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CONTENTS

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Original Short theoretical article

Post-COVID-19 Chronic Fatigue and the Role of Energy Conservation and work Simplification Techniques: An Occupational Therapy Approach

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Abstract

The world is suffering from the COVID-19 pandemic, and all health care professionals are engaged in basic life-saving measures. There is also an immense need for post COVID requirements, which is unseen for this moment urgency. There are different symptoms seen in post-COVID discharge patients which can be managed efficiently. One of the most common symptoms is fatigue. This is a time for a collaborative and interdisciplinary approach and to deal with the issue holistically. There is energy conservation, work simplification, assistive and adaptive technologies that can increase the quality of life of post-discharge COVID patients. This paper aims to refocus on these methods and help them attain a better life.

Keywords*: COVID-19, Occupational therapy, Energy conservation technique, Activities of daily living, rehabilitation.*

Introduction

The world suffered the most cataclysmal experience in 2020 due to the Coronavirus disease (COVID-19) pandemic caused by SARS-CoV-2 infection[1]. COVID-19is a devastating and life-threatening disease declared a pandemic by WHO on March 11, 2020[2]. India confirmed its first case on January 30, 2020[3].According to WHO, globally, until September, there have been 230,418,451 confirmed cases of COVID-19, India has 33,594,803 confirmed cases[4].

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The clinical course of COVID-19 has been incompletely described. Due to its relapsing/remitting nature, the symptoms have been divided into infection related-symptoms (up to 4–5 weeks), acute post-COVID-19 symptoms (from week 5 to week 12), long post-COVID symptoms (from week 12 to week 24), and persistent post-COVID-19 symptoms (lasting more than 24 weeks)[1]. COVID-19 affects people in varied ways with mild to moderate illness. The most common symptoms are fever, dry cough, tiredness. Less common symptoms are aches and pains, sore throat, diarrhea, conjunctivitis, headache, rash on the skin, and loss of taste and smell. Severe symptoms are difficulty breathing or shortness of breath, chest pain or pressure, loss of speech or movement[1,5]. There is literature on post-COVID-19 symptoms and vary from those hospitalized, between symptomatic and asymptomatic, or those who experienced severe health issues with those who recovered at home.

However, all have post-COVID-19 symptoms like brain fog, dizziness, loss of attention, confusion, vomiting, cognitive slowing, cough, throat pain, myalgia, arthralgia, fatigue, dyspnea, etc.[1,6].

Among these post-COVID-19 symptoms, weakness and chronic fatigue persist for an extended period for patients recovered from COVID-19[7,8]. Weakness and fatigue affect a person's health and overall functioning, making them feel disabled both emotionally and cognitivelywhen it lasts for long. It requires regular monitoring and intervention[7,9]. Augment with medical treatment, energy conservation techniques(ECTs) can effectively deal with fatigue and tiredness, making people more independent in daily activities. Occupational Therapy can make life simpler in day-to-day activities and more accessible with the help of non-pharmacological interventions like ECTs. ECTs are how we adapt our daily activities to minimize fatigue. This sequential way can save energy.

Everything we do from morning (waking up from bed) till night is classified as activities, and if we manage these activities efficiently, we can be less tired and do all our work. The aim is to improve quality of life by conserving energy for essential activities and mandatory activities in a typical day.

Simple energy conservation strategies include analyzing our daily work, home, and leisure activities. Then the activities can be modified to minimize energy spent, balance work and rest, list priorities within activities, use the body efficiently, organize workplaces, and use external devices like assistive devices[9].

Energy conservation techniques, work simplification techniques, assistive and adaptive devices.

Energy conservation strategies that can be used which are applied in other chronic conditions where fatigue is also a common problem,

1. Planning a day activity to avoid unnecessary addition of activities and to balance between rest and work. Prioritize the daily routine activities.

2. Planning the activities helps avoid an unnecessary visit to the same place repeatedly, for instance going to the storeroom three times a day for different products required in a day.

3. Planning the daily activities by alternating heavy and light tasks.

4. Categorizing activities to essential, nonessential, and can be delayed actions.

5. Setting in a day realistic and achievable goal in the form of an activities checklist for a day.

6. Gathering things required for a task like cooking, we should have the necessary list of things like oil, veggies, water, spices, etc. so that the person doesn't have to reach out for something frequently.

7. Organize the kitchen or workplace so that the things required infrequently are nearby in our reach to avoid frequent bending or reaching.

8. Take rest breaks in a day when needed before getting tired, after finishing an activity, and before starting a new one.

9. Delegating tasks to others can be partial or whole.

10. Using stool wherever canbe, proper body mechanics and compensatory techniques are as follows (adapted from Velloso et al. 2006[10]).

a) Changing body positions for specific activities like personal hygiene. For example, these activities are carried out in sequence: washing and drying face, combing hair, brushing teeth. These activities are generally performed in a standing position and

unsupported arms. These can be implemented by sitting on a chair in front of the sink with a backrest and arms resting on its edge. A mirror can be lowered down for the person.

b) Similarly, bathing is a long and exhausting task that can be modified by sitting on a stool or chair with back support.

c) A raised toilet can be used for toileting.

d) For putting on and taking off shoes, usually, the patient sits on a chair with a forward bending posture and then picks up shoes from the floor and puts them on, one at a time, remaining bent forward while performing the whole sequence of the activity. All the shoes had laces. This activity can be modified to sitting on the same chair and putting the respective foot into the respective shoe. Then, the person flexes the hip joint and knee, cross one leg over the other, and secures the shoe on foot without bending forward during the activity[10].

e) Storing food bags of 1 kg on high shelves, this activity can be delegated to some other person. If the person stays alone, we must educate them on the importance of placing the bag on shelves located at shoulder level rather than above the head, where a lot of energy is required.

f) Storing food bags of less weight in shelves on shelves located below the pelvis. The person has to bend forward to keep below the pelvis. Alternatively, it can be stored on shelves located at pelvis level so that the person does not have to lean forward for the action.

11. Keeping arms close to our bodies while carrying objects and dividing the load between both arms can conserve energy.

12. Using a small trolley to transport things.

13. All cooking utensils can be lightweight to avoid spending a lot of energy.

14. Sitting down in activities like dressing, cooking, etc., to avoid standing for a long time.

15. Supporting elbows and forearms on a firm surface while doing household chores like cutting or peeling vegetables.

16. Temporary rails can be attached to a wall for supported standing or while toileting.

17. Changing the location of types of equipment and supplies.

18. Eliminating part of an activity to make the movement easier.

19. Identifying and changing incorrect work heights.

20. Changing the time of the activity in a day, like cooking in the afternoon in summer, requires energy. Instead, we can change the time for energy to conserve.

21. Everyone must be taught to listen to the body as they can only say the breaking point. Or the time the body is completely exhausted.

22. By using adaptive and assistive or devices like Reacher so that the person does not have to stand up for small things, walkers, canes, crutches, sock aid, dressing stick, lightweight splints, using key extenders for easy grip, jar openers, cardholders who like to play cards always, book holder, large diameter and textured pen or pencil reduces overuse and can lessen fatigue.

Conclusion

Post COVID rehabilitation is essential for complete recovery and increasing independence in day-to-day activities[11]. These strategies can be challenging initially as the person has to implement them in his daily life. According to the health behaviour model,

long-standing behaviours are ingrained and difficult to change[9]. Therefore, a successful energy conservation program should be based on less theoretical and more practical. Barriers to using ECTs and assistive devices can be lack of awareness, lack of service availability, products specific to the requirements, and financial barriers. The program for each patient has to be tailor-made and particular to the patient's needs[11,12]. These can be implemented by making the products available, increasing accessibility and quality for whoever needs them, decreasing the price so that everyone can afford them. Last but not least, the essential part is acceptability, the most challenging part.

Ethical Clearance: This research did not required an ethics clearance, as this work did not use data collected from human participants.

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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 $p\leq0.05$, $\rho=0.281$. 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.

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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 effect [2] Body image dissatisfaction can be defined as the negative attitude towards one's own body ensuing from a perceived discrepancy between the actual body image and the ideal body image [3] It tends to differ from person to person. An obese woman could perceive herself as obese and make attempts to lose weight or she could perceive herself as normal and make no changes in her diet and routine.

A key to health and weight management is correct self-weight perception and body satisfaction. [4] According to a study, university students are more concerned about body image. [5] It is usually over or underestimated due to various factors like social pressure, peer pressure, etc. Exploring an individual's perception of his/her weight status and relating that perception to his/her real body weight can help in determining unrealistic views on body image. [4]

University students particularly medical students are at a risk for weight gain because of changed lifestyle and eating habits. [6]

Physiotherapy students are expected to have a good knowledge about physical activity and related health benefits. They can be considered as health advocates to promote and prescribe exercise to patients and the general public. [7] Therefore physiotherapy students were chosen for the study.

Study done by Hadia Radwan *et al* [4] on 308 university students between the age of 18-25 year-old showed that majority of the participants (81%) were dissatisfied with their body image. Females desired to lose weight and preferred diet to exercise, while males desired to gain weight and preferred exercise to diet. There was a strong correlation (r^2 = 0.84, $p < 0.001$) between perceived BMI and actual BMI. Actual BMI showed a strong correlation with the BID ($r^2 = 0.57$, $p < 0.001$). Another study by D Priya *et al* [8] where 147 female students of MBBS ladies hostel were included, most of them perceived their image correctly regarding to their weight. Most of the underweight and all overweight females were not satisfied. Underweight females preferred to gain weight and overweight females preferred to lose weight. Some of the subjects skipped meals to lose weight.

Therefore, we thought of doing this study to find correlation of levels of physical activity with weight perception, body mass index and body image dissatisfaction among undergraduate and postgraduate physiotherapy students of government tertiary care hospital.

Materials and Method

This was an observational, cross sectional study of 6 months, one-time assessment, with each session of around 20 minutes. It was an all-inclusive, convenience sampling with a total population of 68 students. Total number of physiotherapy students admitted at our physiotherapy school were 75 ± 5 % dropout rate which is 68. This included 18-25 year-old undergraduate and postgraduate physiotherapy students of both genders.

Participants were recruited in the study after taking written informed consent post the Department Review Board approval [DRB(PT) 2021/16]. Demographic data and perceived weight was recorded. Height and weight was measured and Body Mass Index calculated using the same. Body Image Dissatisfaction score was calculated using Figure Rating Scale. International Physical Activity Questionnaire was filled by the participants and physical activity was calculated.

The outcome measures used in the study were:

Body Mass Index [10]**:** This categorizes a person as underweight (BMI<18.5), normal (BMI 18.5-22.9), overweight (BMI 23-24.9), obese I (BMI 25-29.9) and 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).

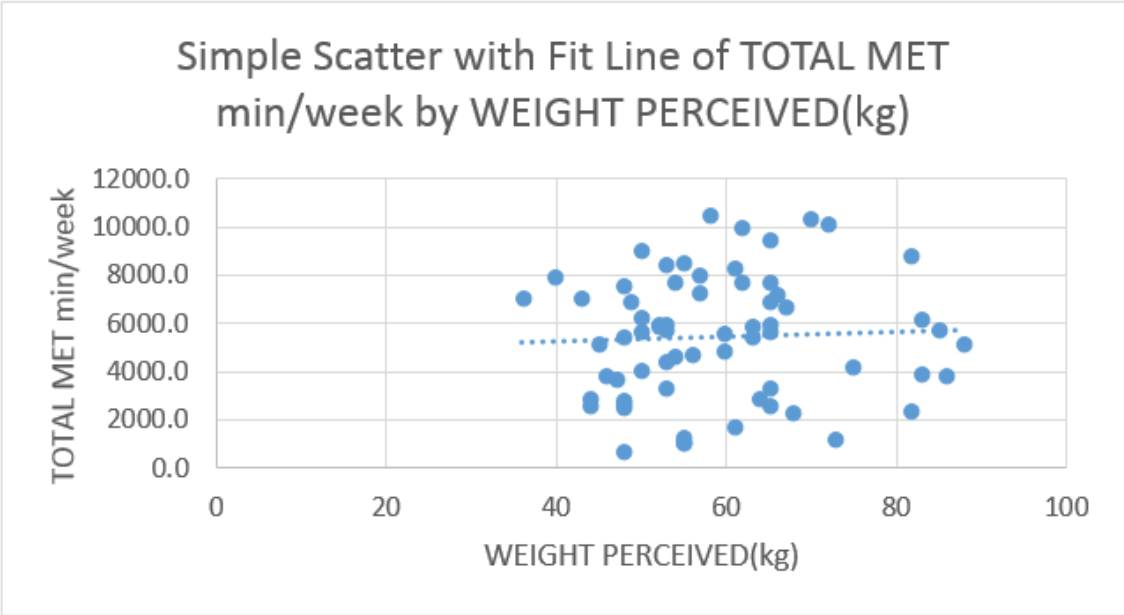
Data Analysis

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 $p< 0.05$

Results and Discussion

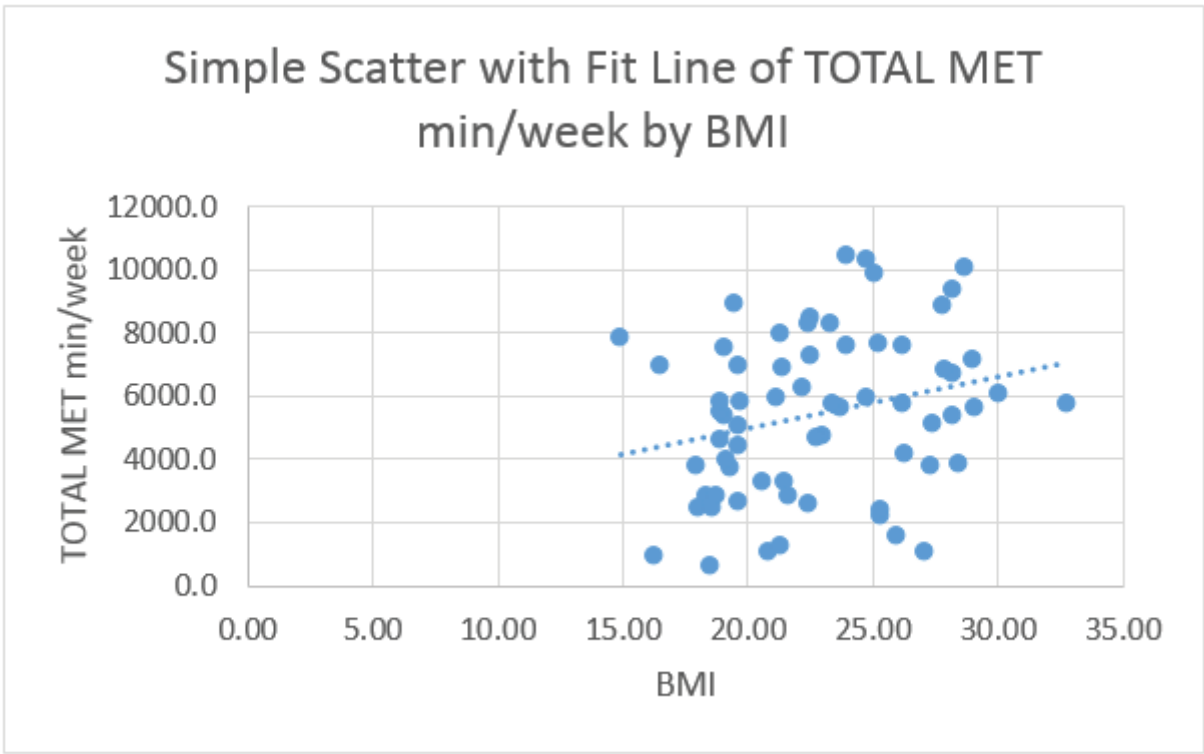
TABLE 1: Correlation of Total MET min/week with weight perceived, Body Mass Index and Body Image Dissatisfaction:

		Weight perceived (kg)	Body Mass Index (kg/m2)	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



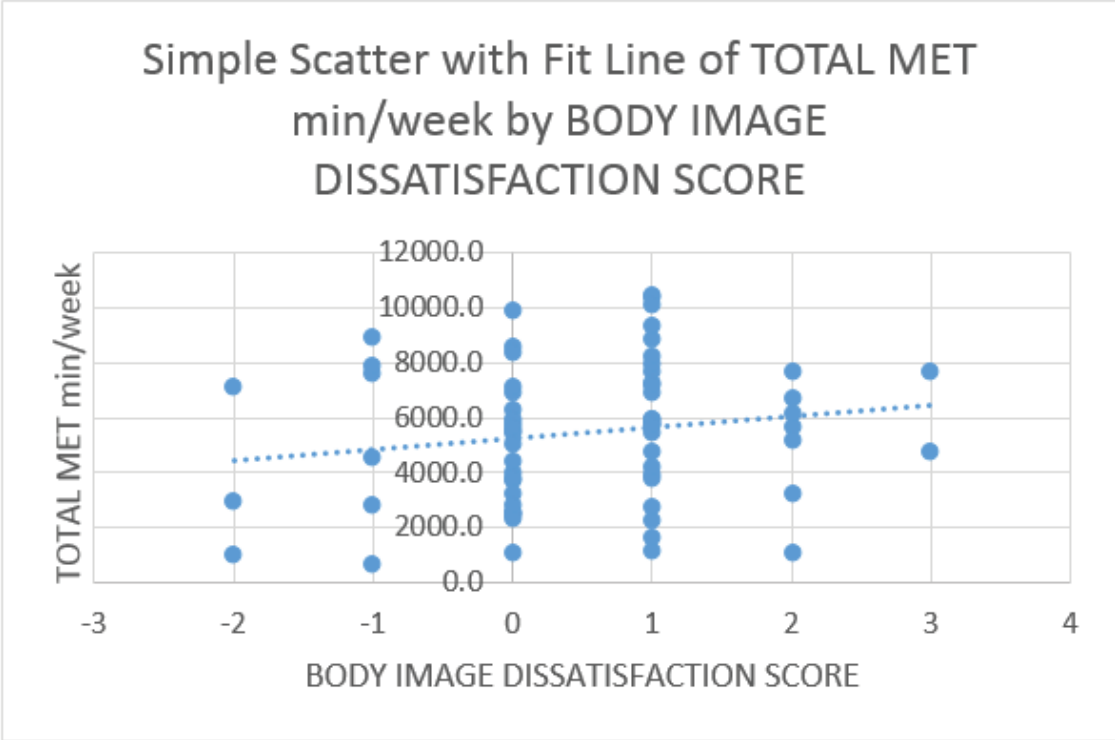
GRAPH 1: Correlation of level of physical activity with weight perceived:

The graph shows no correlation between level of physical activity and weight perception. ($p>0.05$, $\rho= 0.088$)



GRAPH 2: Correlation between level of physical activity and Body Mass Index:

The graph shows a correlation between level of physical activity and Body Mass Index with $p \leq 0.05$, $\rho = 0.281$.



GRAPH 3: Correlation between level of physical activity and Body Image Dissatisfaction score:

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

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.

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

Ethical Clearance- Taken from Department Review Board Committee

Source of Funding –Self

Conflict of Interest - Nil

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Original Study

Face Validity of Gujarati Version of Lower Extremity Functional Scale (LEFS)

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Abstract

Background: Lower extremity functional scale (LEFS), originally developed by Binkley et. al in 1999, is a valid Patient rated outcome measure (PROM) for various musculoskeletal conditions. The scale is originally developed in English languageand has been translated and cross culturally adapted into many languages. In India, the scale is still applied in the original language, i.e. English, and also in its original form. Hence, the need of the study is to find the face validity of Gujarati translated LEFS in accordance with functional activities of Gujarati population.

Methodology: Individuals referred to Physiotherapy clinic and having lower limb musculoskeletal condition were screened for the eligibility. Those who fulfilled the inclusion and exclusion criteria were included in the study. Face validity of Gujarati LEFS was calculated by asking the individuals to grade items of Gujarati translated LEFS according to 5-point Likert scale, including very important, important, relatively important, slightly important and unimportant, as how each item appear to them for measuring lower extremity function.

Results: Item impact score for each item was calculated from frequency and mean item importance score. Item impact score of:

- 15 out of 20 items was more than 1.5
- 5 out of 20 items scored less than 1.5

Results show statistically significant need to change the items of Gujarati translated LEFS.

Conclusion: 5 out of 20 items in Gujarati translated LEFS needs to be modified/eliminated for its implication into Gujarati population.

Keywords: *Lower extremity functional scale (LEFS), Gujarati LEFS, Validity*

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Introduction

Lower extremity functional scale (LEFS), originally developed by Binkley et. al in 1999, is a valid Patient Rated Outcome Measure (PROM) for various musculoskeletal conditions. It contains 20 items for measuring patient function and activity limitation.[1] The scale is originally developed in English language,

and has been translated and cross culturally adapted into Italian, Canadian, French, Dutch, Arabic, Brazilian, Portugese, Malaysian, Finnish, Persian etc. population[2,3,4,]. In India, the scale is still applied in the original language, i.e. English, and also in its original form. Hence, the need of the study is to validate the Gujarati translated LEFS in Gujarati population.Face validity refers to the extent to which a test appears to measure what it is intended to measure.[5]It pertains to whether the test "looks valid" to the respondents. [6]Some authors consider face validity as a component of content validity[7], while others believe it should not be confused with the other types of validity and it cannot replace them. [8,9]

Purpose

To find the face validity of Gujarati translated LEFS in accordance with functional activities of Gujarati population. Objective is to find whether Gujarati LEFS is valid when individuals themselves report about the questionnaire according to their lifestyle.

Methodology

§ STUDY DESIGN: Cross sectional study

§ STUDY SETUP: Physiotherapy department

§ NO. OF SUBJECTS: 11

MATERIALS USED

¡ Pen

¡ Paper

¡ Gujarati translated Lower extremity functional scale

Inclusion criteria:

§ Age- 18-60 years

§ Both male and female

§ Willingness to participate.

§ Subjects having dysfunction or problem related to lower limb

§ Able to understand Gujarati language

Exclusion criteria:

§ Medical red flags or back related problems.

Procedure

Permission was obtained for translation of Lower Extremity Functional Scale (LEFS). LEFS was then translated into Gujarati language according to the Guidelines by Beaton[10]Individuals referred to Physiotherapy clinic and having lower limb musculoskeletal condition were screened for the eligibility. Those who fulfilled the inclusion and exclusion criteria were included in the study after taking written informed consent. Face validity of Gujarati translated LEFS was calculated by asking all the individuals to grade each item of Gujarati translated lower extremity functional scale as how important each item appear to them in measuring their lower extremity dysfunction according to 5-point Likert scale,

5= Very important,

4= Important,

3= Relatively important,

2= Slightly important and

1= Unimportant

ITEM IMPACT SCORE for each item was calculated from frequency and mean item importance score.[11]

¡ Frequency = %of subjects scored item as 4 or 5

¡ Importance = Mean importance score ofitems

ITEM IMPACT SCORE = FREQUENCY/ IMPORTANCE

ITEM IMPACT SCORE >= 1.5 corresponds to 50% of frequency and mean of 3 on 5-point Likert scale. If the **Itemimpact score** of an item is equal to or more than 1.5, it will be maintained in the instrument, otherwise it will be eliminated. [12]

Results

Total of 11 subjects having lower extremity musculoskeletal dysfunction were included in the study. Mean age of individuals was 44.54±12.18 years.All the subjects responded to each item of questionnaire (drop out=0).Microsoft Excel 2010 was used to analyze the data.Item impact score of **15** out of 20 items of Gujarati translated Lower extremity functional scale (LEFS) was more than **1.5**, **5** items scored less than **1.5.**

Results show statistically significant need to change the items of Gujarati translated LEFS.

Table 1 shows Frequency, Mean importance score and Item impact score of LEFS

ITEM OF LEFS	FREQUENCY (%)	IMPORTANCE (MEAN)	ITEM IMPACT SCORE
1	1	5	5
2	1	5	5
3	0.09	1.36	0.12
4	1	5	5
5	0.54	3.2	1.72
6	0.6	3.63	1.98
7	1	5	5
8	1	4.2	4.2
9	0.45	3.36	1.52
10	0.45	3.2	1.5
11	0.9	4.1	3.7
12	0.54	3.36	1.83
13	1	4.6	4.6
14	0.54	3.27	1.76
15	1	4.7	4.7
16	0.27	2.0	0.54
17	0.27	2.0	0.54
18	0.18	1.6	0.29
19	0.18	1.8	0.32
20	1	5	5

Discussion

Results show that **5** out of **20** items in Gujarati translated LEFS were scored less than 1.5 on Item impact score.

The items which scored less were as follows:

¡ નાહવાજવામાંઅથવાબહારનીકળવામાં

¡ સપાટરસ્તાપરદોડવામાં

¡ ઉબડખાબડરસ્તાપરદોડવામાં

¡ ઝડપથીદોડતીવખતેતવિરવળાંકોલેવામાં

¡ કુદકામારવામાં / કુદવામાં

Ø Getting in and out of bath in terms of western culture refers to the use of bathtub. Whereas in India, people usually squat for having bath, or use a stool.

Ø Running, both on even and uneven ground, didn't appear to be important to most of the subjects, as was the case with hopping.

Ø Though the young participants considered these activities useful, but the Item impact score was still low.

Ø Hence, probable reasons for low scores could be differences in the activities in the Gujarati population.

Ø Activities like sitting on the floor, squatting could be more appropriately used to assess lower limb function in Gujarati population.

Conclusion

5 out of 20 items in Gujarati translated LEFS needs to be modified/eliminated for its implication into Gujarati population, considering difference in culture.

Implications

Finding face validity of Gujarati translated LEFS helps to know how important each item appears to the participants. Eliminating or modifying the low scoring item will help in better evaluation of the individual's dysfunction and adapting the scale according to the lifestyle of Gujarati population. Further, after finding face validity, scale will be considered for other forms of validity like content validity.

Declaration

Ethical Approval

Ethical approval for this study was taken from Institutional Ethical Committee.

Funding: This study is not funded by any source. No participant was financially burdened for this study.

Conflict of Interest: None

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Prevalence of Pelvic Girdle Pain During Menstruation and Its Co-Relation with Menstrual Hygiene Products

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Abstract

Background and Purpose: Menstruation and menstrual hygiene females vary among females. Unhygienic menstrual practices sometimes result in adverse health outcomes during menstruation in women. During menstruation, women have many symptoms. Pelvic girdle pain is one of the musculoskeletal symptoms during menstruation. Pelvic girdle pain affects the activity of daily livings and restricts movement. The purpose of this study is to find out the prevalence of pelvic girdle pain during menstruation and its co-relation with menstrual hygiene products.

Methodology: Total 385 women with age groups between 18-30 years were included in the study. All participants were provided with a questionnaire that includes demographic data, a pre-structured Performa, and a pelvic girdle questionnaire. The most common symptoms of pelvic girdle pain are pain in the pelvic area, shooting, and aching pain that spreads throughout the lower body, including the upper thigh and perineum. The majority of females used disposable sanitary pads. There was a low prevalence of pelvic girdle pain during menstruation and negative co-relation between pelvic girdle pain and menstrual hygiene products.

Conclusion: Prevalence of pelvic girdle pain during menstruation is low among young adult female and participant those having a pain had complain of mild to moderate symptoms and there is a negative correlation between menstrual hygiene products and pelvic girdle pain.

Key Words: *Menstruation, Pelvic girdle pain, Menstrual hygiene products.*

Introduction

Menstrual cycle is defined as cyclic events that take place in a rhythmic pattern during the reproductive period of a woman's life.[(1)] Menstruation is the visible manifestation of cyclic physiologic uterine bleeding due to shedding of the endometrium. The first menstrual cycle is known as menarche .Menarche generally begins between ages 11-15 years. [(2-3)]Once the menstrual cycle starts it continues cyclically at intervals of usually 28 days till menopause. [(1-2)]

During menstruation, women have to maintain and practices good hygiene to prevent adverse health outcome.[(4)]Good menstrual hygienic includes like use of sanitary pad and washing of genital areas as necessary .Women who maintain better hygiene during menstruation will increase the confidence of females in various aspects.[(5)]

WHO/UNICEF define menstrual hygiene management as women and adolescent girls are using a clean menstrual management material to absorb or collect menstrual blood, that can be changed in privacy as often as mandatory for the duration of a menstrual period, using soap and water for washing the body as required, and having access to facilities to

dispose of used menstrual management materials. [6] These practices can be influenced by water sanitation and hygiene (WASH). [7]

To collect or absorb the menstrual blood flow menstrual hygiene products are used during menstruation. The both types of materials used are disposable and reusable. [8]Materials are wool, toilet paper, paper from newspapers or books, and some natural materials such as mud, dung, or leaves, foam from mattress are used to collect menstrual blood during menstruation. [9] Some other materials such as sanitary pad (disposable and reusable), menstrual cloth, menstrual cups and tampons are also being used to collects menstrual blood. [8]

Women must have knowledge about menstrual hygiene and good practice has less risk to reproductive tract infections and its consequences[10] Poor menstrual hygiene management may increase the risk of women to reproductive tract infections (RTI) and urinary tract infection also psychological stress outcome [6,11]. Common clinical symptoms of the reproductive tract and urinary infections include backache, lower abdominal pain, genital ulcers, itching in vulva region, swelling, and abnormal discharge from vagina and urinary tract infection symptoms include such as dysuria, increase in urinary frequency without vaginal discharge or irritation. [11-12] Reproductive tract infections are identified as a major public health problem and ranked as second after maternal mortality and morbidity. Reproductive tract infection can leads to serious complication if left untreated like pelvic inflammatory diseases (PID), infertility, cervical cancer, chronic pelvic pain, ectopic pregnancy, preterm labor, miscarriage, stillbirth, congenital infection, genital cancer, and risk of HIV infection. [12-13]

Pelvic girdle pain is musculoskeletal pain. Pelvic girdle pain is common symptom during and after pregnancy. [14-15] But, it is also one of the symptoms during menstruation. Pelvic girdle pain is defined as pain experienced between the posterior iliac crest and the gluteal fold, particularly in the vicinity of the sacroiliac joints. The pain may radiate in the thigh at posterior compartment and can also occur in conjunction with/or separately in the symphysis.[16] most common symptoms of pelvic girdle pain are a pain in the pelvic area, shooting, and aching type of pain and spread over the lower body such as upper thigh and perineum, the pain worsens on weight bearing difficulty in walking and stair climbing.[17] Pelvic girdle pain leads to some dysfunction, emotional stress and reduces health-related quality of life.[14] Due to pelvic girdle pain women may also face difficulties in performing their activities of daily livings(ADLs) such as household work, exercise, implementation, leisure/hobbies, and personal relationships or married life some women cannot walk quickly or cover long distance.[18] To get information regarding the impact of pelvic girdle pain on general functioning the pelvic girdle questionnaire is a recent condition- specific outcome measure developed for patients with pelvic girdle pain. The questionnaire includes object relating to activity-participation and bodily symptoms. [19]

There are very few evidences on the correlation between menstrual hygiene practice and pelvic girdle pain. Hence, this study was aimed to find correlation among these variables.

Methodology

A cross-sectional study was done on age group between 18-30 years of females. This Study was conducted for 6 months from January 2021 to June 2021 under the reference of South Gujrat Medical and Research Center, Surat. Selections of subjects were based on inclusion and exclusion criteria. Inclusion criteria were regular menstrual cycle and age between 18-30 years, exclusion criteria were polycystic ovarian disease, dysmenorrhea, urinary tract infection, pregnancy, lumbar spine pathologies, history of psychiatric illness, endocrine disorder, mentally unstable patient, and parity. A total 385 women were randomly included in the study. All subject provided with a consent form questionnaire including demographic data, pre structured Performa and pelvic girdle pain questionnaire within the period of data collection questionnaire method was used. Participants were explained prior about the study method, significance, and questionnaire filled.

Result

The mean age of the subjects was 22 years, of which 189 females were between the ages of 22-26 years. Women were working between the 9-14 hours that were 47 women. Most of the women 347out of 385 were work moderately. The mean age of the menarche of subjects were 13 years, in that 299 women's age of menarche was 13-15 years. Average duration of the menstrual cycle of the females was 4 day, Among 385 women 116 women's duration of menstrual cycle were 1-4 days. Mean of the frequency of the menstrual cycle was 29 days, in which 211 women's frequency of menstrual cycle was between 21-29 days. Pelvic girdle pain of 4% of females was between scores 23-42.

Most of the women that are 94% were used disposable sanitary pads as a hygiene product. Whereas, 7% women were changed their menstrual products more than 4 times. Majority of women that were 160 out of 385 changed their menstrual materials 2 times a day. All the women were wash their hands before and after changing their menstrual materials. Only 3%women were washing their genital area at the end of the period. More than half of the women that 201 were disposed of their used menstrual materials in household rubbish (bin not in latrine). Majority of the females that are 79% females did not face any infection before or after their menstrual period.

Table 1. Mean of the variables

Age	WorkingHours	Age of menarche	Duration of Menstrual Cycle	Frequency of Menstrual Cycle
385	385	385	385	385
21.8675	6.6831	13.6779	4.5714	29.0130

Table2. Age of Menarche

Age	Frequency
10–12	58
13–15	299
16–19	28
Total	385

Table 3. Frequency of menstrual cycle

Days	Frequency
01–04	166
05–08	219
Total	385

Table 4 .PGP Score

	Frequency	Percent
.00	33	8.5
0-9	4	1.0
10-22	8	2.1
23-42	17	4
43-62	6	2
>63	12	3

Table: 5 Correlation

			PGP Score	SanitaryNapkin
Spearman's	PGPScore	Correlation Coefficient	1.000	-0.059
	Sanitary Napkin	Correlation Coefficient	-0.059	1.000
			0.252	

Discussion

The main purpose of this study was to determine the prevalence of pelvic girdle pain during menstruation and its co-relation with menstrual hygiene products. In the study, the Pelvic Girdle Pain questionnaire was used to evaluate symptoms of pelvic pain, and a pre-structured questionnaire was used to check menstrual hygiene as an outcome measure. To collect data age, Duration of Menstrual cycle, Frequency of Menstrual cycle, Working Hours, Marital status were taken from all participants. The selection of all participants was based on inclusion criteria.

In the current study, the mean age of the participants was 22 years. The majority of women were working for more than 6 hours per day and the nature of work can be identified as moderate work. [20] The majority of females were unmarried.

In the study mean age of menarche was 13 years. Previously a study was done by Teklemariam Gultie et al. to found the mean age of menarche and the studyconcluded that the age of menarche was 14 years. That indicates that the age of menarche can be in between 13-14 years. [21]Shekhar Chauhan et.al. found that adolescent aged girls between 15-19 years were more likely to use a sanitary pad. [22]That co-relate with this study that, 94% of participants were using sanitary pad; findings suggest most commonly used menstrual material by the female was a disposable sanitary pad. Only 1% of females have used tampons and menstrual cups which show females are having limited awareness regarding advanced menstrual hygiene products.

To check for menstrual hygiene few questions were asked to every participant regarding material being used, disposal of used material, changing frequency of used material, genital wash, hand wash, and infection. In this study, women changed their menstrual product brands for better hygiene practices and 49% of women changed their menstrual product brands sometimes. A large number of women did not change their menstrual hygiene products frequently and uses the same product brand.

In the current study, 160 females change their menstrual materials 2 times a day maintain menstrual hygiene whereas hardly 20 females among 385 females change more than 4 times in a day. In the present study 62%, women wash their genital area more than 3 times a day and wash their hands every time before or after changing their used menstrual material to practice good hygiene. The majority of females included in the study disposed of their menstrual material in household rubbish by wrapping it in a plastic bag or by cover around a pad. For storing materials most of the females stored them in a cupboard or drawer by wrapping them in a plastic bag.

21% of female participants have faced reproductive infection before or after a period. If females do not maintain proper hygiene during menstruation, then the chances of reproductive tract infection and urinary tract infection increase. These infections can lead to other side effects in women such as lower abdominal pain, abnormal vaginal discharge, inguinal swelling, to genital ulcers, and pelvic girdle pain. [6, 11, 12] These are some of the most prevalent problems caused by infection, and the goal of this research is to look at the effects of these infections on pelvic girdle pain.

Pelvic girdle pain may experience between the sacroiliac joint and the gluteal fold or in the symphysis pubic. [23] In pelvic girdle pain, symptoms can be moderate to severe pain which affects daily activities such as getting up from a chair, bending, and walking. [23] In this study majority of women were having mild to moderate symptoms of pelvic girdle pain and only a few women detected severe symptoms during menstruation.

In this study, a pelvic girdle pain questionnaire was used as an outcome measure to find out pelvic girdle pain. One study was done by MargrethGorotle et al. on reliability and construct validity of pelvic girdle questionnaire the study concluded that this is a valid and reliable tool to measure pelvic girdle pain. [24] In study findings prevalence of pelvic girdle pain during menstruation is low. Pelvic girdle pain is one of the most commonly reported during pregnancy. [23] However, during pregnancy, the female body is exposed to certain factors that have an impact on the dynamic stability of the pelvis. One important factor is the effect of the relaxin hormone which may provide a combined effect with other hormones and affects the laxity of ligaments in the pelvic girdle as well as other ligaments of the body. [25]

In a present study based on results, the prevalence of pelvic girdle pain is low and the majority of females practices good menstrual hygiene during menstruation. No positive correlation was found between the menstrual hygiene products and pelvic girdle pain. This may be due to; several factors that affect pelvic girdle pain but only one factor was focused on.

