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To Study the Efficacy of Tactile Strengthening of Muscles on Postural Sway and Balance

Gupta Nidhi[1], Goel Vipra[2], Rani Priyanka[2], Rani Pooja[2], Tiwari Gyan Prakash[3]

[1]HOD, [2]Assistant Professor, Adhunik Institute of Education and Research, Duhai, Ghaziabad,
[3]Senior Physiotherapist, Way to Fitness Clinic, Ghaziabad, Uttar Pradesh

ABSTRACT

Nidhi et al worked to study the efficacy of tactile strengthening of muscles on postural sway and balance by giving tactile stimulation through vibrator to the subjects concomitantly on sternocleidomastoid & tibialis posterior and scalenii & tibalis anterior daily for 3 sec. each group, for six days. On day six, same procedure of 3 cm displacement anteriorly and posteriorly and then 6 cm displacement anteriorly and posteriorly, is repeated to record the post test readings for all the outcome measures on the data collection chart. The conclusion of the study was that the tactile strengthening of muscles is effective in improving balance and postural sway in normal subjects.

Keywords: *Balance, Postural Sway, Vibration, Proprioception.*

INTRODUCTION

Balance is a complex process involving the reception and organization of sensory inputs, and the planning and execution of movement, to achieve a goal requiring upright posture[(1)]. Postural control, which can be either static or dynamic, refers to a person's ability to maintain stability of the body and body segments in response to forces that threatens to disturb the body and equilibrium[(2)]. In static posture, the body and its segments are aligned and maintained in certain positions. Dynamic postures refer to postures in which the body or its segments are moving. An understanding of static posture forms the basis for understanding dynamic posture [(2)].

Motor components of balance involve reflexes, automatic postural responses, anticipatory postural responses and volitional postural responses [(1)]. Reflexes and righting reactions support postural orientations at the most basic level. The vestibuloocular reflex (VOR) and vestibulospinal reflex (VSR) contribute to orientation of the eyes, head and body to self and environment [(1), (10)]. At the next level, automatic postural responses operate to keep the centre of gravity over the base of support. They are a set of functionally organized, long loop responses that act to keep the body in a state of equilibrium [(11), (12)]. There are four commonly identified automatic postural responses or strategies namely ankle strategy, hip strategy, suspensory strategy and stepping and reaching strategy [(1)].

Anticipatory postural responses are similar to automatic postural responses, but they occur before the actual disturbance. If a balance disturbance is predicted, the body will respond in advance by developing a "postural set" to counteract the coming forces [(1)].

Volitional postural responses are under conscious control. VPR can range from simple weight shifts to complex balance skills of skaters and gymnasts. They can occur after a stimulus or be self initiated. VPR can occur quickly or slowly depending on the goal at hand[(1)].

Reactive [(8)] (compensatory) [(9)] responses occur as reactions to external forces that displace the body centre of mass. Proactive (anticipatory) responses occur in anticipation of internally generated destabilizing forces such as raising arms to catch a ball or bending forward to tie shoes [(2)].

Limits of stability (LOS) are defined as the maximum distance an individual is able or willing to lean in any direction without loss of balance or changing the base of support. During standing, an individual normally exhibits small range postural shifts (postural sway), cycling intermittently from side to side and from heel to toe [(2)]. Postural sway can be examined using

visual inspection with the patient standing against a postural grid [13], [14]. More sophisticated instrumentation, posturography, utilizes force plate to measure ground reaction forces, either centre of force measures or centre of pressure measures or by the opto- electronic recording system [15]. Eklund (1972) established that oriented whole body tilts could be induced in standing human subjects by applying vibratory stimulation to the ankle postural muscles. Stimulating the tibialis anterior muscles results in a forward tilt and stimulating the triceps surae muscles causes a backward tilt. Other muscles have been investigated. paravertebral (Gregoric et al, 1978; Smetanin et al, 1993), cervical (Gurfinkelet al, 1988;Lund, 1980; Roll and Roll, 1988) and extra ocular (Roll and Roll, 1987). In all these cases, the induced postural responses are oriented in specific direction, depending on the vibrated muscle. Therefore, Roll and Roll, 1988 have suggested that muscle spindle inputs might forms a continuous "proprioceptive chain" from the feet to the eyes, since applying tendon vibration at any level in the chain apparently alters the internal representation of the body posture..

Vision, vestibular, cutaneous and muscle proprioceptive sensory modalities (Felter and Dichigans, 1996; Horak and Shupert, 1994) are involved in postural control. Muscle proprioceptive information seems to play a major role, since it arises from receptors distributed throughout the body, in particular, the representation of the body's static and dynamic geometry might be largely based on muscle proprioceptive inputs that continuously informs the central nervous system about the position of each part of the body in relation to the others [16].

Proprioceptive information from other parts of the body is also necessary for maintenance of equilibrium because appropriate equilibrium adjustments must be made whenever the body is angulated in the chest or abdomen region or elsewhere [17]. Presumably, all this information is algebraically added in the cerebellum and reticular substance of the brainstem, this causing appropriate adjustment in the postural muscles [17].

It is known that the proprioceptive messages arising from various muscles are centrally integrated for perceptual purposes, since applying various spatio-temporal patterns of vibration to the wrist muscles evokes quite complex illusions of movement, for instance, when one draws geometrical figures. (Roll and Gilhodes, 1995; Roll et al, 1996) [16].

