it is one of the very few studies that have studied the level of knowledge about UI in female dancers. In this study, the participants received a moderate mean score (6.48 ± 2.01) in the Urinary Incontinence Quiz. Mary Rose Day et al. also studied on community-dwelling women’s knowledge of urinary incontinence which revealed that women have poor knowledge about urinary incontinence.^[11] Yuan and Willams (2010) found that women lacked knowledge on UI.^[14] It was observed that education and experience contributed positively to the level of knowledge. It is expected that the level of UI knowledge will increase as education and experience increase.

The highest rate of correct answers was observed

in the causes and treatment component which was 53.2% and 51.2% respectively. Considering the statements in the relevant items, we concluded that the participants knew that people who have involuntary loss of urine can live normal lives, the prevalence of

UI is higher among women, there are exercises that can help improve bladder control. Dancers who were already diagnosed with UI knew about the causes and that UI could be prevented with exercises. The highest rate of false answers was observed in the components stating the effect of aging (32%) on urinary incontinence and patient physician response (43%) towards UI. We concluded that the participants had incorrect knowledge on these items because they believed that involuntary urine loss was normal in the elderly, that those who had UI shared their problem with their physician.

Findings in our study revealed that participants had poor knowledge of UI, principally in relation to risk factors (52.8%), symptoms (63%), impact (57.2%), prevention (44.8%), treatment (64%) and management of UI (41.60%). No participant responded correctly to all 30 items. More than one-third (48%) reported that UI was a normal part of ageing, many considered UI to be a normal occurrence after childbirth (36%) and some (20%) did not know. More than one-third did not know (38.8%) whether drinking alcohol or coffee could increase the risk of UI. Interestingly, participants had good overall knowledge of the symptoms (63%) and impact (57.2%) of UI. The majority of participants knew about the impact of UI on lifestyle and quality of life (64%), social activities (72%), psychological distress (76.2%) and finances (18%). When presented with the statement, 'UI can restrict activities of daily living and sexual activities', many indicated that they thought the statement was false (27.8%) or said they did not know (27.8%). In relation to the prevention of UI, many respondents did not know that avoiding

smoking (65%), constipation (68%) obesity (55.4%) and managing long-term illness (68.3%) could help or reduce the risk of UI. In relation to the treatment of UI, many did not know that doing pelvic floor exercises (20%) and increasing time intervals between voids (35.8%) could help. Nearly half (50.2%) of participants reported that 'going to the toilet more often can reduce frequency of urinary incontinence' and the majority (74.5%) of participants reported that pads or diapers were an appropriate intervention for managing incontinence. The study revealed that many participants considered UI as a normal part of aging. These assumptions may impact the on their help seeking behaviour. And therefore, proper education needs to be given to increase awareness of UI which may improve quality of life of the females. Dayana Maia Saboia et al. underwent a study on impact of urinary incontinence types on women's quality of life which concluded that all types of urinary incontinence interfere both in general and specific quality of life.^[12]

On the other hand, Orly Goldstick et al. underwent a study on urinary incontinence in physically active women and female athletes, the results showed that urinary incontinence affects women of all ages, including top female athletes, but is under reported.^[16]

The results show that participants have poor knowledge and awareness about UI. Urinary incontinence is a common condition that has substantial negative impact on wellbeing and quality of life. Increase workshops and counselling sessions can improve awareness and knowledge of UI and help breaking the taboos. This will possibly improve help-seeking behaviour and promote management approaches among women.

Proper knowledge and awareness given to the dancers in understanding their condition, symptoms, impact, prevention, management and treatment with specific counselling, tools and motivation to

consult the handouts will increase the knowledge and awareness and also indirectly improve quality of life and help-seeking behaviour in female dancers. Knowledge about the causes of the problem is necessary for dancers to be able to identify the risk groups beforehand. The prevalence of UI can be reduced when people know that bladder control can be achieved by proper guidance, Exercise and Physiotherapy rehabilitation.

Conclusion

The study of effect of one week program on female dancers' knowledge and awareness regarding Urinary Incontinence concluded that the one-on-one counselling and handouts combined with audio-visual tools have an effect on increasing awareness and knowledge regarding UI in female dancers.

Conflict of Interest – There was no conflict of interest to conduct this study.

Source of Funding - Self

Ethical Approval- As per the Declaration of Helsinki, Ethical approval is not required in this study because the study does not involve any drug or invasive procedure on Humans and animals.

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Pulmonary Tele-Rehabilitation in Patients (Post Covid-19) With Respiratory Complications: A Randomized Controlled Trial

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Abstract

Background: The coronavirus disease of 2019 (COVID-19) epidemic has resulted in a growing population of individuals recovering from SARS-CoV. Although the evidence is limited, observational data suggest that patients who suffer from COVID may experience symptoms long after recovery from acute illness, referred as “long COVID,” post-COVID syndrome or “post-COVID conditions”. The recovery from COVID-19 disease is very different but many features appear to be similar to recovery from other viral illnesses. Our study aims to investigate and validate the effectiveness of respiratory rehabilitative therapeutic program in patients with chronic COVID.

Objective: To analyse the effects of a Pulmonary Tele-rehabilitation Program in Covid-19 Outpatients who received Pulmonary Rehab (Breathing and Therapeutic Exercises) compared to those who only received conventional care.

Method: A Randomized Controlled Trial study has been undertaken. 30 Post COVID Patients meeting inclusion criteria were randomly allocated into two groups. Experimental Group received therapeutic protocol and Controlled Group received conventional care. Duration for the study was 6 weeks. The Significant and relevant tests for this study are Modified Borg Dyspnoea Rating Scale and Fatigue Severity Scale.

Result: The statistical analysis was carried out using ‘t- test’ to determine the effectiveness of breathing and therapeutic exercises. Results showed that the patients in experimental group recovered more rapidly and demonstrated independence in their ADL without any further complications. Females were more fatigued than males, therefore benefitted more from the therapeutic program.

Conclusion: This study demonstrated improvement in patients who received the therapeutic program. No telerehab patients required additional oxygen supplementation or any medical care. Telerehabilitation allowed a valuable service to patients with COVID-19 and helped them to rehabilitate themselves without having to leave their home.

Key words: Covid-19, Dyspnoea, Fatigue, Pulmonary Telerehabilitation

Introduction

Coronavirus disease (COVID-19) is an infectious disease caused by a virus named ‘SARS-CoV2’.

Corona viruses is a large family of viruses that can cause illness ranging from the common cold to more severe diseases like Severe Acute Respiratory

Syndrome (SARS). The term COVID-19 is an acronym in which 'CO' stands for corona, 'VI' for virus, and 'D' for disease of 2019. The COVID-19 is a new disease characterized by symptoms that range from mild cold symptoms to fever and cough¹.

COVID-19 mainly affects the lungs or pulmonary parenchyma. Coronavirus has large range of symptoms that affects various people in different ways. Many people infected with COVID-19 experience mild to moderate respiratory symptoms and recover without any specific treatment but some may need ICU admission depending upon the severity of disease. Current estimate of the Incubation Period of the virus ranges from 2-14 days^{2,7}.

The COVID-19 virus primarily spreads through aerosol generation. The transmission occurs through direct or indirect contact of mucous membranes of eyes, nose, or mouth with respiratory droplets or fomites or through faeces. When an infected person coughs or sneezes the discharge from his nose or droplets of saliva may be inhaled by a healthy person via air-borne droplets². So it's important to avoid direct contact and follow respiratory etiquette for reducing the transmission of COVID-19.

It has been assumed that 80% of patients will present mild symptoms. The 20% remaining patients will need medical care, and 5% of them will require admission to the ICU^{2,9,16}. With a severe or critical condition, the average time from onset of symptoms to recovery is 2-3 weeks assuming things go well with most patients but 3-6 weeks with a less favorable prognosis^{2,17}. The WHO recommends restricting home-isolation for 80% of patients who will not require hospital admittance^{2,18}. Telemedicine is a way to overcome this limitation, as it gives medical personnel a non-face-to-face method of monitoring and diagnosing individuals on a larger scale. This way, these patients have limited contact with other

people on the outside without being too intimidated by their surroundings.

LONG COVID or POST COVID SYNDROME:

Long COVID can be a range of symptoms that typically last awhile after an individual is initially infected with the virus. Patients suffering from Long COVID can experience various symptoms like Difficulty breathing or Shortness of Breath, Tiredness or fatigue, Chest Pain, Exertional Dyspnoea, Dizziness on standing, Joint or muscle pain, Heart Palpitations, Headache, Muscle Weakness, Neurological or Cognitive Impairment, Nutritional disturbances, Fast-beating or Heart Palpitations^{2,8,9,10,30}.

It is very likely that a proportion of the COVID-19 need rehabilitative interventions after their discharge from hospital. It is evidenced that COVID-19 survivors with pre-existing/ongoing lung function impairment should receive a comprehensive pulmonary rehabilitation program following their discharge from hospital⁴. Rehabilitation of COVID-19 patient refers to the individualized rehabilitation treatment program that improve patient's physical and mental conditions and facilitate his prompt return to the family and society. Our study will confirm the potential effectiveness of a therapy conducted at home in order to improve fatigue and breathing issues in people who have been diagnosed with COVID-19. More often than not, respiratory issues are treated by physical therapy in a hospital setting, but home based health care is an option that allows patients the comfort level of their own homes when recovering from any type of illness or disorder. The treatment program for these patients will consist of therapeutic exercises that target respiration through breathing training^{2,19,20,21}.

Pulmonary Rehabilitation:

Pulmonary rehabilitation is a specialized treatment designed specifically for the patients who

suffer from chronic pulmonary diseases after their detailed assessment. It is a dynamic process aimed at promoting quality of life while facilitating the patient to a healthy lifestyle. The short term goal of pulmonary rehabilitation is to reduce dyspnea and fatigue while the long term goal of pulmonary rehabilitation is to preserve the patient's function to the maximum extent, improve his/her quality of life, and facilitating his/her return to an active lifestyle.

Need of Tele-Rehabilitation: COVID-19 is an infectious disease of respiratory tract that results in respiratory, physical and psychological dysfunctions. Therefore, Pulmonary Rehabilitation is important for both admitted as well as discharged patients of COVID-19 as per the demand of current situation. Telerehabilitation is viewed positively by patients^{2,22} and it has been reported as a viable solution to save on costs associated with healthcare²³. A new study has found that being home alone leads to a notable physical deconditioning, not just at the musculoskeletal level, but also implies negative metabolic changes^{24,25}. It may trigger type II diabetes that can worsen the clinical picture of patients affected by COVID-19²⁶. Physical activity programs have been shown to slow the loss of muscle mass and strength in patients with COPD^{2,27}. These programs also reduce the rate of aggravations and hospital admissions among these patients. Implementing a physical activity program could reduce prospective exacerbations for patients with mild symptoms of COVID-19. Regular activity promotes maintenance of muscle mass and strength²⁷ as well as prevents metabolic and nutritional decompensations caused by inactivity. Physical therapists help to ensure that COVID-19 patients will maintain their current functional abilities^{3,11,12}. With the novel coronavirus SARS-CoV-2, SARS was reportedly "catching" on to more and more patients. In response, treatment centres implemented several prevention measures, including

encouraging therapists to avoid coming in contact with infected patients^{3,12}. These measures included the use of telehealth solutions when appropriate for screening therapy patients for infection^{3,12,13}.

The breathing techniques and exercises used in our therapeutic program are based on the Physical Therapy guidelines, latest researches and studies^{3,14,15}. Patients with productive coughs were given active cycle of breathing technique (ACBT) and cough etiquette lessons^{3,12}, the latter being very important in this population due to the risk of SARS-CoV-2 transmission by aerosol generation. Pursed-lip breathing was taught to shortness of breath patients as a form of breathing control. Some patients with respiratory complications were recommended straw breathing as a way to improve their ventilation^{3,12}.

Objective of the Study

To analyse the effects of a Pulmonary Telerehabilitation Program in Covid-19 Outpatients who received Pulmonary Rehab (Breathing Exercises and Therapeutic Exercises) compared to those who only received conventional care.

Materials and Methods

Source of data

Medical records department, Santosh Medical College, Ghaziabad

Sample selection

Population: Discharged Covid-19 Patients

Sample size: 30 subjects

Study Design: Randomized controlled trials (RCTs)

Duration of the Study

6 weeks

Inclusion Criteria

1. Subject's age must be in between 18-55 years.
2. Both Males and Females were included in this study.
3. Covid-19 Outpatients (who are tested negative) engaged in their daily routine work.
4. Subject having functional limitations due to Post COVID Respiratory Complications.
5. Able to ambulate independently, with or without a walking aid.
6. Must have stable vital signs such as heart rate, blood pressure, oxygen saturation.

Exclusion criteria:

1. Subject with chronic lung and kidney ailments.
2. Subject who had respiratory ailments in the last 12 months.
3. Subject suffering from HTN and cardiovascular conditions without medical treatment.
4. Subject who have recent musculoskeletal disorders and not fully recovered.
5. Subject who received physical therapy treatment in the last 3 Months.
6. Subject with cognitive Impairment (eg. previous Mini Mental State Exam Score <24).
7. Poor balance with the risk of falling.

Outcome measures:

1. **Modified Borg Dyspnoea Scale** to measure perceived exertion.
2. **Visual Analogue Scale to Evaluate Fatigue**

Severity (VAS-F), for Measuring Fatigue.