The study states that the prevalence of pelvic girdle pain during menstruation in young adult females age between 18-30 years is 33% and there is a negative correlation between pelvic girdle pain and menstrual hygiene products.

Conclusion

Prevalence of pelvic girdle pain during menstruation is low among young adult females and participant those having a pain had complain of mild to moderate symptoms and there is a negative co-relation between menstrual hygiene products and pelvic girdle pain.

Ethical Clearance: Ethical Clearance was taken from Institutional Ethics Committee, South Gujrat Medical and Research Center, Surat, Gujrat

Source of Funding: Self

Conflict of Interest: None

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Prevalence of Musculoskeletal Pain in the Factory Workers in Post Covid-19 Phase

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Abstract

Study Design: Observational study design. Background- COVID-19 is a novel corona virus which has not been found in humans. The very first case was detected in the Hubei, China at the end of December 2019.

Objectives: To find the musculoskeletal pain in body areas in those factory workers who resumed work following recovery in Post Covid-19 phase.

Procedure: 50 participants were recruited based on inclusion and exclusion criteria. An informed consent was taken from the subjects. Online informed consent was taken from the participants. Questionnaire was filled by the participants. Subject data was computed and analyzed.

Conclusion: According to the findings of the study, we conclude that musculoskeletal pain was prevalent among factory workers who resumed duty in the post Covid-19 phase. This study highlighted the presence of musculoskeletal pain in various region of the body with moderate intensity and dominant in lower back region followed by neck and upper back area.

Keywords: *COVID-19, Observational study, Factory workers, Musculoskeletal pain.*

Introduction

Covid-19 Background Information

COVID-19 is a novel corona virus which has not been found in humans. The very first case was detected in the Hubei, China at the end of December 2019. This virus is highly transmissible and thousands of new cases have been reported around the world every day[1]. Sneezing and coughing are believed to be the commonest forms of transmission which is similar to the outbreak of SARS corona virus which began in 2002 and was thought to have spread by sneeze and cough droplets.[1,2] The transmission of corona virus from animals to humans is rare and this new strain likely came from bats, though one study suggests pangolins may be the source of origin. Some reports trace the cases back to seafood and animal marketing in Wuhan.[3]

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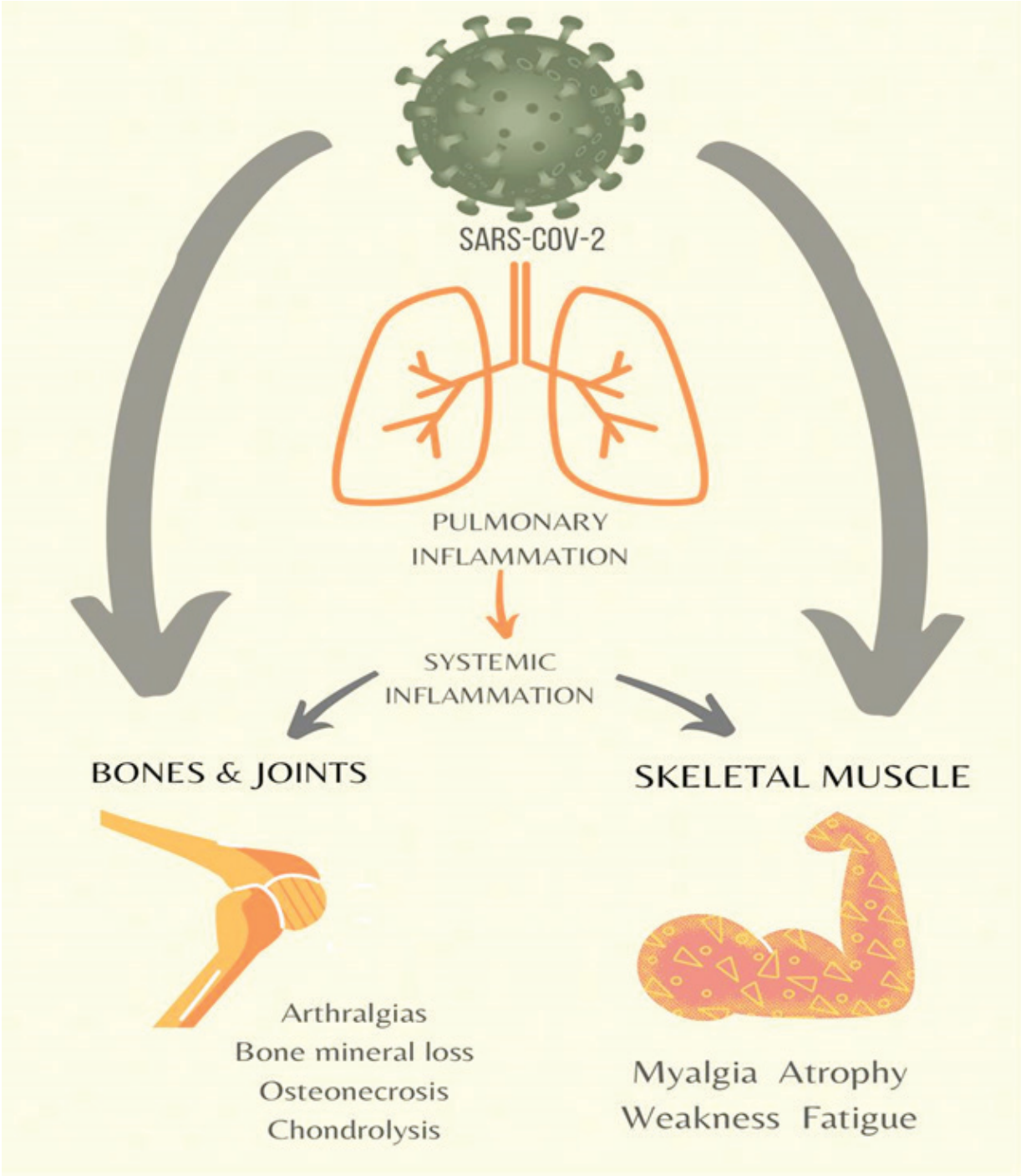

SKELETAL MUSCLE- Myalgias and generalized body weakness have been reported to occur in one-quarter to one-half of symptomatic patients with COVID-19. In a study of 214 Hospitalized patients with COVID-19 in Wuhan, China, 19% of patients had creatine kinase (CK) levels of >200 U/L[4].

BONE AND JOINT- Musculoskeletal disorders (MSDs) are prevalent among workers in the industry which does heavy physical work, often leading to inappropriate working postures for prolonged periods. It significantly increases morbidity and decreases the work ability. As we move forward, new challenges resulting from the impact of this must be faced.[5]

Method

In this study, subjects were recruited after Ethical clearance from the institution. The study included 50 subjects between 22-55 years and was randomly assigned to the online questionnaire. All subjects were evaluated for Numerical Pain Rating Scale (NPRS) and Structured questionnaire with questions related to musculoskeletal pain. Questionnaire validation was done by 5 subject-experts for feedback, improvement, identify possible errors or content changes and to ensure that the online questionnaire is user friendly and easy to understand.

Inclusion Criteria:

1. Age group from 22-55 years
2. Males and females both Individual
3. Those tested positive for Covid-19
4. Musculoskeletal pain following Covid 19
5. Minimum of 8 hrs work duration
6. Who resumed duty post quarantine periods

Exclusion Criteria:

1. Individuals having any musculoskeletal pain before Covid-19 phase
2. Any trauma or systemic disease

TABLE NO 1 - DEMOGRAPHIC DATA

AGE (IN YEARS)	(n=52) %	GENDER	
		MALE 90% (n=47)	FEMALE10% (n=5)
22-32	35% (n=18)	33%(n=17)	2%(n=1)
33-43	31% (n=16)	25%(n=13)	6%(n=3)
44-55	35% (n=18)	33%(n=17)	2%(n=1)

TABLE NO 2 - AREAS OF PAIN

AREA OF PAIN	PAIN (n=52)	SEVERE PAIN(n=52)
NECK	33%(n=17)	21%(n=11)
SHOULDER	23%(n=12)	15%(n=8)
ELBOW	8%(n=4)	6%(n=3)
WRIST	8%(n=4)	6%(n=3)
HAND & FINGERS	0%(n=0)	0%(n=0)
UPPER BACK	27%(n=14)	13%(n=7)
LOWER BACK	46%(n=24)	40%(n=21)

Cont... **TABLE NO 2 - AREAS OF PAIN**

HIP	8%(n=4)	6%(n=3)
KNEE	17%(n=9)	10%(n=5)
ANKLE	4%(n=2)	4%(n=2)
FOOT	6%(n=3)	0%(n=0)
TOES	6%(n=3)	0%(n=0)

Table no 3 - GRADING OF PAIN

PAIN GRADING SCALE(n=52)	PRESENT (NPRS)
1	0%(n=0)
2	10%(n=5)
3	15%(n=8)
4	25%(n=13)
5	27%(n=14)
6	6%(n=3)
7	6%(n=3)
8	4%(n=2)
9	2%(n=1)
10	0%(n=0)

Discussion

The study found that workers who joined back to work in the post Covid-19 phase had Musculoskeletal pain in various regions of the body with moderate intensity which was more at lower back region followed by neck, upper back and knee region. The conducted study was observational and was done among the factory workers who have tested positive for Covid-19.Here for the factory workers, they doing manual work which may aggravate area specific pain related to their work.

Participants worked for 8 hours per day before testing positive and after joining back to work. , Maximum individuals worked for 8 hours per day which can also be a contributing factor. Manual work at factory may be facilitating the pain. Also

31% participants from the 44-55 age groups were hospitalized and study shown that prolonged hospital stay affects the musculoskeletal system.

These participants have joined back to work, doing manual work which may contribute in their symptoms, for the age group 44-55 there were 12 participants who had musculoskeletal pain at neck, shoulder, lower back, upper back and knee region, In this study, the factory workers who may be manual working are prone to specific areas of pain related to their work. It was observed that the 30-to-39-year-old age group presented higher disabling musculoskeletal symptoms. Furthermore, this could be attributed to the higher workload and stress level that middle-aged adults undertook (20)

Out of 52, 26 participants were home quarantined and maximum 62% (n=16) joined back to work within 16-30 days after home quarantine. Maximum pain was found to be at lower back and neck, followed by shoulder, upper back and knee. This may be because of lack of physical activity, prolonged sitting at home and because of which after joining back to work the intensity for the pain might have increased.

These participants have joined back to work, doing manual work which may contribute in their symptoms, for the age group 44-55 there were 12 participants who had musculoskeletal pain at neck, shoulder, lower back, upper back and knee region, Here for the factory workers, they might be doing manual work which may aggravate area specific pain related to their work. In which it was observed that the 30-to-39-year-old age group presented higher disabling musculoskeletal symptoms. Furthermore, this could be attributed to the higher workload and stress level that middle-aged adults undertook (20)

Out of 52, 26 participants were home quarantined and maximum 62% (n=16) joined back to work within 16-30 days after home quarantine. Maximum pain was found to be at lower back and neck, followed by shoulder, upper back and knee. This may be because of lack of physical activity, prolonged sitting at home and because of which after joining back to work the intensity for the pain might have increased.

Conlusion

According to the findings of the study, we conclude that musculoskeletal pain was prevalent among factory workers who resumed duty in the post Covid-19 phase. This study highlighted the presence of musculoskeletal pain in various region of the body with moderate intensity and dominant in lower back region followed by neck and upper back area.

Ethical Clearance- Taken from Institutional Ethical committee

Source of Funding- Self

Conflict of Interest- Nil

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Association between Rounded Shoulder Posture and Pulmonary Capacity among Undergraduate Doctor of Physical Therapy Students

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Abstract

Background: vital capacity and its relationship with posture has previously been studied. Variances in posture has an effect on the inspiratory and expiratory pressures. Spirometry is the preferred choice for measurement of vital capacities. Chronic deviations in posture could have long lasting effects on vital capacity. Physical therapists are prone to suffering long term musculoskeletal disorders, thus affirming the need to have screening protocols in place to prevent onset of such disorders.

Methods: two hundred undergraduate physical therapy students were included in the study. Rounded shoulder posture was assessed using vernier calipers (in supine, distance between tip of shoulder and table was measured). Forced vital capacity and forced expiratory volumes were assed using spirometry.

Conclusions: significant differences were obtained in readings of forced vital capacity and forced expiratory volume between those with rounded shoulders and those without (p-value= 0.000 and 0.003 respectively).Postural changes effect vital capacities. Undergraduate students should be educated regarding proper postures, in order to prevent long term effects.

Key words: *Forced vital capacity, posture, students, pulmonary ventilation*

Introduction

The association of vital capacity with posture is one that is recognized and previously worked on.[1,2,3]Respiratory muscles have functions associated with posture, thus any deviation from normalimpedes the ability of these muscles to perform their function effectively.[4,5]A small change in posture can affect lung capacities. Semi-upright sitting has large variations in inspiratory and expiratory pressures as compared to upright sitting.[6,7]Postural disorders begin in children from an early age,[8,9]and a highly common factor in youth is excessive cell phone usage. The frequency of short term musculoskeletal disorders due to excessive phone usage is high; whereas long term effects are also noticed to some extent.[10]In modern society, pain and associated musculoskeletal disorders are on the rise due poor posture and excessive smart phone usage.[11]Texting posture has been shown to cause disorders in neck, and upper extremities.

Vital capacity is a preferred quantitative measure of respiration due to its ease of measurement.[12]Spirometer

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tests are routinely used in clinical settings to reveal impairment of respiratory organ performance and to look at changes like enhancements as a results of interventions. Measures of vital capacity include: Forced Vital Capacity (FVC), slow vital capacity, and inspiratory vital capacity.[13]Spirometry measures airflow from fully inflated lungs. Muscular force is required in expansion of lungs and thorax, to completely inflate them.Lungs expand passively, and chest is stretched to maximum on full inhalation, following which, forced expiration is performed into a device which records air flow over time. Expiration is a combination of factors such as muscular work, elastic recoil of thoracic wall and lungs, and small and large airways function.[14]

Work related musculoskeletal disorders are prevalent in physical therapists (lifetime prevalence of 91%), and 1 in 6 left the profession due to these disorders.[15] With a cacophony of factors, it is imperative that screening for undergraduate students be performed, in order to identify any effect poor posture, specifically rounded shoulders, may have on pulmonary function.Studies have not been conducted in Pakistan regarding effects of posture on vital capacities. Our study aimed to assess the effects that poor posture could have on university students who have rounded shoulders.

Materials and Methods

The study design was an observational study, carried out in public and private sector universities in Karachi, Pakistan, in 2018. A sample of 200 students was calculated via OpenEpi v3.01, with non-probability, purposive sampling being used to recruit participants. Undergraduate students in various universities were approached, and briefed about the study. Those who signed consent forms were enrolled in the study.Approval for this study was given by Isra Institute of Rehabilitation Sciences.

History of orthopedic, respiratory, neuromuscular, cardiovascular issues were part of exclusion criteria of the study. Participants were divided into two groups; those with rounded shoulders, and those without. Vernier calipers were used to determine the presence of rounded shoulders. Subjects lay supine, and were asked to relax. The distance between the table and peak of the shoulder was recorded, and if it was found to be greater than 2.5 centimeter, they were considered as having rounded shoulders.

For the spirometry procedure, a nose clip was placed. Pulmonary capacity was measured by using portable (SP10) spirometer in sitting position. Pulmonary parameters recorded were FVC, Force Expiratory Volume in one second (FEV1) and Peak Expiratory Flow Rate (PEFR). After explanation of the procedure, participants were instructed to take a few normal breaths, inspire as much as possible, then exhale as hard as they could, until the lungs were completely empty. Three attempts were done, so as to familiarize participants with the procedure, with the third reading being considered for analysis.

Table 1: Assessment of participants without rounded shoulders compared to those with rounded shoulders

Without Rounded Shoulders				
Age	**BMI**	**FEV1**	**FVC**	**PEFR**
21.11±1.86	20.62±3.90	3.06±0.59	3.40±0.56	5.68±0.69
With Rounded Shoulders				
Age	BMI	FEV1	FVC	PEFR
21.48±2.01	20.78±4.19	3.26±0.29	3.74±0.36	6.57±0.66

Results and Discussion

Out of 200 participants, 64 were male and 136 were female. 24 males and 76 females did not have rounded shoulders. 40 males and 60 females had rounded shoulders. Values for age, BMI, FEV1, FVC and PEFR are outlined in Table 1. Significant difference was obtained between groups for FEV1 (p value=0.003), and difference between FVC and PEFR values for rounded shoulders and those without rounded shoulders was highly statistically significant (p value=0.000 for both). Majority of research has been conducted regarding forward head posture and its effects on pulmonary capacity.[16,17, 18]This study aimed to assess the association of rounded shoulders and pulmonary capacities. All three measures assessed in this study were shown to have significant correlation with rounded shoulder posture. Those with rounded shoulders had lower values as compared to those without rounded shoulders.Lin etal[iii] found that slumped posture has a significant effect on lung capacity, and expiratory flow in healthy participants. Excessive usage of smartphones was also linked to rounded shoulders, thus affecting pulmonary capacities, as observed in a study conducted by Kang et al.[19]There are differences in lung capacities found between genders, however, our study did not assess this component.[20, 21]Further, activity levels may play an important part in pulmonary capacities. A longitudinal study found that increased activity levels had a beneficial effect on respiratory functions. Smoking cessation, or not being a smoker, was found to have a similar effect.[22]

Limitations of this study were that digital assessment was not performed for identification of rounded shoulder posture. Activity levels of participants were not taken into consideration when assessing pulmonary function. Majority of the population consisted of female participants. A stratified sample, along with adequate testing protocols is recommended to further explore the relationship between rounded shoulders and pulmonary capacities.

Conclusion

Our study concludes that rounded shoulders can cause differences in pulmonary capacities. Undergraduate students should be advised on ideal sitting postures, as well as reduction of smart phone usage; which will help reduce incidence of musculoskeletal disorders, as well as avoid any negative effects on pulmonary capacities.

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Conflict of Interest: The authors have no conflict of interest to report.

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Ethical Clearance: Taken from Isra Institute of Rehabilitation Sciencesethical committee.

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Effects of Transcutaneous Electrical Nerve Stimulation (Tens) and Therapeutic Ultrasound (US) Given Concurrently (Combination Therapy) Versus Consecutively on Pain and Disability in Patients with Osteoarthritis Knee- A Randomized Clinical Trial

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Abstract

Background : The severity of pain and disability due to osteoarthritis of the knee can lead to an increase in replacement surgeries making conservative management important in improving quality of life. By combining US and TENS, effects of both treatments can be achieved simultaneously also making it time efficient.

Objective : To investigate the effects of combination therapy in reducing pain and disability in patients with OA knee.

Method: 26 participants were recruited for the study and were randomly assigned into two groups. Group A received TENS and US as combination therapy. Group B received TENS and US separately. Both groups received the exercise program for 30 minutes per day for 10 days. The pain was measured by using VAS and WOMAC. Physical function and stiffness was also assessed by using WOMAC scale on the first and tenth day.

Results : Both the groups showed a significant difference in pain outcomes for VAS, physical function, and stiffness in WOMAC ($p<0.001$) but there was no significant difference seen between the groups ($p= 0.5$).

Conclusion : Both treatment modalities are safe and effective in reducing pain and disability in patients with OA knee. Combination therapy had an added benefit of achieving the similar result in a shorter period as compared to when given consecutively

Keywords: *Osteoarthritis, Combination therapy, TENS, Therapeutic ultrasound.*

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Introduction

Osteoarthritis (OA) is the most common musculoskeletal disorder affecting a large population of all genders, races, and countries.[1] It is found to be more common in women than in men and its prevalence

increases with age. This may be due to genetic and hormonal factors, the anatomical difference in the alignments of structures, differences in knee cartilage volume and previous trauma.[2,3]

OA is a heterogeneous chronic disease involving the entire joint, including the articular cartilage, subchondral bone, menisci, and periarticular soft tissues such as the synovial membrane. Articular cartilage has low metabolic activity due to lack of blood vessels lymphatic vessels and nerves; it consists of chondrocytes and a dense extracellular matrix composed primarily of water, collagen, and proteoglycan. The mixture of fluid and matrix provides hyaline cartilage with viscoelastic and mechanical properties for efficient load distribution. If any compositional changes occur, then it will affect the mechanical stability of the extra cellular matrix (ECM) network. It will lead to excessive mechanical surface contact stress in the cartilage, and can directly damage the articular cartilage while weight- bearing. The loss of cartilage and modifications to the bone and synovial membrane contributes to an unfavourable biomechanical environment which increases stress on the joint and causes further progression of cartilage degradation.[4,5,6]

As the prevalence of OA knee increases, the rate of knee arthroplasty also increases. Therefore the main aim of physical therapy management is to decrease pain, improve functional activities and minimize the disability for enhancing the quality of life.[7]

Current clinical practice guidelines (CPGs) for the management of nonsurgical knee OA recommend using a combination of pharmacologic and non-pharmacologic interventions many of which are offered by physical therapists

In the UK and USA, US and IFT are being used together as combination therapy. In general terms, combination therapy involves the simultaneous application of ultrasound (US) with electrical stimulation therapy.[8] But there is a lack of evidence in the literature to support its effectiveness. Mukkannavar P B[9] conducted a study on the effect of combination therapy [TENS & Ultrasound] and ischemic compression in the treatment of active myofascial trigger points. This study found that combination therapy resolved acute active trigger point pain and increases range of motion more rapidly when compared to the ischaemic compression treatment.

By combining US with TENS, the effects of each treatment modality can be achieved, but lower intensities are used to gain the effect. In addition to this, application of combination therapy renders a time-efficient treatment with the similar effects. Hence the study aimed at evaluating if combination therapy would be beneficial when compared to the application of TENS and US separately.

Methods

The study was conducted in the Department of Physiotherapy. Individuals clinically diagnosed with osteoarthritis of the knee were recruited for the study. A sample size of 26 (13 subjects per group) was included in the study using a purposive sampling technique.

Participants

The study was performed with the approval of the Father Muller Medical College Institutional Review Board for studies involving human subjects and written informed consent was obtained from each participant

The inclusion criteria were 1) Individuals with clinically diagnosed with tibiofemoral osteoarthritis of the knee in any age group, 2) all genders, 3) Altman's clinical classification criteria for osteoarthritis knee pain[10] which included knee pain, joint stiffness < 30

min, crepitus, bony enlargement, bony tenderness, no palpable warmth. The subject was included if they fulfilled any two of these criteria. Patients were excluded if they had any 1) sensory deficits, 2) recent surgery over the knee joint, 3)trauma around the knee joint, 4)an open wound in the knee joint, 5) pacemaker, 6)any implants in and around the knee joint, 7)dermatological lesions in the knee, 8)intra-articular corticosteroid injection in the past 6 months.

Interventions

Subjects clinically diagnosed with tibiofemoral OA of the knee were included for this study and were recruited from Physiotherapy OPD. The subjects were screened and enrolled for the study based on inclusion and exclusion criteria. A brief introduction to the treatment procedure was explained to all the subjects. Demographic data were obtained from all the participants. Subjects were randomly assigned into two groups. Pre and Post-intervention outcome measures for the VAS and WOMAC were obtained and compared. The experimental group received TENS and US as combination therapy. Combination therapy of 10 minutes per day was administered to the patient. The control group received TENS and US separately. In this group, TENS was given for 10 minutes followed by the US for 10 minutes. Both groups received an exercise program for 30 minutes every day. Patients receiving TENS were explained that tingling sensation will be felt which should not be unpleasant. BTL -5000 machine (BTL Industries Limited) was used to deliver TENS and US for both the groups. Electrotherapy intervention parameters for both groups were as follows: TENS-2electrode (1channel), high-frequency 100Hz, pulse width: 100 μsec, duration; 10 minutes, intensity as tolerated by the patient. The dosage for US was: 1 MHz, power at 3.5w/cm^2, pulse ratio at 1:1 for 10 minutes at an intensity of 0.8 W/cm^2. The size of the transducer head was 5cm^2. The exercises included for both groups were static quadriceps, dynamic quadriceps, end range knee extension exercises, hamstring curls in prone lying and hip abductor strengthening exercises. Three sets of the exercises were performed with ten repetitions each.

Outcome Measures

Outcome measures were collected at the following time points: 1) on the first day before treatment and 2) the tenth day post-treatment. VAS consists of a straight line with the endpoints defining extreme limits such as "no pain at all" at one end to" most excruciating pain ever imaginable". The patients were asked to mark on the line between the two endpoints which indicated their pain levels. The distance between "no pain at all" and the mark, then defines the subject's pain[11] WOMAC consists of 24 items: 5 pain, 2 stiffness, and 17 physical function items. It produces three subscale scores (pain, stiffness, and physical function) and a total score. Patients were asked to answer each question concerning pain, stiffness, or difficulty experienced in the previous 48 hours.[12]

Sample size

A sample size of 26 (13 subjects per group) was included in the study using purposive sampling technique based on inclusion and exclusion criteria. The sample size was calculated using the following formula based on the parameters of Tascioglu F and Mascarin N C.[13,14]

Statistical Analysis

Statistical analysis was done using the software SPSS, version 23. The demographic data were analysed by t-test and Fishers Exact test. The comparison of pre and post-intervention values within the group was analysed using paired't' test. The comparison of pre and post-intervention values between the groups was analysed using unpaired't' test. The confidence interval was set at 95%.

Results

Twenty-six subjects were recruited for this study based on the inclusion and exclusion criteria. There were no dropouts seen during the study. Figure 1 shows a flow diagram of patient recruitment. All subjects were similar at the baseline with the mean age of 59.54 in Group A (SD±13.09) and 58.62 in Group B (SD±10.37). The within-group analysis by 't' test showed that there was a highly significant difference ($p < 0.001$) in the pre and post-test values for all the components of WOMAC i.e. physical function, pain, stiffness and the total score (Table 1 & table 2). Between-group analysis of Womac found no significant differences between the scores (Table 3). The mean value of VAS for group A and group B showed a difference in the reduction of pain from 70.23 to 30.08 and 66.69 to 21.31 respectively (Figure 2). The p values in both groups were highly significant ($p<0.001$). The intragroup calculation was done by using unpaired t test and there was no significant difference between the groups ($p=0.5$).

TABLE 1: Within group comparison of WOMAC- GROUP A

CATEGORY	GROUP A	MEAN	SD	MEAN DIFFERENCE	STANDARD DIFFERENCE	t value	p value
Physical function	Pre	35.62	13.137	18.69	9.85	6.84	.000<0.001,HS
	Post	16.92	5.852				
Stiffness	Pre	5.08	1.441	3.00	1.73	6.24	.000<0.001,HS
	Post	2.08	1.320				
Pain	Pre	10.92	3.796	7.00	2.89	8.74	.000<0.001,HS
	Post	3.92	1.801				
Total score	Pre	51.62	17.609	28.69	13.52	7.65	.000<0.001,HS
	Post	22.92	7.889				

TABLE 2: Within group comparison of WOMAC- GROUP B

CATEGORY	GROUP B	MEAN	SD	MEAN DIFFERENCE	STANDARD DIFFERENCE	t value	p value
Physical function	Pre	35.62	13.137	21.62	6.40	12.18	.000<0.001,HS
	Post	16.92	5.852				
Stiffness	Pre	5.15	1.573	3.31	1.80	6.64	.000<0.001,HS
	Post	1.85	1.405				
Pain	Pre	9.38	2.468	6.77	1.96	12.42	.000<0.001,HS
	Post	2.62	1.261				
Total score	Pre	48.38	10.300	31.69	65.50	13.80	.000<0.001,HS
	Post	16.69	6.550				

TABLE 3: BETWEEN GROUP ANALYSIS OF WOMAC

CATEGORY	GROUP	MEAN DIFFERENCE	STANDARD DIFFERENCE	t value	p value
Physical function	A	18.69	9.85	0.897	0.379, NS
	B	21.62	6.40		
Stiffness	A	3.00	1.73	0.444	0.661, NS
	B	3.31	1.80		
Pain	A	7.00	2.89	0.238	0.814,NS
	B	6.77	1.96		
Total score	A	28.69	13.52	0.682	0.502,NS
	B	31.69	8.28		

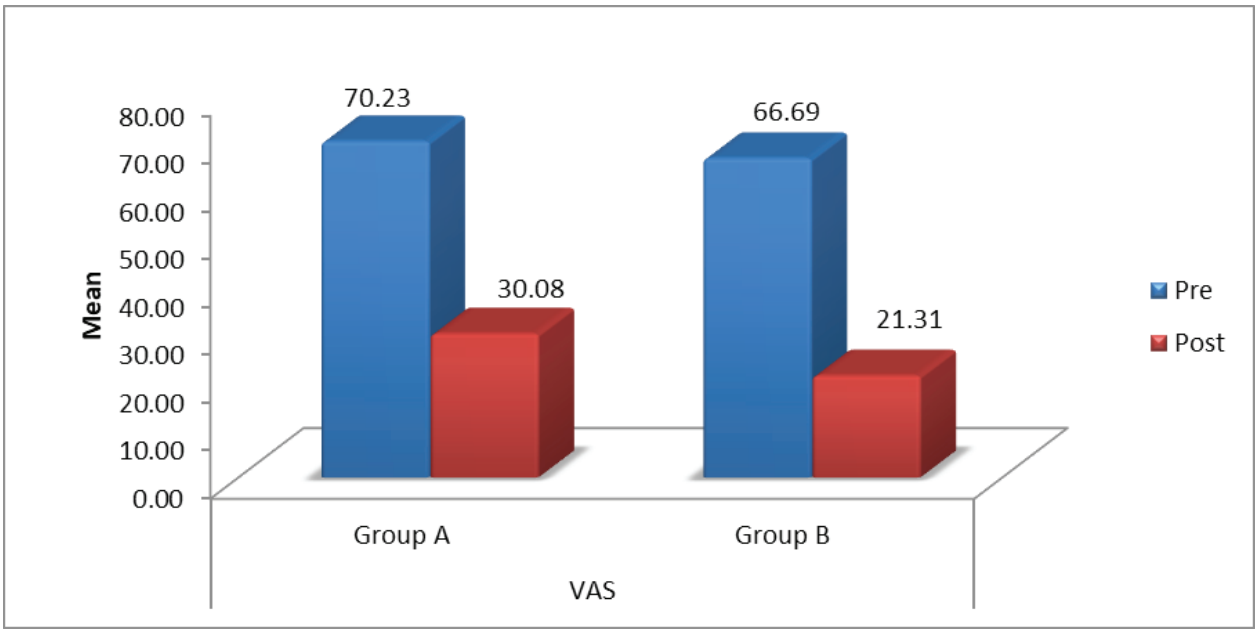

FIGURE 2: Differences in VAS

Discussion

The present study aimed to explore the effect of combination therapy in reducing pain and disability in patients with OA knee. The patients with OA knee included in this study showed significant improvement in the reduction of pain and disability post 10 days of intervention. To our knowledge, this is the first randomized control trial study to find out the effects of combination therapy in OA knee by combining TENS and US.

Previous study conducted by Mukkannavar PB[9] exploring the effect of combination therapy [TENS and ultrasound] and ischemic compression in the treatment of active myofascial trigger points found that combination therapy resolves acute active trigger point pain and increases range of motion rapidly compared to ischaemic compression treatment. Due to limited research in this area, the mechanism of action of combination therapy is unknown. According to Tim Watson[8], combination therapy is a simultaneous application of ultrasound and electrical stimulation namely IFT, TENS or any other form of electrical stimulation. He also describes the advantage of combination therapy; is such that the effects of each treatment modality which can be achieved by low intensities. Combination therapy provides the effects of TENS and US simultaneously. When a peripheral nerve comes in contact with US, its resting membrane potential decreases due to increase in the permeability of nerve membrane for various ions such as sodium and calcium. This will lead to a decrease in the threshold for nerve stimulation, thus the nerve can be depolarized with the use of smaller current. However, the exact mechanism of pain relief cannot be explained. In our study, there was a mean improvement of 70.23 to 30.08 in VAS score and 51.62 to 22.92 in WOMAC score in group A and mean improvement in 66.69 to 21.31 in VAS score and 48.38 to 16.69 in WOMAC score was found in group B, showing an improvement in VAS and WOMAC scores in both the groups. Therefore both treatments showed a positive effect of OA knee. But there was no significant differences in terms of VAS ($p=0.500$) and WOMAC ($p= 0.502$) scores between the groups.

In conclusion, our study found that there was a significant difference in pain outcomes VAS and

WOMAC scale. There was no significant difference seen in between the group. This study showed that both combination therapy and TENS and US given separately was effective in reducing pain and disability in patients with osteoarthritis knee. But with combination therapy the desired effect with respect to reduction of pain, stiffness and improvement in function was obtained in a shorter duration time, making the therapy time- effective for both the therapist and the patient.

Limitations

Simple randomization was done. Therefore, there was an unequal distribution of males and female in this study. Future studies can concentrate on collecting equal male and female samples in each group.

Conclusion

In conclusion, both treatment modalities are safe and effective in reducing pain and disability in patients with OA knee. The overall treatment time used for combination therapy is less than that of TENS and US given separately.

Ethical Clearance: The study was approved by the Father Muller Medical College institutional ethics committee. All the authors were affiliated to Father Muller Medical at the time of the study.

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Physiological Cost Index of Walking in Stroke Patients and their Functional Ambulation Category

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Abstract

Background: Mobility, defined as the ability to walk safely and independently, is integral to the performance of basic activities of daily living.An interruption in the normal gait cycle and the energy conserving characteristics of the trunk and limb motion results in an increased energy expenditure.

Objective: The objective of the study was to compare the Physiological Cost Index(PCI) of walking in stroke survivors with their Functional Ambulation Category(FAC).

Design: Cross Sectional Study

Methods: 30 participants meeting the inclusion and exclusion criteria were included in the study. The participants were graded on FAC. Their heart rate(HR) was recorded pre- and post- 6-Minute-Walk-Test(6MWT). The distance walked was measured and recorded. The PCI was calculated and the data was subjected to statistical analysis.

Results: The mean PCI of all the participants was 0.72(±0.68). A moderate negative correlation existed between the PCI and FAC. The category of FAC increased as the patients PCI of walking decreased.

Conclusion: Increased PCI values could imply lower functional mobility scores on FAC. Therapeutic interventions that alter PCI values and interventions that effectively reduce energy consumption could be identified for better rehabilitation outcomes.

Key words: *Stroke; Physiological Cost Index; Functional Ambulation Classification; 6MWT.*

Introduction

Limb movements are produced as a response to muscle activity. Interruption of the normal gait cycle and the energy conserving characteristics of the trunk and limb motion will result in increased energy expenditure.[1]

Energy expenditure for walking varies with the degree of weakness and spasticity in hemiplegic patients as the condition reduces gait efficiency and increases the energy cost of walking up to twice that of able bodied individuals.[2] The physical capacity of Stroke survivors is often decreased because of de-conditioning thus further increasing the energy demands of activities of daily life.[3]

The Physiological Cost Index(PCI) estimates the energy cost of walking in healthy people, persons with lower limb amputation, walking with prosthesis[4]and also children.[5]It provides insight into endurance for people with stroke though motor impairments impact greatly on the 6-Minute-Walk-Test(6MWT) scores.[6]

The Functional Ambulation Category(FAC) ismeant to assess functional mobility or gait in persons suffering from Stroke.[7] This 6-point scale assesses ambulation status by determining the amount

of human support required by patient when walking, regardless of the use of a personal assistive device.[8,9]

Recovery of mobility, specifically the ability to walk safely and independently in the home and community, is one of the most important goals reported by patients following a stroke. Self-efficacy related to balance and falls and environmental determinants that influence community walking have been studied in the past.[10]

Energy cost is an important parameter in the evaluation of locomotor disability. The search for review identified a lack of studies comparing the PCI of walking and the FAC of stroke survivors. Keeping in view, the socioeconomic impact of stroke on patients, families and health service providers, it is of utmost importance to implement various rehabilitation methods which not only improve balance and gait but simultaneously increase the efficiency of performing the task and also reduce the on-going cost of long term care, as both are crucial for the quality of life of stroke victims.

Methodology

Inclusion Criteria: Stroke survivors aged 30 to 64 years with a history of an incident stroke at least 6 months prior to data collection, weremedically stable with an ability to walk independently (with or without lower limb orthoses)[11] for 6 minutes duration were included in the study.

Exclusion Criteria: Persons who disagreed for participation and those with impaired cognitive function (unable to understand information or follow instructions), communicative impairments, neuromuscular diseases, claudication, and severe musculoskeletal problems affecting the lower extremity or spine were excluded. Persons suffering from any other orthopaedic(musculoskeletal problems relating to conditions other than stroke) or neurological (other than stroke-induced) diseases impairing gait were also excluded. Persons with a history of previous myocardial infarction and/or recurrent stroke and those using walking aids(canes, walkers, rollators etc.) also were excluded from the study.

Procedure:

Ethical clearance was obtained from the Institutional Ethical Committee.