We attempted to investigate whether and how the processing of proprioceptive messages arising from the neck and ankle or both might be involved in the organization and maintenance of body posture. It can be measured or assessed but the use of light emitting diodes (LEDs) along with two handy cameras of SONY company which monitors the position of LEDs [6]. In the experiment, the stimulation was applied concomitantly at both levels to determine to what extent the various links in the proprioceptive chain are functionally interdependent in postural control [7].

METHODOLOGY

- **STUDY DESIGN:** Experimental Design
- **INDEPENDENT VARIABLE:** Vibration
- **DEPENDENT VARIABLE:** Balance as measured by - Functional Reach Test

  Postural sway as measured by- Camera recording with Movable platform.

- **SUBJECTS AND SAMPLING:**

Total number of **30 subjects**, with mean age 26.67 ± 3.18 years who met the inclusion criteria and exclusion criteria, were recruited from **Adhunik Institute of Education and Research, Ghaziabad** based on convenient sampling. Consent was taken from all the subjects.

INCLUSION CRITERIA:

1. Age ranging from 20 to 35 years.
2. Normal basal metabolic index.
3. Normal vision, correction should be 6/12.
4. Mini mental state examination should be normal.
5. Subjects having Berg Balance Scale 100%.

- **EXCLUSION CRITERIA:**

1. Subjects of age more than 35years and less than 20 years of age.
2. Any eye weakness/vision problems.
3. Neurological and musculoskeletal abnormalities.
4. Recent injuries of lower extremities.

5. Any history of psychological illness.

6. Alcoholic and drug addiction.

7. Professional sports person, gymnasts and dancers.

- **INSTRUMENTS AND TOOLS USED:**

Movable platform, Vibrator, Light Emitting Diodes (LED), Camera, Measuring scale.

PROCEDURE [17], [18]

All the selected subjects were called for a six days intervention (tactile stimulation).On pre test day all the subjects were assessed for balance by the BBS & FRT and the postural sway through mechanical platform by moving the platform 3 cm anteriorly then 3 cm posteriorly and then 6 cm anteriorly and 6 cm posteriorly and pre test readings were recorded on data collection chart.

Tactile stimulation through vibrator was given to the subjects concomitantly on sternocleidomastoid & tibialis posterior and scalenii & tibalis anterior daily for 3 sec. each group, for six days. On day six, same procedure of 3 cm displacement anteriorly and posteriorly and then 6 cm displacement anteriorly and posteriorly, is repeated to record the post test readings for all the outcome measures on the data collection chart

DATA ANALYSIS

The data of this study was analyzed by applying paired "t- test" using SPSS 10 version. P value was set at ≤0.05

Observational Analysis has done by camera recording (handy cam- SONY company) to record the postural sway.

RESULTS

Table 1: Shows the mean of age group selected and its standard deviation

	Mean		Std.
	Statistics	Std.error	Statistics
Age	26.6667	.5800	3.1768

t- Test table

Paired Samples test

Table 2: Shows the paired sample test for FRT1-FRT2 and the differences between the mean of Post FRT and Pre FRT

	Mean	Std. Deviation	Std. Error Mean	T	Sig.(2-tailed)
Pair FRT1-FRT2	22.4933	13.9502	2.5469	8.832	.000

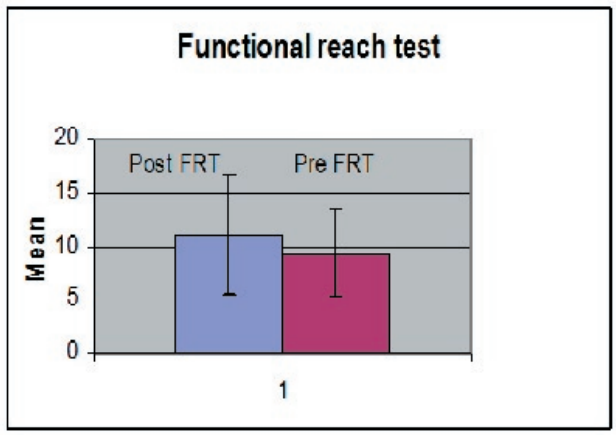

Figure 1: shows the differences between the mean of Post FRT and Pre FRT

DISCUSSION

In this study, better improvements in balance outcome were analyzed using proprioceptive training through tactile strengthening of muscle. This study was done on 30 normal young and healthy subjects with BBS 100%. They were given tactile stimulation intervention to improve the balance.The results of the study shows that balance and postural sway is improved through this intervention with the highly significant results.

The finding that vibration applied to a specific group of muscles can induce distinct postural reaction in a specific direction agrees with previous studies (Eklund, 1972; Roll and roll, 1988; Gregoric et al., 1978; Gurfinkel, 1977; Lund, 1980; Roll et al ,1989b; smetanin et al. ,1993). It suggests that musle proprioceptive inputs originating from body parts as far apart as the ankle and neck can equally contribute to postural control. Further in experiments using support surface anterior and posterior translations to activate stabilizing responses, ankle joint proprioceptive inputs have been hypothesized to be the primary source early activation of muscles of the leg and trunk (Nashner, 1977; Nashner and Woollacott, 1979). These experiments described the response of the body to horizontal platform displacements as consisting of

sway in the opposite direction to the movement of the platform.