Materials Used:

1. Smart Phone/ Tab/ Laptop
2. Reliable Wi-Fi Connection
3. 2 Pillows
4. A Chair
5. 2 Filled Water bottles

Procedure

Records of all discharged patients were taken from Medical Records Department of Santosh Hospital and patients were reached out on call. All those who were interested were asked to fill online data collection form and a written consent was taken from them. Later, they were selected according to the eligibility criteria. The study took place at the selected patient's home and evaluators carried out all measurements at the beginning and end of the study. Only Mild cases were selected, so all the patients must be confined at home. We excluded those patients who may require derivation to hospital care. The Controlled Group had been put on Conventional Care and Experimental Group was provided with a Therapeutic Treatment Protocol, 4 days a week for next 6 weeks.

Data Analysis and Result

Statistical analysis was performed using t-test to determine the effectiveness of breathing and therapeutic exercises on patients comparatively to those who received conventional care only. We analysed the results, in terms of level of fatigue and shortness of breath. The change (pre to post) in outcome measures of two groups were compared by t-test. Categorical (discrete) groups were compared by Variance, mean, p-value and t-test.

Discussion

The purpose of the study was to analyse the effects of a Pulmonary Telerehabilitation Program in Covid-19 Outpatients who received Pulmonary Rehab (Breathing Exercises and Therapeutic Exercises) compared to those who only received conventional care.

The results of this study proved the alternate hypothesis and reject the null hypothesis.

The results showed significant improvement in both the groups and showed that there was a statistically significant difference in between PR (MBDS) and PO (MBDS) i.e., ($p=0.005605$ & $p=0.01121$) and statistically significant difference was found between PR (VAS-F) and PO (VAS-F) i.e., ($p=0.01818$ & $p=0.036359$) of experimental group.

So the result concluded that the patients in experimental group recovered more rapidly and demonstrated independence in their daily living activities without any further complications after a 6 week protocol.

The study also concluded that females were more fatigued than males and got benefitted more with the therapeutic program.

This study presents a detailed description of a randomized controlled trial designed to analyze the results in terms of the level of fatigue, perceived exertion, and respiratory activity of patients who received telerehabilitation after their recovery from acute illness. After the treatment protocol, none of the patients required increased oxygen supplementation or medical care. No adverse events occurred to patients receiving telerehabilitation.

Telerehabilitation is an alternate method of delivering services to patients affected by COVID-19. We consider this study could be of value to

public health, to prevent worsening of the respiratory status of patients suffering from the disease, and so that we could understand the mechanisms that produce these serious alterations and deterioration, which in many cases require hospitalization and the use of mechanical ventilation.

We propose the combination of both breathing exercises and therapeutic exercises for Post Covid Care.

Conclusion

The study concluded that there was significant improvement in pulmonary function and physical functions of both controlled and experimental group but experimental group showed prompt recovery in comparison of controlled group. We conclude that Telerehabilitation is a viable option for patients with Long COVID symptoms and may be a safe way of delivering rehabilitation to the ones in need while avoiding the direct contact with them and at the same time protecting our medical professionals. Pulmonary rehabilitation should be provided throughout the disease management process, regardless of whether the patient is hospitalized or at home. In addition, rehabilitation prescriptions should be individualised based on the patient's specific condition.

Blinding: Evaluator and patients in the study were blinded during the entire process and subjects were unaware of other treatment modalities, also they didn't know if they belong to the experimental or controlled group.

Availability of Data and Materials: The datasets analysed during the current study are available from the corresponding author on reasonable request. The data will be available after the main publication of them.

Conflict of Interest: The authors declare that

they have no competing interests.

Source of Funding: Self

Ethical Clearance: Taken from Institutional Ethical committee.

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Measurement of Baseline Physical Activity in Medical Students by Pedometer and its Correlation with BMI

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Abstract

Objectives – Realizing the sedentary lifestyle of medical students the present study is conducted to assess their physical activity by pedometer, to determine the gender difference, to compare weekdays' activity with weekend, and to find the effect of BMI on physical activity. **Methods** – Physical activity of 30 students was recorded by pedometer for seven days. Mean number of steps per day were calculated for the whole group, boys and the girls. Comparison of groups was done by student t test and p value of < 0.05 was considered significant. Pearson's correlation coefficient was used to determine the relationship between the pedometer determined physical activity and height, weight and BMI. **Results**- The mean age of the subjects was 18.9 + 0.8 years. Average number of steps per day was 8039 + 2533. The mean number of steps per day taken by the boys were significantly more than the girls (9258 + 2736 vs 6821 + 1621, p=0.01). The average number of steps taken by the subjects were significantly more during weekdays than weekend (8279 + 2521 vs 7440 + 3150, p= 0.04). Weight and BMI did not correlate with the number of steps per day, while height had positive correlation. **Conclusions**- Students have suboptimal physical activity; the boys are physically more active than girls; students are more active during week days as compared to weekend; and there was no correlation of weight & BMI with physical activity.

Keywords: Physical activity, medical students, pedometer, BMI

Introduction

Physical activity is essential for good health. Physical inactivity in the modern society has become norm of the day and leads to obesity, coronary artery disease, diabetes, hypertension, osteoporosis, anxiety, depression and even cancer.¹ Studies have shown that

young students going to college are leading sedentary life. In one of the studies using pedometer authors found that the college students took an average of 7,700 steps per day. Their steps fell below the recommended threshold 10,000 steps per day held by researchers as the standard.^{1,2}

There are different means to measure physical activity. Researchers have used self-report techniques, direct observation, heart rate monitors, and accelerometers to measure physical activity.³ A simple counting device called a pedometer is another

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method growing in popularity. By counting the number of steps accumulated in a day, both sedentary behaviors and indicators of insufficient activity can be identified. In addition, pedometers have been found to be a reliable instrument for measuring walking-type movements. With its ease of use, low cost, and low participant burden, pedometer has become a standard tool for measuring physical activity^{4,5}. The use of a pedometer also motivates and promotes an increase in the amount of daily activity a person performs.^{3,6}

Regarding the effect of body mass index (BMI) on physical activity, there is controversial data. Arabaci R¹ did not find any significant effect of BMI on the physical activity while other authors⁷ reported that increased BMI decreased the number of stepstaken. To best of our knowledge so far there is lack data regarding use of pedometer to monitor physical activity in college students from India. Also, we could not retrieve any study on medical students. It is prudent to target the medical students because they are going to be the health care providers and they can preach healthy lifestyle only if they practice it themselves. We conducted this study to assess the physical activity in medical students by pedometer and to find the gender differences, effect of BMI and compare the physical activity during weekdays and weekend.

Methodology

This is a descriptive study done on 30 first phase medical students, 15 boys and 15 girls at B.L.D.E University's Shri B. M. Patil Medical College, Dept. of Physiology. Healthy students who were willing to use pedometer for seven days were recruited for the study and students with known medical disorder i.e. Respiratory, cardiovascular and known hypothyroidism or with presence of any physical disability were excluded from the study.

Procedure

Study was approved from the ethical committee of the college. Students (n=30) were recruited from first year batch on random basis and equal number of boys and girls was chosen. Written informed consent was taken after taking brief history and examination to rule out any medical disorder. Every subject recorded the Demographic profile including Height in cm and weight in Kilograms in the case record form and BMI Kg/m² (body mass index) was calculated. Every student was given a Pedometer 344 (made in China) which is freely available in India, is accurate, economical and gives display of steps, distance covered in miles with calories consumed. Subjects were instructed to tie it at the waistband or belt in the midline of right thigh and was told to use it for consecutive seven days, except when sleeping, showering, or performing sports. The subject was reminded everyday via contact numbers to wear the pedometers and the reading was noted at the end of every day in the log sheet before going to bed at night. Every morning the subject had to reset the pedometer for collecting data, the next day. This continued for seven consecutive days. The compliance was ensured by telephonic contact or by e mail so that they used it regularly. After the completion the student handed over the log sheet and the pedometer back.

Data Analysis

Outcome parameters

1. Mean number of steps per day
 - for each individual
 - for the whole group
 - for female group
 - for male group
 - for working days

for week end days (Saturday and Sunday)

2. BMI – gender wise groups will be made for low BMI (less than 18 kg/m²), Normal BMI (18- 25 kg/m²) and high BMI (more than 25kg/m²)

Statistical Analysis

Data was analyzed using the statistical package for social sciences (SPSS), Version 20. The descriptive analysis included means, frequencies, and standard deviations. Comparison of mean number of steps per day in different groups was done by student t test and p value of < 0.05 was considered significant.

Pearson’s correlation coefficient was used to determine the relationship between the independent variable (pedometer determined physical activity) and each dependent variable (Height, weight and BMI).

Observations & Results

The mean age of the subjects was 18.9 + 0.8

years (range 18-20 years). There was no significant difference between the BMI of boys and girls (22.4 + 2.0 vs 21.5 + 3.4 kg/m²). However, the mean age(19.4+ 0.7 vs 18.5 + 0.7 years), the mean height (173.0 + 6.6 vs 155.9 + 7.1), and the mean weight was significantly more in boys than girls. (p value= 0.00)

Majority of students (76.6%) had normal BMI, 10% were underweight and 13% were overweight. None of the boys was underweight and no student in the whole group was obese.

The average number of steps per day (Mon-Sun) was 8039 + 2533. The mean number of steps per day taken by the boys were significantly more than the girls (9258 + 2736 vs 6821 + 1621, p=0.01)

The graph (Figure1) reveals that average number of steps taken on each day of the week was more in boys as compared to girls and minimum number of steps taken in both the groups was on Sunday.

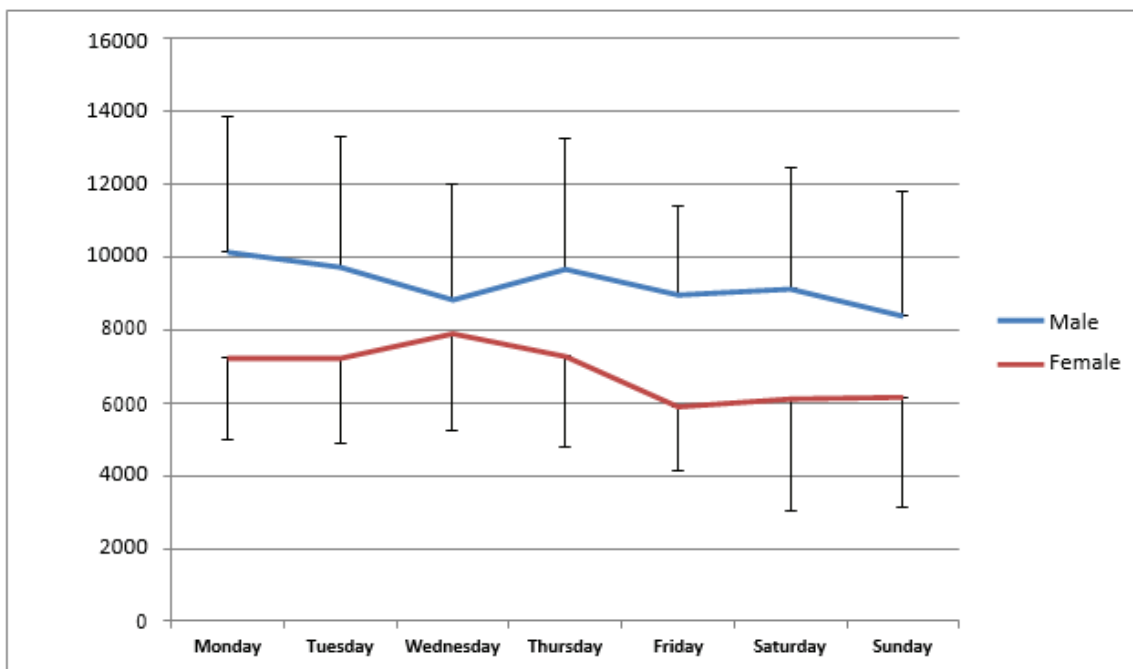


Fig 1. Comparison of number of steps/day (mean + SD) in males vs females according to the day of the week.

Table 1 : Comparison of mean number of steps per day during week days versus weekend

Parameter	Working days (Mon-Fri)	Weekend days (Sat-Sun)	P Value
Steps/day (Mean \pm SD)	8279 \pm 2521	7440 \pm 3150	0.04 (S)

Table 1 depicts that the average number of steps taken by the subjects were significantly more during weekdays than weekend days (8279 + 2521 vs 7440 + 3150, p= 0.04).

Table 2: Level of activity in the study group

Steps / day	Level of activity	Male N=15 n (%)	Female N=15 n (%)	Total N=30 n (%)
< 5000	Sedentary	-	2 (13.33)	2 (6.67)
5000 – 7499	Low Active	5 (33.33)	8 (53.33)	13 (43.33)
7500 – 9999	Somewhat Active	3 (20)	4 (26.67)	7 (23.33)
\geq 10000	Active	7 (46.67)	1 (6.67)	8 (26.67)

Majority of the students were low active (43 %) or somewhat active (23%). About 6.6% were sedentary and all were girls. 26 students were active i.e., took steps more than minimum recommended and most of them were boys. (Table2)

Table 3: Correlation steps per day with height, weight, BMI

	Height	Weight	BMI
Mean steps / day	r= 0.38 P=0.04	r= 0.28 P=0.14	r= 0.07 P=0.71

Table 3 depicts correlation of height, weight and BMI with number of steps per day (Mon-Sun). It was found that weight and BMI did not correlate with the number of steps per day, while height had positive correlation i.e. more the height, more is the number of stepstaken. (p=0.04)

Table 4: Comparison of mean number of steps/days: 7days (Mon-Sun) vs 3 days (Mon, Wed,Fri)

	Mon – Sun	Mon,Wed,Fri	P value
Mean steps / day	8039.71	8154.41	0.5 (NS)

From the students' feedback it was found that using pedometer was an incentive for them to walk more, however putting it for consecutive seven days was tedious.