The purpose of the study was explained to the 63 stroke survivors referred to physiotherapy for neurorehabilitation.30 patients did not meet the inclusion criteria (4 did not consent for participation, 2 had previous myocardial infarction, 13 couldn't stand while 11 couldn't walk independently for at-least 6 mins). 33 patients were included in the study. 3 patients couldn't come for the test due to personal reasons. Demographic data and baseline characteristics of participants were recorded. The participants were categorized according to the FAC. Participants were explained the procedure of 6MWT in detail and informed that they could take rest in the middle of the test/walk if they felt any fatigue, breathlessness or any other problems.

The participants sat on a chair for about 3 minutes prior to 6MWT. HR at rest was measured using the portable pulse oximeter(Scure) and recorded. The participants were then asked to walk along the predetermined 10 meter long track for 6 minutes at their self-selected speed.

Participants were asked to sit on the chair after completing the duration of walk and the post-walk HR was measured and recorded. Distance walked by the participants was measured and recorded for calculating the speed of walking. Data thus collected was used for calculating the PCI of walking using the formula below.[11,12]

PCI = Post Walking HR(beats/min) – Resting HR(beats/min)

Speed(m/min)

Results

Data of the 30 participants was subjected to appropriate statistical data analysis, using SPSS-version23.0.

Table–1: Participants'Demographic Data

	Females	Males	t-value	P-value
N(%)	7(23)	23(77)		0.001*
Mean Age(Years±SD)	52.4(±6.9)	55.4(±8.8)	-0.80237	0.43
Mean PCI(±SD)	0.99(±1.10)	0.65(±0.52)	1.2792	0.21
Mean BMI(±SD)	24.1(±2.9)	23.4(±3.3)	0.491	0.63
6MWD(±SD)	117(±36.8)	124(±37.8)	-0.44435	0.66
Walking Speed	19.5(±6.1)	20.7(±6.3)	-0.45463	0.65

*p<0.05 was statistically significant.

Table–1 demonstrates the participants' demographic details. The participants included 23(77%) male and 7(23%) female stroke patients with a mean PCI of 0.65(±0.52) and 0.99(±1.10) respectively. The Z-Score for 2 population proportions was 4.1312 with a p-value of 0.001 which was significant. The population of males (0.767)among stroke survivors was significantly higher as compared to females (0.233). The mean ages of the men and women were 55.4(±8.8) and 52.4(±6.9) years, while BMI were 23.4(±3.3) and 24.1(±2.9) respectively. There was no significant difference in the mean ages and BMI of both the genders. Gender also did not influence the 6MWD and walking speed.

16 and 14 patients had a right and left sided stroke respectively. 15(50%) patients had a dominant side stroke while an equal number had a non-dominant side stroke, with no difference in proportion. The PCI of patients with dominant(0.58)side stroke and non-dominant(0.88)side stroke were non-significantly different at a *t*-value of -1.2019 and *p*-value of 0.24.

Table–2 shows the participants'details according to the type of Stroke. 21(70%) and 9(30%) suffered an ischaemicstroke(IS) and haemorrhagic stroke(HS) respectively. The proportion of IS(0.7) was significantly higher as compared to HS(0.3) with a mean PCI of 0.84 and 0.45 respectively, at a Z-Score for proportion of 3.0984 and p-value of 0.002.

Table–2: Participants' details according to type of Stroke

	HS	IS	t value	P value
No. of Participants n(%)	9(30)	21(70)		0.002*
Mean Age in Years(±SD)	50.56(±10.37)	56.52(±7.33)	1.80272	0.08
Mean PCI	0.45(±0.34)	0.84(±0.68)	1.45824	0.16

*p<0.05 was statistically significant.

Persons with 1 or more co-morbid conditions, hypertension or diabetes or both, were 13(43%) with a frequency of 7, 3 and 3 respectively. PCI of persons with 1 or more co-morbidities(0.79) was not significantly different from those without co-morbidities(0.68).

The mean 6-minute-walk-distance(6MWD) of all patients was 122.6(±37.04)meters and walking speed was 20.41(±6.1)m/min. The mean blood pressure(BP) of the participants were 131.3(±8.6)/91.16(±11.11) and 138.8(±9.53)/93.83(±10.72) at rest and post 6MWT respectively.

Table–3: Age wise frequency distribution of patients

	30 – 41	42 – 53	54 – 64
No. of Participants n(%)	2(10)	9(27)	19(63)
Mean Age in Years(±SD)	36(±3)	47.1(±4.04)	60.3(±3.04)
Mean PCI	0.24	0.58	0.85

The frequency distribution (Table–3) of participants in the age groups of 30–41, 42–53 and 54–64 years was 2, 9 and 19 with a mean PCI of 0.24, 0.58 and 0.85 respectively. The highest prevalence of stroke was found in the age group of 54–64 years. The Kruskal-Wallis chi squared statistic of 6.097, with a p-value=0.047,signified that one or more of the independent groups were different.

The Dunn test(Table–4), said to be appropriate for groups with unequal number of observations, was used for Post-hoc pairwise multiple comparisonto discern the pairs with significant differences.A PCI was significantly higher among the 54-64 year age group as compared to that of 30-41 years at p-value 0.03.

Table–4: Dunn's p values

Age Classes	30 – 41	42 – 53
42 – 53	0.21	
54 – 64	0.03*	0.12

*p<0.05 was considered statistically significant.

Table–5: Mean PCI, 6MWD and Speed of persons according to FAC

FAC	N	PCI	6MWD	Speed
3	10	1.1	95	15.8(± 4.5)
4	14	0.6	135.7	22.6(± 6)
5	6	0.5	138.3	23(± 5)
Pearson's Correlation Coefficient r		-0.93	0.89	0.89

The mean PCI of walking of all the patients was 0.72(±0.68). The value of r for Pearson's correlation between PCI and the FAC was -0.38. Although technically a weak negative correlation existed between the two variables, the p-value from Pearson(R) Calculator for the same was significant at 0.039.

The frequency distribution of patients(Table–5) across FAC 3, 4, and 5 showed 10, 14 and 6 participants in each category with a mean PCI of 1.1, 0.6 and 0.5 respectively. The PCI of patients with FAC 3 was twice that of those with a FAC 4 or 5. Patients with FAC 4 and 5 demonstrated a 43-45% greater 6MWD and speed of walking as compared to patients with a FAC 3. A correlation of the mean PCI's with the FAC category showed a strong negative correlation(r=-0.93,p=<0.00001). The speed and 6MWD strongly positively correlated with the FAC category(r=0.89,p=<0.00001).

Table–6: Analysis of PCI, 6MWD and Speed of persons with FAC

	adjusted H	d.f.	P value	Dunn p-values		
				FAC 3 & 4	FAC 4 & 5	FAC 3 & 5
Speed	9.587	2	0.008*	0.01*	0.49	0.01*
6MWD	9.587	2	0.008*	0.01*	0.49	0.01*
PCI	2.628	2	0.269			

* p<0.05 was considered statistically significant.

The Kruskal-Wallis chi squared statistic comparing the FAC with speed, 6MWD and PCI (Table–6) was 9.587, with p-value 0.008 for both speed and 6MWD. This p-value signifies that one or more of the independent groups are different. The post-hoc pairwise multiple comparisons(Dunn p-valuesfurther adjusted by Benjamini-Hochberg FDR method)showed that speed and 6MWD among persons with a FAC 4 and 5 was significantly higher than that of those with FAC 3. Thespeed and 6MWD of persons with FAC 4 and 5 were not significantly different.

Discussion

This cross-sectional study aimed to compare the PCI of walking among30-64 years old stroke survivors with their FAC.

30 patients were included in the study. The prevalence of men with stroke was significantly higher than women. The male participants were

three times the female participants. These results are supported by studies which report a 41% higher prevalence of stroke in men than women.[13] Mean ages and BMI were not differentamong both the genders. Influence of gender on 6MWD and walking speed was compared as women and men have different anthropometric characteristics, however no influence was observed. Previousstudy also reports that, there were no differences in preferred walking speed(velocity) and cadence in men and women.[14]

A comparison ofhand dominance and side of occurrence of stroke showed an equal number of patients with dominant and non-dominant side strokes, with a non-significant difference in their PCI. A study reported that 45% stroke survivors were affected by stroke on the dominant arm side, similar to our findings.[15]

70% of the participants in the case group suffered an IS. This is supported by a study which reports that 80% of all strokes are IS while 15% are hemorrhagic strokes.[16] The high prevalence of IS could be due to presence of risk factors (Hypertension and diabetes) which are accounted for increase in the total IS.A higher prevalence of hypertension and diabetes has been reported in men as compared to women in recent studies. In India the crude prevalence of diabetes has been reported at 7.3% and 7.8% among women and men respectively, while that of hypertension was 23.6% and 27.4% women and men respectively.[17] IS has also been reported to be highest among smokers.[18] Age did not influence the type of Stroke in our sample. The PCI of walking in ISsurvivorswere double those in HS survivors.

43% patients reported a presence of comorbid conditions. Highest frequency(33%) of hypertension was noted among participating patients. Elevated BP was reported highly prevalent across different stroke subtypes.[19] The PCI of persons with 1 or more co-morbidities and without co-morbidities were 0.79 and 0.68 respectively. Comparison for habits affecting the PCI was not undertaken as only 5 patients reported a presence of one or more habits (Alcohol consumption, Smoking, Beetle Nut and Tobacco chewing).

The results demonstrated highest frequency of stroke patients after 54 years of age, which was 9 times and 2 times greater than the 30–41 and 42–53 age groups respectively. Significantly higher PCI of walking was also noted in this age group. Increasing prevalence of stroke was noted with increasing age.Previous data which states that risk of stroke more than doubles each decade after the age of 55supports this result.[20] The American Heart Association statistics of 2015 shows increasedstroke prevalence in persons above 60 years.[21]

Results showed that PCI of walking decreased with increased FAC. This may indicate that persons requiring a lower PCI for walking, may tend to require lesser assistance for walking. The speed and distance of walking were also found to be greater in persons with a higher FAC.

Conclusion

The small sample size of the study may be a drawback making the generalization of the result difficult. However walking being a major daily activity, impaired walking function may contribute to greater functional disability after stroke. Factors affecting it need to be assessed and managed appropriately, as improved walking function is the goal most often stated by patients with stroke. We suggest that the stroke-specific exercise guidelines should include PCI as an outcome measure to help patients walk with lesser

energy consumption for a more independent and better living.

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

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Effect of Neurodynamic Slider Technique Combined with Conventional Therapy and Conventional Therapy Alone in Sciatica: A Comparative Study

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Abstract

Background: Functional activity is an important aspect of normal human function. Limited functional activities due to in sciatica have been shown to predispose a person to several restrictions in function and significantly affect the normal daily life.

Objective: To determine and compare the effectiveness of Neurodynamic Slider Technique (NST) with conventional therapy (CT) and conventional therapy alone in sciatica for improving functional ability and pain.

Method: 40 subjects with sciatica were allocated into two groups (20 subjects in each group). The outcome measure used was Oswestry Disability Index (ODI) and Visual Analogue Scale (VAS). Subjects of group A were treated with Conventional therapy only, whereas the subjects of group B were treated with Neurodynamic slider technique. For both the groups, the technique was performed three times a week for a total treatment period of four weeks.

Results: The results demonstrated significant improvement in functional ability for subjects of group B when compared with those of group A ($P<0.05$) at the end of four weeks.

Conclusion: The study shows that CT along with NST are efficient in the rehabilitation of sciatica patients reflecting the improvement of functional ability by reducing pain and considerably increase the physical performance of patients in their own aspects. Thus, Neurodynamic Slider technique along with Conventional therapy can be used in clinical practices for the treatment of sciatica.

Keywords: *Sciatica, Low Back Pain, Functional ability, Neurodynamic slider technique, Conventional therapy, VAS.*

Introduction

Sciatica is a non-specific term commonly used to describe symptoms of pain radiating downward from the buttock over the posterior or lateral side of the lower limb[1]. This condition is due to sciatic nerve compression, the most common cause being herniated disk. Other causes that can be cited are degenerative spine disease, infections, traumatic posterior hip dislocation, congenital anomalies, Piriformis syndrome and lumbar spinal canal stenosis.

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The symptoms include low back pain, pain along the nerve, sensorial disturbances and weakness of the lower limb muscles innervated by the sciatic nerve. Sciatica due to nerve compression, originating from a neurapraxic-type injury, is characterized by a decrease in nerve conductivity and causes selective atrophy of the muscle fibers innervated by compromised motor neurons[2].

World data reveals 40 % or more people have sciatica due to lumbar disc prolapse mostly in younger adults in association with 50-70% lifetime incidence of low back pain. The prevalence of sciatic symptoms reported in the literature varies considerably ranging from 1.6% in the general population to 43% in a selected working population[3].

Physical therapists utilize a wide range of treatment to treat sciatica like electro therapy modalities, general back strengthening or lumber stabilization and neural stretching techniques to treat altered neurodynamic of the neural structures which is been considered to be one of the predominating cause for low back pain[6]. One subgroup that has been examined by number of researches was the patients who had symptoms that are more distal and whose symptoms did not improve with specific directional exercises (flexion/extension exercises). These patients are commonly thought to be experienced due to altered neurodynamic i.e., interaction between nervous system mechanics and physiology[4].

NEURODYNAMIC conceptualized by Michael Shacklock, which refers to the integrated biomechanical, physiological and mechanical functions of the nervous system [5]. Clinical neurodynamic is essentially the clinical application of mechanics and physiology of the nervous system as they relate to each other and are integrated with musculoskeletal function[6]. Neurodynamic is a manual method of applying force to nerve structures through posture and multi-joint movement [7]. Based on the principle that the nervous system should be also stretched and contracted properly to maintain normal muscle tension and ensure range of motion[8], this technique is used for the recovery of soft tissue mobility [9]

"If it cannot move, glide and stretch, then the nervous system's cardinal function of conduction will be useless"[8]. For a peripheral nerve to function properly the nervous system must have the ability to move and slide, withstand stretch and compression. It is important to note that these features are interdependent therefore the Peripheral Nervous System must simultaneously cope with body movement and dissipate mechanical force by adapting to elongation and compression which allow independent movement in relation to its surrounding tissues. [10]

In this study SLR test was used to examine the sensitivity of the structure of sciatic nerve. Straight leg raising test (SLR) is widely used one of the primary diagnostic physical examination tests in patients who have low back pain or low back and leg pain. Slump test is actually a variant of SLR [12]. Maitland (1985) described that slump test can be used as an assessment tool for the identification of possible altered neurodynamic[11].

An important aspect of the neurodynamic approach is that the healthy mechanics of nervous system enable pain-free posture and movement to be achieved[4,8]. Essentially, neural mobilization techniques have been developed from neurodynamic tests. Structural differentiation is performed with all the neurodynamic tests to gain information whether the neurodynamic events participate in the mechanism of symptoms. Neural mobilization techniques have been developed from neurodynamic test [,5,9]. Now that a growing body of evidence is emerging regarding the mechanical effects of neural mobilization techniques like the ipsi-lateral sliders, ipsi-lateral tensioner for different nerves in the body, it is important to find the

benefits of newer techniques like the slider techniques, so that they can be used in specific conditions of low back with radiating symptoms.

The purpose of the present study was to compare the effectiveness of Neurodynamic Slider technique combined with conventional therapy and conventional therapy alone in treatment of Sciatica. This study is being carried out to determine which treatment is better in addressing the dysfunctions. A comparison with the control group will help to further strengthen the available evidence on the effectiveness of Neurodynamic slider techniques.

Methodology

The study was conducted at Florence college of Physiotherapy clinic, Bangalore, India. Ethical clearance was obtained from institutional ethical committee, Florence College of Physiotherapy, Bangalore as per ethical guidelines for biomedical research on Human subjects, 2000 ICMR, New Delhi. The study design was a pre-post experimental study for duration of 6 months. Simple random sample of 40 participants with age ranging 30-55 years, both genders presenting sciatica with or without low backache of symptoms from 2 weeks to 3 months with leg pain greater than back pain in a radicular distribution and changes in symptoms with lumber flexion or extension. Patients should have positive Straight Leg Raise (SLR) of more than 35 degrees with radicular sign with persistent pain radiating to the lower limb and baseline of Visual Analogue Scale score greater than 4 and Oswestry Disability Index score greater than 10% were included in the study. Patients with history of severe trauma, spinal fracture, Infections, Tumors, Secondary Metastases, osteoporosis, Cauda Equina Syndrome, Spinal stenosis, Postoperative conditions in the back and hip, Positive neurological signs exhibited a SLR test of less than 35 degrees and History of a major psychiatric or systemic illness were excluded from the study. Prior to participation, a written informed consent was taken from all patients and were informed about study protocol. Standard full circle goniometer, High Couch, Visual Analogue Scale (VAS), Oswestry Disability Index scale (ODI), Interferential Therapy (IFT), Ultrasound Therapy (UST) were used for the study. All the patients were undergone a pre-treatment examination to assess pain and functional ability using VAS and ODI scale.

Procedure: Subjects willing to participate in the study were briefed about the treatment. After briefing, their written consent was taken. The assessment was performed and the initial Pain and Disability was measured using VAS and ODI scale. Assessment was taken on the 1st day of session and at the end of last session. Patients were given treatment 3 times a week on alternate days till 4 weeks. The subjects were randomly assigned into two groups of 20 each using a simple random distribution into 2 intervention groups. 40 subjects were taken conveniently first come first basis and divided 20 subjects into "Group A" where the treatment allotted to them was Conventional therapy only and 20 subjects into "Group B" and the treatment allotted to them was Conventional therapy along with Neurodynamic Slider Technique. Complete explanations were given to both the groups separately but the subjects were unaware to which group they belonged.

In group A, 20 patients were screened and assessment was performed and pre intervention score was calculated. Treatment was started first with Electrotherapy followed by Piriformis stretch and back strengthening Exercises once the pain had come down. Electrotherapy which included UST, IFT along the course of pain and/or at the Low back for 3

days a week till 4 weeks and exercise were made to do under supervision. UST was used for the duration of 6 minutes at the site of Piriformis muscle. IFT was used 10 minutes at the Lumbar region and/or along the course of pain. The exercise such as Piriformis Stretch was performed as patient was lying on the back with both feet flat on the couch and both knees were bent. Resting the ankle of the affected leg over the knee of the unaffected leg and asked the patient to pull their unaffected thigh toward the chest and hold the position for 15-30 seconds for 3 repetitions which results the stretch of Piriformis muscle on the affected side. Back Extension in prone was performed as patient was lying prone on the couch with palms facing upwards and toes touching the couch. Slowly raising the upper body off the ground by pulling shoulders back and lifting your legs up as far as they can come up. Looking straight ahead throughout the move and patient returned to starting position and repeated for 10 repetitions. Bird and Dog/Quadruped Exercise was done as this exercise begins on all fours with hands directly under shoulders and knees directly under hips. Patient pulls their abs in to the spine. Keeping back and pelvis still and stable, reaching their right arm forward and left leg back. Avoiding the pelvis to rock side to side as they move their leg behind them. Focus was on not letting the rib cage sag toward the floor. Patient reach through their left heel to engage the muscles in the back of the leg and their buttock. Return to the starting position, placing their hand and knee on the floor. Repeating on the other side to complete one rep. This exercise was done for 10 repetitions.

In group B, 20 patients were screened; assessment was performed and pre intervention score was calculated. These patients received Conventional Therapy along with Neurodynamic Slider technique for alternately 3 days a week up to 4 weeks duration. Conventional Therapy was applied same as group – A. Patient was treated with Neurodynamic slider techniques of sciatic nerve to the lower limb as explained by M. Shacklock [4] additional to CT. Neurodynamic Slider technique was given based on irritability and severity of the condition. Depending upon severity of pre intervention score i.e., VAS score >7, Off Loader Position was performed, i.e., in either side lying or supine lying, Hip flexion was below 70 degree, abducted, externally rotated; knee flexed and foot was in comfortable position. This position was maintained for about 2 minutes to relax the sciatic nerve and Piriformis muscle. One Ended Slider which was done distally by moving knee flexion to extension and/or ankle plantar flexion/inversion. The position was in side lying, painful side was uppermost, hips and knees were flexed to approximately 45°. The neck movements (both flexion and extension) were restricted to neutral position or was in relaxed position i.e., Neck in extension or generally performed to a comfortable range and, if this was satisfactory, the movements were progressed further into the next level i.e., Two ended sliders. The movements were on bilateral knee extension or ankle plantar flexion. The neck movements were restricted to one position. The movements were made by the therapist whilst the patient kept the neck stable. Two Ended Slider was performed by moving Neck neutral to extension and Knee flexion to extension for Distal Slider; Neck neutral to flexion and Knee extension to flexion for Proximal Slider. The position was in side lying, painful side uppermost, hips and knees were flexed to approximately 45°. The neck movements (both flexion and extension) were generally performed to a comfortable range and, if this was satisfactory, the movements were progressed further into the range. The movements were done as neck extension/ bilateral knee extension then neck flexion/bilateral knee flexion. The neck movements were generally performed by the therapist whilst the patient moved their knees. Dorsiflexion was optional. This slider techniques were also done in supine once the patient

was comfortable with side lying position can also be performed in the sitting position if this was more convenient.

Results

Comparative statistical analysis has been carried out in the present study. Out Come measurement functional disability and pain was measured using Oswestry Disability Index and Visual Analogue Scale respectively, and the analysis are presented as mean ± SD. Level of significance with p value <0.05 then this is considered as statistically significant.

Table-1: Distribution of subjects according to gender in both groups.

S.no.	Gender	GROUPS	
		GROUP A	GROUP B
1	Male	12(60%)	14(70%)
2	Female	8(40%)	6(30%)
		Chi-Square value=0.4396, df=1, p=0.507,NS	

NS-Not significant. i.e.>0.05

Table-2: Distribution of subjects according to age in both groups.

S.no.	Groups	Age in years		Unpaired t-test
		Range	Mean ± SD	
1	Group A	31-53	41.5±6.2	t=0.4879, p=0.314, NS
2	Group B	30-54	40.45±7.3	

NS-Not significant. i.e.>0.05.

Table-3: Range, Mean, SD, ODI and pain measures in (GROUP A)

S.no	Variables	Pre test		Post test		Paired t-test and Wilcoxon test	p-value
		Range	Mean ±SD	Range	Mean ±SD		
1	ODI	32-60%	47%± 0.086	8-32%	21%± 0.065	Paired t-value=12.28*	p=0.00
2	VAS for pain	5-8	6.85± 0.933	1-4	2.65± 0.875	Z-value=3.919*	p=0.00

Note: * denote –Significant (p<0.05).

Table-4: Range, Mean, SD, ODI and pain measures in (GROUP B)

S.No.	Variables	Pre test		Post test		Paired t-test and Wilcoxon test	p-value
		Range	Mean ±SD	Range	Mean ±SD		
1	ODI	34-58%	47%± .071	8-22%	15%± .042	Paired t-value=18.71*	p=0.000
2	VAS for pain	6-8	7.1± 0.78	1-3	1.85± 0.67	Z-value=3.91*	p=0.000

Note: * denote –Significant (p<0.05)

Table-5: Comparison of post ODI and pain between (GROUP A) and (GROUP B)

S.no.	Variables	GROUP A	GROUP B	Unpaired t-test and Mann-Whitney U test	p-value
		Mean ±SD	Mean ±SD		
1	ODI	21%± 0.065	15%± .042	Unpaired t-value=3.72*	p=0.0003
2	VAS for pain	2.65± 0.875	1.85± 0.67	Z-value=2.73*	p=0.006

Note: * denotes–Significant (p<0.05); NS – Not significant (p>0.05)

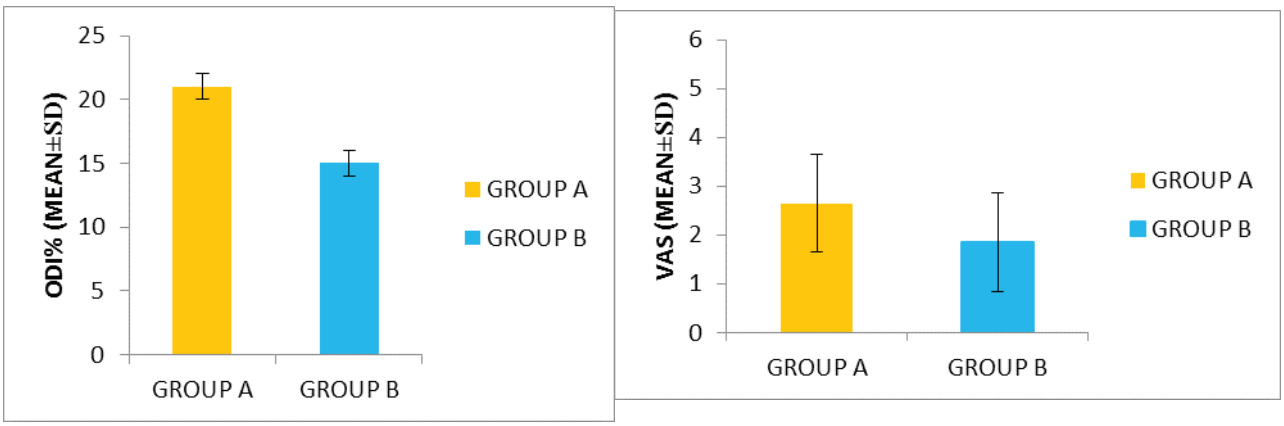

Fig.: Graphs between groups for ODI score and VAS score

Discussion

The Study was aimed to compare the effect of neurodynamic slider technique combined with conventional therapy and conventional therapy alone in 40 Sciatica patients (20 in each group) by means of Visual Analogue Scale (VAS) and Oswestry Disability Index scale (ODI).

The baseline demographic variables were homogeneous in nature in both the groups. In group A there were 12 male subjects and 8 female subjects. Similarly, in group B there were 14 male subjects and 6 female subjects. The mean age in group A, was 41.5 with SD of 6.2 and in group B the mean age was 40.45 with SD of 7.3.

In group A, the mean ODI have improved significantly. Possible explanation for the improved quality of life, functional ability for the subject in group A could be because of viscoelastic nature of the Piriformis muscle, and also Knott. M. and Voss. D. (1968) proposed that the Golgi tendon organ is a nerve receptor found in tendons. This receptors fires when tension increases in the tendon, this tension can be due to stretch or contracting muscle when the Golgi tendon organ fires a signal is sent to the spinal cord causing the agonist muscle to relax [13]. Another reason also could be the placebo effect that has been reported to account for 5% to 72% of the treatment effect [14]. A recent trial found significant positive outcomes for postoperative orthopedic knee surgery patients treated with home IFT versus placebo IFT, providing the first evidence for the efficacy of this modality for musculoskeletal conditions [15]. Thus, future researchers investigating the efficacy of IFT for sciatica or LBP should include an adequate control or placebo group [16].

In group A, the mean VAS score has showed significant improvement. It could may be the stretching of Piriformis muscle and increasing the pain threshold level. This is in accordance to the study by Cristina Bretichwerdt and colleagues found that stretching of the hamstring muscles, either unilateral or bilateral, exerts an immediate hypoalgesic effect, i.e., increase in pressure pain threshold levels. The mechanism behind this is that muscle stretching also activates descending inhibitory pathways [17].

In group B, the mean ODI have improved significantly. This is in accordance to the absolute sciatic nerve excursion during sliding technique [13]. Méndez-Sánchez et all.[18] applied a neurodynamic sliding technique to the hamstrings of healthy male soccer players, observing a greater improvement in ROM than that after general stretching, and Castellote-Caballero et all [19] also applied a neurodynamic sliding technique to 28 healthy football players, with a significant increase in ROM demonstrated using the passive SLR test. These findings were consistent with the results of this study. These findings can be explained as follows: If tension is applied to the nervous system while applying neurodynamics, the reduction of the cross-sectional area and increase in pressure in the nerve result in extension and movement of the sciatic nerve together with the hamstring and compliance of the nerve, resulting in increased flexibility [20,21].

When applying neurodynamics, tension occurs in the nervous system, and pressure within the nerve increases due to the decrease of the cross-sectional area, and the axonal transport system lengthens the sciatic nerve after shortening because of the influence of the surrounding related structures and hamstring flexibility [22]. After extension of the nerve and muscle, muscle performance is improved because of increases in the number of muscle fibre segments and cross-sectional area of muscle fibres[23]. Neurodynamics increases the activity of muscles more significantly than that observed at rest[24,25]. Previous studies reported reductions of muscle tone and muscle spasticity, suppression of hyper tonus, improvement

of grip, recovery of median nerve function [26,27], and pain relief after the application of neurodynamics. After applying a neurodynamic sciatic nerve sliding technique in this study, significant differences were observed in functional ability, quality of life, and range measuring hamstring flexibility by the means of SLR test.

The mean VAS score showed the significant improvement in group B which could be explained due to involvement of central and peripheral modulatory mechanisms, such as activation of muscle[24,26] and joint mechanoreceptors that involve centrally mediated pathways, like the periaqueductal grey in the midbrain, or non-opioid serotonergic and noradrenergic descending inhibitory pathway [28].

Hence based on the analysis and findings, the present study found that with 4 weeks of NST along with conventional therapy showed better result with P value <0.05. So NST along with conventional therapy is a good choice of treatment for people with sciatica. Thus, NST can be used in the treatment of people with sciatica to get improvement in functional ability and pain within a shorter period of time.

Conclusion

This study was intended to compare the effect of Neurodynamic slider technique along with conventional therapy versus conventional therapy alone in sciatica. Taking into the consideration the parameters of pain using VAS and functional disability using Oswestry Disability Index Questionnaire in case of effect of NST with CT versus CT alone in sciatica with or without back pain. The study can be concluded by taking mean scores that effect of NST with CT versus CT alone are efficient in and useful in the rehabilitation of the patients with sciatica. They improve the functional ability, relieve pain mainly in personal care, sleeping, walking, standing aspects of ODI and considerably improve the physical performance of the patients in their own aspects.

Ethical Clearance- Taken from Institutional Ethical Committee of Florence Institute of Physiotherapy

Source of Funding- Self.

Conflict of Interest - Nil

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The Imperatives of Critical Care Physiotherapy

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Abstract

Multiple factors make critically ill patients to be on bed with resultant deconditioning of body multi-system. Physiotherapy is an essential part of multidisciplinary team involved in the management of patients with critical illness.The rehabilitation plan ensures that the patient is treated with the functional needs of the patient in focus. The determinants of implementation of critical care physiotherapy are the patient's need, the level of consciousness of the patient and the physical strength of the patient. Physiotherapy in critical care setting provides several benefits for the critically ill. Thus, there is imperatives of critical care physiotherapy.

Key Words: *Deconditioning, Rehabilitation, critically ill, multi-system, critical care physiotherapy.*

Introduction

Physiotherapy has been recommended as a main component in the management of patients with critical illness.Early physiotherapy is aimed at improving patient's quality of life and preventing critical care unit (CCU) - associated complications like deconditioning, ventilator dependency and respiratory conditions.This intervention prevents and mitigates adverse effects of prolonged bed rest and mechanical ventilation during critical illness. Multiple factors make critically ill patients to be on bed rest. This includes altered level of consciousness, drugs that prevent mobility (sedatives), traumatic injuries, and surgical complications. In 1960's a number of bed rest studies revealed the detrimental physiological effects of inactivity[1]. Bed rest is at a cost and the cost is profound deconditioning of the body.

Deconditioning is described as a state of decreased functional capacity of multiple organ systems, the severity of which is dependent on the degree and duration of immobility. Early progressive mobilization is essential in minimizing functional decline[2]. Physiotherapists are part of the multidisciplinary team in intensive care units. Critical care is the specialized care of patients whose conditions are life-threatening and who require comprehensive care and constant monitoring, usually in intensive care units (ICUs) and high dependency units (HDUs). Physiotherapists use a comprehensive multisystem assessment that includes the respiratory, cardiovascular, neurological, and musculoskeletal systems to formulate individualized treatment plans. Critically ill patients frequently suffer long term physical and psychological complications. They are on long term mechanical ventilation and as a result, 25% display significant muscle weakness, and approximately 90% of long term ICU survivors will have ongoing muscle weakness.

Clinical Implications of Bed Stay

Bed rest decrease VO$_2$ max, and the extent of the loss depends on the length of the bed

rest, with VO_2 max decreasing approximately 0.9% per day over 30 days of bed rest[3, 4]. The decrease in VO_2 max during bed rest appears to be independent of gender and age. However, more fit individuals may experience a greater absolute decrease in VO_2 max compared to less fit individuals[5, 6]. 26% decrease in VO_2 max and cardiac output has been reported after 20 days of bed rest[1]. Similarly, a 17% decrease in VO_2 max following 10 days of bed rest resulted from a 23% decrease in cardiac output[3, 4]. The primary cause of decreased cardiac output and VO_2 max following bed rest is a decrease in stroke volume. Rapid diuresis occurs within the initial 24-48hr of bed rest, resulting in a 10-20% decrease in plasma volume[5, 6]. The primary mechanism for the decrease in stroke volume following bed rest is decrease preload due to a decrease in plasma volume. Bed rest in the supine position results in loss of plasma volume averaging about 600 mL. This loss contributes to the propensity for postural hypotension and syncope. Syncope under any circumstance can result in injury. The possibility of injury is increased if syncope occurs while getting out of a high hospital bed[3, 7].

In the respiratory system, there is potential decrease in lung volumes (secondary to muscle weakness, positioning), reduced expectoration, increased respiratory rate and increased work of breathing. The skeletal system is also affected. Skeletal system functions optimally when exposed to gravity. *Wolff's law* states that the build-up or breakdown of bone is proportionate to the forces being applied (weight bearing, muscle forces and gravity). Maintaining normal bone mass requires a balance between the action of osteoblasts and the osteoclasts. Removal of normal weight bearing activity during bed rest disrupts this balance, and resorption is favoured, resulting initially in an alteration in calcium balance, and later in bone loss[8]. The bones of the lower limbs are the most susceptible to decrease bone mass[9]. Bone mass in the vertebral column decrease by 0.9% following five weeks of bed rest[10]. Greater trochanter bone mass decrease by 4% and spine bone mass decrease by 3% after 12 weeks of bed rest[11]. The following are expected in a patient in critical care unit. Physical Inactivity leading to muscular atrophy and generalized weakness. Diaphragmatic weakness due to prolonged mechanical ventilation. Pressure Ulcers of various grades. Compromised cardiac and respiratory function. Deep vein thrombosis. Infections.

Goals of Physiotherapy Intervention

The short term goals in critical care intervention includes early activity – both passive and active to maintain integrity of musculoskeletal system. Positioning of patients to allow gravity to help sputum drain from the lungs. The use of manual techniques like shaking and vibrations to the ribs to loosen and clear sputum. Suctioning may be needed to suck out the excess sputum. There is also the vital role in weaning a patient off ventilation. Long term goals include a plan for extensive rehabilitation programme to reintegrate and re-initiate the patient into the society. The rehabilitation plan ensures that the patient is treated with the functional needs of the patient in focus. The determinants of implementation of critical care physiotherapy are the patient's need, the level of consciousness of the patient and the physical strength of the patient. The goals of respiratory physiotherapy management are promotion of secretion clearance; maintenance or recruitment of lung volume; optimization of oxygenation, and prevention of respiratory complications in both the intubated and spontaneously breathing patient[12].

There is Prophylactic and therapeutic roles of critical care physiotherapy, prophylactic in all patients confined to bed where there is risk of bronchial obstruction/ ventilatory failure (severe operation, trauma, consciousness disorder) and therapeutic in several cases, principally broncho-pulmonary diseases e.g asthma, obstructive emphysema, pneumonia, bronchiectasis, pulmonary abscess, atelectasis, pulmonary & pleural fibrosis.

Indications and Contra Indications For Critical Care Physiotherapy

The clinical conditions where critical care physiotherapy is indicated are Cardiac conditions cystic fibrosis;bronchiectasis; respiratory muscle weakness in neuromuscular conditions e.g spinal muscular dystrophy; tracheal surgery;surgery for chest wall deformitiesheart/lung transplant; head injuries; premature infants requiring surgery; sepsis; chest infections, neurosurgery (brain tumors, insertion of shunts); burns; road traffic accident; serious fall; severe pneumonia; major surgery; conditions where there is threatened airway; all respiratory arrests; sudden fall in level of consciousness; repeated/prolonged seizures; rising arterial carbon dioxide tension with respiratory acidosis. The contraindications are myocardial infarction; unexplained hemoptysis; pulmonary embolism (P/E) in acute stage; pulmonary hemorrhage; acute pulmonary edema; pneumothorax; risk of increased intra cranial pressure especially when there is plan for postural drainage treatment.

Importance of Pulse Oximetry in CCU

Pulse oximetry is amongst the basic monitoring requirements in CCU, others being,heart rate; blood pressure; respiratory rate; hourly urine output; body temperature; blood gases and 24hourly special drainage volume as in chest tube thoracotomy drainage, CTTD.Pulse oximetry is quick noninvasive and completely painless test with no risk apart from potential skin irritation from the adhesive used in some types of probes. It uses small clamp-like device usually placed on a finger, earlobe/toe. It is fairly accurate with results within a 2% difference either way of actual value.It is significant in the critical care setting as it gives forewarning about the presence of hypoxemiathus leading to a quicker treatment of serious hypoxemia and possibly circumvent serious complications.The presence of pulse oximetry may reduce the number of arterial blood gas samples obtained in the CCU and in the emergency units; reduction in pulmonary transfers to the CCU due to early recognition and treatment of post-operative pulmonary complications. The subsequent maintenance of oxygenation within the physiologic limits might help avert irreversible injury[13]. Pulse oximetry is used to assess patient's ability to tolerate increased exercise administration.