For the ankle muscles, the direction of the postural responses was counter to the direction of the muscle lengthening stimulated by applying vibration (Roll et al., 1989a). indeed, when the nervous system receives a muscle spindle message indicating that vibrated muscle has lengthened and that the body's balance is liable to be upset, a postural response tending to restore the initial body position is triggered.

For the ankle muscles, the vibration gave rise to body tilts in the same direction as the lengthening stimulated in the vibrated muscles. This response results from a combined processing of both neck muscle and vestibular – proprioceptive information. In the case of dorsal neck muscle vibration, a proprioceptive message indicates that the head is inclined forward with respect to the trunk, while the vestibular signal indicates that the head remains straight. A possible interpretation would be that the trunk is swaying backward with respect to the head. As a consequence, the postural sway directed forward in response to the splenii vibration will be a compensatory response returning the body upright (Lekhal et al., 1996). This interpretation is in agreement with various studies showing that the central nervous system is able to integrate the vestibular and neck proprioceptive information to sub serve postural control (Gurfinkel et al.1995; Hlavacka et al.1985; Lund and Broberg, 1983).

When co-stimulation was applied to two adjacent muscles, each of which triggered orthogonal postural reactions when vibrated separately. The direction of jointly elicited postural sway was an intermediate one.

Likewise, costimulating two antagonist muscle groups that elicited postural reactions in opposite direction when vibrated separately resulted in responses with very small amplitude.

On the whole, the above data suggests that all the proprioceptive information arising from two or more muscles at a given body level concomitantly undergoes sensorimotor processing.

Going further, Nashner, 1985 has described two alternative strategies which subjects could use in orienting the head and body in space. The first, called the strap-down mode, fixes the orientation of the head with respect to the body. The second, called stable- platform strategy, fixes the orientation of the head with respect to the gravitational vertical. In this case, orientation of the body in space is perceived in relation to the head fixed in space. It is possible that subjects are using the first strategy to orient head and body, and this activated neck flexor muscles to keep the head incline with the forward movement of the trunk, during posterior platform displacements.

In this study, the later type of strategy is used for orientation of head and body in space.

The balance and postural sway were taken as the dependent variables which were measured using functional reach test and camera recording respectively. Both these parameters are standard methods to analyze balance. Tactile stimulation was given to improve the balance.

The data collected was analyzed using dependent and independent t- test to find the significance in the subjects. The t- test value showed that there were significant improvements in balance in the subjects.

Clinical relevance: - This study showed its clinical relevance in improving balance through tactile stimulation in patients in shorter time duration. This study also demonstrates that it is cost effective as well as energy saving. As it is done on normal young adults so they gain better balance control in old age and thus help in preventing fall and other old age balance complications.

Future scope: -

1. Take more subjects.
2. Take longer duration for study
3. Patients may be taken
4. More reliable objective outcome measures can be taken to assess balance

CONCLUSION

The present study concludes that the tactile strengthening of muscles is effective in improving balance and postural sway in normal subjects.

The study is clinically relevant in the sense that it is cost effective as well as energy and time saving that

means in shorter duration of time we can get better result with less expenditure.

It is beneficial for the normal subjects as the improved balance can help the individuals in their geriatric period in preventing the risk of falls and other balance disorders.

LIMITATIONS OF THE STUDY

- Lesser number of subjects
- Shorter duration of study
- Normal subjects
- Berg Balance Scale- 100%
- Only one quantitative test was taken to assess balance..

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

Source of Funding: Self Funded

Ethical Clearence: Taken from AIER Ethical Committee.

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Correlation of Cognitive Impairment with Functional Mobility & Risk of Fall in Elderly Individuals

Ashwini S Kalsait[1], Lakshmiprabha R[2], Sraswati Iyyar[3], Amita Mehta[4]

[1]PG Student, [2]Associate Professor, [3]Professor, [4]HOD, Department of Physiotherapy, P.T. School & Centre, Seth G.S. Medical College & K.E.M. Hospital, Parel, Mumbai

ABSTRACT

Ageing is an integral part of human life. Elderly people are highly prone to mental comorbidities due to ageing of brain; problems associated with physical health, socioeconomic factors such as breakdown of the family support systems and decreased economic independence. Movement emerges from the interactions of the individual, task with its inherent postural demands, and the environment constraints on postural actions. The individual's capacity to meet interacting task and environmental demands determines the person's functional mobility. Cognitive changes occur with ageing, though the relationship between impairment and function are poorly understood. Falling can be attributed to physiological impairments such as muscular weakness, impaired balance , and slowed reaction time but can also be associated with cognitive impairments. Thus, the aim of the present study was to find out the correlation between cognitive impairment with functional mobility and risk of all in elderly individuals.