There was no difference in mean number of steps/day when mean steps day over a period of three days and over a period of seven days were compared. (Table4)

Discussion

In this study we assessed the physical activity of the medical students using pedometer and found pedometer to be practical, easy to use, inexpensive and fairly accurate in giving the number of steps per day. Literature also has validated it as good equipment to assess the number of steps which correlates with the physical activity.^{4,8}

In this study students were recruited from first phase of medical college to constitute the uniform group. All the subjects were young with mean age being 18.97 ± 0.85 years and in good health. 13.3% were overweight and none of the students were obese. The boys were older by one year, significantly taller and heavier than girls but BMI was similar in both groups. More height & weight in boys could be constitutional and uniformly all the studies quote the similar findings.

We found that the average number of steps taken by students per day (Mon-Sun) were 8039 ± 2533 which is less than the minimum recommended i.e., 10,000 steps/day.^{1,9}

Tudor et al (2004)¹⁰ proposed the following preliminary indices to be used to classify pedometer-determined physical activity in healthy adults: (i) <5000 steps/day may be used as a 'sedentary lifestyle index'; (ii) 5000–7499 steps/day is typical of daily activity excluding sports/exercise and

might be considered 'low active'; (iii) 7500–9999 likely includes some volitional activities (and/or elevated occupational activity demands) and might be considered 'somewhat active'; (iv) ≥ 10000 steps/day indicates the point that should be used to classify individual as 'active' and (v) Individuals who take >12 500 steps/day are likely to be classified as highly active.

In the present study, 43% of students were low active and 23% were somewhat active. Behrens et al⁵, Choi et al², Naim Z et al¹¹ and Joy v et al¹² reported under activity in college students and they advocated that this should be replaced by vigorous exercise.

On gender analysis it is noted that boys were more active than the girls as the number of steps taken were significantly more in boys ($p=0.01$). This difference in boys and girls was also evident during week days and weekend days (Fig 2). Arabaci R et al¹, Rao et al¹³ and Khalili et al¹⁴ also reported more activity in boys than girls while Bassett DR et al⁴ noted more activity in females as compared to boys.

On comparing week days and week end activity for the whole group, it was found that students were significantly more active during week days as compared to weekend days ($p=0.04$) (table 1). Sunday was the day with minimum activity. (Fig 2) More activity during week days has also been observed by other workers.² This has the clinical implication while introducing physical activity program. It will be prudent to introduce activity programs during weekdays.

On correlating height, weight, & BMI with number of steps/day, it was found that weight & BMI did not have any correlation. Arabaci R¹, Hazizi AS et al¹⁵ and Khalili AF¹⁴ did not find significant relationship between physical activity and BMI while Chan et al¹⁶ and Tudor et al⁷ found inverse relationship

between steps/day and BMI. In our study no student was obese and the sample size is small & this may be responsible for negative association of BMI & weight with the physical activity. However, there was positive correlation of height with the physical activity i.e.more is the height, more is the number of steps taken. This might be contributory factor for boys to have a greater number of steps/day in our study because boys had significantly more height than girls. (Table3)

Although the pedometer given to students worked as an incentive for the students to do more physical activity, wearing pedometer for seven days was cumbersome for the students and many refused to participate in the study. So, we analyzed three days (alternate days of a week) data with seven days data and found that there is no difference between the mean number of steps/day (Table4).So, we recommend using pedometer for three days a week on alternate days.

Conclusions & Recommendations

- Obesity is not a problem of medical students
- Students have suboptimal physical activity; we need to introduce awareness & physical activity programs.
- The girls are physically less active than boys; therefore, programs should be geared up for girls.
- Students are more active during week days as compared to weekend; programs during weekdays will be more fruitful.
- Three days monitoring with pedometer is recommended as it is similar to seven days monitoring

Strength of the study

- Provided objective data

Weakness of the study

- Small sample size

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Conflict of Interest: Nil

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Effect of Lumbopelvic Manipulation Versus Tibiofemoral Mobilization on Pain and Quality of Life in Patellofemoral Pain Syndrome

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Abstract

Background: Patellofemoral pain syndrome is a common source of anterior knee pain which accounts for 25-40 percent of all knee problems seen in sports injuries. It is a sharp or dull pain in anterior or retro patellar knee pain that can be aggravated by sustained sitting, squatting, step up and step down. Therapeutic exercise, bracing, taping and orthotics have shown improvement in the treatment of PFPS. Manual therapy also shows little evidence in the management of PFPS.

Objective: The objective of this is to find the effectiveness of Lumbopelvic manipulation versus Tibiofemoral mobilization on pain and quality of life on Patellofemoral pain syndrome.

Methodology: This clinical trial was conducted 50 subjects with patellofemoral pain syndrome. The subjects were selected based on inclusion and exclusion criteria. Baseline assessment was taken and participants were allocated to either Group A LPM (n=25) or Group B TFM (n=25) based on inclusion criteria. Both the techniques were given for 3 days in a week for 4 weeks. Outcome measures NPRS and Kujala anterior knee pain were done at the baseline, 1st week and at 4th weeks after intervention. Outcome measures were compared and used to established an effectiveness of treatment.

Result: The baseline characteristics age, gender, duration of pain, NPRS and KAKS score were calculated for both the groups. The pre-test and post-test difference for NPRS score is 2.12 and 1.56 for Group A (LPM) and Group B (TFM) respectively and for KAKS score is 7.88 and 7.32 for Group A (LPM) and Group B (TFM) respectively. These results show there is no statistically significant difference between both the groups. Hence, both the technique found to be equally effective and no technique is superior to the other.

Conclusion: There is no significant difference between Lumbopelvic manipulation Versus Tibiofemoral mobilization on pain and quality of life in Patellofemoral pain syndrome.

Keywords: Patellofemoral pain syndrome, Lumbopelvic manipulation, Tibiofemoral mobilization.

Introduction

Patellofemoral pain syndrome is defined by retro patellar or peripatellar pain associated with activities involving excessive loading in the lower limb (e.g., walking, running, jumping stair climbing, prolonged

sitting and kneeling). It is a condition affecting both malalignment and muscular dysfunction. It is the most frequent overuse injury of the lower limb and is especially present in those who are physically active. Diffuse pain in one or both the knees is the most

common symptom of PFPS.⁽¹⁾

The factors that commit to PFPS is unclear.^(1,2) Factors such as fear avoidance (kinesiophobia) and catastrophizing may be contributing factor. Central neurological mechanisms such as sensitization or neuropathic pain can also be the mechanisms affecting the pain experienced in some people with patellofemoral pain syndrome.

Furthermore, there are various physical characteristics related to the development of PFPS, such as femoral anteversion, internal rotation of the femur, patellar malalignment, or patellar hypermobility. Patellofemoral pain syndrome can also be related to genu recurvatum, valgus knee, lateral tibial torsion, quadriceps weakness and other dysfunction.⁽³⁾

Manual therapy is most favourable technique to treat a variety of musculoskeletal conditions. The modulatory effects of manual therapy on joint pain mechanisms have been demonstrated experimentally in animal model studies and in chronic pain populations⁽⁴⁾. While the effects of manual therapy are likely multimodal, the modulation of facilitated spinal reflexes i.e., the nociceptive reflex and facilitation of conditioned pain modulation have been demonstrated following application of oscillatory joint mobilization on the affected joint, indicating that the analgesic effects of manual therapy are, at least in part are centrally mediated. Given that patellofemoral pain syndrome is a painful condition related with joint and soft tissue impairments, manual therapy interventions would appear suitable for this population.

Spinal manual therapy includes hands-on mobilisations and/or manipulations of the thoracolumbar region and/or Sacroiliac Joint. Although their immediate positive effects have been repeatedly demonstrated, lumbar manipulations

have been considered inappropriate as stand-alone intervention in patients with PFPS in the short term. The effectiveness of manual therapy focused mainly over spinal region, in the treatment of Patellofemoral pain syndrome is based on the concept of regional interdependence of musculoskeletal problems.⁽⁵⁾

Joint manipulation and mobilization have been used to diminish pain and strengthen muscle activation in people with PFPS. Joint mobilization and manipulation stimulate sensory receptors within and around the joint and it has shown to influence muscle activation both near and distant from the site of intervention.⁽⁶⁾

Joint manipulation can stimulate mechanoreceptor and nociceptor, which are primary receptor involved in muscle inhibition, within and around the joint and can thus affect spinal afferent signals. In addition, because of the common nerve root level of sacroiliac joint (L2-S3), quadriceps (L2-L4) and knee (L2-S3), afferent information from each structure might alter motor signals of the other structure with similar nerve root innervations.⁽⁷⁾

Lumbopelvic manipulation led to a significant decrease in quadriceps inhibition and reported that quadriceps muscle strength increased significantly following sacroiliac joint manipulation in patients with PFPS.⁽⁸⁾

Although alternative interference like therapeutic exercise, braces, taping and orthotics have all shown some level of benefit in the treatment of PFPS., as a result joint manipulation may be less used as a treatment protocol in routine physical therapy care in those with PFPS, as there is little evidence to support its effectiveness in managing pain and function in this population.⁽⁹⁾

The tibiofemoral joint mobilization in PFPS has shown the effect in normalization of biomechanics

and movement pattern. Biomechanically, an anterior-posterior mobilization of the tibiofemoral joint can be presumed to have an effect on the motion of the patella as kinematics of the lower extremity have been thought to influence the patellofemoral joint resulting in decreased anterior knee irritation and it has been concluded that tibiofemoral joint mobilization as a successful management of patellofemoral pain syndrome.⁽¹⁰⁾

The main objective of the present study was thus to compare the effect of lumbopelvic manipulation versus tibiofemoral mobilization on pain and quality of life in patellofemoral pain syndrome. A secondary objective was to determine the effect of each technique within the group at a duration of 4 weeks.

Method

Research design

Non randomized controlled trial, with two parallel group of allocation ratio 1:1.

Participants

Inclusion Criteria: 50 subjects with patellofemoral pain syndrome aged from 18-50 years both male and female participants with anterior knee pain for more than 3 months, with a pain intensity on NPRS ranging from 3-8 score and no other neurological involvement.

Lumbopelvic manipulation:

- Decrease in quadriceps muscle strength and function.

Tibiofemoral mobilization:

- Decrease in the motion of tibiofemoral joint.

Exclusion Criteria: participants were excluded with knee or spine surgery in last 3 years, Severe lumbosacral nerve compression signs, Ligamentous

instability or suspected meniscal injury, Pregnancy and osteoarthritis.

Sampling: Purposive sampling method

Allocation: Subjects were allocated to one of the two groups according to the selection criteria.

Study duration: 3 months

Study setting: Physiotherapy clinic in and around Bangalore

Sample size: 50

Experimental procedure

Ethical clearance was obtained from the concerned ethical committee. Informed consent was taken from 50 participants who fulfilled the inclusion criteria. Baseline assessment was done at the commencement of the protocol. Then the participants were allocated to one of the two groups according to the inclusion criteria, either Group A (Lumbopelvic manipulation) or Group B (Tibiofemoral mobilization) Both the techniques were given three days in a week for alternative days for a duration of four weeks.

All the participants had undergone measurements for three times with an interval period of pre-test, 1st week and 4th week.

Procedure for Group A (LUMBOPELVIC MANIPULATION):

No. of sessions: 3 times per week for 4 weeks.

Patient position: supine lying position.

Technique:

- Lumbopelvic manipulation consists of applying rotational gliding force to the ipsilateral lumbopelvic region of the involved knee.

- The lumbopelvic joint manipulation (Grade

V) was performed on ipsilateral side of the test limb.

- The participant lay supine and the therapist stood contralateral to the side which has to be manipulated.

- The participant was side-bent passively towards and rotated away from the selected side.

- Then a quick thrust in posterior, inferior and lateral direction was applied to the anterior superior iliac spine on the side of involved knee.

- If cavitation was experienced either by examiner or by the participant, during the thrust portion of the manipulation, it will be considered to be complete.

- If no cavitation will be felt, one more thrust was given. Each participant received maximum of two manipulations on symptomatic side.

- If both knees were symptomatic, the participant was asked to choose most symptomatic side to be treated.

Procedure for Group B (TIBIOFEMORAL MOBILIZATION):

- **No. of sessions:** 3 times per week for 4 weeks.
- **Patient position:** crook lying position.

TIBIOFEMORAL ANTERIOR GLIDE:

PATIENT POSITION – Prone, beginning with knee in resting position; progress to the end of available range. Placing a small pad under the distal femur to prevent patellar compression.

HAND PLACEMENT – Grasp the distal tibia with the hand that is closer to it and place the palm of the proximal aspect of the proximal tibia.

MOBILIZING FORCE – apply force with the hand on the proximal tibia in an anterior direction.

TIBIOFEMORAL POSTERIOR GLIDE:

PATIENT POSITION – Supine with the foot resting on the table.

HAND PLACEMENT – Sit on the table with the therapist thigh fixating the participant foot. With both hands, grasp around the tibia, fingers pointing posteriorly and thumb anteriorly.

MOBILIZING FORCE – with extended elbows, push the tibia posteriorly with thumbs.

Outcome Measures:

- i) PAIN - Numeric pain rating scale (NPRS)
- ii) QUALITY OF LIFE - kujala anterior knee pain scale (KAKS).

Statistical Analysis:

The study was conducted on 50 subjects with PFPS to compare the effect of Lumbopelvic Manipulation versus Tibiofemoral Mobilization on pain and quality of life in PFPS. Baseline demographic and clinical characteristics were analysed using median and interquartile range. The data was carefully collected and calculated. In this study Kruskal Wallis test, Mann Whitney U test were used a statistically tool for detecting the significant difference within and between the group A (LPM) and group B (TFM). Descriptive statistics (mean and standard deviation) were also calculated for all the measurements consideration for the study. The sub-group difference was calculated using Kruskal-wallis test and effect size was calculated cohen's d table.