Clinical Benefits of Critical Care Physiotherapy

The beneficial effects of physiotherapy in critical care setting are clearance of lung secretion; promotion of Lung Functions; reduction of Work of Breathing, WOB; reduced incidence of ventilator associated pneumonia; improvement in exercise tolerance; relaxation of contracted respiratory muscles; prevention of respiratory complications and resolution if already present; reduced time spent on Mechanical Ventilation, M/V; reduced time spent on intensive care; reduced cost of care; improvement in Quality of Life, QoL of the patient; reduction in mortality rates and promotion of speedy discharge from the hospital[14, 15, 16, 17].

Summary

Critical Care Physiotherapist views cardiopulmonary system as a whole, interacting with other body systems for optimal function and understands the functions of the multidisciplinary team in the management of critical care patients, including intensive care and cardiopulmonary rehabilitation, and describe the physiotherapist's role in the multidisciplinary team. Physiotherapy interventions incorporate cardiopulmonary goals as well as neuromuscular and musculoskeletal goals for patients to reach maximal rehabilitation potential. The current rehabilitation needs of patient are identified; patient risk of developing physical and non-physical morbidity are identified. For patient at risk, rehabilitation is started as early as clinically possible, which should include measures to prevent avoidable physical and non-physical morbidity and individualized, structured rehabilitation programme with frequent follow-up reviews.

Ethical Clearance – This is an article

Source of Funding – Self

Conflict of Interest – Nil

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Leveraging on Rehabilitation in Long Covid Management

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Abstract

Several cases of pneumonia of unknown cause were reported in Wuhan, Hubei Province, China on 31 Dec. 2019 while novel strain of coronavirus, SARS-CoV-2 was subsequently identified as causative factor ofCOVID-19. It thenspread from that first cluster in Wuhan to become a public health emergency of international concern (PHEIC) and was later recognised by WHO as a pandemic.The COVID-19 pandemic has since caused unprecedented public health challenge and reorganization of the world order. Long term effects of COVID-19 (Long COVID) was recognized in 2020 summer. It wasinitially described as symptoms that lasted for longer than 4weeks before a better definition came up as symptoms persisting for 12weeks and beyond. The cardiopulmonary, neurological and musculoskeletal presentations in Long COVID makes leveraging on rehabilitation in its management inevitable.

Key Words: *Pneumonia, COVID-19, SARS-CoV-2, PHEIC, pandemic, Long COVID, leveraging, rehabilitation.*

Introduction

The course of COVID-19 started with early reports of cases of pneumonia of unknown cause in Wuhan, Hubei Province, China on 31 Dec. 2019. The COVID-19 pandemic was later identified as being caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). WHO declared it a public health emergency of international concern (PHEIC) on 30 Jan. 2020 with far spread to 18 countries outside China.Its further rapid spread makes it to be recognised as a pandemic on 11 March 2020. Later that month, the number of cases outside of China quickly surpassed the number of cases inside China (with >118,000 cases in 114 countries + 4291 deaths). Africa recorded her first COVID-19 case in Egypt on 14 Feb. 2020 andthe first confirmed case in Nigeria was announced on 27February 2020, when an Italian citizen in Lagos tested positive for the virus[1, 2, 3].

The COVID-19 pandemic has since caused unprecedented public health challenge and reorganization of the world order.Its then being an era of border closures; trade restrictions; confinement measures/lockdown; jobs & income losses with livelihoods placed at risk; endangered nutrition; socioeconomic coping strategies (like distress asset sales, child labour and loans); workers health & safety issues; disruptions in Rx of malaria, TB & HIV; passive learning by students; unprepared working force for online education and others;mask mandates[4]. Long term effects of COVID-19 (Long COVID) was recognized in 2020 summer. It wasinitially described as symptoms that lasted for longer than 4weeks. However, a better definition by NICE (National Institute for Health & Care Excellence) surfaced by 2020 ending.NICE stated thatCOVID-19 can last up to 4weeks; persistent symptoms lasting 4-12weeks is described as "ongoing symptomatic COVID-19" and symptoms that persisted 12weeks/more were classified as "post- COVID-19 syndrome"[5, 6, 7, 8, 9].

Prevalence of Long Covid

Between 2-3% and 10% of + COVID-19 experience some symptoms for 12wks or longer

while5-36% non-hospitalized & 39-72% hospitalized COVID-19 patients reported long lasting symptoms, 1-3months post - acute infection;2-21% non-hospitalized & 51-68% hospitalized COVID-19 patients had recurrent symptoms 3-6months post - acute infection;

13-25% non-hospitalized & up to 60% hospitalized COVID-19 patients had persistent symptoms after more than 6months post- acute infection. Common reported symptoms in Long COVID are:fatigue(16-98%); shortness of breath(10-93%); headache (9-91%, 1-3months post- acute infection);fatigue (16-78%); cognitive impairment (13-55%); Respiratory Problems (16-21%, 3-6mtnhs post- acute infection)[8, 10]. Long COVID affects female more than male, middle aged women being worst affected; Female>male, by 4:1, due to genetic disposition; anxiety; more reactive immune response (women of productive age) with lingering virus fragments in remote pockets of the body (viral reservoirs) triggering waves of chronic inflammation. Prevalence increases with age, likelihood increases by 3.5%for each decade of life:There is higher chance with higher weight; smoking; lower incomes; living in deprived areas; chronic illness; hospitalization with COVID-19[8, 10]. Imperial College London recently reported that 2m Adults in England may have had Long COVID and one in 20 Adults reporting persistent COVID-19 symptoms for 12weeks/more[11].

Pathophysiology of Long COVID

Presently, there is limited literature on pathophysiology of Long COVID. However, present findings support multifaceted pathophysiology driven by long term tissue damage (lung, brain, heart) & pathological inflammation from viral persistence, immune dysregulation & autoimmunity[12].Pulmonary scarring (with defective pulmonary gas exchange function/pulmonary radiological abnormalities/ functional impairments) may be responsible for persistent dyspnoea/cough in long COVID[13, 14]. Pathophysiology beyond pulmonary lesions have been suggested since there were reports of persistent symptoms in those with pulmonary, radiological & functional improvements (lasting neurological complications – memory loss/anosmia/ fatigue)[15].A meta-analysis found delirium as a common complication in the acute phase of COVID-19 possibly leading to various neurological sequelae –depression, anxiety, PTSD, memory loss & fatigue[16]resulting from ANS dysfunction[17, 18]. Radiological report of Cardiac abnormalities & myocardial inflammation not associated with initial COVID-19 severity[19]& radiological abnormalities of ventricular remodelling in some[20].Cardiac symptoms (chest pain/heart palpitations/tachycardia) commonly persists for up to 6mths suggesting substantial cardiac sequelae[9, 21, 22, 23]. Radiological evidence of impairments of pancreas, spleen, heart, lung, brain, liver & kidney) persisting for at least 2-3months post hospital discharge in moderate to severe cases[24]. Increased risks of new events of respiratory, diabetes, & cardiovascular diseases occurring within 140days following acute onset have also been reported[25]while auto immunity pathophysiology is seen in T-cells dysfunction through bystander activation with associated thyroid dysfunction[26, 27]. The discovery of SARS-CoV-2 nuclei acid & proteins in small intestines of 50% asymptomatic cases at 4months post disease onset points to induced immune activation at some level[28].

Non Pharmaceutical Interventions

Non Pharmaceutical Interventions (NPIs), are public health measures aimed at preventing and/or control SARS- CoV-2 transmission in the community. They are actions that can be taken apart from getting vaccinated and taking medicine to help slow the spread of COVID-19.It's self-protection & community protection intervention, also known as community mitigation strategies which incorporate

behavioural insights into covid-19 response work (attitudes, behaviour and beliefs) that enhance compliance with NPIs[29]. NPIs which are best used concurrently and in combination are isolation and quarantine; physical distancing; use of facemasks; hand hygiene; surface & object cleaning; travel advice; public & school closures; lockdown.NPIs has been in existence since 1918 when it was used to manage the influenza pandemic('Spanish Flu'). The effectiveness of NPIs is not in doubts, compliance is the issue.Early & Sustainable institution of NPIs in the cultural & socioeconomic context is recommended[30, 31, 32].The relative effectiveness of NPIs in reducing COVID-19 transmission across 130 countries and territories have been reported[33].

Vaccination Intervention

Vaccines long existed before COVID-19 came. COVID-19 increase its awareness and discussions. Apathy & Hesitancy in acceptance have been reported. Vaccine hesitancy are concerns about the decision to get vaccinated or to make one's ward and relation available for vaccination. Hesitancy Attributable Factors are:doubts about its actual needs; safety concerns; possible adverse effects concern; misconceptions; doubts about efficacy; past –ve experiences; heuristic thinking; philosophical issues; religious issues; lack of trust in corporations & public health agencies[34].Currently approved COVID-19 vaccines are:Pfizer-BioNtech; Moderna; Johnson & Johnson's Janssen; Sinopharm; Sinovac; Oxford/AsraZenecca. All the currently authorized & recommended COVID-19 Vaccines are safe, effective and reduce risk of severe illness.

Signs and Symptoms of Long COVID

There are prolonged mutiorgan symptoms & complications beyond initial period of acute infection & illness. The cardiorespiratory symptoms arechronic cough; shortness of breath; chest tightness; chest pain; extreme fatigue; palpitations.Neurological symptoms are cognitive impairment ('brain fog'; loss of concentration; memory issues; dramatic mood changes); headache; sleep disturbance; peripheral neuropathy symptoms (pins & needles & numbness); dizziness; delirium (in older populations). Musculoskeletal symptoms are joint and muscle pains while depression and anxiety are psychological symptoms. Theear, nose and throat symptoms are tinnitus, earache; dizziness; loss of taste & /or smell; sore throat. Abdominal pain; nausea; diarrhoea; anorexia & reduced appetite (in older populations) are gastrointestinal symptoms[6, 7].

Necessity of Rehabilitation in Long COVID Management

Clinical assessments to be done are detailed history taking special notice of comorbidities; travelling history; hospitalization within past few months (ICU, duration, M/V); history of tiredness/lack of strength; history of comorbidity; social demographics. Qualitative tests should take note of BP; PR; RR; Body Temp; Functional Capacity (PFTs-FEV, FEV1); BMI; Waist circumference ; P/A Level (IPAQ)/Sedentary Lifestyle; QoL (SF-36 ≤40 points); Pulse Oximetry; Muscle Weakness (oxford muscle grading); Joint Mobility; NPRS/PPS; cognitive impairment; balance; neuralgic/neuropathic pain; gait; 6MWT (Walked distance/ Gait Speed). Special investigations required are full blood count; renal function test; liver function test; C-reactive protein test; exercise tolerance test (breathlessness/HR/ O2 Saturation)and Check X-Ray by 12weeks post- acute infection in cases of continuing respiratory symptoms). Clinical presentations that warrant rehabilitation arebreathlessness; cough; fatigue; joint pain; muscle pain; cognitive defects; balance defects and ambulatory dysfunctions.

Rehabilitation takes special consideration of NICE guidelines which was published in december 2020[5, 6, 7]. It provided a guideline on the management and care of people with long-term effects of COVID-19 and involvesdetailed assessment of referred COVID-19

patient; symptoms that can affect start of rehabilitation safely should be first investigated. Record of and use of tracking app to monitor goals/recovery/any changes in symptoms should be kept.It further reflects personalised rehabilitation program and provision of additional support for older pts.In cases of postural symptoms (palpitations/dizziness on standing), there is need to carry out lying & standing BP & HR recordings (3mins active stand test/10mins if postural tachycardia syndrome is suspected/other forms of autonomic dysfunction[7, 35].

The clinical implications of breathlessness are possible altered breathing pattern; decreased diaphragmatic movement; greater use of neck & shoulder accessory muscles; shallow breathing; increasing fatigue & breathlessness and higher energy expenditure.Aims of rehabilitation in this instance are to normalise breathing patterns; to increase the efficiency of the respiratory muscles; to lessen energy expenditure; to lessen airway irritation; to reduce fatigue and to lessen & improve breathlessness. The needed protocols are breathing control Technique (well supported sitting position with relaxed chest & shoulder; I:E =1:2; inspiration via nose & expiration via mouth @ 5-10mins per session done at regular intervals throughout the day); diaphragmatic breathing; slow deep breathing; pursed lip breathing and patient education on management of breathlessness.Patient with significant respiratory illness will benefit from personalized pulmonary rehabilitation in forms of ACBT (Breathing Control/Deep Breathing/Huffing), done @ 10mins interval until the chest is cleared of sputum with lighter feeling; respiratory muscle training (RMT) and patient education.Fatigue rehabilitation treatment approach takes the form of planning, pacing & prioritising with specific aim of energy conservation for ADL.Pacing which is aimed at improving QoL & to stabilize health is done by breaking challenging elements into smaller & more manageable ones. Typical practical instances are modifying activities (if showering is exhausting, then sitting instead of standing should be adopted while in the bathroom) and identification of strategies to make ADL easier & effectively manage energy. Patients are encouraged to break between activities.Lastly, patient education on management of fatigue is included in fatigue rehabilitation protocol. The necessity for muscle strength rehabilitation is heightened by the estimated 2% muscle mass loss per day. The useful protocols are moderate exercises intervention in the mode of free active exercises still individually packaged without exacerbation of breathlessness; walking & exercising "little & often" with adequate rest periods and small goals with gradual progression. Patient education is still required in muscle strength rehabilitation. 2017 Study (Pandharipande et al) [36] showed 80% of people who receive M/V experience delirium, which can include hallucinations while for critically ill who do not need M/V, the condition affects 20-40%.Though studies are still on, however Cognitive Rehabilitation Therapy (CRT) can help manage/potentially recover from delirium. CRT protocols are memory training; mental exercises; patient counting of numbers while undergoing exercises; specific thinking pattern practises; psychological support for confused/ disoriented patients; relaxation strategies; pursed lip breathing and patient education.

The justification for leveraging on rehabilitation in long COVID management had a boost with a recent observational study by Daynes et al (2021)[37] revealing that COVID-19 rehabilitation appears feasible & significantly improves clinical outcomes (viz: 112m on Incremental Shuttle Walking Test & 544secs on the Endurance Shuttle Walking Test) with no adverse effects recorded & no drop outs related to symptom worsening. Adopted rehabilitation protocols in this study are 6wks duration;2 supervised sessions/week; aerobics (walking/treadmill based); strengthening Training – upper and lower extremities; educational discussions with hand outs; pacing advice & reinforced alongside the exercise component. Further

evidence is seen in RCT of 72 Elderly COVID-19 survivors which showed productive 6week rehab program (breathing/ stretching/home exs) with improved Lung function; exercise capacity; QoL; anxiety but not depression (Liuk et al, 2020). The adopted protocols in this study were combined breathing & light exercises rehabilitation amongst some discharged COVID-19 patients with ongoing symptoms resulting in healed/improved fatigue symptoms[38].

Pulse oximeter, BP apparatus, thermometer are recommended as home care package for safety purposes and continuous monitoring. Rehabilitation outcomes are the Incremental & Endurance Shuttle Walking Test (ISWT/ESWT) completed on a 10m course with familiarisation test at baseline; COPD Assessment Test (CAT); Functional Assessment of Chronic Illness Therapy FACIT); Medical Research Council Scale; Hospital Anxiety and Depression Scale (HADS); EuroQual 5 Domains (EQ5D); Pulse Oximetry; 6 Minute Walking Test (6MWT); LANSS: Leads Assessment of Neuropathic Symptoms & Signs; Visual Analogue Scale, VAS; Montreal Cognitive Assessment (MoCA); Borg Breathlessness Scale; Rate of Perceived Exertion and Short Form-36 Health Survey, SF-36.

Pertinent Lessons

The salient lessons are need for continuous rethinking of the future of Long COVID management; building back better post COVID; rehabilitation is an established institution in health care management whose importance will continue to unfold with ages; continuous provision of solidarity & support in health care delivery; necessity of swift response in the management of critical conditions. Furthermore, emphasis on environmental health safety can never be too much; travelling is closely related to health, 'continuous look' on travelling/transport industry will enhance public health; home grown health institutions should be better funded and given due financial considerations; continuous knowledge sharing across the divide of health care management because with togetherness we can overcome pandemic knowing that the new normal can become the better normal.

Conclusion

Provision of holistic, multifaceted and well monitored individualized rehabilitation programme in management of Long COVID is safe & demonstrates improvements in exercise capacity and symptoms of breathlessness, fatigue and cognition. Cognitive decline in Long COVID can be arrested and improved upon with rehabilitation.Physical Activity Reactivation (PAR) in Long COVID can be safely and productively carried out with the patient being made to 'step out' of Long COVID with reassured health life. The Functional Physical Activity Tempo (FPAT) can be sustained post Long COVID Rehabilitation. Rehabilitation has a huge role to play in the future of Long COVID, as such research funds sponsors should look in the direction of Rehabilitation.

Ethical Clearance – This is an article

Source of Funding – Self

Conflict of Interest – Nil

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Effect of Flat Feet on Static and Dynamic Balance in Adults

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Abstract

Background: The foot is the most distal segment in the lower extremity chain and represents a small BOS upon which the body maintains balance. Minor biomechanical alterations in the support surface can influence postural-control strategies. However, the implications of a flat foot on balance have received little attention to date.Aimof the present study was to Evaluate the static and dynamic balance in individuals with flat feet.

Method: A total of 40 subjects were recruited. Participants were assigned to 2 groups case group and control group depending on foot type, as defined by the foot ink print method. Subjects were divided into case groups and control groups. The static and dynamic balance were measured through the Unipedal stance test and star excursion balance test respectively.

There was a significant correlation between single-leg stance time (with eyes opened and closed) and flat feet (p-value = < .01). There was a significant correlation between reach distance in some direction (AM, MR, PM, P, AL, LL) with a flat foot (p-value <0 .05).

Conclusion: This study suggests that both static (single leg stance test) and dynamic (SEBT) balance are affected in individuals with flat feet.

Keywords: *Pronated foot, foot structure, Balance.*

Introduction

The foot is a terminal portion of a lower limb that bears weight and makes the human upright and performs activities like walking, running, and jumping. Feet enable ambulation with a bipedal gait and provide a static platform. Thisis due to the elastic arches or springs in the footknown as longitudinal arches. These are segmented in nature to sustain stress and thrusts. During a walking cycle, a normal foot changes from a supple to a rigid position while the concavity of the sole is maintained [(1, 2)].

The important characteristic of this arch is its elasticity, owing to its height and the number of small joints between its parts. Because of their elastic properties, these soft tissues can spread ground contact reaction forces over a longer period, and thus reduce the risk of musculoskeletal wear or damage. Any alteration in these arches can cause pronated and supinated foot which can alter the person's balance [(3, 4, 5)].

Balance has often been used as a measure of lower extremity function and is defined as the process of maintaining the center of gravity within the body's base of support [(6)]. For control of body alignment and

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the center of gravity over the base of support in an upright stance, the central and peripheral components of the nervous system interact constantly. [7, 8]

Balance is maintained in the closed kinetic chain and relies on the integrated feedback and movement strategies among the hip and ankle. Hence, it can be disrupted by diminished afferent feedback or deficiencies in the strength and mechanical stability of any joint or structure along the lower extremity kinetic chain. Balance is often described as being either static or dynamic. [6]

Static balance is commonly assessed by instrumented measurements of ground reaction forces or non-instrumented means. static postural control can be assessed by having an individual attempt to maintain a stationary position while standing on either one or both feet. The common example of non instrumented static balance is an unipedal stance with eyes open and closed [9, 10, 6].

Dynamic balance often involves the completion of a functional task without compromising one's base of support. Numerous tests have been developed to assess the dynamic balance. The star excursion balance test is the most sensitive test for dynamic balance. [11]

Pes planus is a relatively common condition.The prevalence of flexible flatfoot is 21-57% in children at preschool [2] with its prevalence gradually declining to 15–20% in adulthood. In most cases, the pes planus is flexible, with the rigid form observed only in 1% [12].

Excessively pronated foot postures can affect somatosensory input via changes in joint mobility or surface contact area or, change in muscular strategies to maintain a stable base of support. Excessive pronation may place greater demands on the neuromuscular system to stabilize the foot and maintain an upright stance. So, Measurement of balance is an important tool in the assessment of foot dysfunction [1, 13, 14].

Poor foot position sense is thought to hinder accommodation between the plantar surface of the foot and support surface, thus requiring postural adjustments more proximally to maintain upright posture and balance. Although static and dynamic balance to be adversely affected by changes in peripheral input secondary to joint injury and changes in the stability of the surface on which one is standing, however, it is less explored whether subtle alterations in the surface, stability or peripheral input of the support foot can also have an effect on balance in those with different foot types. [15, 16]

Karen P. Cote et al. studied the effect of Pronated and Supinated Foot Postures on Static and Dynamic Postural Stability and found postural stability is affected by foot type under both static and dynamic conditions [15].Far less attention has been focused on whether more subtle alterations in the surface, stability or peripheral input of the support foot may also affect balance in those with different foot types.So the study aims to evaluate the static balance (with eyes opened and closed) and dynamic balance in flat feet.

Methodology

It was an observational study with convenient sampling. Approval was obtained from the institutional research committee. Participants were recruited based on inclusion criteria. Inclusion criteria were age group from 20-50 years, both genders, subjects who diagnosed as flat foot, persons with the normal foot. Participants with H/o any musculoskeletal and neurological conditions affecting balance were excluded. written informed consent was obtained before the commencement of the study.

A total of 45 subjects was assessed by the ink footprint method in which they were made to stand in a pool full of ink water and were asked to step on a paper and the footprint was observed. In normal individuals, the medial portion of the foot was not

visible but in individuals with a flat foot, the medial portion of the foot was completely visible. A total of 20 subjects out of 25 meeting inclusion criteria were included in the study.20 normal subjects with normal feet who were matched with the age and sex of the case group were recruited.

Subjects were assessed for static and dynamic balance tests using Single leg stanceand Star excursion balance test respectively.

Figure :1foot imprint ink method

Static balance is assessed by a single leg stance test (with eye opened and with eye closed).[17] Star Excursion Balance Sheet was made on flex to measure dynamic balanceThe SEBT was performed with the subject standing in the middle of a grid on the flex poster placed on the floor with 8 lines extending at 45° increments from the center of the grid. The grid was constructed and enclosed in a 6-foot by 6-foot (1.83-m × 1.83-m) square on the flex poster. The 8 lines on the grid was named about the direction of reach concerning the stance leg: anterolateral (AL), anterior (A), anteromedial (AM), medial (M), posteromedial (PM), posterior (P), posterolateral (PL), and lateral (L).[18]

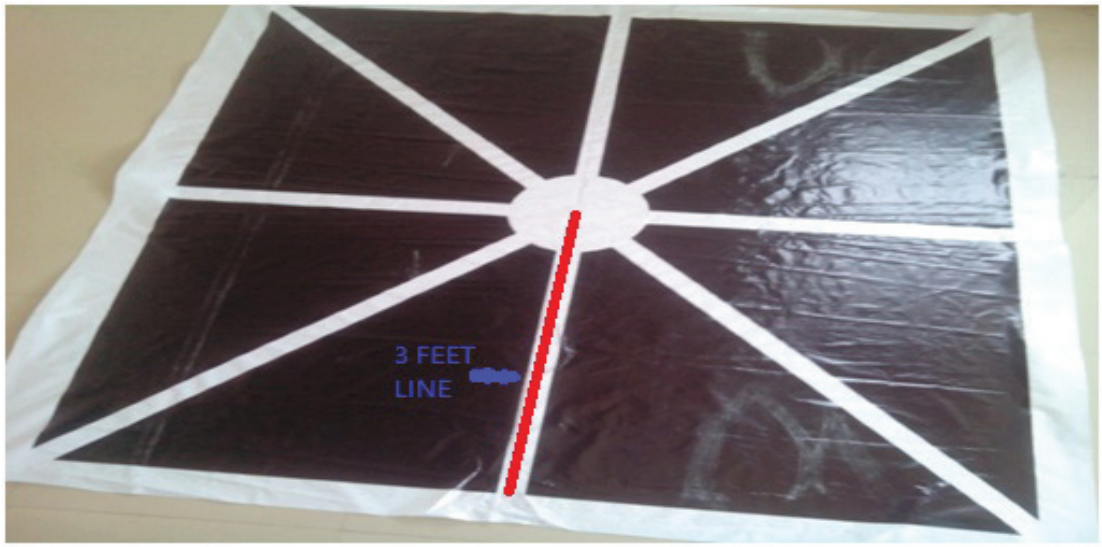

Figure : 2 SEBT Flex

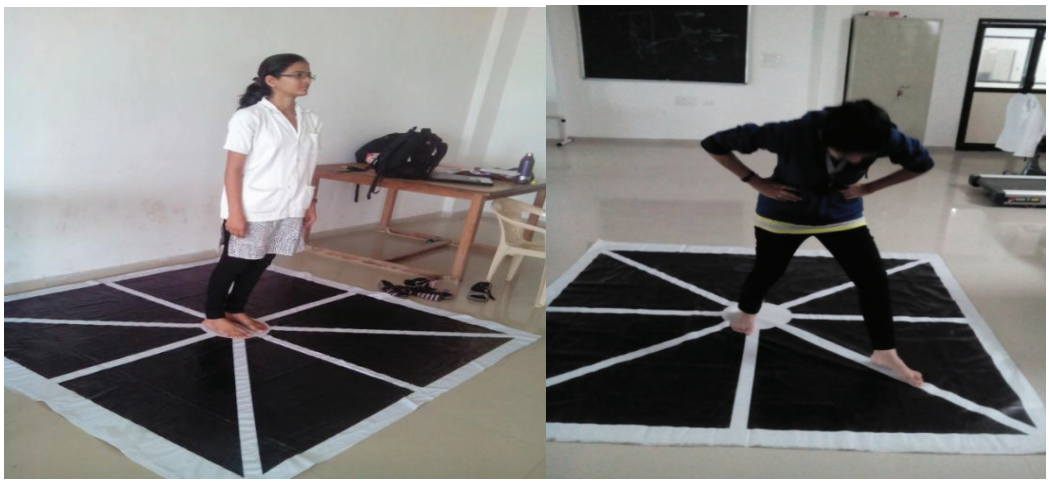

Figure 3 :Starting Position Of SEBT Reach Figure 4:performance of the SEBT

Figure 5 :Measurement of Reach From The Centre Point Of The Grid To The Reach Distance

Results of the tests were documented in MS Excel and were used for data analysis.

Materials:Measuring tape, Chalk, SEBT flex, Stopwatch, Ink, paper

Statistical Analysis

Collected data were analyzed using SPSS 16 version software. Descriptive statistics including Mean, Standard Deviation (SD), and Confidence Interval (CI) were obtained

An Independent t-test was applied to check the difference in mean values of various parameters between case and control groups

An Independent t-test was applied to compare the static balance between case and control groups

An Independent t-test was applied to compare dynamic balance between case and control groups

Table 1: Descriptive Statistics

	NORMAL		FLAT FEET		t-value	p-value
	MEAN	SD	MEAN	SD		
Age	26.40	7.49	26.65	9.89	-.090	.929
Weight	55.50	10.03	59.15	9.91	-1.157	.254
Height	158.90	6.57	159.65	6.17	-.372	.712
BMI	22.20	4.21	22.99	3.65	-.628	.534

The mean value of demographic data was not significantly different between the two groups.

Table 2: Shows Correlation of USPT Time (sec) (with eye opened and closed)

	Normal		Flat feet		t-value	p-value
	MEAN	SD	MEAN	SD		
EOR	12.56	2.14	5.75	1.96	10.18	.00
ECR	5.263	1.37	2.73	.50	7.36	.00
EOL	10.396	2.11	5.46	3.37	5.54	.00
ECL	4.876	1.60	2.33	.76	6.39	.00

[EOR= eye opened right side, ECR= eye closed right side.,EOL= eye opened left side, ECL= eye closed left side]

The mean value of USPT test time with an eye opened and closed in both the legs was significantly more in the case compared to control groups [p value < 0.01]

Table 3.1: **Shows Comparison of SEBT Distances in (Lt) Leg Between Two Groups**

The direction of the reach	NORMAL (n=20)		FLAT FEET (n=20)		t-value	p-value
	Mean	SD	Mean	SD		
A	81.77	4.40	80.80	5.94	.58	.56
AM	80.59	7.90	75.59	7.68	2.02	.04
MR	66.18	9.01	59.82	10.64	2.04	.04
PM	65.88	7.89	85.47	108.29	-.80	.42
P	63.54	5.98	61.79	8.39	.76	.45
PL	71.30	6.00	66.42	8.53	2.09	.04
LL	74.69	4.47	71.09	7.00	1.93	.06
AL	85.77	7.03	81.42	6.93	1.96	.05

[A= anterior, AM= anteriomedial, MR= medial right, PM= posteriomedial,

P= posterior, PL= posteriorlateral, LL = lateral left, AL= anteriolateral]

The mean value of AM, MR, PL, AL direction reach distance with (Lt) leg was significantly different between case and control groups.

The mean value of A, AM, P, LL direction reach distances with (Lt) leg was not significantly different between case and control groups reach.

Table 3.2: Shows comparison of SEBT distances in (Rt) leg between groups

The direction of the reach	NORMAL N=20		FLAT FEET N=18		t-value	p-value
	Mean	SD	Mean	SD		
A	82.09	3.96	81.78	5.35	.20	0.836
AM	85.93	9.25	83.20	6.91	1.02	0.314
MR	76.01	4.50	73.84	5.64	1.31	0.197
PM	73.63	7.10	68.73	10.09	1.74	0.090
P	66.02	7.22	61.32	8.60	1.82	0.076
PL	65.730	8.01	91.15	132.76	-.85	0.398
LL	64.0045	7.79	58.10	10.46	1.98	0.055
AL	80.4965	8.00	72.50	8.07	3.05	0.004

[A= anterior, AM= anteriomedial, MR= medial right, PM= posteriomedial, P= posterior, PL= posteriorlateral, LL = lateral left, AL= anteriolateral]

The mean value of LL, AL direction reach distance with (Rt) leg was significantly different between case and control group.

Mean value of A, AM.MR.PM, P, PL reach distances with (Rt) leg was not significantly different between case and control groups.

Discussion

The result of the present study shows the significant difference between two groups for static balance with single leg support however for the dynamic balance test reach distance for AM, M, PL, AL, and LL were significantly different between the groups. A total of 40 subjects were recruited in the study and equally divided into two groups, 20 patients in case and 20 subjects in the control group.

Statistically, no difference has been found between the groups about age, gender, BMI, and height. In the present study flat feet were found to be more common in females, out of 20 patients in the case group 17 were females and 5 were males. Hassan Daneshmandi, Nader Rahnema et al. (2009) studied "Relationship between Obesity and Flatfoot in High-school Boys and Girls" and concluded that increasing weight temporarily, may cause the existence of significant difference in the prevalence of flatfoot among high-school boys and girls. [19].

In the present study Single leg stance test(with eyes opened and closed) was used to check static balance.[20]. The mean USPT time (sec) (with eye opened and eye closed position) (p-value =<01) was found to be significantly higher in the case compared to the control group.

This is due to Proprioceptive feedback during joint motion depends not only on sensory information from joint receptors (ie, ligament and capsule) but also includes divergent information from skin, articular, and muscle mechanoreceptors. [21].

Increasing the rear angle leads to an increase in the angle of heel valgus, which leads to balance disruption. Change in the alignment of the heels, which is the junction of the muscles and ligaments of the foot leads to change in the muscle stretch angles and inactive elements around joints. This leads to incorrect messages from the foot to the central nervous system, which can in turn affect the balance. Moreover, the development of heel valgus results in limited contact of the heel with the ground surface; therefore, fewer sensory receptors participate in sending necessary information to maintain balance. [22]

A similar study was conducted by Mohammad Taghi Karimi (2013) on "Evaluation of standing stability in the individual with flat feet" and suggested that individuals with the flat foot are more unstable when compared with normal individuals during quiet standing [23]. Karen P. Cote et al in 2005 studied "Effects of Pronated and Supinated Foot Postures on Static and Dynamic Postural Stability" concluded that some aspects of postural stability are affected by foot type, but we believe structural stability, rather than altered proprioception,is likely the basis for our results [15].

The purpose of using SEBT in the present study was to identify dynamic balance deficits in patients with a variety of lower extremity conditions. During the study height and leg length were statistically adjusted with a reach distance. Results for mean normal values of the reach distance in 8 directions were comparable to those values obtained by Phillip A. Gribble and Jay Hertel in 2003.[11] A significant correlation ($p < .05$) was found between height and excursion distance, and leg length and excursion ($p < .05$) distance in six of the eight directions [9].

Results for SEBT revealed that only certain reach directions were affected in the case group.There was a significant reduction in 6 reach direction (AM ,MR,PL,AL,LL (p-value = < .05) in case group . Both the groups reached similar distances in the A and P directions.

Karen P. Cote et al (2005) studied Effects of Pronated and Supinated Foot Postures on Static and Dynamic Postural Stability and revealed that only certain reach directions in SEBT were affected by foot type. Postural stability is affected by foot type under both static and dynamic conditions [9].

Reduced distance in an oblique and lateral direction in flat foot patients might be due to excessive pronators tend to collapse toward the medial aspect of the foot and have a reduced ability to maintain rigid support in full weight-bearing. This medial deviation and greater foot mobility may account for pronators and reduce dynamic reach in the lateral direction. It requires more muscle strength, neuromuscular control, and more accurate proprioception in the lower extremity joints to maintain dynamic balance [9].

A recent study by Olmsted et al revealed that reach distance on the SEBT was significantly less in individuals with chronic ankle instability and different foot type than in normal individuals, these results were found across all reach directions and were not direction-dependent. In contrast, we found differences in only certain directions in pronated feet [16].

Conclusion

Both static and dynamic balance is affected in individuals with flatfoot as compared to individuals with a normal foot. In subjects with a flat foot, the meantime was lesser than subjects with a normal foot. SEBT is affected in flat feet specifically in AM, MR, PL, AL, LL directions.

Limitations

1. The majority of flat feet subjects were between 20-30 years of age.

2. Few males with flat feet as compared to the number of females subjects.

3. Assessment of confirmation of flat feet was done by ink print method which is dichotomous. No objective method was used to assess the degree of flat foot.

Ethical Clearance- The Ethical Approval was taken from Sumandeep Vidyapeeth Institutional ethical committee.(SV1EC/ON/PHY/BNMPH3/D15009)

Source of Funding- Self

Conflict of Interest-Nil

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Original Research Article

Effect of Motor Imagery on Hand Function in Parkinson's Disease: A Pilot Randomised Control Trial

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Abstract

Background: Parkinson's disease is a neurodegenerative disease characterized byprogressive impairment of motor skills. Parkinson Disease patients often have poorer fine hand skills, reduced hand grip strength, deficits in prehension which deteriorates autonomy in activities of daily living. This study assesses the effect of motor imagery on hand function in Parkinson disease.

Objective: To assess the effect of Motor Imagery on Hand Function in Parkinson's Disease patients using the Jebsen Taylor Hand Function Test

Method: Subjects with Parkinson's Disease were randomised in two groups: Control and Experimental. Both groups were assessed using the Jebsen Taylor Hand Function test. The control group receives conventional treatment consisting of flexibility and strength training whereas the experimental group receives Motor imagery combined with conventional treatment. Both groups were reassessed using the Jebsen Taylor Hand Function test after 3 weeks. The differences in the group were noted and statistically analysed.

Results: Both groups showed significant improvement in hand function post intervention. Although not statistically significant, the difference in experimental group was larger than the control group.

Conclusion: Motor imagery is a promising tool in neurorehabilitation. Motor imagery can have additional benefits when combined with conventional physical therapy to improve hand function in Parkinson's Disease

Keywords: *Action Observation, Jebsen Taylor Hand Function Test, Kinaesthetic imagery, Mental Rehearsal, Motor Imagery, Parkinson's Disease*

Introduction

Parkinson's disease (PD) is a neurodegenerative disease whose cardinal clinical features were first described by the English physician *James Parkinson* in 1817. Clinically, Parkinson's disease is characterized by resting tremor, rigidity, bradykinesia (slowing), and gaitimpairment, known as the "cardinal features" of the disease. In PD, dopamine denervation with loss of dopaminergic tone leads to increased firing of neurons in the STN and GPi, excessive inhibition of the thalamus, reduced activation of cortical motor systems, and the development of parkinsonian features.[1] PD patients exhibit sensory deficits such as decreased spatial and temporal tactile discrimination thresholds of the fingertips, and deficits in proprioceptive acuity. Impairments of reach are seen from the very start as patients tend to exhibit difficulty in movement initiation to a target. During the reach, PD patients exhibit deficits in hand pre-shaping to object geometry.[2]

Motor imagery is a cognitive process, as the patient imagines performing a movement without actually doing it (Lotze and Cohen, 2006).