Keywords: *Aging, Functional mobility, Cognitive impairment, Risk of Fall, etc,.*

INTRODUCTION

In older individuals, mobility disability, impaired activities of daily living due to walking and balance difficulties, is common and associated with loss of independence, disability, and death.[1] With Aging there is deterioration of various physiological capacities such as muscle strength, aerobic capacity, neuro–muscular coordination and flexibility which can lead to impaired physical performance.[2] The concept of functional mobility has also been attracting growing concern .It has become a matter of increasing urgency to look for ways to maintain & improve the functional abilities of elderly to help them to cope individually in the community. Coping in everyday life is important for measuring functional health which in turn affects their quality of life.[3] Falls in geriatric population is one of the commonest problems. Falls is a marker of poor health and decline function.[3] Falls are the leading cause of both fatal and other injuries for adults aged 65 years.[4] Cognition plays a vital role in the ability to simultaneously walk while carrying out other motor and cognitive processes (e.g., talking to a companion during walking, reading a street sign, navigating an uneven surface, or planning ahead) and while inhibiting the response to potential distractions to gait (e.g., traffic noise).[5] Cognitive abilities of older persons range from normal, to mild cognitive impairment, to dementia.[6] Age related cognitive decline occurs in tandem with the physical degradation of brain structure. There are various biological (eg oxidative stress, chronic inflammation, hormonal imbalance, obesity,) & psychological (eg anxiety, stress, depression, social & personal relationships.) risk factors which affects the optimal brain function and cognitive ability . It interacts with one another, greatly influencing the manner in which we age.[7,8] Thus the aim of present study was to correlation of cognitive impairment with functional mobility & risk of fall in elderly individuals.

Corresponding author:
Ms. Ashwini S Kalsait,
PG Student, Department of Physiotherapy, P.T. School & Centre, Seth G.S. Medical College & K.E.M. Hospital, Parel, Mumbai.
Email Id: ashwini.kalsait@gmail.com
Contact no.: 9970128659

MATERIALS AND METHOD

Approval for the study was taken from the

Institutional Ethics Committee and the approval committee of Maharashtra University of Health Sciences Nasik. The study design was cross sectional correlational study with calculated sample size of 152 elderly individuals selected from Physiotherapy OPD Tertiary Health Care Setup. The inclusion criteria were:

- Elderly who are willing to participate and ready to sign informed consent document.
- Participant should be able to read and write (language English, Marathi, Hindi).
- Age group 60 to 85 years.
- Community ambulating individuals.
- GDS score <10
- MoCA score < 26

Exclusion criteria were:

- Any acute musculoskeletal / Cardio respiratory disorder
- Any neurological disorder
- Any Acute Vestibular disorder
- Having uncontrolled hypertension or diabetes mellitus
- Uncorrected visual / hearing disorder.

The elderly individuals were assessed for 45 minutes for single visit. A written informed consent document in a language best understood by the subject (English / Hindi / Marathi) was obtained.

The Screening for depression by Geriatric Depression Scale-Short Form (GDS–SF) was done first followed by cognitive status by Montreal Cognitive Assessment (MoCA). Rest time of 5 minutes was given between the two assessments. Subjects were fulfilling inclusion criteria further assessed for fall risk by 4 Peninsula Health Fall Risk Assessment Tool (4PHFRAT) and functional mobility by Timed "Up & Go" test respectively.

SCREENING tools used were

- **Geriatric Depression Scale Short Form** GDS (SF): It has a 15 yes / no questions, rated 1/0 on response.
- **Montreal Cognitive Assessment**: This test took less than 10 minutes to administer included items to assess the cognitive domains of visuo-spatial ability(Clock drawing and cube copying), memory (5-word list learning and delayed recall), executive function (abbreviated trails-B, phonemic fluency, and similarities tasks), attention, concentration and working memory (target detection using finger tapping, serial subtraction, and digits forward/backward) language (picture naming and sentence Repetition) and orientation (time/place).

The maximum possible score on the MoCA is 30 points and is sensitive to the subject's education level. A score of < 26 is generally accepted cut off for cognitive impairment. MoCA has a sensitivity of 90% and a specificity of 78% for detecting MCI. So we used score< 26 in our study as a cut off. Study showed 152 individuals had MoCA score <26 reflecting cognitive impairment were included in study for further assessment and 8 individuals were excluded as they were cognitively normal.

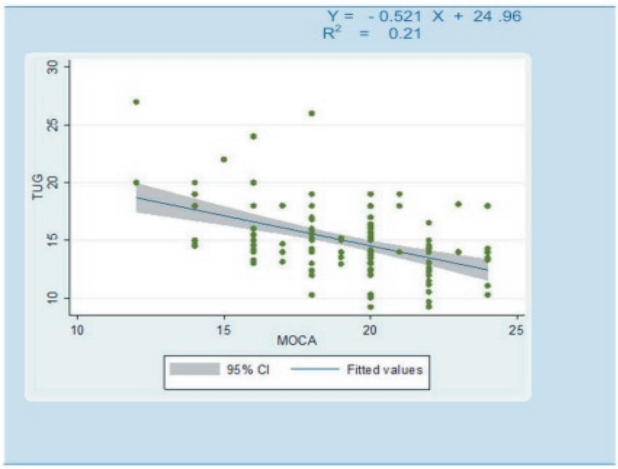
Outcome measures:

1) Montreal Cognitive Assessment (MoCA)
2) Peninsula Health Fall Risk Assessment Tool
3) Timed "Up and Go" Test

RESULTS

Data analysis was performed by using Statistical package for social sciences SPSS 23.0 Version. The Shapiro-Wilk Test was used for assessing normality of data. Since the data was found to be normally distributed the Parametric Tests were used.

A p value of < 0.05 was considered to be statistically significant. Power of the study was 80 %. Confidence interval of 95 % was chosen.