Table: 1 BASELINE CHARACTERISTICS OF PARTICIPANTS

Baseline characteristics	Group A (LPM)* N (25)	Group B (TFM)* N (25)
Gender, (in mean)		
Male	13	10
Female	10	15
Age (M±S.D)	28.32±4.87	28.44±44
Side of knee pain		
Right side	14	11
Left side	16	9
Duration of pain (months) (MEDIAN±IR)	5±2	5±3
NPRS* SCORE (0 – 10) (MEDIAN±IR)	7±1	5±2
KAKS* SCORE (0 – 100) (MEDIAN±IR)	72±11	72±8

*Abbreviations used: LPM: Lumbopelvic manipulation, IR – Interquartile range TFM: Tibiofemoral mobilization, NPRS – Numeric pain rating scale, KAKS – Kujala anterior knee pain scale.

Table: 1 shows the baseline characteristics of main variables for both Group A (LPM) and group B (TFM). Which represents the age in years of the subject in both the group with range of 19-36 years. Ordinal data are in Median ± Interquartile Range (Median±IR).

Table: 2 Comparative effectiveness of Group A (Lumbopelvic Manipulation) versus Group B (Tibiofemoral Mobilization) on pain using NPRS scale.

Outcome measure (NPRS)	Pre-test (MEAN±S.D)	Post-test (MEAN±S.D)	Difference B/W Post-Pre (MEAN±S.D)	p – value*
Group A (LPM)	6.56±1.35	4.48±1.06	2.12±0.99	.5486**
Group B (TFM)	5.76±1.10	4.26±0.89	1.56±1.13	

****Not significant**

The above Table 2 shows the pre-test and post-test difference value of NPRS scale from baseline to post-test (4th week) for both the Group A (LPM) and Group B (TFM). Mann-Whitney U test was done to calculate the statistical significance and found to be .5486, which is not significant $p < .05$.

Table: 3 Comparative effectiveness of Group A (Lumbopelvic Manipulation) versus Group B (Tibiofemoral Mobilization) on Quality-of-life using KAKS SCALE.

Outcome measure (KAKS)	Pre-test (MEAN±S.D)	Post-test (MEAN±S.D)	Difference B/W Post-Pre (MEAN±S.D)	p – value*
Group A (LPM)	72.24±5.2	80.12±2.25	7.88±4.86	.7039**
Group B (TFM)	72.52±5.72	80.96±3.28	7.32±4.36	

**Not significant

The above Table 3 shows the pre-test and post-test difference value of KAKS scale from baseline to post-test (4th week) for both the Group A (LPM) and Group B (TFM). Mann-Whitney U test was done to calculate the statistical significance and found to be .7039, which is not significant $p < .05$.

Table: 4 NPRS scores at baseline, 1st week and 4th week within group mean changes scores of Group A (LPM) and Group B (TFM).

OUTCOME MEASURES	Group A (LPM) mean ± Standard Deviation	Group B (TFM) mean ± Standard Deviation
Knee pain intensity (NPRS 0-10) Baseline	6.56±1.35	5.76±1.10
1st week changes	5.04±0.82	4.92±1.01
Short-term changes: Within-group changes baseline to 1st week	1.52	0.84
4th week changes	4.48±1.06	4.26±0.89
Long term changes: Within-group changes baseline to 4th week	2.08	1.5
p – value*	.00001*	.0007*

* $p < .05$ significant

Table 4 includes the difference between the baseline, 1st week and 4th week scores of NPRS for each group and difference between the groups. Kruskal-

Wallis test shows that within group changes are statistically significant within group A (.00001) and group B (.0007). Where both the result is significant statistically $p < .05$.

Table: 5 KAKS scores at baseline, 1st week and 4th week within group mean changes scores of Group A (LPM) and Group B (TFM).

OUTCOME MEASURES	LPM Mean ± Standard deviation	TFM Mean ± Standard deviation
Kujala anterior knee pain scale (0-100) Baseline	72.24±5.2	72.52±5.72
1st week changes	76.64±2.85	77.4±4.44
Short-term changes: Within-group changes baseline to 1st week	4.4	4.88
4th week changes	80.12±2.25	80.96±3.28
Long-term changes: Within-group changes baseline to 4th week	7.88	8.44
p – value*	.00001	.00001

* $p < .05$ significant

Table 5 includes the difference between the baseline, 1st week and 4th week scores of KAKS scores for each group and difference between the groups. Kruskal-Wallis test shows that within group changes are statistically significant within group A (.00001) and group B (.00001). Where both the result is significant statistically $p < .05$.

EFFECT SIZE: (i) when comparing the effect size using mean and standard deviation of Group A (LPM) and Group B (TFM) on NPRS score using the difference in pre-test and post-test values with confidence interval 95%. The Effect-size r was found to be **0.14**, when comparing the relationship between

‘ r ’ and ‘ d ’ value, the magnitude of treatment effect is **SMALL**, according to Cohen’s standard.

(ii) when comparing the effect size using mean and standard deviation of Group A (LPM) and Group B (TFM) on KAKS score using the difference in pre-test and post-test values, with confidence interval 95%. The Effect-size r was found to be **0.147**, when comparing the relationship between ‘ r ’ and ‘ d ’ value, the magnitude of treatment effect is **SMALL** according to Cohen’s standard.

Results

50 subjects were included in this study. The statistics was done by using Kruskal-Wallis test and

Mann Whitney U test to see the effectiveness of both the intervention Lumbopelvic manipulation and Tibiofemoral mobilization among patellofemoral pain syndrome. There is evidence of significant difference within the group A (LPM) was noted on NPRS score p-value is .00001 and KAKS score p-value is .00001 and Group B (TFM) was noted on NPRS score p-value is .00007 and KAKS score p-value is .00001. There was no significant difference when compared between pre-test and post-test difference in Group A (LPM) and Group B (TFM) on NPRS score was 2.12 and 1.56 respectively, at the duration of 4 weeks. The results suggests that there is no difference in NPRS score when compared between the groups, and it is also found statistically not significant p-value .5486 ($p < .05$) and when compared pre-test and post-test difference in Group A (LPM) and Group B (TFM) for KAKS score was 7.88 and 7.32 respectively, at the duration of 4 weeks. The results suggests that there is no significant difference between KAKS score when compared between the group, and it is also found statistically not significant p-value .7039 ($p < .05$). Hence, this study proves that there is no statistical difference when compared between the group and no technique is superior to the other. Both the technique used in this study found to be equivalent.

Discussion

In this present study, the main objective of this clinical trial was to find out the effectiveness of Lumbopelvic manipulation versus Tibiofemoral mobilization on pain and quality of life in patellofemoral pain syndrome. The study results were interpreted on basis on outcome measure were used in this study. According to the results, the average changes obtained on the self-reported outcome obtained by the subjects in both the groups, (NPRS & KUJALA scale) Group A (LPM) versus Group B (TFM) there was no significant improvement on pain and quality

of life in patellofemoral pain syndrome receiving the interventions. But when compared within the groups there is significant improvement in pain and quality of life in patellofemoral pain syndrome. This makes a conclusion that both the technique is proportionately improved.

Changes in pain intensity between Group A (Lumbopelvic manipulation) versus Group B (Tibiofemoral mobilization):

The result of this present study showed that comparatively no significant improvement in pain intensity between the Group A (LPM) versus Group B (TFM). The pre- and post-test mean difference was found to be 2.06 and 1.46 from baseline to 4th week for Group A and Group B respectively. These results suggest that there is no difference in pain intensity when compared between the groups, and it is also found to be statistically not significant $p = .1141$ ($p > .05$).

Iverson PT et al., developed a clinical prediction rule (CPR) to identify patients with PFPS who may respond favourably immediately following lumbopelvic manipulation. Although the mechanism that accounts for symptom relief is not known, the authors theorized that neurophysiologic changes or regional interdependence may have been responsible for the observed changes²⁹. Previously, **Suter and colleagues** demonstrated that a lumbopelvic manipulation led to a significant decrease in quadriceps inhibition³⁰, and **Hillermann et al.** reported that quadriceps muscle strength increased significantly following sacroiliac joint manipulation in patients with PFPS³². However, none of these studies was able to show any benefit beyond the immediate effects of the treatment. All the previous studies as to the best of our knowledge shows only immediate effect of Lumbopelvic manipulation, and our results also suggest that lumbopelvic manipulation is a successful

management for patellofemoral pain syndrome when applied for a duration of 4 weeks. Lumbopelvic manipulation can also be combined with other mode of treatment protocol like Vastus medialis oblique strengthening, ischemic compression and tapping for long term management as shown effective in previous studies.

Courtney et al., (2016) has concluded that 3 min of anterior-to-posterior glides of flexed knee reduced pain sensitivity and facilitated improvements in descending pain inhibitory system³³. Also, in a study by **Moss et al, (2007)** concluded that 9 mins of accessory mobilization to the knee immediately minimized pain and improved functional performance in patients with mild-to-moderate Osteoarthritis³⁴. There is also lack of studies which shows effect of Tibiofemoral mobilization on patellofemoral pain syndrome. Only one study has done and it shows positive effect on pain intensity and Quality of Life.

Justin M Lantz et al., 2016 has shown improvement in both biomechanical and neurophysiological outcome measures after 8 sessions of Tibiofemoral mobilization on PFPS. Mobilization was in accordance with Concave-convex rule of the tibiofemoral joint in a manner accepted to promote knee flexion³⁵. Several studies have ben advocated the use of tibiofemoral joint mobilizations in reducing pain, increasing motor unit recruitment, and improving function in patients with Osteoarthritis of the knee. Tibiofemoral mobilization was found to be effective in reducing anterior knee pain and increase patient's functional status which enhanced Quality of Life in our study.

The conclusion of this study was stated that both the Lumbopelvic manipulation and Tibiofemoral mobilization was found to be effective in reducing knee pain equivalently and indeed no technique is superior to the other one. Hence, according to the

statistical analysis this study rejected the alternate hypothesis.

Changes in Quality-of-Life scale between Group A (Lumbopelvic manipulation) versus Group B (Tibiofemoral mobilization):

The result of this present study showed statistically no significant improvement in Quality of life between the Group A (LPM) and Group B (TFM). The pre-test and post-test mean difference in Group A (LPM) and Group B (TFM) for Quality of life was 7.2 and 8.01 respectively, at the duration of 4 weeks. These results suggest that there is no difference in Quality of life when compared between the groups, and it is also found to be statistically not significant $p = 1$ ($p > .05$).

Sally. L Coburn et al., 2018 concluded that individuals with PFPS aged under 50 years, have impaired knee- and health-related QoL compared to the general population and pain-free individuals. Findings from previous intervention studies indicate that knee- and health-related QoL improved following interventions for PFP including bracing, taping, manual therapy and exercise therapy.³⁶

Neal R. Glaviano 2017 conducted a study on physical levels in individual with and without PFPS. He had concluded that individuals with PFPS are less physically active than their healthy counterparts in both steps per day and minutes spent conducting physical activity. A relationship between subjective function and physical activity exists in individuals with PFPS.³⁷

Sirous Azizi et al., 2020 concluded that using manual therapy caused significant improvements in PFPS patients compared to the sole therapeutic exercise. Accordingly, incorporating this method can improve the functions of PFPS patients. Hence, according to the statistical analysis this study rejected the alternate hypothesis³⁸. Both the groups had equal improvement and indeed no group is superior to the other.

Changes in pain intensity within Group A (Lumbopelvic manipulation):

The secondary objective of this study was to find out the difference in pain intensity within each group at the duration of 1st week and 4th week. The results show that the mean difference in NPRS score at the duration of 1st week and 4th week as 1.54 and 2.07 respectively, which shows that changes are statistically significant with value of .002 ($p < .05$).

Previous research on the reliability and responsiveness of NPRS score in individual with Patellofemoral pain syndrome identified as minimal clinically importance difference from 1.5 to 2.0cm. In the present study, Group A (LPM) had a mean difference in NPRS score of 2.08 from baseline to 4th week. There is a change in NPRS score of 2cm within the group A (LPM) post-test which concludes it is clinically significant according to Minimally clinically important difference. (MCID)

Changes in pain intensity within Group B (Tibiofemoral mobilization):

The secondary objective of this study was to find out the difference in pain intensity within each group at the duration of 1st week and 4th week. The results show that the mean difference in NPRS score at the duration of 1st week and 4th week for Group B as 1.4 and 1.47 respectively which shows that changes are statistically significant with value of .00561 ($p < .05$).

Previous research on the reliability and responsiveness of NPRS score in individual with Patellofemoral pain syndrome identified as minimal clinically importance difference from 1.5 to 2.0cm. In the present study, Group B (TFM) had a mean difference in NPRS score of 1.5 from baseline to 4th week. There is a change in NPRS score of 1.5cm within the group B (TFM) post-test which concludes it is clinically significant according to Minimally

clinically important difference. (MCID).

Conclusion

This study concludes that, both Lumbopelvic Manipulation and Tibiofemoral mobilization technique found to be effective in reducing knee pain and quality of life among patellofemoral pain syndrome and indeed no technique is superior to the other. Thus, this study hereby accepts the Null hypothesis that there is a no significant difference between Lumbopelvic manipulation versus Tibiofemoral mobilization on pain and quality of life among patellofemoral pain syndrome.

Limitations

Firstly, the Duration of the study was 4 weeks (can be done for long duration) and it also did not include long term follow up. Secondly, biomechanical and structural factors such as Q angle and hip internal rotation were not assessed and the subjects were assessed in different time duration, which may influence the quality of tests. There was lack of prior research studies. Thirdly there was no control group in this study. The exercise programme given in this study did not progress in load or repetition during the treatment period. Lastly participants in this study were young, the results may not be generalized to all age groups.