Motor imagery is divided into:

1. Kinaesthetic imagery: the patient imagines moving their body parts without actually moving them

2. Action observation: watching other individuals performing similar actions (Stinear etal, 2006). [3]

Imaginary movements have been shown to be linked to conscious activation of areas of the brain which are also involved in the preparation and execution of the movement. The structures involved in imaginary movements are the premotor and accessory motor zones (Brodmann field 6), the parietal cortex and cingulate gyrus, the basal ganglia, and the cerebellum [17, 38, 53]. These brain structures are known to have a role in the planning and monitoring of movement execution. Studies have also demonstrated activation of the primary motor cortex (Brodmann field 4). During motor imagery, the excitability of the corticospinal tract was modulated by the same temporal and spatial characteristics as during the actual movements.

Motor imagery ability is assessed by the kinesthetic and visual imagery questionnaire i.e., KVIQ 10 scale.[4] The aim of this questionnaire is to determine the extent to which individuals are able to visualize and feel imagined movements. The subject is asked to rate, on a 5-point ordinal scale, the clarity of the visual image or the intensity of the sensations associated with the imagined movement. The KVIQ 10 scale consists of the following movements: Shoulder flexion, thumb to finger tips, forward trunk flexion, hip abduction, foot tapping

Mental imagery has been used as a training strategy to promote the relearning of daily tasks for people after an acute stroke. A study by *Hua Liu et al*,stated that combining mental practice with physical practice may be a more effective treatment strategy than physical training alone for hand recovery in stroke patients [5] The imagery process is likely to improve the planning and execution of both the trained and the untrained (novel) tasks. The effect of its relearning appears to help patients to retain and generalize the skills and tasks learned in the rehabilitation program.[6] In study with 159 athletes it was shown that motor imagery was a useful tool for sports training, and that elite athletes used motor imagery more than recreational athletes. [7] Motor imagery is not only a non-invasive practice but also does not raise safety risks, does not require sophisticated equipment and can be easily administered in the patient's house.

This pilot study aims to study the effect of motor imagery on hand function in Parkinson's disease and evaluate treatment protocols. The study also intends to test standard outcome measures and ease of administering these tests. This study can be used to assess the feasibility of the research hypothesis before conducting a large trial.

Materials and Method

Subjects clinically diagnosed with Parkinson's disease were selected and randomly allocated to two groups: control and experimental. A total of 6 patients (3 in each group) were recruited as per the inclusion and exclusion criteria:

Inclusion Criteria:

1. Subjects who are clinically diagnosed with Parkinson's Disease

2. Subjects on Stage 1 to Stage 3 of Modified Hoen and Yahr Scale

3. A score of 30 out of 50 on KVIQ-10 scale [8]

4. Subjects with a score more than 24 out of 30 on the MMSE scale

Exclusion Criteria:

1. Subjects with cognitive, visual, auditoryor psychological impairmentsor non- cooperative patients.

2. Subjects with other neurological deficits

3. Subjects on Stage 4 and Stage 5 Of Modified Hoen and Yahr Scale

4. Subjects with Musculoskeletal impairments affecting hand function

A written and informed consent was taken by participants. Materials required for the study included paper, pen, coffee cans, kidney beans, checkers, glass, cones, cards.

Outcome measure: Jebsen Taylor Hand Function Test - The Jebsen Taylor Hand Function Test (JTHFT) is a standardized evaluative measure of functional hand motor skills and is a reliable and easily available assessment tool for assessing the hand function of PD subjects. The scale consists of 7 items that measure: (a) fine motor skills; (b) weighted functional tasks; and (c) non-weighted functional tasks. Each item is scored according to time taken to complete the task. The scores for all 7 items are then summed for a total score.

Intervention:

1. Motor Imagery ability will be assessed by the KVIQ 10 scale whereas the hand function will be assessed by the Jebsen Hand Function Test prior to the intervention.

2. The Control Group will receive the following:

a. Conventional Treatment

i. Exercise training of the Upper Extremity:

· Flexibility: Stretching of the Pectoralis Major, biceps and triceps. Each stretch held for 15 to 60 seconds for 4 repetitions.

· Strength Training: Based on overload principle. Resistance can be added by free weights, dumbbells and resistance bands. 3 to 4 sets of 8 to 12 repetitions.

b. Relaxation Phase

i. Jacobson's Progressive Relaxation: Consists of physically tensing a particular muscle group in a given order and then to relax and let go of the muscle contraction.

ii. Diaphragmatic breathing Exercise

3. Experimental Group will receive the following:

c. Conventional Treatment consisting of flexibility and strength training and for the same duration as the control group.

d. Motor Imagery: Instead of relaxation phase, the experimental group receives Motor Imagery for the same duration. Motor Imagery consists of:

· Action Observation - During action observation, the subject is asked to closely observe the therapist as the therapist performs the exercise. The therapist will perform each exercise twice.

· Mental Practice - For this, the subject has to close his/her eyes and mentally perform the exercise shown to him/her by the therapist previously. The subject has to imagine himself/herself performing the movement without actually doing it.

· Action Execution - After mental rehearsal, the subject opens his/her eyes and now performs the same exercise as shown to him previously by the therapist.

e. Exercise to be administered: 2 repetitions of

each task.[5]

· Pronation - Supination: Subject is in sitting position. Elbows flexed to 90° and hands resting on the thigh. Patient is asked to perform pronation and supination.

· Elbow flexion - extension: Subject is in sitting position. He/she is instructed to bend the elbows and straighten them.

· Making a fist: Subject is in sitting position. Elbows flexed to 90° and hands resting on the thigh. He / She has to open and close his fist.

· Stacking up Cones: Subject is in sitting position, preferably on a chair with back supported. Cones are placed on a table in front of the subject. He / She is asked to stack the cones one upon the other.

· Picking up beans from one plate and placing them on the other: Subject is in sitting position, preferably on a chair with back supported. Two plates are placed on a table in front of the subject. One plate contains beans. The subject is asked to pick up beans from one place and place them into the other.

4. Experimental group will receive conventional Treatment along with MotorImagery for 3 days per week for 3 weeks.[9]

5. Control group receives only Conventional Treatment for the same duration

6. Both groups will be reassessed by the Jebsen Taylor Hand Function Test three weeks later

7. Data will be obtained and statistically analysed.

Fig.1 Action Observation: Subject observes as the therapist performs the exercise.

Fig.2 Mental Practice: Subject mentally rehearses the exercise without actually performing the exercise

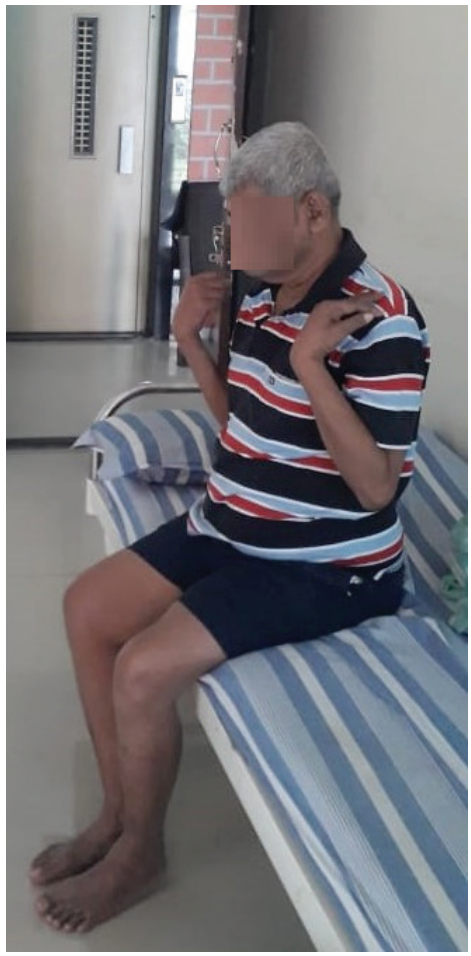

Fig.3 Action execution: Subject performs the exercise after mental rehearsal

Results

Time required to complete the Jebsen Taylor Hand Function Test prior to beginning of intervention is noted. Post 3 weeks of intervention, difference in hand function as assessed by the time required to complete the Jebsen Hand Function Test is noted and compared. A reduction in time suggests positive effects. Within the group, a comparison was made using the paired t-test. An independent t-test was conducted for comparison between both groups. Dominant and Non-Dominant hand was analysed separately.

All statistical calculations were carried out using IBM SPSS 28.0

Control Group: Improvement in hand function post-conventional physiotherapy.

The mean difference between pre- and post-intervention time for thedominant hand was statistically significant (p=0.058). Similarly, for the non-dominant hand, significant improvement (p=0.044) was observed.

Table1: Time taken (in mean) by control group to complete JTHFT; SD – standard deviation.

	Pre Time (SD)	Post Time (SD)	Pre-Post (SD)
Dominant Hand	147.33 (36.17)	133.33 (33.47)	14 (6.08)
Non-Dominant Hand	160.33 (42.19)	140.66 (34.93)	19.66 (7.37)

Experimental Group: Improvement in hand function after receiving Motor imagery combined with conventional physiotherapy

There was a significant improvement for both dominant (p=0.046) and non-dominant

(p=0.031) hands.

Table2: Time taken (in mean) by experimental group to complete JTHFT; SD – standard deviation.

	Pre Time (SD)	Post Time (SD)	Pre-Post (SD)
Dominant Hand	174.66 (18.77)	148.33 (22.35)	26.33 (10.11)
Non-Dominant Hand	203.33 (31.08)	175.66 (32.75)	27.66 (8.62)

Comparison between Control and Experimental Group

When the dominant hands were compared, the mean difference of 26.33 sec (SD10.11) of the experimental group was larger compared to the control group of 14 sec (SD 6.08). However, this difference was not statistically significant (p=0.145)

Similarly, for the non-dominant hand, the mean difference between the two groups was not statistically significant (p=0.289). However, the mean difference

for the experimental group

27.66 sec (SD 8.62) was more than control group 19.66 sec (SD 7.37)

Table3: Comparison of the mean difference of the time taken in seconds to complete JTHFT using the dominant hand

	EXPERIMENTAL	CONTROL
MEAN DIFFERENCE	26.33	14
STD DEV	10.11	6.08

Table4: Comparison of the mean difference of the time taken in seconds to complete JTHFT using the non-dominant hand

	EXPERIMENTAL	CONTROL
MEAN DIFFERENCE	27.66	19.66
STD DEV	8.62	7.37

Discussion

In this pilot study, subjects with Parkinson's disease received two different interventions: motor imagery combined with physical therapy and physical therapy alone. The effect of these interventions on hand function was analysed and compared using the Jebsen Taylor Hand Function Test (JTHFT). The JTHFT measures the time taken to complete seven different subtasks. A reduction in time post-intervention suggests positive effects.

Motor imagery refers to a technique where a task/exercise has to be observed and then mentally rehearsed before performing it. The learning effects of motor imagery are not the result of peripheral low threshold activation of muscles but the result of a central mechanism.[7] Since motor imagery is associated with the activation of somatotopically organized sections of the motor cortices,[10] imagery of hand movements will activate the similar regions in the brain which are responsible for actual movement. Similar phenomena have also been reported with observation of tasks. There is not only an increase in regional cerebral blood flow but also enhanced corticospinal facilitation. These changes can be attributed to the mirror neuron system [7]

The preliminary result of this study suggests that both the control and experimental group had a significant change in their hand function post-intervention. Although the mean difference for the experimental group was larger than the control group for both dominant and non-dominant hands, this result is not statistically significant. Observation of the activity in the experimental group may have helped the participants memorize and thus better plan the movement before performing it. Imagination of movement may also act as a simulator providing feedback regarding the movement prior to performing it. Imagery may be used to improve intrinsic

motivation and individual self-confidence.[11]A greater improvement in hand grip strength may have been responsible for improving the hand function in the experimental group, this is supported in a study by*Alejandro Losana-Ferrer et al*, who conducted a randomized control trial to evaluate the effect of motor imagery and action observation on hand grip strength, EMG activity and intramuscular oxygenation. Hand grip strength significantly increased in the motor imagery and action observation groups.[12]Thus, improvement in hand function following a motor imagery session can be the resultof a combination of neurological, physiological and psychological (increased arousal, motivation and confidence) adaptations.

The amount of time spent in a motor imagery intervention needs to be assessed. Even though an average duration of motor imagery has been reported to be 17 minutes [8] levels of education and degree of understanding could affect the results with some people requiring familiarisation with the technique before the beginning of motor imagery intervention in order to achieve positive results. Imagery tasks will therefore need to be trained and described carefully to provide reliable results. It is worth mentioning that subjects are likely to experience mental fatigue over continuous imagery sessions, thus shorter periods of imagery combined with rests or relaxations are likely to have more beneficial effect than longer sessions. Motor imagery of shorter duration has greater effects on muscle strength than mental imagery training performed over longer durations (7-12 weeks). [13]*Wakefield* and *Smith* also indicate that training programs delivered in three sessions per week are more effective than those conducted once or twice per week.[14]

Further research can explore if motor imagery alone can be an alternative to physical training when it is difficult to train physically in the presence of severe debilitating impairments to minimize disuse induced strength and functional losses. Motor imagery is a relatively safe procedure and can be administered even at home. It does not require use of any sophisticated equipment and does not cause undue muscle fatigue. Motor imagery can prove to be beneficialand should be included in rehabilitation programs along with physical training.

Limitations of the study include a small sample size; owing to the small sample size, the results of this study cannot be used in a clinical setting.Another factor that needs to be considered in future studies will be evaluating the effects of motor imagery during the 'ON' and 'OFF' phases of anti-Parkinson drugs. The long-term benefits of the programme between the two groups have not been compared,thus, establishing which group has beneficial sustained effect is difficult.

Conclusion

The results of this study suggest motor imagery combined with physical therapy has additional benefits when compared to physical therapy alone. Motor imagery can be considered a promising rehabilitative tool in this patient group. Larger studies are needed to support this finding and establish the specificity of treatment.

Competing Interest: The authors declare no conflicts of work.

Ethical Clearance: Ethical clearance was obtained from the research ethical committee at DPO's Nett College of Physiotherapy.

Source of Funding: Self

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Impact of Menopausal Symptoms on Quality of Life in Indian Women

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Abstract

Menopause is a normal physiologic process, defined as the permanent cessation of menses for 12 months or more due to cessation of ovarian hormone production. The age at natural menopause is between 45 years and 50 years. Early menopause is defined as menopause occurring before the age of 45 years, while premature menopause occurs before the age of 40 years. Around 20% of the patients suffer from severe menopausal symptoms, 60% suffer from mild symptoms and 20% may have no symptoms at all. Health workers are searching for different ways to manage menopause to minimize discomfort and inconvenience during menopausal transition, so as to improve the quality of life of these women. The aim of the study was to study the impact of menopausal symptoms on quality of life using MRS scale, HFRDIS scale, WHO-BRFE scale. In Western India very few studies have been done on menopause and no published literature has been found among these females. Thus, the present study focuses on the various climacteric symptoms on quality of life using the Greene climacteric scale and Menopause Specific Quality Of Life Scale among females of Pune Maharashtra.

Keywords: *MRS scale, HFRDIS scale, WHO-BRFE scale, Menopause, Premenopausal, perimenopausal.*

Introduction

Etymologically, the origin of the word menopause lies in the Greek words, "meno" (menses, month) and "pause" (stop, cease).[1]

Menopause is a normal physiologic process, defined as the permanent cessation of menses for 12 months or more due to cessation of ovarian hormone production. According to the World Health Organization (WHO) classification, premenopausal women are those who have experienced regular menstrual bleeding within the last 12 months, perimenopausal women are defined as those women who have experienced irregular menses within the last 12 months or the absence of menstrual bleeding for more than 3 months but less than 12 months, and postmenopausal women are those who have not experienced menstrual bleeding for 12 months or more. The age at natural menopause is between 45 years and 50 years. Early menopause is defined as menopause occurring before the age of 45 years, while premature menopause occurs before the age of 40 years.[2]

Menopause is a critical period in a woman's life that not only marks the end of reproductive ability but is also associated with multiple physical, vasomotor, psychological, and sexual complaints [3]

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Around 20% of the patients suffer from severe menopausal symptoms, 60% suffer from mild symptoms and 20% may have no symptoms at all. Menopausal symptoms include mood changes, bloating, aches and pains, headaches, hot flushes, night sweats, tiredness, insomnia, weight gain, depression, irritability, forgetfulness, lack of concentration, urinary frequency, vaginal dryness and sexual problems. These symptoms vary in severity and character from person to person.[4]

Health workers are searching for different ways to manage menopause to minimize discomfort and inconvenience during menopausal transition, so as to improve the quality of life of these women. Since estrogen deficiency is the cause of perimenopausal symptoms, estrogen replacement therapy (HRT) is the most effective treatment. However, HRT has been associated with an increased risk of breast cancer, uterine cancer, thromboembolic heart disease and stroke. Recent results from Women's Health Initiative (WHI) and Heart and estrogen/progestin replacement study (HERS), demonstrated increased risk of cardiovascular disease (CVD) and breast malignancy amongst women randomized to hormone therapy. More women are becoming aware of the serious side-effects; hence the use of HRT for menopausal symptoms has decreased.

Considering the limitation of HRT, the present need is to explore new options for the management of menopausal symptoms in the form of non-hormonal drug therapy and non-pharmacological measures. The current recommendations are: Change in lifestyle, Regular exercise, Diet, Yoga, therapeutic massage and other stress-reducing measures.[5]

The aim of the study was to study the impact of menopausal symptoms on quality of life using MRS scale, HFRDIS scale, WHO-BRFE scale.

Material and Methods

Menopausal Rating Scale **[**MRS], Hot Flushes Related Daily Interference Scale.[HFRDIS], WHO Quality Of Life-BREF SCALE these questionnaires were used to know to menopausal symptoms on quality of life.

Inclusion criteria: Women with age between 40 to 50 years.

Exclusion criteria:

Women on medications such as anxiolytics, anti-depressants, to avoid treatment-related effects, diagnosed with serious disease or mental retardation And women not giving consent for the data collection due to own reasons.

Result

For the study we have taken study sample of 100 women of all menopausal stages falling in age group of 40-55 years.

The Total mean age in the Perimenopausal women is 42.45 year, The mean age of Menopausal women is 48 years and The mean age of Postmenopausal women is 52.63 years.

The Perimenopausal women with Normal BMI are 55% with Overweight BMI are 27% with Obese BMI are 18%. The Menopausal women with Normal BMI are 37%, with Overweight BMI are53% and with Obese BMI 10%. The Postmenopausal women with Normal BMI are 33%, with Overweight BMI are 50% and with Obese BMI are 17%.

The Perimenopausal women have total mean score of GCS =16.08 and Total mean score of MSQOL is 28. The menopausal women have Total mean score of GCS= 13.17 and Total mean score of MSQOL is 27.21.The postmenopausal women have Total mean score of GCS=14.13 and Total mean score of MSQOL is 29.37.

By GCS scale the Perimenopausal women with sedentary lifestyle have more symptoms (i.e.). 16.87 compared to the women practicing yoga (i.e.) 15.42. Also Menopausal women with sedentary lifestyle have more symptoms (i. e.) 14.45 compared to the women practicing yoga(i.e.) 11.05.In Postmenopausal women with practicing Yoga have less symptoms(i.e.) 13.41 compared to sedentary lifestyle women (i.e.)15.38.

By MSQOL scale, In the Perimenopausal women the quality of women is more affected I sedentary lifestyle women (i.e.) 30.87 than the women practicing Yoga (i.e.) 25.57. In Menopausal women the quality of life is more affected in women with sedentary lifestyle (i.e.) 31.36 than compared o the women practicing Yoga (i.e.) 21.94. In Postmenopausal women the quality of life is more affected in sedentary lifestyle women (i.e.) 32.41 than the women practicing Yoga (i.e.) 28.

Discussion

For the above study we have screened a total of 150 subjects out of which 100 women of all menopausal stages falling in category of 40 to 55 years of age group included according to the inclusion criteria. Data was documented by using Greene Climacteric Scale and Menopause Specific Quality Of Life Scale and written consent form was taken from all the subjects. The 100 women were divided into 3 groups i.e. Perimenopausal, Menopausal and Postmenopausal women's. The women were again divided into exercising and sedentary life style women. The Perimenopausal women are 40, Menopausal women are 30 and Postmenopausal women are 30. The risk factor for severity of menopausal symptoms among demographic, health, lifestyle and BMI was also assessed. Results from current study show medium family size, lower age at menarche.

The Menopause-specific quality of life is self-administered and consists of a total of 29 items in a Likert scale format. Each item assesses the impact of one of four domains of menopausal symptoms, as experienced over the last month (vasomotor, psychosocial, physical and sexual). Items pertaining to a specific symptom are rated as present or not present and if bothersome on a zero to six scale [7]. The Greene climacteric scale is a self-administered and consists of a total of 21 items. It provides a brief measure of menopausal symptoms. It is a for pointer scale which is divided as 0= Not at all, 1= A little, 2= Quite a bit, 3= Extremely. [11].

The mean age at menopause in present study was observed as 48 years, which is similar to the mean age at menopause reported by P.P. Venugopalan, and .[7].However it is higher in comparison to mean age at menopause of Indian women of 44 years by Singh and Arora.[8] and 44.7 years by Shah[9]. Another study done by Peeyananjarassri (2006), conducted a survey among 270 women aged 45-65 years who attended the gynecological and menopause clinic in Songklanagarind Hospital shows average age at menopause 48.7 years which is similar to our study result. [10].The standard mean age of attaining menopause among Indian women is 47.5[12].

According to the menopausal groups evaluated we found in our study that the Menopausal symptoms are more likely observed in Perimenopausal i.e. 16.08 women comparative to Menopausal women i.e. 13.17 and Postmenopausal women i.e. 14.13. This is very similar to the results reported in study of Noori and Nisar Sohoo [Severity of Menopausal symptoms and the quality of life at different status of Menopause: a community based survey from rural Sindh, Pakistan] [13].One recent study performed on Jordanian women showed that a higher frequency of symptoms occurred in the perimenopausal women compared to menopausal women and postmenopausal women.[14]. In contrast, the study by Chedraui in Ecuador found that there is a significant increasing trend in the rate of

menopausal symptoms from peri to post menopausal women; this also might reflect the influence of different racial/ethnic groups on menopausal symptoms. [15].

In the study done by Sagar Borker and Shruthi Bhat they found the quality of life is more compromised in postmenopausal women compared to perimenopausal and menopausal women. [7] Our result showed that the postmenopausal women have 29.37 comparatively more than perimenopausal i.e.28 and postmenopausal women i.e. 27.21. The similar results were reported in study of Aida AlDughaither and Mohammed AlAteeq [Menopausal symptoms and quality of life among Saudi women visiting primary care clinics in Riyadh, Saudi Arabia][16].

The effects of yoga participation n the quality of life of women in our study showed that the women practicing yoga daily have less compromised quality of life and menopausal symptoms in all menopausal stages. The similar results were reported by the Brandi Crowe and Francis McGuire [The effects of yoga participation on women's quality of life and symptom management during the menopausal transition] [17]

Conclusion

The current study, attempted to assess the symptomatology of menopause in all stages of menopause. Perimenopausal symptoms widely vary in women populations, accurate recording and understanding of which is essential to plan effective investigations to improve the quality of life.

Limitation of Study:

1. The diagnosis of menopause is often retrospective, it have to rely on accurate knowledge & unbiased reporting of age. The accuracy of information depends upon period of time since menopause, alertness, motivation & educational level of the women studied.

2. The prevalence of hot flushes & night sweats, which are important symptoms. They are misinterpretated or misunderstood by women in the current study setting. This could be due to misinterpretation of symptoms & a shy attitude.

Further Scope of Study:

The menopause related symptoms have been studied extensively in western countries, few data available in Asia especially in south Asia. There are many misunderstandings regarding menopausal symptoms among women's. Hence, awareness in disseminating health education for postmenopausal women is prime importance.

Ethical Clearance: Ethical approval was obtained from MGM Medical College Institutional Ethics Committee.

Conflict of Interest: Authors declared no conflicts of interest**.**

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A Study on Effect of Phonophoresis on the Management of Delayed Onset Muscle Sorenessin Healthy F'emale Adults

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Abstract

Background: Delayed-onset muscle soreness (D OMS) is described as a sensation of pain and stiffness in skeletal muscle following a session of rigorous or unaccustomed exercise. Many interventions have been used in an attempt to prevent delayed onset muscle Soreness. This include stretching, massage, cryotherapy, electrical stimulation, ultrasound, pharmacological agents, and warm up and cool-down. Warm up (Gentle exercise preceding vigorous physical activity) is said to reduce muscle strain injuries by increasing muscle temperatures and hence muscle compliance. The effectiveness of ultrasound on DOMS shows that ultrasound enhanced the development of DOMS but that this enhancement was offset by the anti-inflammatory analgesic action of salicylate phonophoresis. Study aimed to compare the effectiveness of warm up and phonophoresis on the management of DOMS in healthy female adults.

Material & Method: This comparative study was conducted among the 40 subjects of age group ranging frorn 18 to 25 years recruited from Yenepoya University. Prior to participation, the subjects were explained about the study and obtained an informed consent from all the participants. Tenderness was measured in 10 minutes 24and 48 hours after exercise by applying a pressure algometer and recorded the measurement

Result: Total of 40 female who consented to be part of study were included and grouped as Group A (Warm-up) and Group B (Phonophoresis). The results of this study showed effect of phonophoresis on DOMS is more than warm up. There was a statistically significant difference in the mean between the two groups ($p<0.001$), warm up and phonophoresis group

Conclusion: The study showed that phonophoresis is more effective in alleviating DOMS than warm up.

Keywords: *Warm up, DOMS, Phonophoresis, soreness.*

Introduction

Phonophoresis consists of using ultrasound to drive a drug through the skin and into underlying tissues. In theory, ultrasound can enhance the trans-dermal delivery of certain pharmacologic agents to skeletal muscle, tissue, bursae, tendons, and so on. Delayed-onset muscle soreness (DOMS) is described as a sensation of pain and stiffness in skeletal muscle following a session of rigorous or unaccustomed exercise. The term "delayed-onset" refers to the fact that peak levels of soreness typically occur around 24 to 72 hours following the exercise session. Delayed-onset muscle soreness does appear, however, to

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be a transient disorder, and there are no apparent permanent effects of this condition.[1] The typical symptoms associated with DOMS are pain, strength loss, muscle tenderness, stiffness and swelling.[2] Exercise-induced muscle damage and DOMS are temporary phenomenon, they cause reduction in muscle contractile force, ROM and physical performance. Therefore proper treatment methods are needed to enhance recovery from the muscle injury and to alleviate DOMS. [2]

Activity that places un-accustomed loads on muscle may lead to delayed onset muscle soreness. This type of soreness is different from acute soreness, which is the pain that develops after the cessation of exercise, peaks between 24 and 72 hours, arid eventually disappears by 5-7 days post exercise.[3] This is usually attributable to an increase in hydrogen ions associated with lactic acid accumulation. Although the actual pathophysiology of DOMS is debatable, most researchers agree that it results from strenuous eccentric muscle activity. Eccentric resistance training causes extreme soreness compared to static and concentric muscle actions which causes little or no delayed soreness.[4] It is generally agreed that the presence of disrupted sarcomeres in myofibrils and damage to the excitation-contraction coupling system are the two prominent signs of damage in a muscle immediately after it has been subjected to a series of eccentric contractions.[5]

Many interventions have been used in an attempt to prevent delayed-onset muscle soreness. This include stretching, massage, cryotherapy, electrical stimulation, ultrasound, pharmacological agents, and warm up and cool-down. Some of these interventions are self-administered and some are administered by physiotherapists or other health professionals .It is thought that the compliant muscle can be stretched further before it is damaged. With the onset of physical activity, muscular contractions will generate more heat than at rest. This increase in muscle temperature has been found to improve the necessary chemical reactions that make a muscle contract.[6]

It is important that there is a need to systematically investigate the optimal way of managing delayed-onset muscle soreness thus preventing damage to muscle fibres. The study aimed to compare the effectiveness of warm up and phonophoresis on the management of DOMS in healthy female adults.

Material & Method

This comparative study was conducted among the subjects of age group ranging from 18 to 25 years. Prior to participation, the subjects were explained about the study and an informed consent was taken from the subjects. Subjects were screened for the inclusion and exclusion criteria and those who fulfil the criteria was included in the study. Ethical clearance was taken from the Ethical clearance committee. 20 samples were included in each group that is, (warm up and phonophoresis) forming a total of 40 samples as study population.

Subjects aged between 18-25yrs of female were included and individuals with cardiac, neurologic and musculoskeletal disorders, any current illness, un-cooperative participants and taking any anti-inflammatory medications were excluded from the study.

Healthy female adults were selected to one of two groups using a blocked procedure (20 participants per group). Each participant was allocated to one of two groups: a warm-up, group A and a phonophoresis, group B. Initially, all participants rested in a seated position for 10 minutes. Subsequently, participants in group A performs l0-minute warm-up. Muscle soreness was induced using unaccustomed eccentric exercise. The exercise were designed to induce muscle soreness in the gastrocnemius muscle of the right leg and involved walking backwards downhill

on a tread mill inclined at 13 degrees for 30 minutes, leading with the right leg. A participant was instructed to take large backward steps with the right leg and to strike the treadmill with the toe of the right foot and with the right knee extended. Immediately after the exercise, participants of phonophoresis group got 10 minutes of phonophoresis treatment.[2,7]

Participants in warm up group sat for further 10 minutes. Participants were instructed to refrain from strenuous physical activities for three days after the exercise in this study. Muscle soreness in the gastrocnemius muscle of the right leg was assessed10 minutes after the exercise, and then at 24-hour intervals over the three days following the exercise.

Procedure: Group A performs l0-minute warm-up consisted of walking forwards uphill on a gently inclined treadmill (3degrees inclination) for 10 minutes at 4.5 to 5 kph. Muscle soreness was induced using unaccustomed eccentric exercise to all the participants. The exercise was designed to induce muscle soreness in the gastrocnemius muscle of the right leg and involved walking backwards downhill on a treadmill inclined at 13 degrees, for 30 minutes, leading with the right leg. Participants were instructed to take large backwards step with the right leg and to strike the treadmill with the toe of the right foot and with the right knee extended. Immediately after the exercise, participants of group B got 10 minutes of phonophoresis treatment[2] with a fixed frequency of 1 MHz and a 10-cm2 sound head was used to administer the treatments. Treatment procedures commenced with the therapist applying a fixed amount (10-12mL) of salicylate cream to the skin and then applying the ultrasound head over the cream using small, continuous, circular movements. Group B received ultrasound treatment initiated at 1.5 w/ cm of continuous-wave ultrasound and the intensity was decreased when the subject experienced anything other than a sensation of mild warmth. Participants of group B were seated for further 10 minutes and they were treated on three consecutive days by 24 hour interval. (7' I and to) All the participants were instructed to refrain from strenuous physical activities for three days after the exercise in this study.

Visual analogue scale: Soreness was rated on two scales: a 100-mm visual analogue scale anchored at 'no pain' and 'most severe pain' and a l0-point numerical rating scale anchored at .no pain' and 'most severe pain'. Participants reported when they first felt discomfort. Low forces are associated with high levels of tenderness.

Pressure algometer: Tenderness was measured in 10 minutes 24and.48h ours after exercise by applying pressure algometer to the calf over the belly of the most-tender part of the gastrocnemius muscle with progressively increasing force. [8]

Statistical Analysis

The data was entered in the Microsoft Excel sheet and analysed using SPSS (Version 22. 0) for windows. Paired t-test/Wilcoxon signed rank test was used to compare the pre-post comparison for both the methods (warm up and phonophoresis) based on normality. Two independent sample t test/Mann Whitney U-test were used to compare the effectiveness of warm up and phonophoresis in management of DOMS based on normality.

Result

Total of 40 female who consented to be part of study were included and grouped as Group A (Warm-up) and Group B (Phonophoresis).

Table 1: Comparison of pressure algometer reading between the groups at day 1, 2 and 3			
Day	**Group A**	**Group B**	**T (p value)**
Day 1	5.74 ± 1.27	5.36 ± 1.05	1.025 (0.312)
Day 2	5.27 ± 1.34	4.34 ± 1.31	2.226 (0.032)*
Day 3	6.93 ± 1.05	6.60 ± 1.26	0.893 (0.378)
*p<0.05 was considered statistically significant.			

There was a statistically significant difference in the mean pressure algometer scores between group A and B for day 2 (p value<0.05). There was no statistically significant difference in the mean pressure algometer scores between group A and B for day 3. (p value >0.05) (Table 1)

Table 2: Comparison of VAS score between the groups at day 1, 2 and 3			
Day	**Group A**	**Group B**	**T (p value)**
Day 1	3.90 ± 1.99	4.25 ± 1.94	0.562 (0.578)
Day 2	5.05 ± 1.73	5.50 ± 1.79	0.808 (0.324)
Day 3	2.30 ± 1.08	2.65 ± 1.38	0.890 (0.379)
*p<0.05 was considered statistically significant.			

There was no statistically significant difference in the mean VAS scores between group A and B for day 1, 2 and3 respectively.(p value>0.05) (Table 2)

Discussion

This study was conducted by Yendurance Zone, Yenepoya University, to compare the effectiveness of warm up and phonophoresis. This study was performed among the 40 female adults aged between 18 to 25 years. This population was chosen to generalize the results for this age groups. This study was conducted at Yendurance Zone, Yenepoya University was completed in the month of April 2016. The results of the study indicated that phonophoresisis effective than warm up for the management of DOMS in terms of pressure algometer reading and VAS score and were also comparable to other studies.

In a study by Roberta YW et al. the results showed that warm-up reduced muscle soreness. In another study Brain C et al, did a study on effects of ultrasound and Trolamine salicylate phonophoresis on delayed-onset muscle soreness. The results showed that salicylate phonophoresis may be useful in clinical situations in which it is desirable to administer ultrasound without increasing inflammation.[9]

In a study by Tiffany Windju, et al., to assess the use of Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) in treating delayed onset muscle soreness (DOMS). Author concluded that NSAIDs work to reduce inflammation by inhibiting the cyclo-oxygenase COX enzyme which is necessary for prostaglandin synthesis; when inflammatory prostaglandins cannot be made vascular permeability is not increased, swelling is limited and less soreness

is experienced at the site of muscle injury.[10] According to the present study warm up and phonophoresis showed significantly greater gains in the management of DOMS. The gains achieved by warm up and phonophoresis was significantly different from each other. It is important that phonophoresis is effective to alleviate DOMS and to enhance recovery from muscle injury.

In the current study, all the girls who participated successfully completed the study without missing a single session with the same eagerness and keenness throughout the study. The goals established at the initial and subsequent evaluations were met as quickly and as sensibly as possible.

Limitation: Due to small size we cannot project the findings of our study to be entire population of healthy female adults.

Conclusion

Phonophoresis showed to be more effective than warm up in alleviating DOMS than warm up. The comparison done between the two groups (warm up and phonophoresis) suggests that both warm up and phonophoresis have some effect in alleviating the DOMS.

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An association of Pulmonary Function Test with Pectoralis Minor Tightness and Forward Head Posture in Healthy College Going Students- Correlational Study

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Abstract

Background: In forward head posture posture, the respiratory mechanism is most commonly affected due to muscular imbalance in the thoracic, cervical & shoulder regions which will hamper breathing capacities. The literature is mostly available with pectoralis major muscle tightness and weakness of scapular muscles but very few articles are available for pectoralis minor tightness and its effect on breathing capacities. So, the study aims to determine the effect of pectoralis minor muscle tightness and forward head posture on pulmonary function test in healthy individuals aged 17 to 25 years.

Methods: A total of 120 subjects were included in the study based on inclusion & exclusion criteria. Before data collection, Pre-evaluation of the subject was done by using Flexi-ruler for kyphotic & lordotic curve, Pectoralis minor tightness test by measure tape in both upper limb and Inter-scapular distance. The procedure includes a pulmonary function test in which measurements include FEV1, FVC, MVV, FEV1/FVC & MVV*40/FEV1 by using a computerised spirometer for diagnostic spirometry.

Results: The statistical analysis was done by using Pearson's correlation coefficient which shows a poor but positive correlation between Inter-scapular distance, Flexi curve angle, and all pulmonary function test measurements(r=0.315, 0.251, 0.047, 0.301 & 0.047 between interscapular and pulmonary function test& r=-0.085, 0.075, 0.004, -0.050 & 0.018).While poor & negative correlation between left and right pectoralis minor tightness & all measures of pulmonary function(r=-0.059, -0.106, 0.048, 0.004 & 0.353 between left pectorals tightness & PFT while for right pectorals tightness & PFT, r=-0.22, -0.015, -0.035, -0.037 & -0.047).

Conclusion: Pulmonary function parameters show poor correlation which means the respiratory mechanism is not being impaired due to tightness of pectoralis minor muscle & forward head posture of healthy individuals aged 18 to 25.