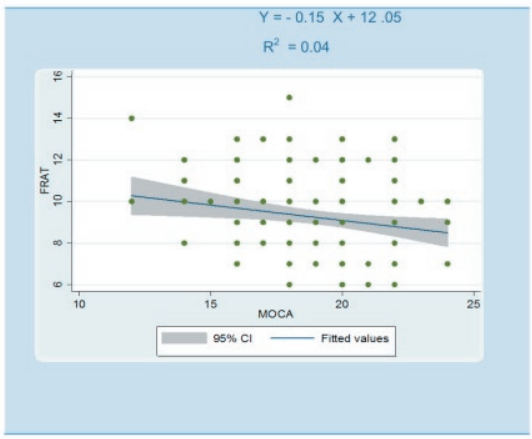


Graph 1. Correlation and Regression of MoCA with TUG

Graph 1 shows that the MoCA had negative correlation with TUG (r = - 0.457, p<0.001) which was statistically significant.

As the score of MoCA decreases the time taken to complete of TUG increases which means that as cognition declines functional mobility also declines.

Linear regression analysis showed that one unit decrease in MoCA increases TUG by – 0. 52 and vice versa .95% confidence interval (-0.68 - 0.36), p value 0.001. So there was significant association. After adjusting with age and gender; MOCA (p<0.001), Age (p=0.02) and male gender (p=0.03) were significantly associated with TUG.



Graph 2. Correlation and Regression of MoCA with FRAT

Graph 2 shows that The MoCA had negative correlation with FRAT (r = - 0.197, p<0.015) which was statistically significant which means as cognition declines the risk of fall increases.

Linear regression analysis it showed that One unit decrease in MoCA increases FRAT by -0.15 and vice versa 95%confidence interval (-0.27 to -0.03) , p value 0.002 . So there was significant association. After adjusting with age and gender it showed that there was a significant association between Age (p=0.002) and FRAT irrespective of gender. MoCA (p=0.06), Gender (p=0.12) was not significantly associated with FRAT.

DISCUSSION

The present study was done to find out the correlation between cognitive impairment, functional mobility and risk of fall in elderly individuals.

The results of study shows that

1. There is negative correlation between cognition (MoCA) and functional mobility (TUG)

2. There is negative correlation between cognition (MoCA) and fall risk (FRAT).

This showed that as the score of MoCA decreases the time taken to complete TUG increases and as the score of MoCA decreases the score of FRAT also increases which means that as cognition declines functional mobility also declines & risk of fall increases in elderly individuals.

Aron Buchman et al 2011 found that among ambulatory elders, cognition is associated with incident of mobility impairment and mobility decline. Mobility requires complex interaction of neural systems which control gait initiation, planning and execution and the adaptation of these movements to meet motivational and environmental demands.[9]

Some prior studies have also suggested that executive cognitive function may be preferentially related to mobility.[10] Executive function (EF) is a higher order cognitive processes that use and modify information from many cortical sensory systems to modulate and produce action.[11] These integrative functions include both cognitive and motor components that are necessary for effective, goal-directed actions. It also controls the attentional resources. There is an age associated shift from automatic (lower level) movement control to attentional (higher level) movement control involving motor imagery, somatosensory information, and visual feedback. Given this, it may be that central control mechanisms are even more important to maintaining postural stability than the peripheral sensorimotor system in older adults.

Rigby et al 1998 studied the contribution of executive cognitive abilities in ADLS. He found that executive functioning is an important factor for self – reported and observed performance of complex, independent ADL. Intact EF can actually serve as a fall preventation measure by minimizing behaviour that jeopardizes safely despite motor and sensory impairments.

In a cross-sectional study Teresa Y Liu-Ambrose et al 2008, found that older women with MCI have greater risk for falls than those without MCI. In a meta-analysis performed by SUSAN W. MUIR et al 2012 suggest that that cognitive deficits detected on clinical assessment

are associated with increased fall risk in older adults.

McMichael KA, et al 2008 concluded that Lower scores on the mini mental state examination (MMSE, cognitive assessment test) have been associated with an increased risk of falls and have been identified as a predictor of fall risk on the Get Up and Go test in a large group of community dwelling older adults. Watson NL et al (J Gerontol A Biol Sci Med Sci 201o), McMichael KA et al (Geriatric Nursing 2008), Zuliani G et al (JAGS 2005) in their studies using a battery of neuropsychological tests have found that older adults with impairments in EF walk slower, fall more often , and perform worse on mobility tasks.

Functional mobility was assessed using the timed up and go test (TUG). Although the TUG may look simple, it is based on several different aspects of strength, balance, mobility and coordination of serial movements. The sit to stand component requires anterior displacement of centre of mass while preparing for standing, acceleration in anterior- posterior and vertical plane, push off, and finally stabilization in standing. It also requires initiation of stepping, straight walking and preparation for turning and actual turning. Hence TUG duration has been associated with cognitive function. According to Carr and Shepherd, reaction time has been consistently found to decline with age and individuals with slowed reaction time may be susceptible to falls as a result of an inability to correct postural imbalance quickly enough.

In present study we found that age, male gender, cognitive impairment had significant association with functional mobility. This can be confirmed by the adjusted model of regression analysis between MoCA and TUG which says that inspite of the above confounding factors, cognition plays an important role in functional mobility. Cognitive impairment is not significantly associated with risk of fall since there are various causes of fall other than cognition. The age & gender adjusted model of regression analysis between MoCA & FRAT in our study shows that these confounding factors may have a greater effect on risk of fall rather than cognition.