Conflict of Interest: Nil

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A Study on the Effect of Functional Electrical Stimulation on Hand Function in Stroke Patients with Flexor Synergy in Upper Limb

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Abstract

Background and Purpose: To determine whether Functional Electrical Stimulation can improve motor function of hand in spastic hemiplegics and whether any improvements are maintained

Methods: 30 subjects of stroke with spastic hemiplegia with flexor synergy upper limb. 15 patients in each group, Group A (Functional Electrical Stimulation group) & Group B (Control group). Group-A received Functional Electrical Stimulation plus standard inpatient/outpatient stroke rehabilitation program. Group-B received only standard inpatient/outpatient stroke rehabilitation program. Assessment data were recorded before treatment, at 4, 8, 12 and 24 weeks. Outcome Measures were Action Research Arm Test Score, Range Of Motion of Active Wrist extension, Functional independence measure, Modified Ashworth Scale.

Results: Use of Functional Electrical Stimulation resulted in improvement of hand functions in patients. There was decrease in wrist flexors muscle tone and subsequent improvement in activities of daily livings observed. There was no significant improvement observed in Active Wrist extension.

Conclusion: Functional Electrical Stimulation is an important intervention in the treatment of stroke with spastic hemiplegia. It can help in the improvement of hand functions when prescribed along with exercises.

Key words: Stroke, Hemiplegia, muscle spasticity, rehabilitation, Electric Stimulation, Exercise

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Introduction

Mortality & morbidity due to stroke is very high across the world. Approximately 20 million peoples each year are expected to suffer from stroke and out of these 5 million will not survive¹. 85% of stroke related deaths occur in developing countries².

Stroke mortality & morbidity in India has prevalence of 55.6 per 100,000 all ages (1), 0.63

million deaths³, 1.44-1.64 million cases of new acute strokes every year^{3,4}, DALYs lost due to stroke were 795.57 per 100,000 person-years⁵ (730.43 in men and 552.86 in women), 12% of strokes occur in the population aged <40 years⁶, 28-30 day case fatality^{1,7} ranges from 18-41%. Stroke is also a leading cause of functional impairments, with 20% of survivors requiring institutional care after 3 months & 15-30% being permanently disabled⁸.

Brunnstrom⁹ & Sawner¹⁰ described the process of recovery following stroke induced Hemiplegia in 7 different stages. From the stage where minimal voluntary movement begins to appear a basic synergy pattern seen i.e. increased spasticity of some group of muscles hinder isolated joint movement. The flexor synergy of upper limb includes shoulder adduction, flexion, and internal rotation with elbow flexion, wrist pronation and flexion, and finger and thumb adduction, flexion into palm^{9,10,11}.

This pathological synergy is increased in the hemiparetic limb during efforts to use it for a specific task¹². Often the individual is able to close the fingers into fist (part of the flexion synergy), but is unable to open the fingers. Abnormal synergies constitute significant impairment that needs to be addressed by rehabilitation¹³.

The degree of post stroke motor recovery varies widely. It is directly related to the degree of initial severity and the interval from stroke to initiation of voluntary movement^{11,14,15}. During this recovery period, motor recovery is believed to be enhanced by various techniques such as the neurodevelopmental techniques¹⁶, sensorimotor integration¹⁷, proprioceptive neuromuscular facilitation¹⁸, biofeedback¹⁹ and functional utilization of evolving synergies⁹. These techniques seldom facilitate significant improvements in reaching, grasping & releasing functions and the patients are often released to home with a paralyzed

arm.

There is a different approach which is based on functional electrical stimulation (FES) of muscles to augment hand function²⁰. FES is a technology that uses short duration electrical pulses applied at skin and activates weak muscles to produce functional movements²¹.

Objective of study was to determine whether FES can improve motor function of hand & any improvements are maintained after FES in spastic hemiplegic patients as per schedule.

Materials and Methods

We studied 30 hemiplegic stroke patients in a Prospective Interventional study comparing standard treatment with standard treatment plus FES, in each group 15 patients were taken for study. Patient was divided in 2 groups- Group A (FES group) & Group B (control group). All subjects in both groups received standard physical, occupational, & speech therapy interventions as per the inpatient/outpatient stroke rehabilitation program.

The study was approved by the National Institute for Locomotor Disabilities (NILD) Institutional ethics committee. Written informed consent was taken from the patient or a close relative. Patients attending Outpatient Department (OPD) and Inpatient Department (IPD) of NILD, Kolkata, India during the February 2015 to August 2016. Patients diagnosed to have stroke with hemiplegia with flexor synergy of upper limb. Subjects were randomly allocated through chit box method into two groups. It is a simple method of generating random sequence. For random allocation of 30 case into two groups equally, prepared 15 chits writing "A" (for group A) on 15 chits & "B" (for group B) on 15 chits. After folding the chits & putting in a box & well mixing, drew a chit, note the letter written on it, & then drew the second chit without replacing

the first, note it & proceed similarly until the last i.e. 30th chit is drawn.

Inclusion Criteria:

1. Unilateral stroke in a medically stable patient within 2 years of occurrence of stroke
2. Hemiparesis with presence of flexor synergy in involved upper limb
3. Age > 18 years
4. No limitation of passive joint range of motion in the involved limb
5. Have voluntary extension of wrist (of at least 10 degrees from the resting position) & fingers
6. Some active movements in affected shoulder & elbow
7. Adequate language function to respond to 2-step commands

Exclusion Criteria

1. Patients with flexor synergy due to cause other than stroke
2. No voluntary movement of the shoulder & elbow
3. Clinical evidence of shoulder subluxation (one finger with or more)
4. Presence of severe spasticity of wrist muscles (Modified Ashworth more than 2)
5. Mini-mental examination score <21
6. History of epilepsy/recent convulsions
7. Previous history of wrist problem (including previous hemiplegia or arthritis)
8. Presence of implanted electronic devices,

respiratory insufficiency, hepatic or renal insufficiency, pregnancy, peripheral neuropathies

9. Received injection Botulinum toxin-A within last 3 months
10. Patients taking antispasticity medications
11. Active reflex sympathetic dystrophy or existing residual weakness due to lower motor neuron lesions of either extremity
12. Unable to express themselves in speech or to comprehend verbal or written information
13. Any co-morbid neurological disease (Lower motor neuron lesions of the impaired upper extremity, spinal cord injury, traumatic brain injury, multiple sclerosis, Parkinson's disease)
14. Intolerance of FES by patient
15. Dermatitis/burn in area of FES application
16. Unwilling to participate in study

Group-A: While using FES (MegaXP FES Machine, South Korea), patients were instructed to sit quietly for 30 minutes. Two electrodes of bipolar in configuration were used (active and indifferent) to generate a flow of current. Bipolar electrodes are both the same size meaning the current at each site will be equal. Bipolar systems enable greater targeting of muscles. Wrist & finger extensors, Extensor Carpi Radialis Longus (ECRL)/Extensor Carpi Radialis Brevis (ECRB), Extensor Carpi Ulnaris (ECU) & Extensor Digitorum Communis (EDC) were stimulated with a pair of non-adhesive electrodes. The skin surface electrodes with Meditech gel (Ultrasound Gel) were used for better conduction & comfort of the subjects. Diameter of Surface electrode (rubber pad) was 1.5 inch. Proximally over forearm below the elbow one electrode was placed, and the other one was placed distally on the forearm (positioned

for optimally balanced joint movement). Electrodes carefully placed to avoid either radial or ulna deviation of the wrist. If there is excessive ulnar deviation, the active electrode moved towards the ECRB on the radial side of the forearm. If radial deviation occurs, the electrode moved towards the ECU on the ulnar side of forearm.

The stimulus pulse was a symmetric biphasic rectangular waveform with amplitude ranging between 10-20 mA (depending on response), pulse width of 300 microseconds, frequency ranging between 25-35 Hz. Stimulation was given for 30 minutes' period/day, 3 days/week for 8 weeks.

Total 24 sessions of FES were given. The current amplitude & frequency were adjusted to patient's comfort & response.

Group B (control group) - Received only standard conventional treatment/therapy. Therapy was continued consecutively for 24 sittings, thrice a week for 8 weeks.

Assessment data were recorded before treatment, at 4, 8, 12 (1st follow-up 4-week post FES) & 24 (2nd follow-up 16 weeks post FES) weeks.

Outcome Measures

1. Modified Ashworth Scale (MAS)
2. Action Research Arm Test (ARAT) score by ARAT Kit
3. Functional Independence Measure (FIM-self-care component) score- (Total Score 42)
4. Active Range of Motion of Wrist Extension (AROM)

Statistical Analysis

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed

by SPSS 20.0.1 and GraphPad Prism version 5. Descriptive statistical analysis was performed to calculate the means with corresponding standard deviations (SD). Chi-square (χ^2) test was performed to find the associations. Paired t-test was used to compare the means. $p < 0.05$ was taken to be statistically significant.

Findings

The patients who were included in this study underwent 5 assessments. Initially, 32 patients were included. Two patients dropped out of the study. One patient suffered from second attack of stroke and was discarded. Another patient was not regular for FES application, hence was also discarded. The final number of participants taken for data analysis was 30, 15 patients in each group. According to protocol of the study, patient population age > 18 year, who fulfilled inclusion criteria were eligible to participate in the study. The mean age of patients who were included after fulfilling the criteria of the study in FES group was 52.86 years and in control group was 53.13 years. However, no statistical significance difference was found between FES & control group. In our study, in FES group 73.3 % of patients were male & 26.7 % were female. Sex ratio was 2.7: 1. In control group, 60% male & 40 % female patients. Sex ratio was 1.5: 1. However, no statistical significance difference of this ratio was found between FES & control group. The association between the gender and age of study population was not found to be statistically significant. Mean duration of stroke was 7.3 months in FES group, 7.06 months in control group. However, no statistical significant difference was found between FES & control group. In FES group there were 33.3% left sided hemiplegics & 66.7% right sided hemiplegics. In control group there were 20% left sided hemiplegics & 80% right sided hemiplegics. However, no statistical significant

difference was found between FES & control group. (Table 1)

Table 1 Demographic characteristics

	FES Group	Control Group
Age in Years- mean(SD)	52.86 (12.36)	53.13 (9.73)
Sex : male –female ratio	11:4	9:6
Duration of stroke- months- mean(SD)	7.33 (5.12)	7.06 (4.54)
Side of Hemiplegia- Right: left	10:5	12:3
Height(cm) mean(SD)	165.2 (10.67)	162.13 (10.98)
Weight(Kg) mean(SD)	65.86 (9.5)	70.80 (4.6)

Discussion

At 4 weeks after giving FES mean ARAT score in FES group was 17.8 & statistically significant ($p=0.0003$) improvement. At 8 weeks mean ARAT score in FES group was 25.06 & statistically significant ($p=0.0001$) improvement. At 12 weeks & 24 weeks (follow-ups after completion of FES) improvement in ARAT score was maintained & was statistically significant. In ARAT score more improvement were observed at 8 weeks in grip & grasp sub-scores, in pinch or gross movement no significant improvement were seen. Achieved improvement in grip & grasp functions were maintained up-to 24 weeks.

The subjects mainly described functional improvement as better ability to grasp and release small objects and more functional use of the affected upper limb in the activities of daily living. Powell et al also found significant improvement in the grip and grasp scores of the ARAT as compare to the control group²².

When comparing hand functions with FES at the 4 week and 8 weeks, the hand function is more improved at 8 weeks of FES application. All the

patients in addition to FES were on conventional physical & occupational therapy at our institute & home based exercise programs and hence this improvement in hand function could be a combined effect of these factors. This implies that the continued use of FES along with therapy resulted in improved hand functions in these patients.

There was some improvement observed in Active Wrist extension in FES group at 8 weeks but no statistically significant difference was found between the two groups. Active wrist extension range was assessed by Powell et al found no significant improvement in active wrist extension²². We found no evidence in literature for improvement in active wrist extension ROM.

In present study wrist flexor spasticity of the affected limb was assessed. At 4 weeks no significant improvement was found in spasticity in two groups ($p=0.13603$). At 8 weeks statistically significant improvement was found in spasticity in FES group ($p=0.0032$). At 12 weeks (1st follow-up) statistically significant improvement was maintained. At 24 weeks (2nd follow-up) improvement in spasticity was

only maintained in 1 patient (6.7%) but in rest of patients (93.3%) spasticity returned to the base level (as before FES application). Study by Popovic et al found a decrease of tone in comparison to the control group²³. King found a decrease in wrist flexor tone after FES in wrist extensors compared to stretching of wrist flexors²⁴.

At 4 weeks mean FIM score was 31.1 & statistically significant improvement was found in FIM score (p=0.0005). At 8 weeks mean FIM score was 32.5, was found to be statistically significant (p=0.0152). At 12 weeks (1st follow-up 4 week post

FES) & 24 weeks (2nd follow-up 16 weeks post FES), statistically significant improvement in FIM score was maintained. Chae et al and Francisco et al observed significant motor improvement FES group compared to the control group on Fugl-Meyer test (FM) & FIM Score (self-care component)^{25, 26}. Only 2 participants complained of pain and discomfort initially for few minutes during FES application. One patient complained of Skin redness after FES application. One patient suffered with one episode of vasovagal syncope & recovered and FES was continued. Otherwise no serious complications observed.