Keywords: *Forward head posture, pulmonary function test, pectoralis minor muscle tightness*

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Introduction

The ideal posture is the position in which minimal stress is required to maintain the position and any alteration in this position can increase the stress to the joints and changes the line of gravity, and it is known

as "faulty posture"[1] Deviation from this optimal ideal standing posture changes the LOG, BOS, COG, will cause excessive strain on internal forces that are passive structure and will increase the muscle activity on that particular joints or structure. [2] If this posture is adapted continuously in daily life then slowly the body will adapt it causing the shortening or lengthening of the muscles or ligaments[2]. There are so many posture deviations but among them forward head posture is taken into consideration because it is the most common posture seen in adult, and it is adapted while using Smartphone, carrying a heavy backload, using computers having slouched posture, so it is taken to study the effects on healthy individuals. [1,3] In this posture, the head is positioned more anteriorly due to which LOG shifts anteriorly, so it will increase the flexion movement; due to increases in cervical lordosis also there will be the occurrence of protraction movements which will produce an extension of the upper cervical spine and flexion of the lower cervical spine[2,3]. There will be more adaptive lengthening of upper posterior back muscles, and adaptive shortening of anterior shoulder muscles more severe will leads to kyphosis. Due to medial rotation and shortening the muscle involved in moving the scapula downward and anteriorly (forward) and outward are serratus anterior, pectoralis minor, pectoralis major, subclavius muscle[4]. If there is the adaptive shortening of pectoralis minor it will alter the scapular position by altering scapular kinematics by increasing internal rotation, downward rotation, the anterior tilt of the scapula causing the protracted shoulder and shortening of this muscle will hamper the lung volumes[5]. Chronic shortening will affect normal scapular kinematics in individuals with shoulder impingement and not allow the scapula to fully upwardly rotated, externally rotated, posterior tip, or elevated ultimately reduce the lung capacity due to a decrease in thoracic cavity expansion and decreasing activation of the accessory muscle of inspiration[6]. In Forward Head Posture, there is the weakening of the upper thoracic muscle and shortening of anterior chest muscle as this creates the musculature imbalances and due to it, there is the weakness of accessory respiratory muscles which further decreases lung capacities[7]. As pectoralis minor is an accessory Inspiratory muscle so a person with pectoralis minor tightness and forward head posture can go for a pulmonary function test for checking all parameters which are directly related to breathing problems[8]. So the main aim of this study is to correlate that pectoralis minor tightness in FHP affects the lung capacities in the normal individual having bad posture, using Smartphone's working for long hours and to improve breathing problems and posture and to reduce the breathing difficulty in this age group[9] as this study is conducted because there are fewer articles available on pulmonary function test and pectoralis minor tightness with forward head & rounded shoulder.

Methods and Materials

1. Subjects: Healthy non-smoker subjects were recruited for this cross-sectional study from the S S Agrawal group of colleges in India. According to G Power analysis with 0.5 power and 95% confidence interval & 0.05 significance level, a total of 120 samples were selected based on inclusion and exclusion criteria. Inclusion criteria include the healthy person who was between 17 to 25 years old, those have a pectoralis minor muscle tightness up to 2.5 cm, having a Flexi curve angle between 20^0 to 40^0, the interscapular distance between 3 to 4 inch. Individuals were excluded if they presented with a history of smoking, any respiratory, cardiovascular, or neuromuscular disease, and had fixed deformities of the shoulder and upper quadrant.

2. Pre-evaluation of participants: Before the pre-evaluation of participants informed consent was given to all and included those who were willingly participated in the study. The pre-evaluation of

subjects includes interscapular distance, Flexi curve angle, and pectoralis minor muscle tightness test.

3. Pulmonary Function test measurements: To measure lung function under the American Thoracic Society (ATS) guidelines, a computerized spirometer with a standard mouthpiece was used. All participants underwent pulmonary function testing with forced expiratory volume(FEV1), Forced vital capacity, FEV1/FVC, Maximal voluntary ventilation(MVV), MVV*40/FEV1 in the sitting position.Theparticipants were familiar with the test protocols before the start of the test and were permitted to do several trials before the test. A mouthpiece with no teeth grip was used when conducting spirometry, and the subject held the mouthpiece securely with the nose closed by the nose clip.A minimum of three trials with the best (highest) test result retained for analysis was completed by all subjects. Between each trial, a minimum 3-minute rest was provided. The same instructions were given to all the subjects when conducting the tests to prevent bias.

4. Statistical Analysis: The statistical analysis was done by using SPSS 20(IBM, NY). Using the Kolmogorov-Smirnov test, normality was tested and determined. For relationship, the correlation coefficient was calculated by using Karl Pearson's correlation coefficient to determine the association of pulmonary function test with (i)pectoralis minor tightness, (ii)Interscapualr distance, and (iii) Flexi-curve angle

Results

3247766992. Sociodemographic characteristics:

Table 1 shows demographic data of 120 participants in which 18 were male & 102 were female participants and in the age group, 17 to 19-year-old the participants were 70, in 20 to 22-year-old category the participants were 42 and in 22 to 25 year old it was 8 participants included in the study.

3247766992. Relationship between lung function and pectoralis minor tightness: (Table 2 & 3)

Pectoralis minor tightness on both the side was negatively but poorly correlated with FEV1 & FVC which indicated there was a decrease in the capacity of lung function with an increase in tightness but as it was very poor so obvious affection couldn't be seen in the participants.While the left side of pectoralis minor tightness was poorly but positively correlated with FEV1/FVC, MVV & MVV*40/FEV1 which indicate if tightness increases there will be decreases in Table 2 where r=-0.22 & -0.059 for FEV1 for tightness on right & left side of pectoralis minor muscle. All most all lung function test was negatively correlated with pectoralis minor tightness that suggesting with an increase in tightness, pulmonary function outcome measures will be declined & it may hamper the respiratory function of healthy individuals(r= -0.015, 0.048 for FVC, r=-0.047, 0.086 for MVV*40/FEV1 and MVV r=-0.037 & 0.004 on right & left side of pectoralis muscle) but here the correlation is poorly related with muscle tightness so it will no more hampering respiration. In the age group 23-25-year-old individuals having a good relationship with pectoralis tightness as r= 0.224 for FVC, -0.535 for FEV1/FVC, -0.785 for MVV & -0.709 for MVV*40/FEV1 on right side of pectoralis minor tightness)that suggesting as age is increased, participants may have problems in lung functions mainly MVV, FEV1/FVC ratio & MVV*40/FEV1 if they have a more tightness of pectoralis minor muscle on right side of shoulder region seen in Table 3.

3247766993. Relationship between lung function and the flexi-curve angle: (Table 2 & 3)

Flexi-curve angle was positively correlated with all parameters except FEV1 & MVV as it was negatively correlated with them in which r= -0.085 & -0.050. So it means if the angle increases in cervical there will be a decrease in the FEV1 & MVV

which indicates that less effort will be generated for maximal voluntary ventilation but it's too minimally affected so it won't be affecting lung function Table 2. In all age groups, the r-value will be around 0.2 or 0.3 indicating a poor correlation between Flexi curve angle & lung function testing parameters.

3247766994. Relationship between lung function and Interscapular distance: (Table 2 & 3)

Among all outcome measures, Interscapular distance was highly correlated with FEV1 & MVV where r = 0.315 & 0.301 which shows a distance between two superior angles of scapula increases there will be a decrease in the FEV1 & MVV that suggesting forced expiratory capacity will be affected & less effort will be generated in the muscles of respiration due to weakness of upper posterior back muscles in Table 2. Compare to another age group, FEV1 in 20-22-year-old participants were adequately correlated with interscapular distance as r value are 0.44 while other age groups were poorly where r = 0.19 for 17 to 19 year old & 0.237 for 23 to 25-year-old subjects but positively correlated with distance. but FVC was equally but adequately correlated in the age of 20-22 & 23-25 years (r= 0.451 for 20 to 22-year-old & 0.434 for 23 to 25 year old)which shows these groups have a significant association with interscapular distance while the ratio between FEV1/FVC was highly correlated in the age group 23-25 years old healthy individuals in Table 3 as the r was - 0712. In the age group 23-25, MVV has correlated adequately but a negative relationship with Interscapular distance as r= -0.465 while MVV*40/ FEV1 was highly related with Interscapular distance which means if Interscapular distance increases, MVV & MVV*40/FEV1 will be reduced due to muscular imbalance between extensor group of muscles and flexor group of muscles of the upper back region & respiratory effort will be less due to this cause.

Table 1: Sociodemographic characteristics

Variables	N(%)	Mean	Standard Deviation
Age	120(100)	19.56	1.704
17-19	70(58.34%)		
20-22	42(35%)		
23-25	8(6.66%)		
Height	120(100%)	53.58	12.81
Weight	120(100%)	160.65	9.10
BMI	120(100%)	20.66	4.54
Gender	120	1.115	0.359
Male	18(15%)		
Female	102(85%)		

Table 2 shows Pearson's correlation coefficient in the 120 healthy individuals

Variables	FEV1		FVC		FEV1/FVC		MVV		MVV*/FEV1	
	r	P value	r	P value	r	P value	r	P value	r	P-value
Intrascapular distance	0.315	0.00	0.251	0.006	0.047	0.613	0.301	0.001	0.047	0.614
Right side pectoralis minor tightness	-0.22	0.772	-0.015	0.871	-0.035	0.706	-0.037	0.735	-0.047	0.609
Left side pectoralis minor tightness	-0.059	0.521	-0.106	0.249	0.048	0.599	0.004	0.970	0.086	0.353
Flexi-curve angle	-0.085	0.354	0.075	0.416	0.004	0.965	-0.050	0.585	0.018	0.842

Table 3 shows Pearson's correlation coefficient with categories of age group between 17 to 25 year-old

	FEV1			FVC			FEV1/FVC			MVV			MVV*40/FEV1		
Age Group	17-19	20-22	23-25	17-19	20-22	23-25	17-19	20-22	23-25	17-19	20-22	23-25	17-19	20-22	23-25
Intrascapular distance	0.198	0.444	0.237	0.097	0.451	0.434	0.087	-0.089	-0.712	0.261	0.387	-0.465	0.097	-0.039	-0.616
Right side pectoralis minor tightness	-0.060	-0.103	0.004	-0.045	-0.117	0.224	-0.053	0.234	-0.535	-0.021	-0.024	-0.785	0.056	-0.013	-0.709
Left side pectoralis minor tightness	0.020	-0.061	0.130	0.040	-0.076	0.142	-0.097	0.179	-0.197	-0.031	0.009	-0.127	-0.058	-0.006	-0.236
Flexi-curve angle	-0.172	0.044	0.209	-0.208	0.002	0.063	0.119	-0.105	0.019	0.075	-0.102	0.247	0.215	-0.209	-0.004

Discussion

Due toprolonged cycles of extreme stress and the contraction of neck muscles to correct an unstable head position, forward head posture induces intense stiffness in the neck flexors[9].The length–tension relationship of the force in the respiratory muscles associated with the neck flexors is also altered by forward head posture[10].So, the purpose of our research was to find a relationship between forward head posture, pectoralis minor pulmonary tightness. The ratio of FEV1 / FVC and ISD, Flexi curve, and left pectoral minor tightness between FVC and ISD ratio of MVV*40 / FEV1 and ISD, Flexi curve, and left pectoral minor tightness between FVC and ISD ratio of MVV*40 / FEV1 and ISD, Flexi curve, were substantial positive weak correlation of MVV

and ISD.This correlation of ISD, Flexi-curve, Left pectoralis minor on FEV1, FVC, MVV, FEV1 / FVC ratio, MVV*40 / FEV1 seems significant because it indicates that there will be a decrease in FVC, FEV1, MVV, FEV1 / FVC, MVV*40 / FEV1 in the forward head posture with a rise in ISD, Flexi curve and Left pectoralis minor tightness. When Kim et al [11] compared the pulmonary functions of a forward head posture group and a control (healthy) group, the FVC in the forward head posture group was 81.95 percent, while the FVC in the control group was 93.54 percent, indicating that the FVC in the forward head posture group was slightly lower than the control group.The Forward Head Posture is also included in this study as it causes the shortening and weakening of accessory respiratory muscles such as serratus anterior, pectoralis major, pectoralis minor muscle, as they help them during the inspiration phase of breathing. Pectoralis minor is the muscle that helps the anterior muscle of the serratus draw the scapula to the chest and helps to check the gap from the acromion to the treatment table during deep inspiration, as stated in the introduction. Deepika Singla, and Zubia Veqar et al [12]studies, there is the alteration in scapular position and abnormal alignment occur in the cervical and thoracic spine due to the adaption of the Forward Shoulder In this posture there is anterior tilting, downwardly rotated, protracted scapula due to this there is the decrease in respiratory muscle activity as this muscle goes in tightening or weakness decrease in accessory muscle also increase in the forward angulations of scapulae there will be increases in slope of the upper thoracic spine with this there will be increased anterior-posterior diameter of the chest with the increase in kyphotic posture also reduced glenohumeral joint motion by reducing scapular posterior tilt. As the association finds that Forward Head Posture contributes to Forward Shoulder Posture and increases in thoracic kyphosis, this study was performed to estimate the decrease in pulmonary values such as FVC, FEV1, MVV, FEV1 / FVC ratio in the typical person with small pectoral tightness as this posture is now widely adapted by adults when using cell phones, carrying heavy backpacks, having weak posture when attending long lectures. V K VIJAYAN et al, studies[13] have shown that the positive association between MVV and FEV1 indicates that as MVV decreases the indirect proportion of the degree of respiratory muscle weakness in malnourished patients and the determination of MVV may also be helpful in the assessment of chronic pulmonary diseases and the relationship between malnutrition and chronic pulmonary diseases is increasingly being identified. Forward Head Posture is an abnormal posture, and during expiration, it may increase the internal pressure of the trunk and increase the dynamic mechanisms. The flexibility of the musculature of the cervical and thoracic spine is also important because it smoothes the respiratory function due to imbalances as discussed, there will be a decrease in endurance and proprioception of these muscles in FHP, there will be increases in muscle tension around the thoracic spine and limiting the upper range of motion of the thoracic. For this cause, in a normal person with FHP, lung capacity is measured, leading to small pectoralis minor tightness and affecting the lung capacity or not.The association between pulmonary function and forward head posture, pectoralis minor tightness and flexicurve angle for thoracic kyphotic posture is very weak in the present study, however. Almost all variables except FEV1 & FVC were moderate to strongly correlated in the age group of 23 to 25, but was negatively correlated with the right side pectoralis minor tightness, suggesting that as age increases, muscle tightness will decrease lung functional capacity. However, in the age group 17 to 19, the flexi curve angle is poorly but negatively associated with FVC, indicating that as the forward head posture increases, the FVC value decreases. Only Interscapular distance and MVV, FEV1, FVC, FEV1/FVC, MVV*40/FEV1

showed a positive poor correlation in our research, suggesting that the weakening of posterior scapular muscles affects PFT parameters and that there is no difference in PFT parameters between right and left pectoralis minor tightness.

Conclusion

Intra scapular Distance shows an association between MVV, FVC, FEV_1 which has poor correlation but in other variables like Flexi curve and Right and Left Pectoralis tightness are not correlated significantly with PFT values in a normal healthy individual. So there is no association between Pulmonary Function test and person with pectoralis minor tightness and forward head posture.

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Conflict of Interest: None

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Knowledge and Awareness of Work-Related Musculoskeletal Disorders and Office Ergonomics among Bankers in Maval Region

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Abstract

Objective: Primary Objective: To analyse the knowledge and awareness of work-related musculoskeletal disorders among bankers in Maval region using a self- administered survey-based questionnaire.

To analyse the knowledge and awareness of office ergonomics among bankers in Maval region using a self-administered survey-based questionnaire.

Secondary Objective: To find association between the knowledge and awareness of work-related musculoskeletal disorders and office ergonomics among bankers in Maval region and their age as a part of demographic data.

Method: It was a cross-sectional study in which a self-madequestionnaire was used to know the knowledge and awareness of work-related musculoskeletal disorders and office ergonomics among bankers.Google form link of the same was mailed to the 252 participants by making a list of all banks in Maval region, approached in person and telephonically and their data was collected.After collecting the data,it was analysed statistically and representation of qualitative characteristics like age, gender was represented through graphical pie charts. The survey results were shown as percentage in the form of graphical representation through pie charts and in the tabular form.

Results: Through results it was seen that bankers were aware about work-related musculoskeletal disorders and office ergonomics but were not implementing it their working tenure.

Keywords: *Awareness, Office Ergonomics, Knowledge, Work-Related Musculoskeletal Disorders.*

Introduction

In India Banking is the lifeline of the nation and its people.[10] Banking has helped in developing the vital sectors of the economy and lead to a fresh start of progress on the Indian horizon[10]. With the advent of computers in 21st century, there is an increased dependency on computers1.Even in Banking Industry there is shift of manual physical work to computerised sedentarywork. Musculoskeletaldisorders (MSDs) consist of minor physical injuries/disorders[10]. It include variety of conditions that affect the muscles, bones, ligaments and joints[10].The severity of the MSD can vary. Pain and discomfort may interfere with everyday activities. MSDs are extremely common, and the risk increases with age. Early diagnosis is the

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key to minimize the pain which will further decrease bodily damage[10].Rapid technological developments, especially in the use of electronic data, have affected both workers and the work place (Jensen C et al,2002)[10]. Work-related Musculoskeletal Disorders can affect shoulders, arms, elbows, wrists, hands, back, legs and feet. Its mechanism of injury is by forceful or repetitive movements or a poor working posture[10]. Symptoms include tender-ness, aches and pains, tingling, stiffness and swelling[10]. Lower and upper back pain and muscle spasm could be due to incorrect seating, which also affects the cervical spine and neck muscles leading to pain[10]. Increased forces across the joints plays a major role in the relationship between a high BMI and weight-bearing joints (back and lower extremities), compared to symptoms in non-weight-bearing joints (in the shoulder/neck and upper extremities)[9]. Computer usage has been responsible to increased risk of musculoskeletal disorders. In some individuals, pain may recur or persist, leading to long-term physical disability, reduced work capacity, and sickness absence.Banking sector employees are found to be working for longer duration on computer assuming Awkward Postures, and also the correct work ergonomics are not followed at majority of work stations in the banks.Due to lack of a sound ergonomic design, increased work for prolonged periods can adversely develop musculoskeletal disorders (MSDs)[8]. A brief knowledge of the principles of ergonomics of workstation setup and exercises can help in combating work related discomfort and maximize work productivity.[5] Ergonomics is a relatively new concept in India yet to be considered an integral component of most workplaces. The findings got through the current study can establish a firm brickwork for future research and ergonomic training in the banking setups[5]. In view of this, the present study is carried to know the knowledge and awareness about the work-related musculoskeletal disorders and the knowledge and awareness about office ergonomics among bankers.

Materials and Methodology

It was a cross-sectional study in which a self-madequestionnaire was used to know the knowledge and awareness of work-related musculoskeletal disorders and office ergonomics among bankers in Maval regions.Ethics committee clearance was taken prior to start of the study.A online self-made questionnaire was made through google form. Google form link of the same was mailed to the 252 participants by making a list of all banks in Maval region, approached in person and telephonically and their data was collected. The google form did not reveal the identity of the participant.After completion, the data was analysed statistically and representation of qualitative characteristics like age, gender was represented through graphical pie charts. The survey results were shown as percentage in the form of graphical representation through pie charts. The present study was conducted from month January2021-May 2021 in MAEER's Physiotherapy College, Talegaon- Dabhade, Pune.

Outcome measure

The questionnaire contains 3 domains:

Domain 1: Demographic data (Age, Gender, BMI, Lifestyle, Job Tenure, Type of Branch)

Domain2**:** Questions on Awareness about work-related musculoskeletal disorders like Questions on Work-related musculoskeletal disorders and Repetitive stress injuries.

Domain 3: Questions about Office Ergonomics and Work Environment related factors like Office Ergonomics, Workstation design, Working hours, Ergonomic Chair.All questions were relevant and closed ended, framed in a yes or no pattern and also in a Likert scale.

Results

The following is the demographic data of the bankers from the banks of Maval region which were included in the study.

Table no.1: Demographic data:

DESCRIPTIVE	CRITERIA	FREQUENCY	PERCENTAGE
Gender	Male	122	48.4
	Female	130	51.6
Age	26-45	171	68
	46 -60	81	32
BMI	Normal (18-24.9)	103.	41
	Overweight(25-29.9)	101	40
	Obese(30->40)	48	19
Lifestyle	Active	125	49.6
	Sedentary	127	50.4

Table no.2: Representation of commonly affected regions of WRMSD in Bankers:

AFFECTED REGIONS	PERCENTAGE
1.Neck	28.2%
2.Lower back	22.6%
3.Upper back	10.7%
4.Shoulder	10.7%
5.Knee	9.1%

Table no.3:Representation of factors important for smooth working at bank:

FACTORS IMPORTANT FOR A SMOOTH WORKING AT BANK	PERCENTAGE
1.Work area design	5.6%
2.Body posture	12.3%
3.Working chair	4.4%
4.Health	4%
5.Lighting	0.4%
6.Working hours	2.4%
7.Work environment	8.3%
8.Rest breaks	5.6%
9.All of the above	57.1%

Table no.4:Representation of Awareness of ergonomically correct Workstation:

QUESTIONS	YES	NO
1.Aware about correct arrangement of computer, mouse and keyboard.	67.9%	32.1%
2.Know the distance to fix the monitor screen while working.	57.9%	42.1%
3.Aware about ergonomically designed keyboard.	39.7%	60.3%
4.Know to keep the objects within reach zone.	76.2%	23.8%
5.Aware about the height of table.	63.5%	36.5%

Table no.5: LIKERT SCALE: Likert scale ranging from 1 to 5, for each statement circle from 1 to 5 where, 1-strongly agree 2-agreed 3-neutral 4-disagree 5-strongly disagree.

QUESTIONS	1	2	3	4	5
1.I am aware about consulting physio for WMSK.	31.3%	25%	22.6%	11.9%	9.1%
2.I am aware that exercise is the role to MSK.	42.9%	18.7%	19%	8.7%	10.7%

Cont... **Table no.5: LIKERT SCALE: Likert scale ranging from 1 to 5, for each statement circle from 1 to 5 where, 1-strongly agree 2-agreed 3-neutral 4-disagree 5-strongly disagree.**

3.WMSD increases employee absentism.	39.7%	18.3%	19.4%	10.7%	11.9%
4.My job needs me frequently standup for longer period.	18.7%	16.7%	22.6%	22.2%	20.2%
5.My job needs me to carry heavy objects.	9.9%	12.7%	28.6%	20.2%	28.6%
6.My bank should undertake ergonomic sessions.	42.1%	12.7%	23.4%	10.3%	11.5%

Discussion

The questionnaire was completed and returned by 252 out of 255 bank employees. In this study over 51.6% were females and 48.4% were males.Table 1 showed the BMI of Bankers which reflected that103 bankers were having normal BMI which ranges from 18-24.9 and 101 of them were overweight and 48 of the bankers from the total sample size were obese.The bankers were divided into two age groups, Group1:26years-45years of age and Group2:46years -60 years of age. Group1 consisted of 171bankers i.e 68% of the total sample size and Group2 consisted of 81 bankers i.e 32% as shown in Table no.2. Most of the bankers were of young and middle age. Therefore, their mean age was 40. The lifestyle pattern of bankers reflected that, 50.4% of the bankers were sedentary and 49.6% of the bankers were active performing exercise of any form, for atleast 30mins thrice a week.Domain 2 consisted of questions on work-related musculoskeletal disorders, where 73.8% of the bankers were aware about the work-related musculoskeletal disorders while 80.2% of the population have experienced it in their working tenure.Among the bankers who have experienced work-related musculoskeletal disorders, Neck region was the most commonly affected (28.2%). Following are serial of occurrence were lower back (22.6%), upper back (10.7%), shoulder was about 10.7% and knee about 9.1%. So, focusing to the fact that Neck and lower back were most affected region and upper back, shoulder, wrist, hip, knee, ankle were least affected regions (Table no.2) in accordance with previous literature given by Seema Patel et al[11]. About 42.50% of bankers found that all the risk factors like faulty body postures, Repeated movements, Increased job demand, Reduction in rest breaks, Poor work station, Duration of work, associated stress are responsible for work-related musculoskeletal disorders. This closely points to the fact that all risk factors are equally responsible for occurrence of work-related musculoskeletal disorders and same has been opined by most of the bankers in the study. This is in the

accordance with previous study given by Kristel oha et all[7], Revati Deshpande[12]. In this Domain some repetitive stress injuries questions were also included, so about 60.3% of the bankers were aware about the repetitive stress injuries, 54.4% had experienced it in their work tenure. About 79.8% of the bankers are aware that repeated movements can leads to Repetitive stress injuries and 44.8% of bankers have the knowledge about the preventive strategies of repetitive stress injuries in accordance with previous literature given by Revati Deshpande[12]. In Domain 3 questions were included on office ergonomics, about 61.1% of the bankers had knowledge about the concept of office ergonomics. 84.1% of the bankers felt that office ergonomics has a important and crucial role in banking sector to avoid work-related musculoskeletal disorders.From table no.3, 57.1% of the bankers felt that all factors like work area design, Body posture, Working chair, Health, Lighting, working hours, work Environment and Rest breaks are important for a smooth working at banking sector in accordance with previous literature given by Revati Deshpande[12]. Through table no.4, it suggested that 67.9% of the bankers were aware about the correct arrangement of computer, mouse and keyboard to influence a smooth working. About 57.9% of the bankers were aware about the distance to fix the monitor screen while working. 60.3% of the bankers were not aware about the ergonomically designed keyboard. About 76.2% of the bankers were aware that the required objects should be kept within their reaching zone in accordance with previous study given by Revati Deshpande[12]. 63.5% of the bankers were aware that the height of the table should be correct while working.Some questions were asked on working hours, 51.6% of the bankers were not aware about the 20-20 rule. The rule is defined as taking regular breaks every 20 minutes by looking at object 20 feet away instead on the screen in near for 20 seconds.(Burak Turgut)[13]. About 83.7% of the bankers felt that job rotation can enhance the work productivity in the banking sector. About 33.7% of the bankers felt that <2hrs time is the ideal time to sit at one place while working in accordance with previous literature given by Revati Deshpande[12]. About 84.9% of the bankers were aware that use of adjustable chair in bank can increase in work performance. 81.7% of them were aware that office chair should include all supports like neck, upper back, lower back, knee and footrest. 59.5% of the bankers felt that upright sitting is the ergonomically correct posture to sit while working.

Questionnaire consisted of likert scale shown in table no.5; which indicated that 31.3% of the bankers were aware about consulting physiotherapist for the work-related musculoskeletal disorders,42.9% of the bankers were aware that the exercise is the key key role to musculoskeletal disorders, this is the chief finding that the study postulated. 42.1% of the bankers were strongly agreeing that their bank should undertake ergonomic sessions for them. From the knowledge thus gained about the awareness of exercise and Physiotherapist consultation among bankers, there emerges an ardent need to conduct Physiotherapy sessions and short exercise plans to be given to bankers.39.7% of the bankers strongly agrees to that fact that work-related musculoskeletal disorders can lead to increase in employee absentism in accordance with previous literature given by MEH Larsson, L. Nordeman, S. Bernhardsson[8].

Association of age was done with the awareness and knowledge of work-related musculoskeletal disorders and office ergonomics using chi-square test. Bankers were divided into two age groups i.e below 45 years and above 45 years.Age was associated with awareness of WRMSD's, awareness of RSI, awareness of office ergonomics and awareness of role of office ergonomics in bank, Out of which the Association of awareness of office ergonomics with age was statistically significant @ p=0.0006

($p<0.05$) @ Chi-square value=11.761.This concluded that younger population like below 45 years of age of bankers are more aware about the ergonomics as they exhibited keen knowledge through various social media platforms being technologically sound population as compared to their senior counterparts.

Conclusion

From the above findings, the study highlights to the fact that majority of the bankers are aware and posses the knowledge about WRMSD's and the office ergonomics. However, what is seen is that the implementation of the correct office ergonomics, practicing correct exercises, taking rest breaks in between long hours of work is lacking in bankers due to workload.So, a Physiotherapist can be appointed by respective banks who can conduct a short ergonomic session which can include exercises, stretches, various methods to deal with the workplace injuries so that they can use it in their daily work routine to minimize the work-related musculoskeletal disorders/injuries and can improve their work productivity and enhance their working morale.

Limitation:

This study was done on smaller sample size. It was done in only Maval region, other regions in Pune can be considered.This study only checks, how much the bankers are aware about the WRMSD's and Office Ergonomics.No further guidance were included about the ergonomics and work-related musculoskeletal disorders and preventive strategies for it.No Interventions were done and no ergonomic sessions were taken.

Clinical Implication and Future Goals:

Further studies can be done by educating the bankers to follow correct ergonomics and exercises thus, enhancing their working morale in the banks. This will also help to reduce the risk of development of work-related musculoskeletal disorders by enhancing the employee work productivity and making the bankers ergonomically sound.Further studies can be done in large sample size.Future studies can be done in whole Pune region.Long term follow-up studies can be done by giving ergonomic exercises to the bankers and preventive strategies which will improve their working skills.In future, studies can be done to find association of the knowledge and awareness of work-related musculoskeletal disorders and office ergonomics among bankers with their lifestyle and BMI as a part of demographic data.

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Association of Social Networks with Health-Related Quality of Life and Physical Functioning in Community Dwelling Elderly Women – A Pilot Study

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Abstract

Background: Social network is the web of relationships that surrounds an individual, social isolation occur when social network breaks down, stronger and closer social ties represent social resources in times of need, reduce a sense of isolation, and increase the mental and physical function. A considerable amount of evidence has consistently demonstrated the benefit of social networking for health, emotional and physical well-being. The purpose of this study is to find out the relationship of social network with quality of life, health and physical functioning.

Objective of The Study: To estimate the relationship between social networks with health-related quality of life and physical functioning.

Methodology: In this cross sectional Pilot study,30 women aged 65 years and older who were selected conveniently and assessed using Lubben social network scale-6(LSNS-6) for social network participation, WHO General Health Questionnaire for Health related quality of life (WHOQOL-BREF), Timed Up and Go (TUG) test for mobility and Functional Reach Test (FRT) for balance.

Result: Pearson's correlation coefficient was calculated between the parameters, a very highly significant positive correlation was found between Social Networks (LSNS-6) and WHOQOL-BREF 4 Domains ($p<0.001$). Among 4 domains Domain-1 and Domain-4 correlation were having very strong positive correlation with a correlation coefficient $r= 0.900$, $r= 0.863$ respectively and Domain-2 ($r= 0.700$), Domain-3 ($r= 0.600$) were having strong correlation. Along with that there exists a highly significant moderate positive correlation of LSNS-6 with balance ($p=.012$, $r= .452$) and a very highly significant strong negative correlation with mobility ($p= 0.000$, $r= -0.630$).

Conclusion: The study showed that in elderly, health related quality of life is associated with better social networks. Analysis of relationship between social networks with balance and mobility showed better the social networks higher the balance and mobility.

Key Words: *Social networks, Health related quality of life, Physical functioning, Balance, Mobility.*

Background and Need of the Study

Ageing is a process of becoming older; it affects everyone in society in one way or the other. Globally, the elderly population constitutes about 12 percent of the total population of 7.3 billion. In India too, the size and percentage of elderly population has been increasing in recent years and this trend is likely to continue in the coming decades. The elderly

population has increased from 77 million in 2001 to 104 million in 2011.by 2050; the elderly population is likely to increase by three times to reach around 300 million. The relatively young India of today will turn into a rapidly greying society in the coming decades[1].

The social networks are the web of relationships that surrounds an individual[2]. Furthermore, stronger and closer social ties represent social resources in times of need, reduce a sense of isolation, and increase the mental and physical functioning of older adults[2,3,4,5]. Social network size declines with ageing, in particular for the oldest old[6]. Larger social networks have a protective influence on cognitive function among elderly women aged 75 years and older[7]. On the other hand, small social networks are known to be associated with negative outcomes such as poor health and well-being[8,9,10]. This is also true for some older adults, where smaller social networks are found to be a risk factor for depressive symptoms[10], more loneliness[11], worse cognition and higher dementia incidence[7].

World Health Organization (WHO) Quality of Life group defines QOL as ‘‘individuals’ perceptions of their position in life in the context of the culture and value systems in which they live and in reference to their goals, expectations, standards, and concerns” [12]. Increasing age is associated with an increased risk of chronic disease, functional decline and hospitalization[13,14]. Such disadvantages may influence both the ability to maintain a social network and the possible positive health effects attached to it. However, maintenance of physical independence, health and a good quality of life (Q0L) for the older population are considered important public health goals[15].This is also a political goal and is even seen as a legal right[16,17]. Furthermore, the QOL is an important concern in healthcare departments involving elderly people and can provide a clinical outcome measure of healthcare[18,19,20].

Physical function is the capacity of an individual to perform the physical activities of daily living, and includes motor function and control, physical fitness and habitual physical activity[21]. Physical functioning includes mobility, balance and muscle strength, which are key factors in preserving a high level of functioning in later years, and concerns the physiological capacity necessary for a person to perform daily tasks safely and independently with vigour and alertness[22,23,24,25]. However, the ageing process tends to reduce mobility, balance and muscle strength, and thus results in difficulties in performing the activities of daily living and normal functioning of elderly people[26,27].

A large proportion of people lives alone and has small social networks and low participation in social activities, making them more susceptible to feelings of loneliness. Evidence has documented that loneliness in old age appears to be an important risk factor of being inactive and worse health, including morbidity and mortality, depression, lower levels of self-rated physical health, and hypertension as well as cardiovascular disease, diabetes, and migraine. An elderly-friendly supportive environment to promote healthy aging include providing opportunities for the elderly to participate in social engagement, improving the living environment, and promoting age diversity in the work environment[28]. An important goal for politicians and public health stakeholders, and for older people, is to decrease the period of disability at the end of life by delaying its onset[29]. At present, more women than men survive to an advanced age, and older women face more physical limitations and disabilities than men of the same [30,31]. It is therefore important to study the importance of social networking for older women. Identifying and addressing possible associations between the social network, health related quality of life and physical functioning may enhance our understanding of such associations, which in turn may not only help us to tailor care more specifically to fit individuals’ needs and preferences, but also help

to improve the quality of healthcare and its outcome[32].

Hence the aim of the study was to find the relationship between social networks with health related quality of life and physical functioning in community dwelling elderly women.

Materials and Methods

A cross sectional pilot Study was carried out in a period of 12 months from March 2019 to March 2020. The study was done in elderly women aged 65 years and above residing in Mangaluru city and bordering areas.

Participants who are willing to take part in the study were screened for inclusion and exclusion criteria, i.e., participant should be Independently mobile without any Psychiatric disorders, debilitating chronic diseases that required restricted amounts of activity for safety reasons, Recent surgeries, Auditory or visual challenge, Acute neurological illness like stroke and Parkinson's disease. After seeking their written consent, and the subjects falling within the inclusion criteria were recruited for the study. A sample size of 30 was estimated for Pilot Study. Purposive sampling method was used to include the participants in the study.

Ethical clearance was obtained from the ethics committee of A J Institute of Medical Sciences, Mangaluru. The subjects participating in the study were given patient information sheet containing the study details, the informed consent were obtained from the subjects prior to the study.

OUTCOME MEASURES

Lubben Social Network Scale (LSNS-6)

Social networks assessment Lubben Social Network Scale (LSNS-6) was used. The LSNS-6 includes 6 items which measure the size of active and intimate networks of family and friends with whom they could talk to or call for help. [33].

WHOQOL-BREF

Health related quality of life was measured using WHOQOL-BREF questionnaire; it is a shorter version of widely used QOL assessment instrument comprises of 26 items in the domains of physical health, psychological health, social relationships and environment[34].

Timed Up and Go (TUG)

Mobility was assessed using Timed Up and Go (TUG) test. The TUG test measures the time taken by a person to rise from a chair, walk 3 m quickly but safely, turn and walk back to the chair, and sit down. A customary walking aid was used if necessary. A chair of approximately 46cm in height, with arm-rests, was placed to face a marker 3 m away[35].

Functional Reach Test(FRT)

To assess balance, the Functional Reach Test was used which measure the maximum distance (cm) subjects could reach the arms forward from a standing position while maintaining a fixed base of support. The better score out of two attempts was recorded, with higher values indicating better balance[36].

PROCEDURE

The initial assessment of medical history, physical therapy assessment, medical record screening was done. Brief introductions about the procedures were explained to all the subjects. Each participant will be given the questionnaire to fill up and asked to perform the test for mobility and balance. The interview method was used if required; any doubts about the questionnaire and tests were cleared by the principal investigator. The outcomes were measured as the same day with a gap of 10 minute in between the scales. The score were recorded on a recording sheet and entered into an excel worksheet on the same day.

Result

A total of 30 women with a mean age of 71.03±7.07 years participated in the study. The mean and standard deviation of the outcome measures were LSNS-6 questionnaire 15.40±5.48, WHOQOL-BREF Domain-115.20±4.26, Domain-2 14.10±2.55, Domain-37.20±1.35, Domain-415.70±4.29, TUG 14.73±2.77, and FRT 19.00±4.63.

TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS AND OUTCOME MEASURE SCORE

Descriptive Statistics

	Mean± Std. Deviation
Age	71.03±7.073
LSNS-6	15.40±5.481
WHOQOL-BREF Domain1	15.20±4.262
WHOQOL-BREF Domain 2	14.10±2.550
WHOQOL-BREF Domain 3	7.200±1.349
WHOQOL-BREF Domain 4	15.70±4.292
TUG	14.73±2.77
FRT	19.00±4.638

There was a very highly significant positive correlation present between Social Networks (LSNS-6) and WHOQOL-BREF ($p<0.001$). Among 4 the four domains, Domain-1 and Domain-4 correlation were having very strong positive correlation with a correlation coefficient r= 0.900, r= 0.863 respectively. Domain-2 (r= 0.700), Domain-3 (r= 0.600) were having strong correlation.