CONCLUSION

1. This study concludes that, as cognition declines there is decline in the functional mobility and increase in risk o fall.

Since there was a negative correlation between

- MoCA and TUG
- MoCA and FRAT.

2. Cognitive impairment was significantly associated with functional mobility even after adjusting for confounders like age & gender.

3. Cognitive impairment was not significantly associated with risk of fall after adjusting for confounders like age & gender , indicating that these confounders may have greater effect on the risk of fall apart from the cognition. Limitation of the study was that as MoCA is the screening tool we could not associate the individual domains of cognition with TUG / FRAT.

Conflict of Interest: None

Source of Funding: None

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Evaluation of Public Infrastructures and Transportation Accessibility for People with Disabilities in Ahmedabad City

Titiksh Varma[1], Hetal Tripathi[2], Krupa Prabhakar[3], Hardik Parab[4]

[1]Occupational Therapist, Civil Hospital, Asarwa, Ahmedabad, [2]Occupational Therapist, [3]Physiotherapist, Government Spine Institute, Civil Hospital Campus, Asarwa, Ahmedabad, [4]Lecturer, Ahmedabad Physiotherapy College, Bopal, Ahmedabad

ABSTRACT

The purpose of the study was to evaluate the public infrastructures and transportation accessibility for people with disabilities in Ahmedabad city which includes to find out the average accessibility of all the sampled buildings in Ahmedabad, to evaluate the accessibility of the categorized buildings, to evaluate the accessibility of internal & external environments of the buildings, to find out the minimum and maximum accessible buildings in Ahmedabad city. In this study 20 samples were selected using a stratified sampling and they were divided into four categories- 1st- Hospitals & Clinical Departments, 2nd- Transportation, 3rd - Public buildings, 4th - Public parks, Malls, Amusement & Historical Places. Accessibility of each Public Infrastructure and Transportation system was determined by using an Access audit form. Percentage of the total positive markings was analyzed. Result shows public buildings have the lowest accessibility score in compare to others. Average accessibility of the Ahmedabad buildings is 30.33% which is very low. Hospitals & Clinical Departments are more accessible than other public infrastructures and transportation. From this study, it has been concluded that public infrastructures and transportation of Ahmedabad are very less accessible for people with disabilities. Therefore, modifications in public infrastructures and transportation need to be done to make them accessible which help people with disabilities to live their lives at fullest and independently.

Keywords: *BPA- Blind Peoples' Association,* ***AIMS****- Ahmedabad Institute of Medical Sciences,* ***GSI-*** *Government Spine Institute,* ***BRTS****- Bus Rapid Transition System,* ***RTO-*** *Regional Transport Office.*

INTRODUCTION

Disability- "Any restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being resulting from impairment" To be considered anyone as a disabled person, he/she should not be able to perform day to day activities considered normal for his age, sex or physique[(1)]. Due to these disabilities, visiting public buildings, daily neighborhood travels, work/ business trips, family outings & social trips and using transportation system for special occasions becomes difficult. All these are very essential components of life which is a great deal for people with disabilities due to inaccessible environment.

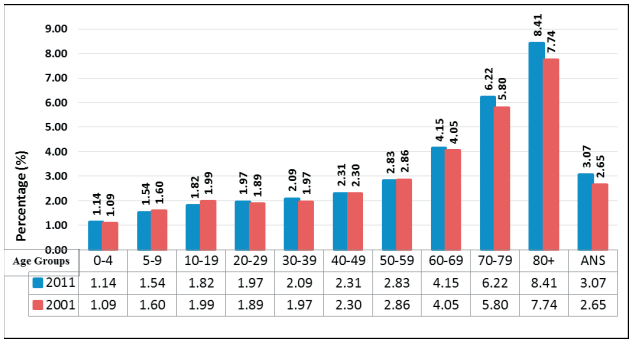
India is a signatory to the proclamation on the full participation and equality of people with disabilities, signed at the launch to the pacific decade of disabled persons in 1993. With regards to accessibility and transport, the Act instructs transport operators and government authorities that modifications happen within the limits of the economic capacity and development of the relevant institutions. This clause has been criticized as being open to abuse by government departments which fail to make adequate budgetary allocations for accessibility programs. On the positive side, the act has been credited with shifting public attention towards the need of people with disabilities[(2)].

Corresponding author:
Dr. Hetal Tripathi,
(M.O.T., Pediatrics) Occupational Therapist,
Government Spine Institute, Civil Hospital Campus,
Asarwa, Ahmedabad
Mobile No- 08000641554, 07574852740
E-mail I.D.-hetalttripathi@gmail.com

Table-1: Proportion of Disabled Population by Type of Disability in India: 2011

Type of Disability	Persons	Males	Females
Total Disability (%)	100.0%	100.0%	100.0%
In Seeing	18.8%	17.6%	20.2%
In Hearing	18.9%	17.9%	20.2%
In Speech	7.5%	7.5%	7.4%
In Movement	20.3%	22.5%	17.5%
Mental Retardation	5.6%	5.8%	5.4%
Mental Illness	2.7%	2.8%	2.6%
Any Other	18.4%	18.2%	18.6%
Multiple Disability	7.9%	7.8%	8.1%

Mainly four types of disabilities (Non-Ambulatory, Semi-Ambulatory, Sight and Hearing) have been considered while preparing the guidelines for barrier free environment[3].