Table 2 ARAT score, FIM Score, Spasticity, and Wrist AROM

		Pre-FES		At 4 weeks(12 sessions of FES)		8 week(24 sessions of FES)		12 week(1st follow up post FES)		24 week(2nd follow up post FES)	
		FES	Control	FES	Control	FES	Control	FES	Control	FES	Control
ARAT Score, mean(SD)		9.86 (6.96)	8.46 (3.37)	17.8 (7.57)	8.86 (3.35)	25.06 (9.55)	12.4 (4.27)	25.66 (9.55)	12.8 (4.87)	26.0 (9.39)	12.8 (4.87)
AROM-degrees, mean(SD)		19.66 (9.15)	13.66 (4.41)	25.66 (8.42)	15.0 (4.62)	29.33 (10.49)	19.33 (7.03)	29.66 (10.43)	19.66 (6.6)	30 (10.17)	19.66 (6.6)
Spasticity (On MAS)	1	0	2	0	0	4	0	4	0	1	0
	1+	4	5	4	8	11	8	11	8	4	8
	2	11	8	11	7	0	7	0	7	10	7
FIM(Self-care component) Score, mean(SD)		28.4 (4.20)	25.4 (3.88)	31.13 (3.31)	26.26 (3.45)	32.46 (2.94)	28.66 (4.86)	33.33 (3.01)	28.66 (4.86)	33.33 (2.66)	28.66 (4.86)

Results are mean (SD) unless otherwise stated.

Limitations

There are few studies published on the use of FES for hand functions in stroke patients with flexor synergy of upper limb. In our study, isometric muscle strength of wrist muscles, motor co-ordination, motor dexterity scales were not included these may have some effect on the outcome. There is lack of uniformity in hand function pattern in stroke patients with flexor synergy of upper limb, which can result in variability of data. Studies at Larger level will be required to determine whether FES of upper limb muscles after stroke improved hand function and ADLs.

Conclusions

This study was conducted to find the effectiveness of FES on hand functions during Activity of Daily Livings in patients with CVA with spastic hemiplegics with flexor synergy in upper limb and the following findings were obtained by analyzing the parameters namely ARAT Score, ROM of Active Wrist extension, Spasticity (On MAS Scale), FIM Score (Self-care component). We were unable to find similar studies published in Indian setup.

FES is an important tool for improving the hand functions during ADLs in patients with CVA with spastic hemiplegics with flexor synergy in upper limb. FES in wrist extensors enhances motor functional recovery and decreases upper-extremity disability. This is evident from the results of our study which show that patients had improved hand functions & ADLs with FES application and improvement was maintained 16 weeks after FES application (at 1st & 2nd follow-ups). Effect of FES on spasticity was maintained for 4 weeks after discontinuation of FES. So effect of FES on spasticity was short term.

Conflict of Interest- The author has no potential conflicts of interest to disclose.

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Ethical Clearance- Taken from institutional ethical committee

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A Comparative Study on the Effects of Task Oriented Balance Training Program with or without Altered Sensory Input on Balance and Functional Performance in Older Adults : A Case Control Study

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Abstract

Background and purpose: This study was designed to compare the effectiveness of task oriented balance training program with altered sensory input versus task oriented balance training program without altered sensory input. This helps us to choose a better training program for improving and reducing the risk of fall in elderly population

Subjects: Fourty eight older adults from independent life-care communities, aged 71 to 75 years (X = 79.2, SD = 6.2), participated.

Methods: Patients were divided into group A and group B. Group A received Task oriented balance training program with altered sensory input while the group B receiving task oriented balance training program without altered sensory input. Subjects were then assessed on balance scale – Berg balance scale (BBS) and Functional performance measure – Ten meter walk test (10MWT).

Results: There was a significant improvement in BBS and 10MWT in patients performed Task oriented training program with altered sensory input than the patients performed Task oriented training program without altered sensory input.

Conclusion: Although the obtained results reveal that subjects in both groups were benefitted from balance training interventions with a significant improvement in post intervention balance scores on BBS and functional measure, ie.10 meter walk test, subjects in group A performed better than Group B. The improvement may be as the result of increased use of somatosensory. And this sensory compensation might have improved sensorimotor integration of postural control in the central nervous system, thus serving to activate and coordinate motor processes i.e. action of proper muscle synergies.⁸

Key Words : task oriented balance, older adults, altered sensory, BBS, functional performance scale, 10 meter walk test.

Introduction

Maintenance of posture and ability to move about the environment depends on the orientation and balance.¹ Balance is a complex biologic function

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depend upon the sensory input through visual, tactile, proprioceptive and vestibular systems. Decrements in sensory functions and strength have been reported with the age which in turn frequently causes elderly to seek medical advices and admission to hospital. Poor balance is initially detectable in sixth decade of life rather than exception by one's late eighties.² Balance and mobility disorders are single largest cause of disability in individuals of 60 years or older and is often manifested as falls and fall related injuries.

Effective preventive strategies require a better understanding of the causes of risk factors for falling among elderly persons.³ The etiology of fall is a multifactorial and typically involves a dynamic interaction between intrinsic and extrinsic factors. Intrinsic factors include age and disease related changes within individual that increases chances of falls. (eg. Visual impairments, neurological and musculoskeletal disabilities, dementia etc.) where as extrinsic factors are environmental hazards that produce opportunity for a fall to occur. (eg. slippery surface, loose rugs, poor lighting , low bed , toilet seats.)

Exercise may play an important role in maintaining fitness and stability in older persons and may have special benefits for those at risk of falling.⁵ Exercise intervention in the form of task oriented exercise programs are now recognized as a new strategy to improve functional status of chronic stroke individuals and it was found that adaptations of regular exercises with the use of surface and vision manipulation to challenge balance could improve of somatosensory integration and have a positive effect on postural stability in stroke patients. This type of intervention has further shown to be effective at improving postural stability in neurologically intact elderly people.⁶ But none of the studies have investigated the effect of task oriented balance exercise with or without altered

sensory inputs in elderly people. Keeping this in the view study was designed to see the effects of task oriented balance training program with or without altered sensory input on balance and functional performance in older adults. A second objective was to establish the feasibility of multisensory training in older adults. The effects of task oriented balance training program with or without altered sensory input on balance and functional performance has not been proved early. This helps us to choose a better training program for improving and reducing the risk of fall in elderly population.

Methodology

Research Design

A pre and post test experimental design was used. 48 older adults from Veerapandi village took part in this study. Patients were divided into group A and group B. Group A received Task oriented balance training program with altered sensory input consisted of 11 males and 13 females with a mean age of 71.79 ± 3.91 years while the group B receiving task oriented balance training program without altered sensory input consisted of 3 males and 11 females with a mean age of 71.79 ± 4.00 years. The two groups were comparable with respect to age, height and weight. The subjects were gathered through a geriatric camp organized at the community centre, Veerapandi, Salem through simple convenience sampling of fifty older adults who took part in this study. Subjects who fulfilled the inclusion criteria and were ready to attend the exercise program regularly were only selected.

Criteria for Selection

Inclusion criteria

Subjects who had age 65years or above community dwelling older adults and not institutionalized or hospitalized.

- Mini Mental State Examination (MMSE) scores > 24

- Subjects who were able to walk independently without any assistive devices.

Exclusion criteria

- Subjects who had fallen recently within previous year.

- An acute illness that may interfere with the participation in the study.

- Unable and limiting cardiac diseases.

- History of cardiac surgery, neurological diseases with residual impairments, orthopaedic illness, or dizziness.

- Subjects who had uncorrected hearing or visual impairment

- Subjects who were not receiving physical therapy or any exercise program.

SAMPLE SIZE AND METHOD OF SELECTION

48 communities dwelling older adults were selected from the population who gathered through a geriatric camp organized in Veerapandi, Salem using simple convenient sampling and were divided into two equal groups randomly.

Variables

Independent variables

- Task oriented balance training program with altered sensory output.

- Task oriented balance training program without altered sensory input.

Dependent variable

- Balance

- Functional performance

VALIDITY AND RELIABILITY OF THE TOOL USED

Berg Balance Scale and Ten meter walk test are valid and reliable tools for assessing balance and functional performance respectively.

Setting

The study was conducted in community centre, Veerapandi, Salem.

A pre and post test experimental design was used. The subjects were invited to participate in the study and were then randomly assigned to one of the two groups. A detailed explanation of the procedure was given after which subjects signed the informed consent. Subjects were then assessed on one balance scale – Berg balance scale (BBS) and one Functional performance measure – Ten meter walk test (10MWT).

Group A performed exercise 1-5 normal conditions, ie; eyes open and hard regular surface. As a part of multisensory training, group A performed exercise under the following conditions.

- Eyes open, firm surface
- Eyes open, soft surface
- Eyes closed , firm surface
- Eyes closed ,soft surface

The soft surface condition was performed with subjects standing on a 50cm X 62cm foam mat (2.5 cm thick) the number of repetitions given were 2-3 sets of 8-10 repetitions.

Group B performed all of the exercises such as stepping up and down , stepping backwards and sideways, stepping over blocks of various heights in normal conditions, ie, eyes open and hard regular

surface.

Finally both groups of subjects completed their sessions with a 10minute cool down period, where flexibility and range of motion exercise were performed. These exercises focused on major muscle groups involved during the protocol (quadriceps, hamstrings, core muscles, upper back muscles, and neck muscles.) after an intervention of three weeks with five sessions per week, the subjects were again assessed on above mentioned scales. The data were tabulated and analyzed using appropriate statistical tools.

Statistical Analysis

The collected data were subjected to statistical analysis using paired ‘t’ test to compare the difference of pre-session scores and post session scores within a single group. A significance level of $p < 0.05$ was fixed. A student’s t-test was used to compare the

performance of subjects of Group A and Group B on BBS for balance and 10 meter walking test for functional performance.

Results

- There was a significant improvement in BBS and 10MWT in patients performed Task oriented training program with altered sensory input.
- There was a significant improvement in BBS and 10 MWT in patients performed Task oriented balance training program without altered sensory input.
- When both group were compared, it was found that patient performed Task oriented balance training program with altered sensory input were significantly better than patients performed Task oriented balance training program without altered sensory input in terms of BBS and 10MWT.

Table – 1.1: Group A- Task oriented balance training program with altered sensory input

Sl. No.	Variable	‘t’ cal Value	‘t’ Tab Value
1	Berg Balance Score	31.74	2.262
2	10 meter walk test	27.14	

Table – 1.2: Group B – Task oriented balance training program without altered sensory input.

Sl No.	Variable	‘t’ cal value	‘t’Tab Value
1	Berg Balance Score	8.29	2.262
2	10 meter walk test	12.64	

Table – 1.3: Independent ‘t’ test

Sl.No.	Variable	‘t’ cal value	‘t’ Tab value
1	Berg Balance Score	9.62	2.262
2	10 meter walk test	11.82	

Discussion

This study was designed to compare the effectiveness of task oriented balance training program with altered sensory input versus task oriented balance training program without altered sensory input. The results obtained reveal that subjects in both groups benefitted from balance training interventions with a significant improvement in post intervention balance scores on BBS, on modified clinical sensory interaction for balance and functional measure, ie.10 meter walk test. Although post intervention scores were highly significant in both the groups, subjects in group A performed better than Group B.

In Group A, multisensory training was incorporated along with task oriented training program. As a part of multisensory training program, exercises performed were based on manipulation of sensory input from visual i.e. closing the eyes and somatosensory i.e. standing on foam surface as well as manipulation of musculoskeletal system i.e. standing on one leg a tandem stance for 10 seconds.⁷ The improvement may be the result of increased use of somatosensory, visual and vestibular information when performing exercises in sensory deprivation conditions. The sensory compensation might have improved sensorimotor integration of postural control in the central nervous system, thus serving to activate and coordinate motor processes i.e. action of proper muscle synergies.⁸

Previous studies by Hu and Woolacott (1994), Bonan et al (2004) using a static standing balance protocol involving sensory manipulation of visual, vestibular and somatosensory system ,reported important changes in the muscles and movement characteristics of postural responses after 10 hours of training in healthy older adults.⁹

This model suggests that training programs should be customized to the needs of individual, and a specific target physiological system should be identified for training to be effective. So addition of multi- sensory training would have led to more improvements in post intervention balance scores in group A than group B.

Conclusion

This study thus concludes that though both task oriented balance training program with altered sensory input and task oriented balance training program without altered sensory input show significant improvement on balance outcome scale and functional performance measure, the subjects participated in task oriented training program with altered sensory input showed a significantly better improvement in balance and functional performance when compared to patients performed task oriented balance training program without altered input.

Conflict of Interest : Nil

Ethical Clearance : Obtained from Vinayaka Mission College of Physiotherapy.

Source of Funding : Nil

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A Comparative Study of Incidence of Musculoskeletal Injuries in Amateur and Professional Boxers

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Abstract

Boxing is the physical skill of fighting with fists. Boxing involves fusion of coordinated fast paced movements of hands and feet, dodging skill, muscular strength and high aerobic capacity. Boxing is similar to other physical activities in that there is a presumed risk of injury through participation. Previous literature suggests that 27.1-93.4 % of injuries involve the head in which most injuries are minor, with lacerations and contusions being most common. In the opinion of the authors that head and hand/wrist related injuries should be considered an inherent risk to boxing, caused by impact and equipment related factors. Thus, the present study focuses on injuries in boxers during training sessions.

Keywords: Boxers, Amature, Professional, Injuries.

Introduction

Boxing is the physical skill of fighting with fists. It is believed to have originated as a sport around 800BC³, with the first historical reference being an account from the 23rd Ancient Olympic Games in 688BC⁵. The modern day sport has developed from rules and standards established since this time. Boxing involves fusion of co-ordinated fast paced movements of hands and feet, dodging skill, muscular strength and high aerobic capacity.

Boxing has two participation forms: Professional & Amateur. Each has its own rules, and analysis of

the injuries in each is important, as different injury patterns may exist¹. For both forms of boxing, a win is achieved by scoring more points than an opponent by delivering more blows to the designated scoring regions of the body (trunk and head), or by an opponent being unable to complete a bout⁷. Boxing is similar to other physical activities in that there is a presumed risk of injury through participation.