TABLE 2: THE CORRELATION BETWEEN SOCIAL NETWORKS AND WHOQOL-BREF 4

		Domain-1	**Domain-2**	**Domain-3**	**Domain-4**
LSNS-6	Pearson Correlation	.900	.700	.600	.863
	Sig. (2 Tailed)	.000	.000	.000	.000
	N	30	30	30	.30

DOMAINS

On Karl Pearson Correlation test, a statistically significant moderate positive co-relation (r =0.452, p=0.01) was estimated between Social Networks (LSNS-6) and balance (FRT score)−

TABLE 3: CORRELATION BETWEEN SOCIAL NETWORKS AND BALANCE

		FRT
LSNS-6	Pearson Correlation	.452
	Sig. (2-tailed)	.012
	N	30

Karl Pearson correlation was done to estimate the relationship between Social Networks (LSNS-6) and mobility (TUG score).It was found that there is a very highly significant strong negative correlation was present between these variables (r = -0.63, p=.00).

TABLE 4: CORRELATION BETWEEN SOCIAL NETWORKS AND MOBILIY.

		TUG
LSNS-6	Pearson Correlation	-.630
	Sig. (2-tailed)	.000
	N	30

Discussion

The study investigated the association of social networks with health-related quality of life and physical function of mobility and balance in community dwelling elderly women aged 65 years and above. The study was carried out among urban population of selected district in Southern India.

The demographic shift within the human population identified worldwide over the last decades. Whereas birth rates are drastically decreasing in industrialized countries, life expectancy is increasing and the mortality rate is declining. Reasons for this demographic shift are a suspended or total lack of desire to have children among the younger generation on the one hand, improved health care and increased hygiene standards and health education on the other hand[33]. In India the percentage of greying society is increasing along with the world population[1]. However, it is desirable to not only reach an old age but also achieve healthy ageing ideally with a high quality of life, where physical functioning and social networks play central roles[33].Substantial evidence accumulated suggest that social relationships are important for mental and physical well-being across the lifespan. The celebration of Individualism, autonomy, addressing of physical and material needs more importantly than the social need forgetting the biological fact that we are fundamentally a social species and our nature is to recognize, interact, and form relationships with conspecifics[37]. Evidence suggests that women live to an increased age compared to men[32]. Considering these factors our study was to find the association of social networks with health-related quality of life and physical functioning in community dwelling elderly women.

Our results suggest that reduced social network features a negative impact on the health related quality of life in community dwelling elderly women. We studied the association of social networks with 4 domains (physical, psychological, social and environmental) of quality of life. A decreased social connections and thus lack the health promoting influences of social others, reduced social network size and quality will end up in the feeling of loneliness, depressive symptoms, less motivation to participate in physical activity etc. In our study also we've found a robust correlation between social networks and each domain of quality of life[38]. In humans, deficits in social relationships like social isolation or low social support cancause chronic activation of immune, neuroendocrine, and metabolic systems that dwell the pathways, leading to cardiovascular, neoplastic,

and other common aging-related diseases40. Similar associations were found in the previous studies too. Bergland et al 2015 suggest that close social relationships, participating in social networks will leads to better quality of life[32]. Similarly, a study done by Martin Niedermeier et al generally confirmed a positive relationship between physical functioning and QOL[33].

Our results showed a reduced physical functioning with reduced social networks. The mechanisms underlying the association between social activity and disability are unknown. Social activity may reinforce the neural networks and musculoskeletal function required to maintain functional dependence in the face of declining physiologic reserve capacity in later life, in what may be a case of "use it or lose it" with regard to function. Indeed, previous work has shown that social activity is associated with a slower rate of decline in motor function[39]. Psychosocial perspective, social activity may reinforce meaningful social roles, thereby providing a sense of value and belonging and more active participation in physical activities this will leads to improved physical functioning and quality of life in its various domains. Gerontologists have long recognized that older person's . Who has higher levels of daily activity and larger social networks have less disability in later life. This relation between the variables that is social networks and physical functioning is applicable in either direction too. Our study result is also in line with the previous studies. A study done by Yang Claire Yang et al. 2015 found that particular network and support characteristics may have unique influences on health. They found that the links between social embedded and better physical functioning, as well as lower clinically significant disease risks[39]. Study done by Bryan D. James also concluded that socially active older adults tend to be more physically active with better physical functioning characteristics[40].

Our study included participants who stayed alone, who stayed with family, widows, divorcees etc. The majority of the participant's education qualifications were also different. Our study population included only elderly women aged 65 and above, being vulnerable population with a low educational level, they were ignorant of the need to express their problems and was afraid to answer many questions because of the fear of being abandoned. But from the available data and the interview method used to collect the data, we found that elderly women experience lack of social support due to fast competent growing society, poor attention given to the to the elderly population from the family they belongs to, loss of spouse, loss of friends and unable to reach close friends due to physical challenges. Along with that family members give more concentration to the physical and materialistic needs of the elderly. Family being the basic primary social support system the social support is disturbed in the primary level when above mentions things happens. So this eventually progress to the feeling of loneliness, depression and associated health related complications and disability. The participants who lost their spouse were more vulnerable to the fear of death it leads to making them less active and withdraw from the family and friend circle and which further leads to the feeling of loneliness. Age related physical challenges appeared to prevent participation in social activities and social networks. Our study and the previous studies show the relationship in either direction between the variables too.

Even though our study has its own limitations the results shows a strong relationship between social networks with health related quality of life and physical functioning in elderly women. The relation between the variables in either direction was also profound in our study and the past literature. Social network characteristics can include the network size, the connection between members of the network, and therefore the frequency of contact between network

members. Social activity also referred to as social participation or engagement which includes meeting friends, attending events or functions, volunteering or participating in occupational duties or group recreational activities. Social support, often divided into emotional, instrumental, and informational. Social support refers to a person's perception of the availability of help or support from others in their social network.

Finding relationship of social networks with health related quality of life and physical functioning has several implications. Social networks and activity represent structural aspects of social relationships, while social support represents functional aspects of social relationships[41]. This sense of attachment to family, friends, and community may provide a strong motivation to take care of functional performance in later life. Reduced social networks size and quality leads to loneliness and depressive symptoms; it has been already established that loneliness is further associated with adverse health outcomes, including mortality, morbidity, depression, poor sleep, systolic hypertension, heart disease etc.[38]. Good social networks in elderly, apart from making them lonely, the associated improved perceived quality of life could lessen the effects of age related decline in functioning.

Educating elderly on the need of social networks and its health promotion effects may be considered in the light of findings of this study. As physical therapists, we aim to promote healthy ageing lessening the impact of disease and disability associated with ageing. We can better their physical functional status; cognitive status and emotional status health promoting therapeutic exercises in group. Engaging in group exercise among community dwelling elderly will give them an opportunity to interact with people facing similar challenges and be emotionally strong by sharing and caring each other: along with the functional improvement by doing exercise. In addition, being one among the primary health care providers, we may also educate and encourage social workers or community agencies on the need for social interaction in elderly; and for consideration of social programs such as group meals, senior centre activities, and volunteerism, which may ameliorate and reduce the impairments associated with reduced social networks[42]. Better Social networks in elderly could contribute to achieve healthy ageing, by creating physically and mentally strong active elderly population with a better perceived quality of life.

Limitations

Our study was done in community dwelling elderly women aged 65 and above, the educational, cultural, family backgrounds were different among the participants and this makes it difficult to generalise data even though the population of study and the study setting were clearly defined. The sample size of the study was also small. The LSNS-6 which was used to assess the social networks only focus on the size of the social networks, it does not give a close look up towards the quality of social networks and other aspects of it. It also appeared that participants needed prompting to open up and answer the questions. Using culturally validated questionnaire could also help participants to express themselves more accurately.

Further studies may be undertaken with a larger sample more exclusively defined population since different cultural educational and family backgrounds could possibly affect the social network participation and quality of it.

Conclusion

The study concluded that in elderly, higher health related quality of life is associated with better social networks. Analysis of relationship between social networks with balance and mobility showed that better the social networks higher the balance and mobility.

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A Study of Internet Gaming Disorder among Adolescents and It's Corelation with Age and Gender

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Abstract

Background: To corelate internet gaming disorder with gender and age**.**

Objective: To study internet gaming disorder among adolescents and find it's correlation with age and gender**.**

Materials and Methods: A correlational design was used. The study was conducted with 100adolescents 50 males and 50 females each. 100 adolescents were selected based on the inclusion criteria written consent from children and their parents were taken. Subject demographic data wastaken,and Internet Gaming Disorder Scale-20 was used to measure internet gaming disorder.

Results: The findings of corelation between IGD-20 scores and gender shows that Males significantly showed higher associated with higher scores in Internet Gaming Disorder Scale- 20(r=0.742) and corelation between IGD-20 scores and age indicate that the respondent's scores of Internet Gaming Disorder scale with Age shows no significant relationship. (r=-.017).

Conclusion: The study concluded that among sample population 4% came under the likely disorder of internet gaming according to internet gaming disorder scale (IGD-20). It demonstrates that Males significantly showed higher association with higher scores in Internet Gaming Disorder Scale- 20 and scores of Internet Gaming Disorder scale with Age shows no significant relationship.

Key Words: *Internet gaming, Internet gaming disorder scale, Adolescents, Gaming.*

Introduction

The present study aimed to correlate internet gaming disorder with age and gender among Indian adolescents. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), describes gaming disorder (GD) (mentioned as Internet GD) as a persistent and recurrent pattern of playing digital games be it online or offline, leading to a clinically significant distress.[1]. The field of technology has advanced including the gaming industry; the advent of high-tech handheld gaming devices such as smartphones, gaming consoles, or tablets; and the increased penetration of the Internet that is accessible at an increasingly affordable price have made gaming more engaging, attractive, accessible, and affordable. [2] Although gaming is a harmless leisure activity for most players, at least a subset of them experiences one of the more adverse consequences consequent to

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engagement in this behavior.

Despite Internet gaming disorder's name IGD doesn't require that the individual exhibit symptoms of addiction only with online video games. Problematic use can occur in both offline and online settings, [3] although reports of video game "addiction" often involve online games such as Massively Multiplayer Online Role-Playing Games.

The published literature has documented physical, psychological, social, and work-related problems such as disturbed sleep pattern, dehydration, pressure sores, increased irritability, and aggression, depressive and/or anxiety symptoms, poor academic performance, and fails to care for interpersonal relationships and work-related commitments among persons with problematic gaming [4] .

In part due to differences in assessment, preponderance estimates of IGD separate considerably across studies, especially in adolescents. In representative studies, rates of IGD among adolescents range from 1.7 to 8.5% [5-7], although one review suggests that truly addictive use (versus not just excessive play patterns) appears to be present in 2–5% of youth [5,7].

Between March 2017 and July 2018, a cross-sectional study was performed. The frequency of online video game addiction was determined to be 73.9 percent in this survey of 575 teenagers. Adolescents who were hooked to online video games played for 7 hours per day, or 20 hours per week on their mobile phones. [8,9]

Definitive conclusions about the efficacy of any one approach or set of combined approaches or their comparative effectiveness cannot yet be made because of the lack of randomized, controlled research.

EXPERIMENTAL HYPOTHESIS

HA1- there is a corelation between internet gaming disorder score and gender.

HA2 - there is a corelation between internet gaming disorder score and age.

Null Hypothesis

H01: there is no corelation between internet gaming disorder score and gender.

H02: there is no corelation between internet gaming disorder score and age

Methodology

TYPE OF STUDY: correlational study design

SAMPLE SIZE: A minimum of 100 subjects were selected for the study based on inclusion & exclusion criteria

SAMPLING DESIGN: Convenient Sampling

VARIABLES

· INTERNET GAMING DISORDER scale score

· Gender

· Age

Inclusion Criteria

· Participants in the age group11-18 years of age.

· Not have any physical disability.

· Participants having internet access.

· Participants having personal multimedia devices

Exclusioncriteria

· Adolescents with any neurobehavioral or psychiatric conditions.

· Participants not having internet connectivity

Outcome Measures

1. Semi-structured tool
2. The Internet gaming disorder scale[22-24]

Procedure

Sample size of 100 participants was selected for the study,50 males and 50 females. Informed consent from guardians/participants was taken. Subjects were screened to rule out the inclusion and exclusion criteria and Subject demographic data and gaming usage variables, namely duration, devices used, time spent on gaming, and similar other variables was taken via semi structured tool. Subjects were then divided into 2 groups having 25 females and 25 males each:

- Early adolescents(11-14yrs),
- Late adolescents(15-18yrs).

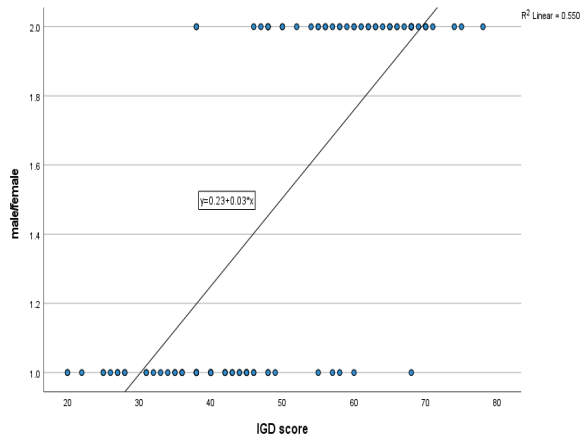
Internet Gaming Disorder Scale was given to subjects. Data was analyzed using statistical testand Co-relation of IGD test score with age and gender was found. Results were formed according to the analysis of data then Study was concluded based on the results of data analyze

Statistical Interpretation

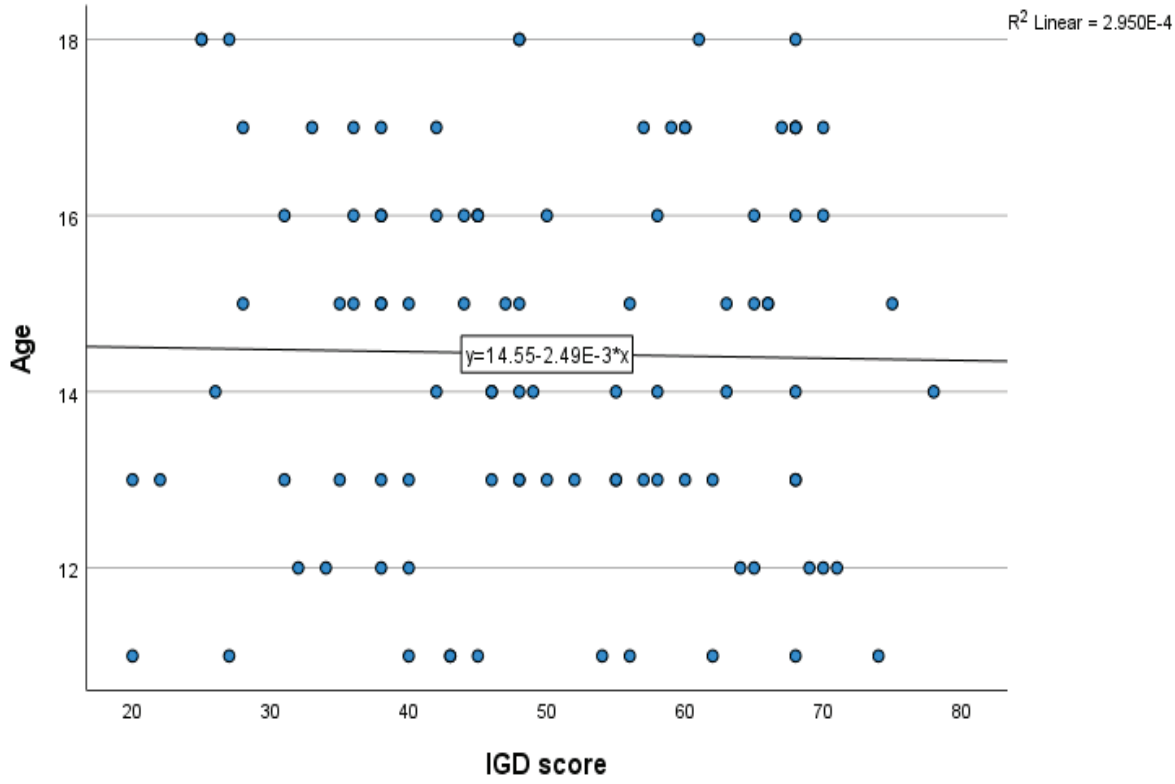
Data was analysed using the IBM Statistical Package of Social Sciences (SPSS) version 28 software for windows. Descriptive Statistics was done on the demographic characteristics such as age, gender, class/grade, type of internet games played, types of devices used for internet gaming and gaming hours per day. Karl Pearson's correlation test (2-tailed) was used for finding the correlation of age and gender with the scores of The Internet Gaming Disorder Scale (IGD-20)[22-24]. The significance value for the study results was set at P <0.05.

Result

This study was taken upto study internet gaming disorder among adolescents and find it's correlation with age and gender**.** Hypothesis of the study was to find the corelation between internet gaming disorder score and gender and to find the corelation between internet gaming disorder score and agein adolescents who met the inclusion and exclusion criteria of the study. The finding shows that responders were classified into two categories, having 1:1 ratio of male is to females, age group 1 that included participants aged from 11 to 14 years with mean of 12.64 and age group 2 had 15 to 18 years old participants with mean of 16.26.In internet gaming disorder scale score, Lowest score obtained was 20 and highest was 78 with a mean of 49.83. Out of 100 participants, 4 met the cut off point for Internet gaming disorder scale i.e, 71 points were disordered gamers, 96 were other gamers.



INTERPRETATION:In bivariate Analysis for finding the corelation between IGD-20 scores and gender, Males significantly showed higher associated with higher scores in Internet Gaming Disorder Scale-20.They showed a strong positive linear relationship with r value 0.742.



INTERPRETATIONParameter estimates in finding the corelation between IGD-20 scores and age indicate that the respondent's scores of Internet Gaming Disorder scale with Age shows no significant relationship with r value -.017.

Discussion

The aim of this study was to investigate the relationship of internet gaming disorder with age and gender. To examine whether Internet gaming disorder has any relationship with age and gender, data was collected from 100 adolescents who have their own multimedia device for playing games. The INTERNET GAMING DISORDER SCALE[22-24] (IGD-20 Test) [10] a standardized psychometric tool was used to assess Gaming Disorder among us participants of the study.According to the results of this research, a positive correlation exists between Internet gaming disorder and gender. Positive correlation means that a high value on IGD scores is associated with a high frequency of Male. With "r" value of 0.742 which shows strong linear relationship between these two variables. This result rejects the null hypothesis that states that there is there is no corelation between internet gaming disorder score and gender. In China, a study done by **Yanqiu Yu et al** states that adolescent males had a higher prevalence of IGD than females. [11] The three forms of maladaptive cognitions specific to Internet gaming with substantial impact sizes were largely mediated by the sex difference in IGD prevalence. Furthermore, teenage boys were more likely than their female counterparts to have such maladaptive cognitions. IGD, if left untreated, can have negative psychosocial consequences for gamers

and their families. [10-12]

Another finding of this research indicates that the correlation between the respondent's scores of Internet Gaming Disorder scale with Age were not significant with "r" value of -.017. This result accepts the null hypothesis (H02) which states that there is no corelation between internet gaming disorder score and age. Although study done by **Griffiths MD et.al** states that IGD appears to be more prevalent among older adolescents. The results of the present study revealed that 4% of the study's sample was classified using the IGD-20 Test, as having Internet Gaming Disorder. The incidence of IGD as reported in other studies, with a range of 1.2 percent in Germany [7] and 14.6 percent in the United Kingdom [12] Studies conducted in India showed a prevalence rate r from 12.3% to 73.9%. [20-21]According to **Mentzoni et al**, 15.4% of male adolescents aged 16 to 21 years and 9.7% of young men aged 22 to 27 years have problematic video game use, while rates in all other age and sex categories were under 3%.[17]

IGD is a serious emerging adolescent male health issue, according to the evaluated literature. Men's increased risk, for example, has been validated by IGD sex differences studies, whereas neuroscience is helping to map IGD addiction circuits [16] and CBT is a potential generic treatment.[15,16]. In minors, IGD interferes with daily living activities related to schoolwork, such as skipping school classes [7] and academic performance [18]. The substantial sleep problems observed in minors with IGD [7] could be linked to these schoolwork interferences. IGD may also be more common among students who perform poorly in school. Qualitative studies in addiction have found that activity engagement is often reduced in other areas such as leisure, play, sleep, etc. This could lead to disruption in occupational performance areas in adolescence resulting in isolation, frustration, preoccupation with thoughts and lack of enthusiasm.

Conclusion

The present study aimed to correlate internet gaming disorder with age and gender among Indian adolescents. In this study we found that among sample population 4% came under the likely disorder of internet gaming according to internet gaming disorder scale (IGD20). The findings advance our understanding of the nature of gaming addiction. It demonstrates that Males significantly showed higher association with higher scores in Internet Gaming Disorder Scale- 20 and scores of Internet Gaming Disorder scale with Age shows no significant relationship. The results raise social awareness and the risk associated with Internet gaming among the male population

Ethical Clearance-Nil

Source of Funding- Nil

Conflict of Interest –Nil

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Correlation between Vitamin D and Heel Pain in Healthy Adults During Covid-19 in South Gujarat: A Cross Sectional Study

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Abstract

Background: Vitamin D is been traditionally known as anti-ricketic factor or sunshine vitamin. Vitamin D is a fat-soluble vitamin and its synthesis in the body is dependent on multiple factors like latitude, atmospheric pollution, clothing, skin pigmentation duration and time of exposure to sunlight. Assessment of vitamin D status of an individual is best reflected by measurement of circulating vitamin D metabolites. 2 metabolites S, namely 25, hydroxyvitamin D 1,25 dihydroxy vitamin D. Exposure to sunlight is responsible for physiological production of vitamin D endogenously in the skin from 7 dehydrocholesterol present in the subcutaneous fat. Vitamin D deficiency prevails in epidemic proportion all over the India subcontinent with a prevalence of 70%-100% in the general population. Association of vitamin D deficiency with a variety of nonspecific bone pain particularly in women. Vitamin D deficiency was recently suggested to trigger chronic disease. Planter heel pain is a common musculoskeletal foot disorder that can have a negative impact on activities of daily living and it is of multifactorial etiology. Pathogenesis of planter heel pain is considered to be excessive cumulative strain at the enthesis of the plantar facia. Low vitamin D levels have been associated with an increased in inflammatory cytokines and a significantly increased risk of pneumonia viral upper respiratory tract infections. Experimental reports have shown vitamin D has a role in reducing the risk of COVID-19 including consideration of the fact that the outbreak occurred in winter and the fact the vitamin D deficiency contributes to acute respiratory distress syndrome and case-fatality rates increased with age and with chronic disease co-morbidity, both of which are associated with a lower 1,25(OH)2D co-contraction.

Aim of Study: Aim of the study is to find correlation between vitamin D and heel pain in healthy adults.

Objective: To determine if there is correlation between vitamin D and heel pain in healthy adults.

Materials and Methods: 108 patients were assessed using NPRS for heel pain and also assessed for Vitamin D using lap reports in south Gujarat. The method of the sampling was convenient. All the subjects were familiarized about the whole procedure.

Results: The result showed negative correlation (p=0.023) between vitamin D and heel pain in healthy adults. The subjects used in the study was male and female age of 15 to 60. Lab reports was used to check vitamin D and NPRS was used to assess the heel pain. The level of the significance is 0.023 (<0.05) for vitamin D and heel pain.

Conclusion: The result of the study showed negative correlation between heel pain and vitamin D in healthy adults. By increasing the sun exposure and intake of vitamin D medicine heel pain can be decreased in healthy adults. For clinical purpose, physical therapist can advise the patient who have heel pain to go for vitamin D testing.

Keywords: *Vitamin D, heel pain, COVID-19.*

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Introduction

Vitamin D was classified as a vitamin in the early 20th century and in the second half of the 20th

century as a pro-hormone ("conditional" vitamin) [1,2]. Vitamin D has been traditionally known as "anti-ricket factor or sunshine vitamin". It is a matchless nutrient because it can be synthesized endogenously (skin) and it functions as a hormone [3]. Assessment of vitamin D status of an individual is best reflected by measurement of circulating vitamin D metabolites. Only two metabolites, namely, 25-hydroxyvitamin D [25(OH) D] and 1,25-dihydroxyvitamin D [1,25(OH) 2D], have received the greatest attention in biochemical estimation of vitamin D. Of these, the need for measuring serum 1,25(OH)2D is limited.

On the other hand, serum 25(OH)D provides the single best assessment of vitamin D status [4]. Although vitamin D has been traditionally considered important for skeletal health, recent studies have reported that vitamin D also has beneficial effects on extra skeletal tissues [1]. Several studies have suggested possible links between vitamin D and cardiovascular disease risk [11,12], diabetes [13,14], hypertension [15], and dyslipidemia [16,17]. There is an association of vitamin D deficiency with a variety of nonspecific bone pain, particularly in women [26]. Vitamin D deficiency was recently suggested to trigger chronic disease [27]. Levels of vitamin D are most likely to influence the occurrence of knee osteoarthritis (OA), one the most common bone diseases [23].

Plantar heel pain is a common musculoskeletal foot disorder that can have a negative impact on activities of daily living and it is of multifactorial etiology. A variety of mechanical factors, which result in excessive load at the plantar fascia insertion, are thought to contribute to the onset of the condition. This review presents the evidence for associations between commonly assessed mechanical factors and plantar heel pain, which could guide management. Plantar heel pain is associated with a higher BMI in non-athletic groups, reduced dorsiflexion range of motion, as well as reduced strength in specific foot and ankle muscle groups [29].

Causes of heel pain potentially include:Achilles's tendon rupture, where the tendon is torn, Achille's tendinitis, Plantar fasciitis, Heel bursitis, stress fracture, Poor posture, bone cyst etc.

In Current study authors found that vitamin D deficiency (as suggested by serum 25 (OH) D concentration < 20ng/ml) is far more prevalent in patients with severe COVID–19 disease requiring ICU admission and thereby risks the chances of life [22]. Infections of the respiratory tract are more frequent in the winter months and especially in the northern latitudes than they are in summer. This obviously also applies to the COVID-19 infectious disease that briefly spread all over the world in the winter months and became a pandemic. A common feature of the winter months and the inhabitants of all countries north of the 42nd parallel is a hypo-avitaminosis D that frequently occurs during this period. In addition, during cold temperature the virus will be more easily transmitted [30]. However, it is reasonable to hypothesize that vitamin D supplementation may enhance host immune responses against COVID-19 and its aggressive effects on all organ systems. Serum vitamin D levels above 50 ng/ml (125 nmol/l) may have beneficial effects in reducing the incidence and severity of various viral diseases, including COVID-19[31].

Material and Methods

Pen, Paper, Vitamin D Reports, Data Collection Form, (NPRS) Numerical Pain Rating Scale, Weighing Scale, Measure Tape.

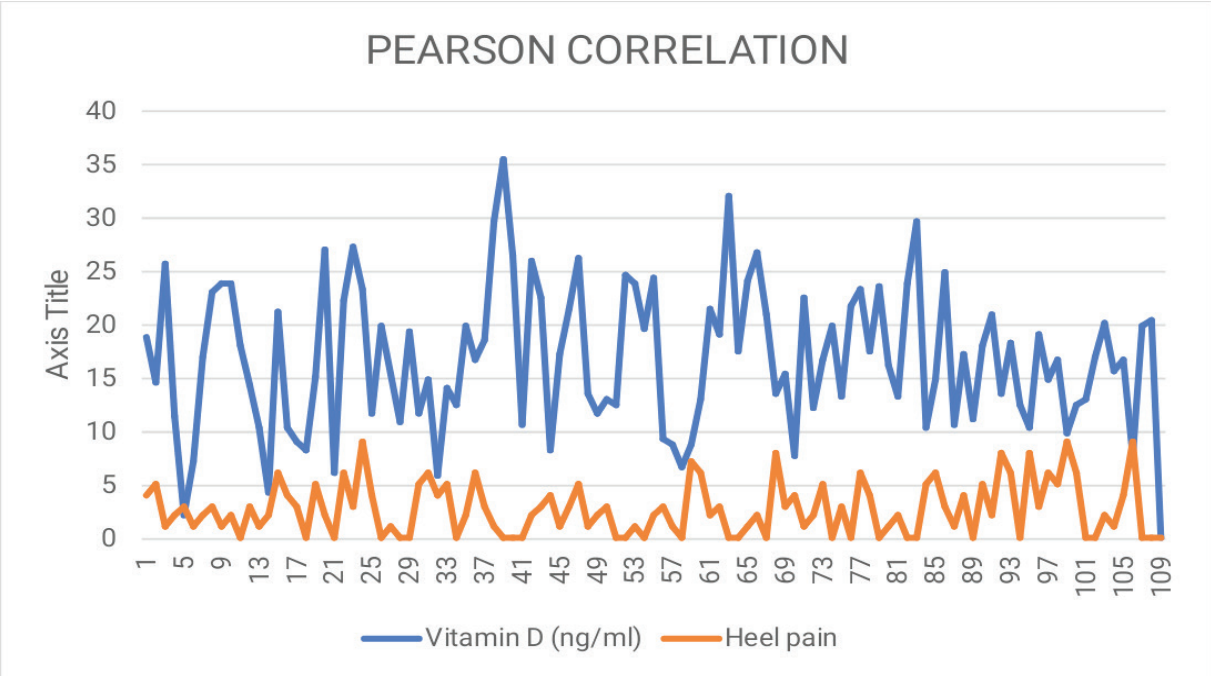
Procedure: The institutional ethical committee gave ethical clearance. The purpose of this study was explained and written consent was obtained from all the subjects. Subjects were preliminary screened based on the inclusion and exclusion criteria and their demographic data was collected like age, gender,

height, weight, BMI, occupation, sun exposure. After that checking of vitamin D reports of the patient was done. Then they were assessing for heel pain with the help of numerical pain rating scale.

Statistical Findings

Data analysis was done using SPSS version 16.In the present study 108 participants was included. (Male-38, Female-70). Participant were assessed for vitamin D and also assessed for heel pain by numerical pain rating scale.The Pearson coefficient of correlation was used to find correlation between vitamin D and heel pain.The baseline data was obtained from demographic data of vitamin D and heel pain.Statistically the correlation between vitamin D and heel pain is significant as p value is 0.023, which is less, then 0.05.

Negative correlation is seen as the value of r is (r = -0.219).Female are more prevalent in heel pain than male.



Discussion

The objective of this study was to find the correlation between vitamin D and heel pain in healthy adults.

In this cross-sectional study of 38 men and 70 women age of 15 to 60 years were participated. The total numbers of participants were 108 including male and female. The percentage of male population was 35% and that of female population was 53%. Then they were assessed for data such as vitamin D and heel pain. The NPRS was used to assess the heel pain.

In this study the mean±SD value of vitamin D was 16.8458±6.50945, the mean±SD value of heel pain was 2.6759±2.46405.It is found in our study that as the vitamin D increase the heel pain is decrease.There was a significant mild correlation was found between vitamin D and heel pain in our study.

Conclusion

This study concludes that decrease in level of vitamin D can lead to heel pain in healthy adults. By increasing the sun exposure and intake of vitamin D medicine heel pain can decreased in healthy adults. So,

this study provide the further insights into correlation between vitamin D and heel pain.

Conflict of Interest – None

Source of Funding- Self

Ethical Clearance –UkaTarsadia University

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Physical Activity Levels among Community Dwelling and Care Home Dwelling Elderly Population

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Abstract

Background: Ageing is frequently associated with a decrease in physical activity and consequently a decline in physical fitness. Physical activity is associated with psychological health, and a large number of studies have begun to document preventive effects for depression or neurodegenerative diseases. However, health-related quality of life is composed not only of a physical or cognitive functioning domain, but also by the feelings of well-being.

Objective: To determine the difference in physical activity levels among community dwelling and care home dwelling elderly population.

Method: 100 healthy elderly subjects aged 60 to 85 years were included in the study, out of which 50 subjects were recruited from community and 50 subjects were recruited from care homes. Physical activity level of all the subjects was assessed using Frenchay Activity Index (FAI).

Results: Krushkal Wallis ANOVA test was carried out to compare the values between the groups for Frenchay Activity Index (FAI) and it was found to be statistically significant ($p<0.05$).

Conclusion: Based on the results of the study, it can be concludedthat the physical activity levels of the elderly population in community dwelling was significantly better than those who were living in care homes.

Keywords: *Physical activity, Community dwelling, Care home dwelling, Frenchey Activity Index (FAI)*

Introduction

The elderly population is growing very fast and United Nations have estimated that the number of the people aged 60 and older around the world would be over 1.9 billion by 2050. The American College of Sports Medicine (ACSM) recommends that regular, moderate intensity physical activity is the key to good health. The Center for Disease Control and Prevention (CDC) and theAmerican Heart Association also agree with ACSM'S recommendation that to maintain good health, adults need a minimum of 30 minutes, 5 days/ week moderate intensity physical activity or atleast 20 minutes vigorous-intensity activity for a minimum of 3 days/week. Along with health benefits that are associated with regular physical activity for older adults, there is a strong relationship between physical

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activity, physical fitness, risk of falling and cognitive ability.[1]The WHO has many recommendations for people aged 65 years and above which provides options for individuals who choose either moderate-intensity exercises (150 min/week)or vigorous-intensity exercises (75 min/week).[2] Though there are a lot of benefits from maintaining an active lifestyle, many older adults are inactive.[1]The lifeexpectancy in India is much less than 60 years. Research shows that most Indians appear to consider themselves old much earlier than their chronological age of 60 years and that the Indian women regard themselves to be older even much earlier than that.[3]

Physical activity can be defined as "any movement of the bodyproduced by the skeletal muscles resulting in energy expenditure". The level of physical activity is often used as a means to monitor and evaluate public health and almost always is associated with health status. This monitoring is important especially for older people over 60 years of age to prevent many diseases and inactivity and thereby helps in reduction of mortality rates.[1, 4]

Regular physical activity is important in improving and developing both physical and mental health of individuals. Literature review revealsthat chronic diseases can be prevented when individuals are physically active. Active life increases social interaction by developing their cognitive functions and helps individuals to stay independent.[5]Being physically active increases strength, balance, and stamina and decreases the risk of, or helps control, many chronic diseases. As people age, there is a tendency to be less physically active, and this decrease in activity has been shown to have a negative effect on a person's strength, balance, and stamina leading to increase in falls and loss of confidence.[2]

Physical activity is associated with psychological well-being, and many studies have begun to understand the preventive effects for depression or neurodegenerative diseases. However, health related quality of life is not only of a physical or cognitive functioning domain, but also by the feelings of wellbeing. Well-being, considered as the way people feel about their life, is a multifaceted phenomenon especially in the aging population.[6]

Care home or old age home is ahome environment primarily for those elderly persons who are unable to stay with family members due to various reasons. It is an alternative shelter where the older individuals live, can share their feelings and experiences with each other. It is an institutional type of setup and the people live here according to some rules and regulations.Community dwelling elders are the elderly individuals who reside in the community with their family members.[7]ArunaDubey, et al concluded in a study that the general feelings of the elderly women living in the families were better than that of the women living in the institutions. Better social relations were maintained by the family dwellers because they had regular interaction, expressions of feelings and support from the family. Women living in the care homes felt lonelier, depressive and had a lower level of satisfaction withlife.[3]On the contrary, Rishi Panday et al, in their study stated that the QOL was better in those elderly people who were living in old age homes compared to those who were living within family setup which was due to the facilities available at the old age homes.[7]However, there is a lack of literature on the physical activity levels of the community dwelling and care home dwelling elderly population. As the emotional well-being of a person can affect the physical activity levels[5] and thereby can affect the quality of life of a person, there exists a need to determine if there will be any difference in the physical activity levels among community dwelling and care home dwelling elderly population.

Methodology

100 healthy subjects aged between 60 to 85 years

were selected for the study, 50 subjectswere selected from the community and 50 from care home dwellings across Bangalore. Subjects with any acute illness, neurological or perceptual disorders, acute or unstable musculoskeletal injuries, high blood pressure, visual deficits affecting mobility or test performance and unwilling patients were excluded from the study. Permission was obtained from the old age homes and written consent was taken from the subjects prior to the study.Institutional Ethical Committee permission was obtained. Demographic variables such as age, gender were documented.Subjects were assessed for their physical activity levels using the Frenchay Activity Index (FAI).[8, 9, 10]Results were compared to know the physical activity levels of the elderly population living in the community and care homes.

Results

Table 1 and 2 represent the distribution of the subjects according to their gender and age categories respectively.Table-3 represents the comparison of physical activity level of elderly subjects between community dwelling and care home dwelling subjects over the age groups. Table-4 shows the distribution of the subjects according to physical activity level in both the groups and Table-5 represents the correlation between age and physical activity of elderly subjects in both the groups.