Graph-1 Proportion of Disabled Population in the respective age groups India: 2001-2011[4]

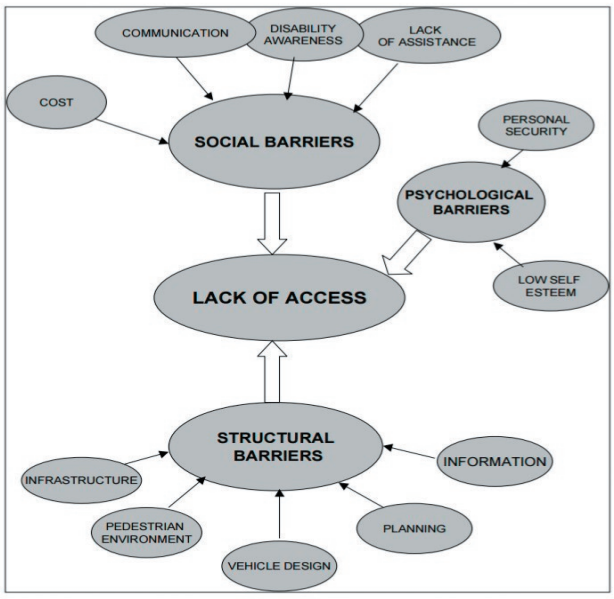


Chart- 1: Barriers to accessibility identified by needs analysis[2]

Rehabilitation empowers the individual to achieve satisfaction in productive activity and personal fulfillment, by engaging in social and functional interaction with other people and his/her environment. Restriction of mobility is likely to be the most common handicap amongst people with disabilities[5]. In order to enhance ambulation in individuals with a disability involving the lower limbs, wheelchairs may be essential on a temporary or permanent basis. Wheelchairs provide the users with many benefits which include mobility, continuing or broadening community and social activities, conserving energy and enhancing quality of life[6]. However, even when the person with a disability has a suitable and well-fitted wheelchair, its value is diminished when there is lack of wheelchair accessibility to buildings. It may even be more frustrating when these public buildings which serve as shelter for the employment, education, social and recreation needs of the wheelchair users. In order for the wheelchair users to fit in and function independently in any community, there must be a concerted effort to incorporate wheelchair accessibility in the interior and exterior of public buildings and the transportation and road systems[7].

New wheelchair users find themselves facing the architectural and attitudinal barriers of society, while still struggling to recognize their own attitudes. Major psychosocial changes in areas ranging from body image to vocational role, take place during the rehabilitation process[8]. There is an interactive relationship between the person and the environment; variability in the degree of interdependence among the environment subsystem within which human interaction occurs has been noted. This diversity reflects the differences normally present in society, and various theorists have stated that it may be easier or better to adapt the environment than try to change the person[9]. A more inclusive approach is to think in terms of the Universal Rights of Access and to

seek to improve accessibility and usability for everyone. This way of thinking benefits everybody, not just those with impairments[10].

It is essential to accept that very few handicapped or elderly persons living in such a special housing are able to drive or have their own cars, because of their handicaps or age, or even for economic reasons. This means that both groups must rely on public transportation which is not enough to design a barrier free building for the handicapped and elderly. The shops should be accessible with all essential barrier free design elements such as ramped approach along with stepped approach, adequate space for landing, sufficiently wide corridor, signages, sliding or automatic door, guiding warning block, accessible counter, telephone booth, mail box, and toilet facilities[11].

Ahmedabad, a populated mega city, and the major urban center for western India, provides the setting for the research. There are several laws and guidelines given by government of India for barrier free environment and accessibility like PWD Act (Ch.-8, section - 44 & 46), The National Trust Act, Beuro of Indian standers national building code 2005, guidelines and space standards for barrier free built environment for disabled elderly persons 1998. Although these laws and guidelines for barrier free environment and accessibility are laid down by government of India, inaccessibility for the person with disability is a major issue.

Need of the Study:

To evaluate the public infrastructures and transportation accessibility for people with disabilities in Ahmedabad city

- To find out the average accessibility of all the sampled buildings in Ahmedabad
- To evaluate the accessibility of the categorized buildings
- To evaluate the accessibility of internal & external environment of the buildings
- To find out the minimum and maximum accessible buildings in Ahmedabad city

Materials & Method

Study Design: Observational study

Study Setting: Ahmedabad

Sample Size: 20

Sampling Method: Stratified Sampling

Procedure:

The study was a descriptive survey research involving one-time observation of the building with no attempt to manipulate any variable. The samples were selected using a stratified sampling, except for the categories where the numbers of buildings were few. Accessibility of each public Infrastructure and transportation system were determined by using an Access audit form developed by Dr. Uma Tuli (Chief Commissioner for Persons with Disabilities). It covers various areas like External environment (Car Parking, Taxi Stand, Mail Box, Water Cooler, Pathways, Curbs, Pedestrian, and General Obstructions) and Internal Environment (Main Entrance, Doors, Corridors, Elevators, Slop Ramps, Stairs, Handrails, Restrooms, Eating Outlets, Public Telephones, Resting facilities, Reception)[12].