Previous literature suggests that 27.1-93.4 % of injuries involve the head in which most injuries are minor, with lacerations and contusions being most common. There is paucity of literature about risk factors associated with the development of injuries in either professional or amateur boxers. Scientific data is limited due the fact that most studies have used retired participants rather than currently participating boxers as well as amateur competitors.

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Despite the knowledge that injuries during training can occur to boxers, there is a paucity of data pertaining to injuries sustained during these times.¹⁴ There is a paucity of data pertaining to injuries sustained during these times. This is especially so for sparring, with only one study published so far^{10, 11, and 13}.

“Shoulder” injuries make up between 7.1% to 27.5% of the total injuries suffered by boxers (Jordan, et al., 1990; Potter, et al., 2011; Welch, et al., 1986). The majority of injuries reported were to the head or hand/wrist area of participants. In the opinion of the authors that head and hand/wrist related injuries should be considered an inherent risk to boxing, caused by impact and equipment related factors (Murphy & Sheard, 2006). These factors would most effectively be addressed through rule or equipment changes (alteration in glove size, usage of head gear, reduced scoring of head shots, and hand wrapping strategies). When excluding these impacts related issues, the primary injury site to boxers while training is the “shoulder”.¹⁷

Therefore we aim to find a comparison between incidence of musculoskeletal injuries in Amateur and Professional boxers.

Need of the Study

Boxing is a contact sport. Most of the study focuses on injuries in boxers during competition. There are very few studies done on injuries in boxers during training sessions. Hence the need of study arises.

Aim & Objective

Aim:

- To find comparison between incidence of musculoskeletal injuries in Amateur and Professional boxers.

Objectives:

- To find the incidence of musculoskeletal injuries in Amateur boxers.
- To find the incidence of musculoskeletal injuries in Professional boxers.
- To find the comparison between incidence of injuries in Amateur and Professional boxers.

Review of Literature

1. Porter M, Clin. J sport Med. 1996 Apr; 6 (2): 97- 101. studied the incidence and severity of injuries resulting from amateur boxing in Ireland. A prospective five month survey of injuries which occurred during competitive amateur boxing and training. The incidence of injuries in competition was 0.92 injuries per mean- hour of play (0.7 injuries per boxer per year), while the incidence in training was 0.69 injuries per boxer per year. Cerebral injuries were reported only in competition. Hand, wrist and facial injuries were related to direct impact and occurred more frequently in competition than training.

2. T Zazryn: A prospective cohort study of injury in amateur and professional boxing states that British journal of sports medicine was carried out over 2004-05 in 35 amateur and 14 professional boxers which resulted 21 injuries (71% of head, 2.0 injuries/ 1000 hours of boxing) was calculated. The study concluded that the high exposure experienced by the boxers indicated that boxing has acute injury rates comparable to, after lower than, those found in other contact sports. Further, acute injuries during training appear to be less common and severe than those sustained in bouts.

3. Feehan LM, et al., J Hand Surg Am. 2006 Sep: 31 (7) : 1068-74 : A population based study done on incidence and demographics of hand fractures in British Columbai, Canada states that a

total of 72,481 hand fractures were identified. 50% were phalangeal fractures, 42% were metacarpal fractures and 8% were multiple fractures. This study provides a robust projection of annual incidence rates for hand fractures because they were able to review all occurrences of a hand fracture within a population base of approximately 4 million people over a 5-year period.

Methodology

- **STUDY DESIGN:** Observational
- **SAMPLING TECHNIQUE:** - Convenient sampling.
- **SAMPLE SIZE:** 26

The registered 13 participants were taken for the study and 13 amateur participants were taken from the gymkhana.

- **INCLUSION CRITERIA:**
 - a. Amateur and Professional boxers.
 - b. Male and female boxers.
- **EXCLUSION CRITERIA:**
 - a. Any neurological condition present.
 - b. Congenital malformations/conditions.

- **MATERIALS USED:**

- 1) DURATION OF PRACTICE SESSION.

- a. Pen
- b. Questionnaire

Procedure

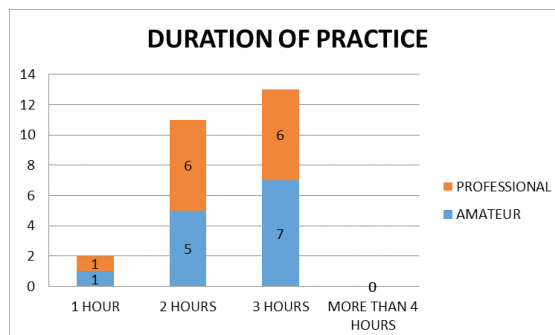
Ethical Approval: The study commenced after approval from the ethical committee.

Participants: - The participants were recruited from gymkhana based on inclusion and exclusion criteria. Before enrolling the participants for the study, purpose of the study was explained to each participant and an verbal consent was taken from the participants. Each participant was interviewed personally and a questionnaire was given to them to fill it to avoid any bias and interference from other participants and peers. At the end of study, the data was collected, coded and tabulated using descriptive and inferential statistics. All analysis was done using SPSS for windows.

Observation and Results

For the study we have taken a study sample of 26 boxers out of which 13 were professionals and 13 were amateur boxers.

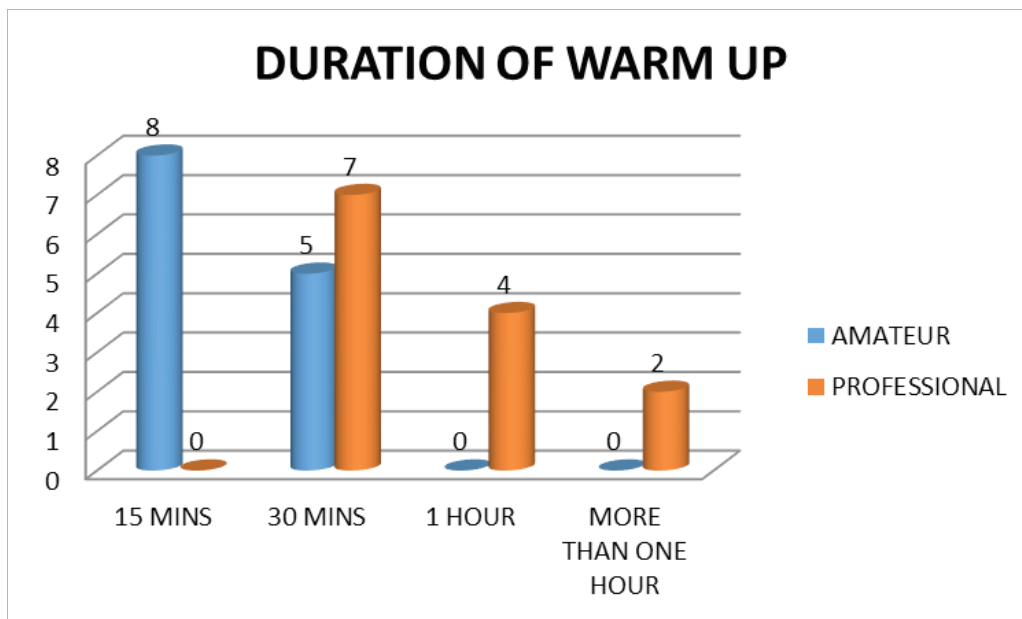
In years of practicing amateur and professional boxers we found out that years of practice for Amateur boxers ranges from 2-3 years whereas for Professional boxers 90% were of 5 years and 10% consisted of 4 years.



GRAPH 1:

The above graph shows the duration of practice of professional and amateur boxers.

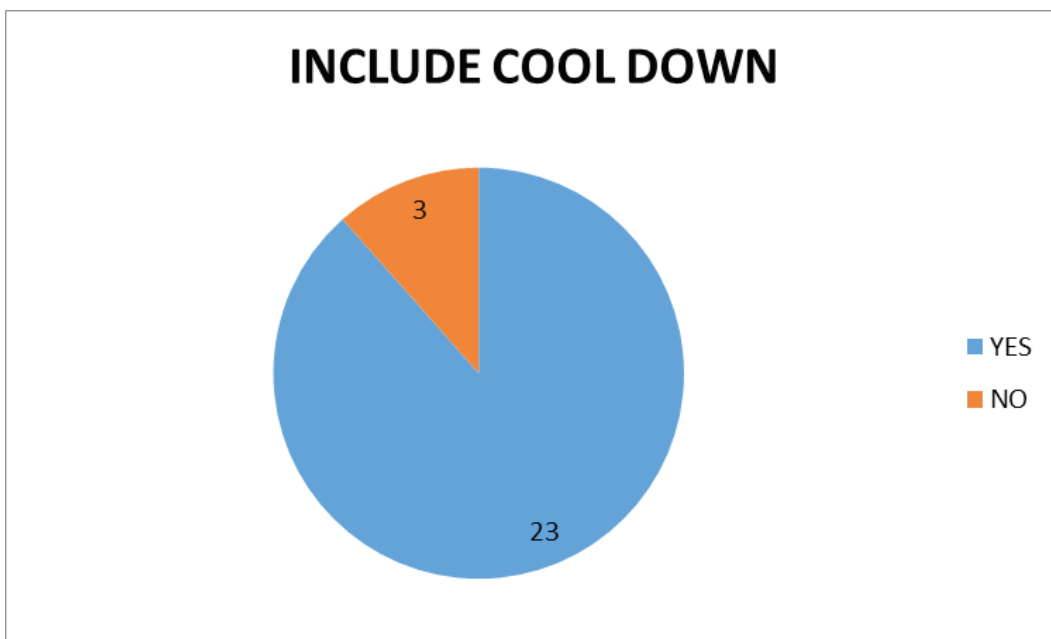
2) DURATION OF WARM UP SESSION.



GRAPH 2:

The above graph shows the duration of warm up performed by amateur and professional boxers. Amateur boxers did warmup for 15-20 mins whereas Professional boxers did warmup ranging from 15mins to 1 hour.

3) DOES IT INCLUDE COOL DOWN SESSION AFTER TRAINING?

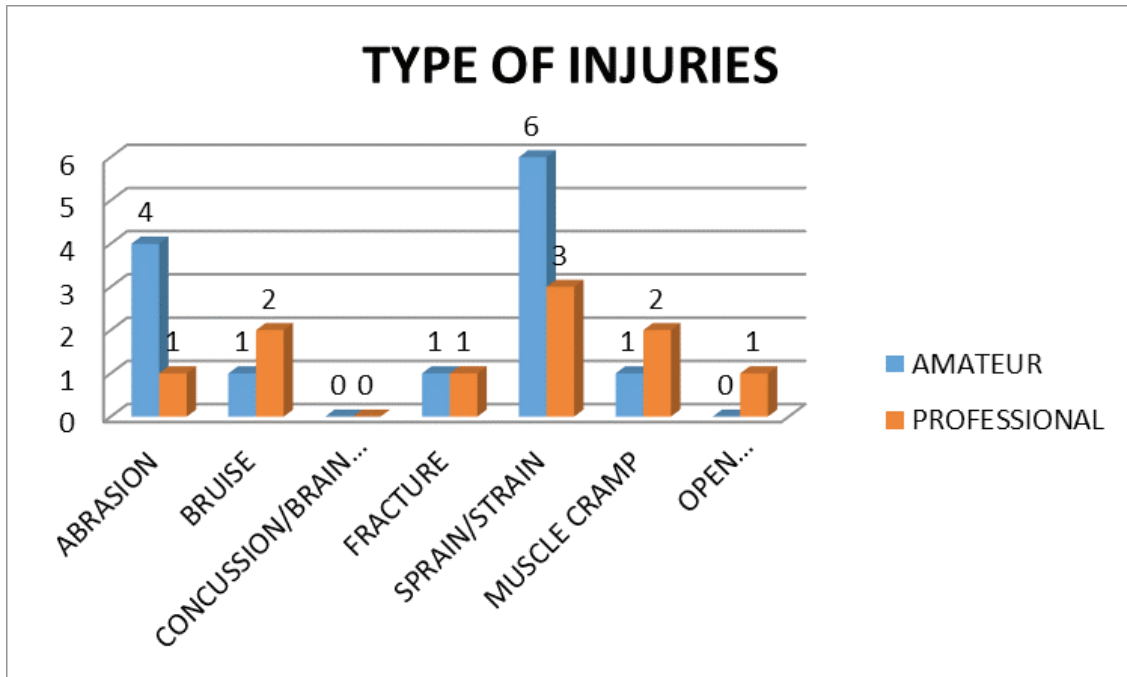


GRAPH 3:

The above pie chart depicts that 88.46% of boxers included cool down session while

11.53% of boxers did not.

4) WHAT ARE THE TYPE OF INJURIES SUFFERED BY THE BOXERS?



GRAPH 4:

The above graph shows types of injuries in amateur and professional boxers.

Discussion

Amature boxers suffered more injuries as compared to professional boxers in the form of shoulder injuries, forearm, hand and neck injuries possible reasons for their injuries could be insufficient training, lack of knowledge of injury prevention.

Shoulder injuries were common. Upper Limb injuries accounted for 48.27 % of all injuries. Due to the specific movements that boxing requires, one of the most common areas that become more susceptible to injury or overuse are the shoulder muscles. Since most of the warm up session includes circuit training, less emphasis is given in strengthening of the shoulder girdle muscles and posture correction.

In our study there were 50% amateur and 50% professional boxers.

Years of practice for amateur boxers ranged from 2-3 years whereas for professional boxers it was more than 4 years.

Both amateur and professional boxers did adequate warmup before the practice session.

Duration of warm up for amateur boxers was between 15-30 minutes whereas for professional boxers it was more than 30 minutes.