Table-1: Distribution of the subjectsaccording to gender in both groups

S. No.	Gender	Group	
		Community dwelling	Care dwelling
1	Male	26(52.0%)	28(56.0%)
2	Female	24(48.0%)	22(44.0%)
NS-Not Significant ie. p>0.05		Chi-Square value=0.161, df=1, p=0.688,NS (p>0.05)	

Table-2: Subjects according to age categories in both the groups

S.No.	Age in years	Community dwelling		Care home dwelling		Chi-Square Value
		No.	%	%	%	
1	60-65	20	40	25	50	2.75,df = 4 NS
2	66-70	15	30	13	26	
3	71-75	9	8	10	20	
4	76-80	3	6	1	2	
5	81-85	3	6	1	2	

Table-3: Comparison of physical activity level of elderly subjects in between community dwelling and care home dwelling subjects over the age groups

S. No.	Age	Community dwelling elderly		Care home dwelling elderly	
		Range	Mean ± SD	Range	Mean ± SD
1	60-65	13-36	20.85±6.13	5-25	14.64±5.42
2	66-70	8-35	23.27±6.46	7-27	14.46±5.79
3	71-75	21-33	23.56±4.06	8-20	13.90±3.84
4	76-80	22-33	28.0±5.56	8-8	8.00±0
5	81-85	11-24	15.67±7.23	14-14	14.00±0
6	Overall age	8-36	24.58±6.40	5-27	14.30±5.12
Krushkal Wallis ANOVA		Hcal=2.898, p<0.05, S		Hcal=0.404, p>0.05, NS	

Table-4: Distribution of elderly subjects according to Physical activity level in both the groups

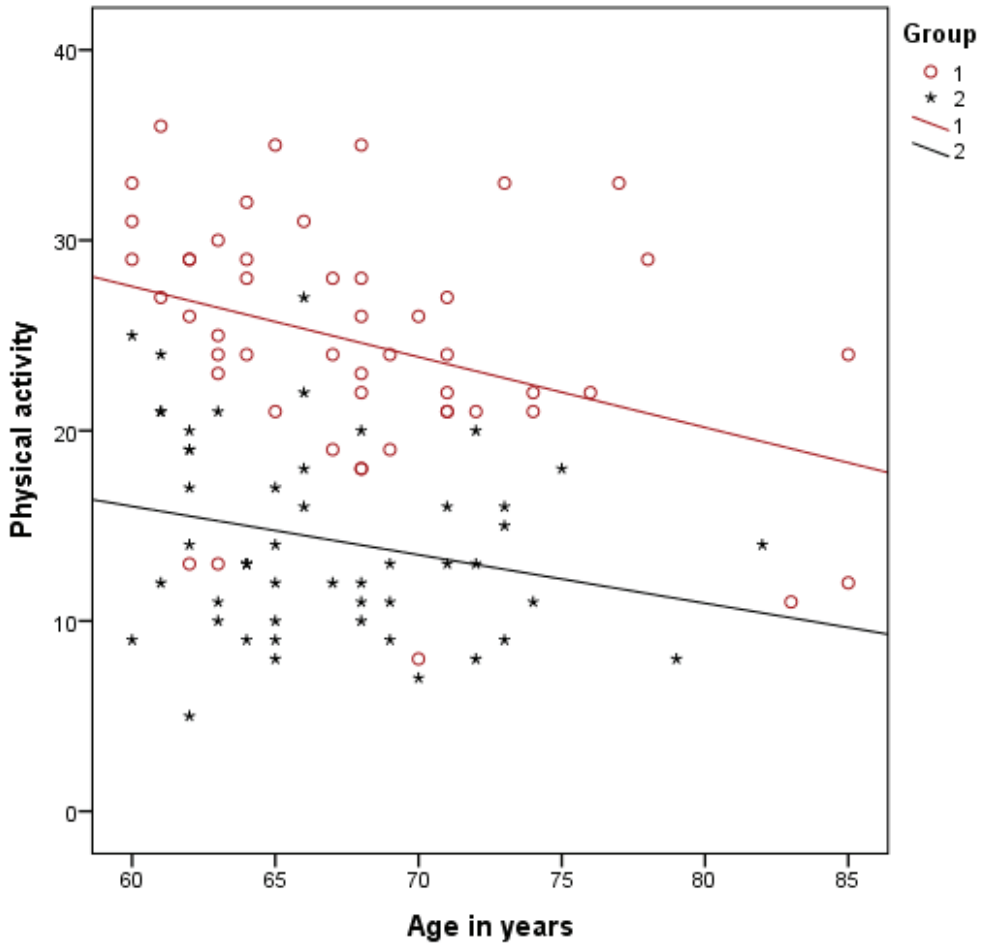
S.No.	Physical activity level	Community dwelling		Care dwelling	
		Frequency	Percentage	Frequency	Percentage
1	(<50%)	18	36.0	47	94.0
2	(50% -75%)	29	58.0	3	6.0
3	(>75%)	3	6.0	0	0
4	Over all	50	100	50	100

Note: % of maximum physical activity score was 45.

Table-5 Relation between age and physical activity of the subjects in both the groups

Groups	r-value	p-value
Community dwelling	-0.357*	p<0.01
Care dwelling	-0.248NS	p>0.05

Significant (p<0.05); NS- Not Significant (p>0.05)



Discussion

Ageing is commonly associated with a reduction in physical activity and as a result, physical fitness declines.[11]Physical activity is associated with mental health, and many studies have begun to report preventive effects for depression or neurodegenerative diseases. However, health-related quality of life is not only composed of physical and cognitive functioning domain, but also includes the feelings of well-being.[6]

This study aimed to determine if there is any difference in physical activity levels among community dwelling and care home dwelling elderly population. The statistical analysis of the baseline characteristics of gender and age of the elderly subjects included in the study were homogenous in both the groups.The FAI score for the physical activity suggests that the physical activity level of subjects in the community dwelling group was statistically significant than the physical activity level of subjects in the care home dwelling group. The results are in line with a study conducted by the BekirMehtap et al where physical activity levels of elderly individuals were examined and it was found that 28.8% of them were very active, 53.6% of them wereminimally active and 17.6% of them were inactive. Their study suggested that gender, age, perception level of health, smoking habits and presence of any chronic disease affects the physical activity level of aged individuals living in a nursing home.[5] In the present study, among the community dwelling elderly subjects, 36.0% of them had <50% physical activity, 58.0% of them had 50% - 75% physical activity and 6.0% of them had >75% physical

activity. But, in the subjects living in care homes, 94.0% of them had <50% physical activity, 6.0% of them had 50% - 75% physical activity and none of them had >75% physical activity. Results show that the subjects living in the community were more active and their physical activity levels were better. A negative correlation was observed between age and physical activity levels in both groups. It is seen that with increase in the age of the subjects, the level of physical activity reduced. This is in accordance with a study done by SasaPantelic et al in which there was reduction in physical activity level and the functional fitness due to ageing.[4] Another study concluded that the reduction in physical activity level and functional fitness was the same in men and women and is due to aging process, reduction of muscle strength, changes in body fat percentage, flexibility, agility and endurance.[12]Being a time bound study, sample size was small and the population included in the study were from one geographical location and hence the results cannot be generalized. The facilities available in the care homes were not considered and that could have also affected the results of the study. Another limitation of the study was that height, weight and BMI of the subjects was not considered. Future studies can be carried out on larger samples and wider geographical area. Researchers can also attempt to consider other social aspects which are related to ageing.Based on the results of the present study, it can be concluded that the physical activity levels of the elderly subjects in the community dwelling group was better than the subjects in the care home dwelling group and that physical activity levels of the elderly population decreases as the age of the subjects increases.

Conflict of Interest – None

Source of Funding – Self

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To Study the Effect of Smartphone Multitasking on Dynamic Balance in Young Adults

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Abstract

The objectives of this research was to see how using smartphone functions during gait affected dynamic balance. From a university, a sample of 100 subjects was taken. Four types of gait tasks were given: General Gait (to walk without any task); Task Gait 1 (to walk while chatting through text); Task Gait 2 (to walk while web surfing and hearing music) and Task Gait 3 (to walk while playing an online multiplayer videogame). The conditions were the same for all the experiments. The subjects used earphones for listening to music and having conversation during games. The sequence of tasks was not done in systematic manner. The Timed Up and Go (TUG) test was used to assess dynamic balance. After three repetitions of the tasks, the mean of the measured values was analysed. In the TUG tests, there were statistically significant unfavourable differences. Use of smartphone features during walking affects dynamic balance of a person. As a result, when ambulating, using various features of a cell phone may result in falls and injuries.

Keywords: *Smartphone, Multitasking, Dynamic balance, Timed Up and Go (TUG) Test*

Introduction

In India, smartphone users are anticipated to rise from 468 million users in 2017 to 859 million by 2022. [1]The easy availability of smartphones and its ability to provide variety of information has led common man to increase his dependency on smartphone as well as its excessive use caused many complications.[2]

One research on smart phone uses among the young people shows that during weekdays, a person uses smartphone for 5.1 hours and during weekend, uses for 5.9 hours. This implies that in average, youngsters use smart phones noticeably a lot and most of the feature used was chatting as well as playing games.[3]According to a study on university students of degree and addiction of smartphone usage, 31% of subjects showed ocular fatigue, 15% showed myalgia, and 5% showed neural dysfunction. Moreover, psychiatric conditions such as interpersonal disorder, social anxiety, and smartphone dependence were also seen among the most subjects.[4] (Park, J.S., et al. 2014) Further, all day long use of smartphone may result in an incorrect posture such as upper cross syndrome[5] as well as damages ligaments and other nearby soft tissues. While using a smartphone during gait, visual and auditory distractions occur certainly.[6]

It has been also seen that visual distraction may affect static balance during simple, dual or multi tasks resulting in postural sway.[7-8] As smartphones

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are potable, its various features are easy to use while ambulating. Particularly, during gait, listening to music, chatting, web surfing and playing games are some of the smartphone's functions used commonly. Using different smartphone functions during walking are called dual- or multitasking.[9] However, probability of injuries as well as falls increase due to such multitask mainly in an accidental or unexpected situation as cognitive function decreases.

There is need to maintain the balance for functional activities in a static or dynamic situation.[10] For balance control, there is need of synergy between the neural pathways and muscular skeletal systems as well as surrounding related effects. Furthermore, for adequate control of balance the interplay between vestibular function, visual feedback, proprioception, musculoskeletal and cognitive functions is crucial.[11-12] Thus, any fact or information is inaccurate, this results in an evident impact on balance.[13] A research indicated that use of smartphone can restrain visual data and, thus, postural balance is impaired.[14] Also it is necessary to remember that if there is decrease in sensory or motor control, it is stated by an increase in sway.[15]

People use smartphones even while walking and this behaviour interferes with the perception of speeding vehicles and nearby things thus gait velocity is decreased, and the risk of road accidents is increased as it also causes distraction.[2] It is seen that a person generally while waiting on something, or when they are in moving transport uses smart phones the most. Multitasking conditions, such as utilising mobile phone features while in a moving vehicle, might contribute to posture impairment. Despite that, there are only few research done which explore this prospect of usage of smartphone.

Particularly, dual tasking using smartphone functions during gait, like listening to music, chatting, browsing internet, or playing a videogame, has been seen to affect the dynamic balance.[16] The cognitive distraction due to use of a smartphone decreases awareness in society thereby increasing risky behaviour, like not looking sideways and neglecting traffic lights while going across the street. A study discovered that talking on the phone is less distracting than hearing music and chatting via messages, because messaging includes both reading and typing: an activity where there is need of more cognitive demand than talking, whereas hearing music is relatively continuous vestibular distraction.[17] These studies only examined the behavioural effect of using smartphones which may result in accidents due to distractions.

Aims and Objective: The goal of this study was to see how using different smartphone functionalities while walking affected dynamic equilibrium. This will help to imply the risk of using a smartphone during ambulation.

Experimental Hypothesis: There is significant effect of multitasking using smartphone during gait on dynamic balance in college students.

Null Hypothesis: There is no significant effect of multitasking using smartphone during gait on dynamic balance in college students.

Methodology

Research Design- Cross sectional observational study

Inclusion Criteria:

1. Both males and females

2. Age group: 20-25 years.[17]

3. Participants are using smartphone for at least 4 hours per week for the past 1 year. 4. Should understand verbal command/ English. 5. Normal vision or corrected with use of spectacles.

EXCLUSION Criteria: 1. History of vestibular problems. 2. History of reported dizziness. 3. Could not stand properly due to lower limb injury.

4. Any history or diagnosed case of neurological or psychiatric disorder which could affect outcome of study.

OUTCOME MEASURE: Score of TIMED UP and GO Test (TUG Score)

PROCEDURE: For this study, 75 female and 25 male participants without any symptoms were recruited from a local institute. The subjects were given a verbal description of the study's goal, as well as a demonstration of the test. Consent was also taken from all the subjects prior to study. The following test was performed:

TIMED UP and GO (TUG) test

1. Participants wear their usual footwear and if needed, may use mobility aid.

2. The participant first seat on a chair then stands up on researcher's command, walks for three meters, turn around, walk back and then sit on chair.

3. When the subject is seated once again, time is stopped.

Documentation of time taken was done in seconds with the help of a stopwatch. And the time recorded is the score given for this test.

Following four tasks were executed in total:

General Gait: to walk without any task; Task Gait 1: to walk while chatting through text; Task Gait 2: to walk while web surfing and hearing musicand,Task Gait 3: to walk while playing an online multiplayervideogame. The participants used earphones for listening to music as well as while having conversation during games. After three repetitions of the tasks, the mean of the measured data was analysed. The sequence of tasks was not done in systematic manner so that the learning effect can be avoided. Demonstration of the test was given. Before the competition of timed trial, a practice trial was also done.

Result

Data was analysed using t-test for paired variables as well as Karl Pearson's correlation constant which are used to discern the relationship among different variables of the study, followed by regression analysis to appraise the effects of multitasking using smartphone features on dynamic balance of the students with 20.0 version of SPSS. The significance level was chosen at $p<0.05$.

The general characteristics of the participants were an age of 22.26 ± 0.27 years, a height of 169.28 ± 1.21 cm tall, and a weight of 63.31 ± 1.81 kg.

As shown in table 1, p-value was found to 0.001 which is significant i.e., there is significant effect of dual tasking using smartphone (texting messages) on dynamic balance. As shown in Table 2, p-value was found to 0.001 which is significant i.e., there is significant effect of dual tasking using smartphone (web surfing while listening music) on dynamic balance.

As shown in Table 3, p-value was found to 0.001 which is significant i.e., there is significant effect of dual tasking using smartphone (playing multiplayer videogames) on dynamic balance.

As shown in Table 4, level of significance was found to 0.01 as well as there is significant effect of dual tasking using smartphone (playing multiplayer videogames) on dynamic balance. Highly correlation relationship is seen between General Gait and Task 1; moderate correlation relationship is seen between General Gait and Task 2 whereas mild correlation relationship is seen between General Gait and Task 3.

Table 1: Paired T-test to show the comparison between General Gait and Task.

	Mean	Standard deviation	T-value	P-value
General Gait	7.8651	1.03969	13.399	.001
Task 1	9.2519	1.49303		

Table 2: Paired T-test to show the comparison between General Gait and Task 2.

	Mean	Standard deviation	T-value	P-value
General Gait	7.87	1.04	12.65	.001
Task 2	9.32	1.52		

Table 3: Paired T-test to show the comparison between General Gait and Task 3.

	Mean	Standard deviation	T-value	P-value
General Gait	7.8651	1.03969	20.966	.000
Task 3	10.5068	1.52217		

Table 4: Karl Pearson's correlation to show correlation between different tasks.

	General Gait	Task 1	Task 2
Task 1	.721**		
Task 2	.654**	.935**	
Task 3	.572**	.859**	.882**

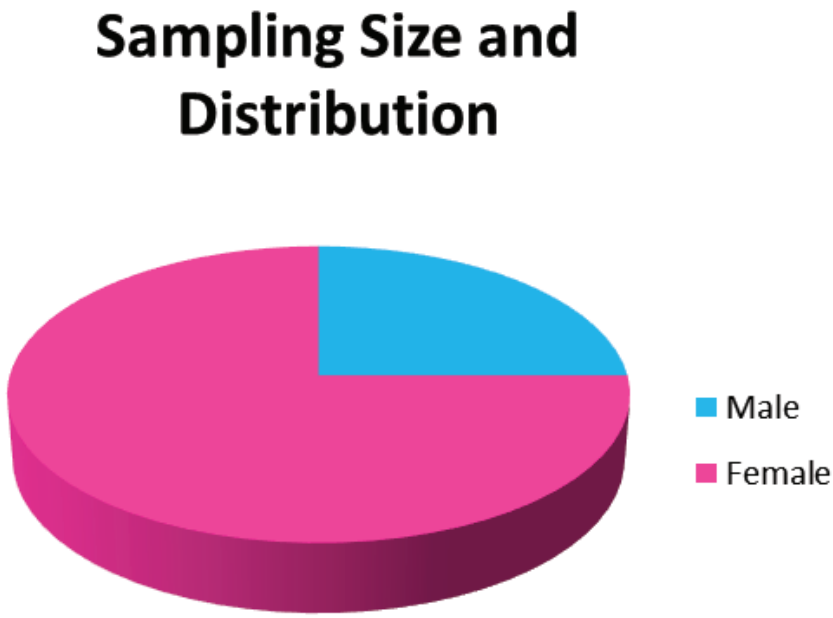

Figure 1: Sample size and distribution

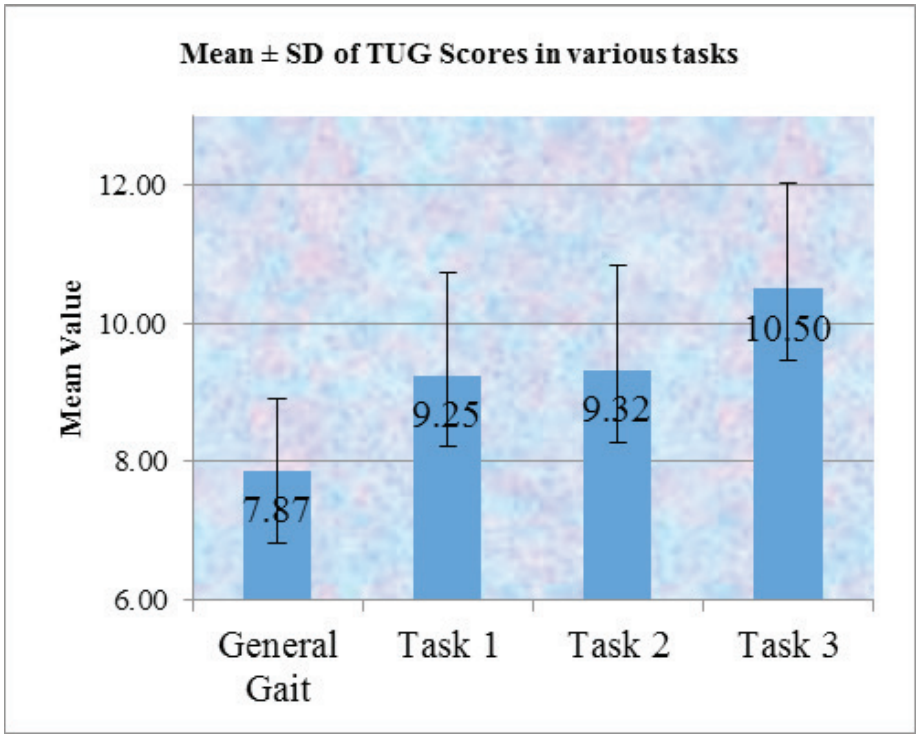

Figure 2: Comparison of Mean ± SD of Timed Up and Go Score in various tasks performed in the study.

Discussion

The smartphone users are the highest among twenties, which is also the most significant for the research on balance. [17] Multitasking with different functions of the smartphone is quite common. Such multi-tasking activities reduce cognitive ability, affecting control of balance as well as posture. For control of posture and balance, visual and vestibular sensation, cognitive function, and the muscular system should work in an integrated manner. Therefore, in this study, we intended to look at the effects of multitasking using various smartphone features while walking on dynamic balance.

Measuring dynamic balance using the Timed Up and Go (TUG) test, the result showed that dynamic balance decreased as the gait time taken is longer for multi-tasking using smartphone features in proportion to single task where no mobile phone is being used during walking.

The outcomes of this research show that playing games decreased cognitive ability the most significantly, thus decreasing the dynamic balance the most among all the tasks performed. This was followed by internet browsing while hearing music and then sending a message which has the least impact on dynamic balance.

During the multitasking using smartphone during gait, as the tasks became more complicated sways increased which results in a longer gait time. These findings support In Hyong's research, which found that when using a mobile phone in a dual task situation, balance decreases in the anterior, posteromedial, and posterolateral directions because attention is required during simple tasks like listening to music and browsing the internet, but balance decreases significantly during more difficult tasks like writing a report and playing video games.[16] Likewise, Kim et al. while investigating the effect of using a smartphone on obstacle gait found that the participants exhibited significant sway.[2] Also, gait velocity as well as cadence was decreased.[18-21]These results agreed with the results found in this study also.

Lacour et al. while examining found that generally there was no difficulty in balance and postural control doing any single task, but during a dual task, there was decrease in postural and balance control and the advanced cognitive task was given, the postural and balance control ability became more decreased.[22]

Physiologically, for balance control, there is need that there should be integrated communication between vestibular system as well as visual function and kinaesthesia in the cerebrospinal nervous system.[23] Different sensations already needed while walking; and if it is done along with using various smartphone features, visual and vestibular functions lack generally, thus sensory data necessary for general gait now dependent on superficial sensory perceptions and proprioception.[24] Hereby also confirmed that smartphone multitasking during gait decreases dynamic balance as there is need for compensation so that walking may be more stable. Thus, it results in reducing the walker's capability to distinguish or cope with potential challenges and risks in surrounding hence the chances of accidents increases during walking in outdoor area.

According to a study conducted Chen P. et al. in 2018 while investigating pedestrians in Taipei,Taiwan hearing music was the most connected with pedestrian smartphone misuse and inattentional deafness, whereas Pokémon Go (an augmented reality mobile game) was the most related with inattentional blindness and poor contextual awareness.[25]Thus, a person should avoid using mobile phone while walking. Using smartphone features while ambulating which may look easy, but it may be cause of accidents and injuries. So, executing a single task rather than using various features of mobile phone during gait is

a good way to prevent falls or injuries.

Clinical relevance: As it has been observed that multitasking using smartphone during gait while walking has a negative effect on dynamic balance. Therefore, the use of various smartphone functions while walking as well as on moving transport should be decreased.

Limitations of this study were as follows:

· As this study was intended on younger generation, the old people who are not much skilled in using mobile phone were excluded.

· Sample size is small.

· For tasks, not various complex functions of smartphones were given.

· It is necessary to research the use of multiple functions of smartphone during walking in various environments in the future as here experiment is done in normal environment.

Scope for future research:

· Study can be further divided based on gender.

· Study can be taken from other age groups.

· Study can involve various complex smartphone functions as tasks.

Conclusion

This study concluded that there was significant effect of multitasking using smartphone during gait on dynamic balance. Hence, the experimental hypothesis is accepted. Using smartphone features while walking affects dynamic balance of a person. So, using various features of a cell phone while ambulating may cause falls and injuries.

Conflicts of Interest: There are no financial conflicts of interest to disclose.

Source of Funding: The source of funding was self.

Ethical Clearance: Banarasidas Chandiwala Institute of Physiotherapy, New Delhi ethical committee approved this study. Human participants gave their informed consents.

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Effectiveness of Chest PNF and breathing Exercises on Pulmonary Function and Chest Expansion in Male Smokers

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Abstract

Background: Cigarettes constitutes various harmful substances like Nicotine which leads to diseases like COPD (Chronic obstructive pulmonary disease), atherosclerosis, and other respiratory and cardiopulmonary disease. This may leads to wheezing, frequent coughing with or without sputum, increased breathlessness and reduced endurance of respiratory muscles. The main objective of the study is to identify more significant effect of Chest proprioceptive neuromuscular facilitation and Breathing Exercises on pulmonary function and chest expansion in male Smokers.

Method: This comparative study was executed on 50 subjects based on the criteria of the study, which were randomly divided into Group A & B. Subjects in Group A received chest proprioceptive neuromuscular facilitation technique but subjects in Group B received breathing exercises for 2 weeks. Pulmonary functions were assessed by Spirometry and chest expansion was measured at axillary level, nipple level and Xiphisternum level by measuring tape. All measurements were taken at the baseline and on the last day of 2nd week. Independent t-test and paired t-test were used to analyse the data.

Conclusion: More significant improvement in terms of pulmonary functions and Chest expansion was observed in group A who received chest proprioceptive neuromuscular facilitation in contrast to group B that received breathing exercises.

Key Words: *Breathing exercises, Chest proprioceptive neuromuscular facilitation, chest expansion, pulmonary function, smokers*

Introduction

Approximately, 4 million deaths occurred in 1999 from tobacco and it is also estimated that the annual number of deaths is likely to increase to 10 million by the 2030s.(1) Generally, people begin smoking during adolescence or early adulthood.(2) Smoking gives feeling of pleasure as the inhaled substances trigger chemical reactions in nerve endings in the brain, which are similar to naturally occurring substances like endorphins and dopamine.

The total number of people who will die from cigarette smoking will exceeds the total number of people dying from AIDS, Cancer, or Traffic accidents, etc.; according to predictions by the WHO (World Health Organization). Cigarettes constitutes various harmful substances like Nicotine which leads to smoking causing various diseases like COPD (Chronic

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obstructive pulmonary disease), atherosclerosis, and other respiratory and cardiopulmonary disease.[3] This may leads to wheezing, frequent coughing with or without sputum, increased breathlessness, reduced endurance and strength of respiratory muscles and tightness in the chest.[4] Even the early stage of smoking might affect the respiratory function of young adults due to acute alterations in the lung.[5]

Smoking has negative effect on forced vital capacity (FVC), forced expiratory volume in one second (FEV1) and FEV1 /FVC in pulmonary function along with increased forced residual capacity.[6] Studies have shown reduced pulmonary functions of smokers as compared to non-smokers.[7][8] In a study by Mumtaz et. al., FVC, FEV1 and FVC/FEV1 was found significantly reduced in young adult smokers when compared to non-smokers of same age group.[7]

The expansion and contraction of the lungs are affected by the capacity of the thorax, which is determined by the mobility of the skeletal muscles, the elasticity of surrounding soft tissues, and the intensity of the respiratory muscles.[9] Strength of respiratory muscles depends on the maximal effort made by the muscles used in chest expansion while breathing. Tantisuwat et al., found decreased chest circumference of smoking youths especially at the axillary level which is associated with reduced AP and ML diameter of the upper chest expansion. Reduced chest expansion would affect the performance and work of breathing, hence, may cause dyspnea.[5]

Muscle strength can be enhanced through three-dimensional spiral large scale resistive exercises using proprioceptive neuromuscular facilitation (PNF) indicated by a study which was conducted by Dietz.[10] It provides proprioceptive feedback to the respiratory muscles which creates reflex respiratory movement responses and improves rate and depth of respiration. Stretch reflex is used to facilitate the initiation of inhalation and Repeated Contractions are used to facilitate an increase in inspiratory volume. For breathing control, isotonic contractions are also useful.[11]

Therapeutic interventions are required to improve exercise ability and breathing by augmentation of respiratory muscle function. The aim of breathing exercise interventions is to improve strength, endurance and co-ordination of respiratory muscles.[2] Deep breathing exercise can reduce the work of breathing by decreasing the respiratory rate and relaxing accessory muscles. Strength and endurance of respiratory muscles can be improved by various breathing exercises such as Pursed-lip breathing, Diaphragmatic breathing, Glossopharyngeal breathing and Costal breathing.[4]

The aim of this study was to examine the effects of Chest Proprioceptive Neuromuscular Facilitation and Breathing exercises on pulmonary function and chest expansion in male smokers.

Material and Method

This experimental study was conducted in the outpatient department of Maharishi Markandeshwar institute of physiotherapy and rehabilitation in 2018. Ethical approval was taken from Departmental ethical committee, MMDU. The sample size was calculated by G-Power software, using the power of study 0.95 and probability error 0.05. The calculated sample size was 50.

Inclusion and exclusion criteria:

Male Smokers, aged between 18-30 years who had history of smoking of 2 pack years were recruited for the study. All the subjects had a body mass index (BMI) in the range of 18.5–23 kg/m2. Subjects who had history of any presence of systemic, respiratory, cardiovascular diseases or any orthopaedic disease and subjects with any psychological disorder were excluded from the study.

Assessment parameters:

Subjects underwent assessment for pulmonary function (Spirometry in accordance with American Thoracic Society guidelines) and chest expansion measurement (at axillary, nipple and xiphisternal level).

All the measurements were taken at the baseline and on the last day of 2nd week.

Method

The whole procedure was described to all subjects and written informed consent was taken from them prior to the study. A total of 50 males were randomly allocated into two groups. Group A with 25 subjects in it received chest PNF, and Group B with similar no. of subjects in it i.e. 25 received Breathing exercises. Exercises were performed for 2 weeks in both the groups. Chest expansion exercises were included along with the following protocol in both the groups.

Group A (chest PNF): Subjects received chest PNF in following positions- Supine, side-lying and prone position. Chest PNF technique included oblique downward pressure at the sternum, diagonal pressure at lower rib cage in the supine line, caudal medial pressure at side-lying, Caudal pressure over ribcage in prone lying, dorsal and caudal pressure in prone on the elbow. The duration of the treatment was 30 minutes a day for 3 days per week for 2 weeks.

Group B (Breathing exercises): Subjects received Deep breathing exercises which includes segmental breathing, diaphragmatic breathing and pursed-lip breathing for 30 minutes a day for 3 days per week for 2 weeks.[12]

Results

The data was analyzed by using the software package SPSS 21 for window version. Mean and standard deviation of all the parameters were taken. To compare the difference between the groups for variables (pulmonary function and chest expansion) at baseline and last day of 2nd week independent t-test was used as shown in table 1. Differences within the group A (shown in table 2) and within group B (shown in table 3) for the variables (pulmonary function and chest expansion) at baseline and last day of 2nd week were compared by paired t-test. The level of significance was 95% ($p \leq 0.05$).

At the beginning of the study on pre-exercise comparison, groups were found to be homogenous for Age, height, weight, BMI and outcomes measured FVC, FEV1, FVC/FEV1, chest expansion at axillary level, nipple level and xiphisternal level.

Discussion

Present study was executed to compare the effects of Chest PNF and Breathing exercises on lung function test and chest expansion measurement in male smokers. Findings of this study revealed that both groups yielded significant improvement on pulmonary function test and chest expansion measurement.

Results of this study yielded that subjects in Group A which performed Chest PNF for 2 weeks showed more clinically significant increase in FVC by 10.5 %, in FEV_1 by 18 % and in FVC/FEV_1 by 5 % than the subjects in Group B who performed Breathing exercises showed significant increase in FVC by 9.8 %, in FEV1 by 14 % and FVC/FEV_1 by 1 %. It has been proved that Chest PNF leads to increased strength as well as endurance of the respiratory muscles.

According to Felter et al., sensory muscle spindles are present in intercostal muscles as well as in diaphragm that respond to elongation. Muscle fibers recruited when signal is sent via spinal cord and anterior horn cell and thus increase the strength. Stretch reflex is activated by stretching ribs and diaphragm which helps to take deep breaths.[13]

Breathing exercise also produced a beneficial effect on pulmonary function and chest wall expansion. The possible physiology behind this improvement could be the ability of patients to achieve some breathing control with these exercises and reduce the respiratory muscle tension which can be better utilised during respiration. It also produces a calming effect, which can reduce the breathing effort.[12]

M. Paulraj et al. concluded in his study that the PNF of respiration was more effective and can be a useful therapy in improving exercise capacity in patients with COPD.[4] Similarly, KyoChul Seo et al. conducted a study which concluded that PNF of respiration showed greater improvement in pulmonary function than diaphragmatic breathing.[10]

On contrary, in another study by KyoChul Seo revealed that the diaphragm respiration exercises showed a greater improvement in pulmonary function. [3]

Hyun-ju jun et al. presented a study which investigated the effects of an intervention program to enhance the pulmonary function and muscle activity of elderly smokers show that Feedback Breathing Exercise and Balloon Blowing Exercises improved the pulmonary functions of elderly smokers.[2]

Result of this study showed more significant improvement in Group A who received Chest PNF in chest expansion measurement at axillary level by 6%, at nipple level by 10.1% and at Xiphisternum level by 10.5% as compared to the subjects in Group B who received Breathing exercises at axillary level by 4.4%, at nipple level by 9% and at Xiphisternum level by 10.1%.

Chest PNF provides proprioceptive stimulus to the primary respiratory muscles, which increases chest wall mobility. As mentioned earlier, it also contracts diaphragm and abdominal muscles. The rigid chest wall muscles may be inhibited through autogenic inhibition and promotes mobility to the chest wall. PNF also increases stress relaxation to the chest wall muscles which promotes chest wall mobility. [14] A previous study done by Saha et al demonstrated a positive effect of chest PNF along with breathing exercises on chest expansion measurement in patients with Parkinsonism.[12]

In a study by Kim et al showed effects of breathing exercises on chest expansion in elderly with inspiratory muscle weaknesses.[9] As Muscle tension of the rib cage and mechanical properties caused by movement of the rib cage are important factors in air flow during inspiration and expiration. [14] The expansion and contraction of the lungs are mainly affected by the capacity of the thorax, which is determined by the mobility of the skeletal muscles, the elasticity of surrounding soft tissues, and the intensity of the respiratory muscles.[15]

Limitations of the study are small sample size and short treatment duration. For further future researches, studies can be done on larger sample size and for longer treatment duration and this comparative study can also be done including both males and females.

Table 1: Comparison of variables between the Group A & Group B

Baseline Comparison				
Variables	GROUP A (Mean ± SD)	GROUP B (Mean ± SD)	t-value	p-value
FVC	3.80 ± 0.76	3.06 ± 0.86	-1.732	0.09^{NS}

Cont... ***Table 1: Comparison of variables between the Group A & Group B***

FEV_1	2.40 ± 0.81	1.96 ± 0.73	-1.998	0.061^{NS}
FVC/FEV_1	65.56 ± 9.65	59.92 ± 15.78	-1.524	0.134^{NS}
Axillary level	4.32 ± 1.10	3.18 ± 1.07	-1.295	0.202^{NS}
Nipple level	3.76 ± 1.09	3.08 ± 1.30	-1.409	0.165^{NS}
Xiphisternal level	3.04 ± 1.02	2.16 ± 0.71	-1.930	0.060^{NS}
Comparison at 2nd week				
FVC	4.20 ± 0.86	3.36 ± 0.90	-3.348	0.002*
FEV1	2.84 ± 0.62	2.24 ± 0.87	-2.781	0.008*
FVC/FEV1	68.84 ± 9.81	60.40 ± 15.67	-2.261	0.029*
Axillary level	4.60 ± 1.04	3.32 ± 1.20	-2.265	0.028*
Nipple level	4.14 ± 1.02	3.36 ± 1.28	-2.070	0.044*
Xiphisternal level	3.36 ± 0.96	2.38 ± 0.80	-2.730	0.009*

NS: Non-Significant (p>0.05)

*Significant (p<0.05)

Table 2: Comparison of variables within Group-A

GROUP-A				
Variables	**Baseline (Mean ± SD)**	**2nd week (Mean ± SD)**	**t-value**	**p-value**
FVC	3.80 ± 0.76	4.20 ± 0.86	-3.098	0.005*
FEV1	2.40 ± 0.81	2.84 ± 0.62	-2.400	0.024*
FVC/FEV1	65.56 ± 9.65	68.84 ± 9.81	-4.311	0.000**
Axillary level	4.32 ± 1.10	4.60 ± 1.04	-2.281	0.032*
Nipple level	3.76 ± 1.09	4.14 ± 1.02	-3.055	0.005*
Xiphisternal level	3.04 ± 1.02	3.36 ± 0.95	-3.361	0.003*

*Significant (p<0.05)

**Highly Significant (p<0.000)

Table 3: Comparison of variables within Group-B

GROUP-B				
Variables	**Baseline (Mean ± SD)**	**2nd week (Mean ± SD)**	**t-value**	**p-value**
FVC	3.06 ± 0.86	3.36 ± 0.90	-1.976	0.05*
FEV1	1.96 ± 0.73	2.24 ± 0.87	-2.069	0.045*
FVC/FEV1	59.92 ± 15.78	60.40 ± 15.67	-1.999	0.048*
Axillary level	3.18 ± 1.07	3.32 ± 1.20	-2.041	0.047*
Nipple level	3.08 ± 1.30	3.36 ± 1.28	-2.445	0.030*
Xiphisternal level	2.16 ± 0.71	2.38 ± 0.80	-2.151	0.041*

*Significant ($p<0.05$)

Figure 1: Chest PNF in supine-position

Figure 2: Chest PNF in side-lying position

Figure 3: Chest PNF in prone-lying position

Figure 4: Pursed-lip breathing

Figure 5: Segmental breathing

Figure 6: Diaphragmatic breathing

Conclusion

In conclusion, both training programs i.e. Chest PNF and Breathing exercises yielded a clinically significant improvement on pulmonary function and chest expansion. These findings are clinically relevant thereby supporting the use of Chest PNF and Breathing exercises as adjunct to pulmonary rehabilitation protocol in the management of male smokers.

Conflict of Interest: NIL

Source of Funding: Self

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