The type of warm up included circuit training, get up and start jumping rope and shadow boxing which was followed by adequate cool down sessions.

Amateur boxing suffered injuries more over shoulder, hand, neck in the form of sprain and abrasions out of which 61.53% had injuries during training session and 23.07% had injuries during

both competition and training; whereas professional boxers had 53.84% injuries during training session and 15.38% injuries during competition.

Boxing and shoulder injuries by Renaldo Dixon may 05, 2014 states the repetitive punches that a boxer throws during training sessions can lead to injuries of the shoulder involving muscles, ligaments and tendons.

53.84% boxers used protective gear sometimes and 46.15% used them always for their training session.

Protective gear were in the form of mouth guard, head gear, taping, ankle brace and others which included centre guard.

James Skitt (24.01.12) stated that competition rules limit the amount of bandaging allowed and ban the use of tape, but in the squads training environment Gatt has introduced a new technique that includes wrapping foam around the knuckles and using tape to support the wrist and thumb, whilst insisting that athlete wear minimum 14 oz gloves for gym work and sparring.

76.92% Boxers had awareness regarding physiotherapy treatment given to them during training and post injury.

Doug word stated that boxers are especially susceptible to shoulder injuries because they are a primary focal point when delivering punches, blocking punches and keeping your hands up. In order to strengthen these muscles and protect the boxer's shoulder from injury, there are few exercises and approaches which should be worked upon in training sessions.

Conclusion

From the study, it is concluded that incidence of

musculoskeletal injuries in boxers were found to be 62.06% in amateur boxers and 37.93% in professional boxers.

Upper limb injuries were found to be most affected (48.27%) with shoulder joints involved in 42.85 % of boxers.

Further Scope of Study

- Study can be carried out in large sample size.
- Clinical evaluation can be done and interventions can be given according to the type of injury.
- To find out methods to prevent the musculoskeletal injuries in boxers.

Limitations

- Small sample size (especially female boxers)
- No clinical evaluation was done.
- No clinical assessment was done

Source of Funding- The study is Self funded.

Conflict of Interest - Nil.

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Association of Musculoskeletal Pain and Psychological Stress with the use of Personal Electronic Devices among College Going Students – A Virtual Cross-sectional Study

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Abstract

Background: Computer use is associated with increased risk for musculoskeletal disorders due to adopted static postures and highly repetitive hand motions. At colleges, students use computers, mobile phones, laptop or tablet for communication, learning and entertainment. Social isolation, loneliness, physical inactivity or sedentary lifestyle are individual entities. Owing to the present situation, where the public interaction is restricted, the above factors can interfere in mental health status as well as on musculoskeletal system of the students. So, the aim was to study the association of musculoskeletal pain and psychological stress with the use of personal electronic devices among college going students.

Method: An online short form questionnaire was prepared using Google forms which consisted of survey related questions from Nordic Musculoskeletal Questionnaire and Perceived Stress Scale. Total 100 college going students were recruited as per selection criteria and online form was distributed amongst them. Data analysis by chi-square test showed significant association of musculoskeletal pain ($P < 0.05$) but no association of psychological stress ($P > 0.05$) with the use of personal electronic devices among college going students.

Conclusion: Musculoskeletal pain was commonly associated with the use of personal electronic devices rather than psychological stress among college going students.

Keywords: Nordic Musculoskeletal Questionnaire, Perceived Stress Scale

Introduction

Computer use for prolonged time would contribute to increased risk for musculoskeletal

disorders (MSD).^{1,2} These disorders include neck pain, shoulder strain, forearm tenosynovitis, carpal tunnel syndrome and deQuervain's syndrome.³ For mobile phone use, excessive neck flexion posture and thumb joint strain have been reported to be significant factor for musculoskeletal disorders and these studies were based on conventional keypad phones.^{4,5} So far, only few of exploratory studies have examined the physical demands in using multi-touch devices⁶⁻⁹, reporting on the neck and upper limb posture as

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well as muscle activity in using smart phone devices. These are mainly based on standardized tasks of short durations from 1 to 10 minutes in either sitting or standing positions. A recent systemic review has reported that there is some evidence for the factors of neck flexion, frequency of phone calls, texting and gaming contributing to musculoskeletal complaints among mobile phone users.¹⁰

Healthcare practitioners like nurses, dentists and physical therapists have been identified at risk for development of Work Related Musculoskeletal Disorders (WRMD) due to risk factors like heavy physical work, repeated lifting & handling of loads, overstrained and awkward posture in the form of bending & twisting, repetitiveness of different joint movements, use of high frequency vibration tools, psychological stress and prolonged stationary body position.¹¹⁻¹⁶

Musculoskeletal disorders include a wide range of inflammatory and degenerative conditions affecting muscles, tendons, ligaments, joints, peripheral nerves and blood vessels.¹⁷ These disorders are associated with high social and economic costs,¹⁸ ultimately affecting the quality of life.^{17,19}

Nordic Musculoskeletal Questionnaire (NMQ): The NMQ can be used as a questionnaire or as a structured interview. However, significantly higher frequencies of musculoskeletal issues were reported when the questionnaire was administered as a part of a focused study on musculoskeletal issues and work factors than when administered as a part of a periodic general healthy examination.²⁰

Section 1: a general questionnaire of 40 items identifying areas of body causing musculoskeletal problems. Completion is reinforced by a body map to indicate nine symptom sites being neck, shoulders, upper back, elbows, low back, wrist/hands, hips/

thighs, knees and ankles/feet. Participants are asked if they had any musculoskeletal issue in the last 12 months and last 7 days which has restricted their normal activity.

Section 2: additional questions relating to a neck, the shoulders and the lower back relevant issues. 25 questions elicit any accidents affecting each area, functional effect at home and work (change of job or duties), duration of the problem assessment by a healthcare practitioner and musculoskeletal problems in the last 7 days.

Perceived Stress Scale (PSS): PSS is the most widely utilized psychological instrument for measurement of perception of stress. It is a measure of the degree to which situation in one's life are considered as stressful. Items are designed to highlight how unpredictable, uncontrollable and overloaded participants find their lives. The scale also includes a count of direct queries about current levels of experienced stress. The items are easy to comprehend and the response alternatives are simple to grasp. The questions in the PSS ask about emotions and thoughts during the last month. In each case, participants are asked how often they felt a certain way.^{21,22}

Materials and Method

Study Design: A Virtual Cross-Sectional study

Study Population: College going students

Study Setting: Physiotherapy Colleges in Vadodara

Sampling Design: Convenience sampling method

Sample size: 100 students

Inclusion criteria:

- Age group: 18 to 24 years
- Gender: Both male and female

- Students showing signs of musculoskeletal pain as well as psychological stress.

- Students who are able to comprehend commands.

- Willingness to participate in the study.

Exclusion criteria:

- Students suffering from chronic disease affecting the musculoskeletal system such as rheumatoid arthritis, osteoarthritis and other connective tissue disorders.

- Any previous trauma or surgery or infection anywhere in the body.

- Students who are not physically fit during the time of data collection.

- Students suffering from major psychological ailments like schizophrenia, dementia etc.

Materials used:

- Google Survey Form

- Nordic Musculoskeletal Questionnaire (NMQ)

- Perceived Stress Scale (PSS)

Outcome Measures:

1) Nordic Musculoskeletal Questionnaire (NMQ)

- NMQ was established from a project funded by the Nordic Council of Ministers.

- The NMQ can be utilized as a questionnaire or as a structured interview.

- Advantages:

- a) Standardization of the questions

- b) Worldwide recognition

- c) Used free of charge

- d) Possibility of self-evaluation

- e) Relatively quick identification of the symptoms

- f) Applicability in large populations

- Limitations:

- a) Obligatory answering of the questions

- b) Difficulty in determining the truthfulness of the responses

- c) Encounter problem of application in countries that do not speak english (for errors in translation, interpretation and/or validation)

- d) Restriction of questions to three areas of the body (lower back, neck and shoulders)

- e) Identification only of the symptoms

- f) Complex data analysis for large populations

- g) Different aspects of responses depending on the technician administering the questionnaire

2) Perceived Stress Scale (PSS)

- PSS is the most widely utilized psychological instrument for measurement of perception of stress.

- It is a measure of the degree to which situations in one's life are considered as stressful.

- Items were designed to tap how unpredictable, uncontrollable and overloaded participants find their lives.

- The scale also includes a count of direct queries about current levels of experienced stress.

- The items are easy to comprehend and the response alternatives are simple to grasp.

The questions in the PSS ask about emotions and thoughts during the last month.

Scoring: PSS scores are obtained by responses (e.g. 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7 & 8) and then summing across all scale items.

Individual scores on PSS can range from 0-40 with higher scores indicating higher level of perceived stress:

a) Scores ranging from 0-13 will be considered low stress

b) Scores ranging from 14-26 will be considered moderate stress

c) Scores ranging from 27-40 will be considered high perceived stress

A short form questionnaire was prepared using online portal named Google forms which consisted of survey related questions from Nordic Musculoskeletal

Questionnaire (NMQ) and Perceived Stress Scale (PSS). The following link was created using the Google form : <https://forms.gle/Cr4HfrZk3b4hEeUG6>. Total 100 college going students (age between 18-24) were selected (convenience sampling) on the basis of inclusion and exclusion criteria from Physiotherapy Colleges in Vadodara. After taking virtual informed consent from the students, study was executed. The online link for Google form was distributed amongst the students selected for this study and the responses were recorded in the Microsoft excel sheet for further data analysis.

Results and Discussion

Ø Data was analysed by SPSS software version 20.0 and Microsoft Excel 2010. Prior to the statistical test, data was screened for normal distribution by Shapiro-Wilk test. After normal distribution of the data, Chi-square test (non-parametric test) was applied at 0.05 level of significance with 95% of confidence interval.

Table 1. Correlation of musculoskeletal pain with the use of personal electronic devices

Use of Electronic Devices	No. of Regions (Musculoskeletal Pain)			Chi-square value	Degrees of freedom (df)	P value
	(1)	(2)	(3)			
Laptops	2 1.43 0.227203	2 1.64 0.079024	0 0.92 0.92	59.35	14	0.005
Laptops, Tablets	1 0.35 1.207143	0 0.41 0.41	0 0.23 0.23			
Smartphones	44 30.15 6.362272	28 34.6 1.211016	12 19.38 2.810341			
Smartphones, Laptops	5 9.33 2.009528	18 10.66 5.053996	3 6 1.5			
Smartphones, Laptops, Tablets	0 1.43 1.43	4 1.64 3.396098	0 0.92 0.92			
Smartphones, Laptops, Tablets, Television	0 1.07 1.07	0 1.23 1.23	3 0.69 7.733478			
Smartphones, Laptops, Television	1 6.82 4.966628	6 7.79 0.411309	12 4.38 13.25671			
Smartphones, Television	3 5.38 1.052862	6 6.15 0.003659	6 3.46 1.864624			

Table 2. Correlation of psychological stress with the use of personal electronic devices

Use of Electronic Devices	Perceived Stress Scale Interpretation			Chi-square value	Degrees of freedom (df)	P value
	Low	Moderate	High			
Laptops	0 0.24 0.24	1 0.6 0.266667	2 2.16 0.011852	7.05	14	0.99
Laptops, Tablets	0 0.08 0.08	0 0.2 0.2	1 0.72 0.108889			
Smartphones	5 4.96 0.000323	14 12.4 0.206452	43 44.64 0.060251			
Smartphones, Laptops	2 1.2 0.533333	4 3 0.333333	9 10.8 0.3			
Smartphones, Laptops, Tablets	0 0.16 0.16	0 0.4 0.4	2 1.44 0.217778			
Smartphones, Laptops, Tablets, Television	0 0.08 0.08	0 0.2 0.2	1 0.72 0.108889			
Smartphones, Laptops, Television	1 0.64 0.2025	1 1.6 0.225	6 5.76 0.01			
Smartphones, Television	0 0.64 0.64	0 1.6 1.6	8 5.76 0.871111			

Here, Chi-square (non-parametric) test showed significant association of musculoskeletal pain ($\chi^2= 59.35$, $df=14$, $P< 0.05$) but no association of psychological stress ($\chi^2= 7.05$, $df=14$, $P> 0.05$) with the use of personal electronic devices among college going students.

In this study, a short form questionnaire was prepared using online portal named Google form which consisted of survey related questions from

Nordic Musculoskeletal Questionnaire (NMQ) and Perceived Stress Scale (PSS).

The results of this study (using non-parametric tests) showed that there was significant association of musculoskeletal pain with the use of personal electronic devices as measured by Nordic Musculoskeletal Questionnaire (NMQ) but there was no association of psychological stress with the use of personal electronic devices as measured by Perceived

Stress Scale (PSS).

Conclusion

The results of this study supported the alternative hypothesis (H_A) and indicated that there was significant association of musculoskeletal pain with the use of personal electronic devices as measured by Nordic Musculoskeletal Questionnaire (NMQ). The findings also supported the null hypothesis (H_0) and showed that there was no association of psychological stress with the use of personal electronic devices as measured by Perceived Stress Scale (PSS). So, this study concluded that musculoskeletal pain was commonly associated with the use of personal electronic devices rather than psychological stress among college going students.

Limitations

· Due to pandemic situation, this study was conducted virtually rather than physically by preparing a short form questionnaire using online portal named Google forms.

· The present study only examined a total of 100 college going students using a convenience sampling method and this sample size is not sufficient for identifying a significant relationship between musculoskeletal pain and use of personal electronic device.

Ethical Clearance – Ethical clearance was obtained from The Institutional Review Board from Pioneer Physiotherapy College, Vadodara.

Source of Funding – Self

Conflict of interest – Nil

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