Samples were divided into four categories-

1st Category- Hospitals & Clinical Department

- BPA
- AIMS
- Shardaben Hospital
- GSI
- Civil Hospital

2nd Category- Transportation

- Kalupur Railway Station
- State Transportation Station
- BRTS

3rd Category- Public Buildings

- Town Hall
- Axis Bank
- Central Bank of India
- RTO
- Collector Office
- Post Office

4th Category- Public parks, Malls, Amusement & Historical Places

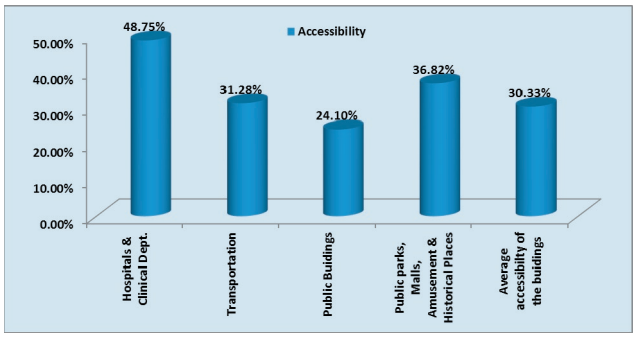
- Riverfront Park
- Kankaria lake
- Adalaj Stepwell
- Big Bazar Mall

- Gandhi Aashram
- Temple

Permission to take the required measurements was also obtained from the appropriate authority in charge of the buildings. Physical observation of the study site was carried out by the researchers and necessary measurements were taken and the access audit form was filled up by one of the authors in which each positive marking was represented by "1" and negative marking was represented by "0". If any of the given parameters was not present in the sample, it was represented as "Not Applicable". Percentage of the total positive markings was analyzed.

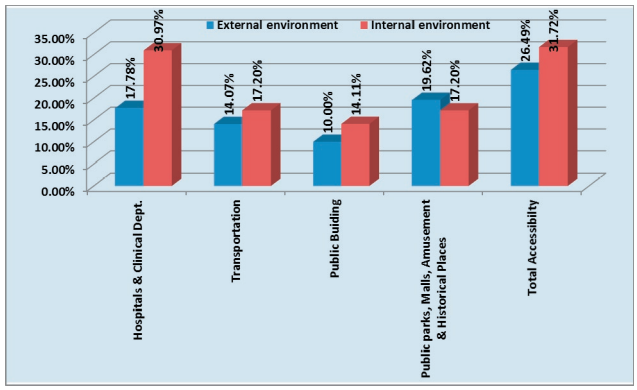
FINDINGS & DISCUSSION

- Hospitals & Clinical Departments (48.75%) are more accessible than other public infrastructures and transportation.
- Public buildings have the lowest accessibility score (24.10%) in compare to others.
- Average accessibility of the Ahmedabad buildings is very low (30.33%).



Graph-2: Accessibility (%) of categorized buildings

- External environment (26.49%) has low accessibility score in comparison to the internal environment (31.72%).
- Hospitals & clinical departments have good accessibility of internal environment (30.97%) but still they have low accessibility of external environment (17.78%).
- In the case of each parameter, Mail Box is not accessible at all (0.0 %) whereas Resting facilities are having maximum accessibility (67.10%)



Graph-3: Accessibility (%) of External and Internal environment

Table-2: Accessibility of the parameters of External Environment

External Environment				
Parameters	**Hospitals & Clinical Department**	**Transportation**	**Public Buildings**	**Public parks, Malls, Amusement & Historical Places**
Car Parking	10.77%	0.00%	0.00%	0.00%
Taxi Stand	20.00%	50.00%	16.66%	41.65%
Mail Box	0.00%	0.00%	0.00%	0.00%
Water Cooler	13.33%	0.00%	16.66%	5.55%
Pathways	25.45%	27.27%	9.09%	31.81%
Curbs	10.00%	11.11%	5.55%	24.99%
Pedestrian	12.00%	0.00%	10.00%	26.66%
General Obstructions	45.00%	41.66%	45.82%	37.49%

Table-3: Accessibility of the parameters of Internal Environment

Internal Environment				
Parameters	**Hospitals & Clinical Department**	**Transportation**	**Public Buildings**	**Public parks, Malls, Amusement & Historical Places**
Main Entrance	63.08%	35.89%	26.91%	28.19%
Doors	33.33%	8.33%	26.38%	19.44%
Corridors	63.33%	55.55%	33.32%	49.98%
Elevators	22.86%	0.00%	0.00%	4.76%
Stairs	36.67%	30.55%	31.93%	38.87%
Slop Ramps	28.00%	16.67%	0.00%	13.33%
Handrails	52.00%	36.66%	13.33%	10.00%
Restrooms	8.33%	0.00%	0.00%	5.55%
Eating Outlets	16.67%	11.11%	0.00%	5.55%
Public Telephones	6.67%	0.00%	0.00%	2.78%
Resting facilities	40.00%	33.33%	36.65%	39.98%
Reception	23.33%	16.67%	30.54%	13.88%

CONCLUSION

• From this study it has been concluded that Hospitals and clinical departments are the best accessible than others, still they need to modify as many number of people with disabilities visit them very frequently. Public infrastructures and Transportation of Ahmedabad are very less accessible for people with disabilities. Therefore, modifications in public infrastructures and transportation need to be done to make them accessible which assist people with disabilities to live their lives at fullest and independently. This kind of researches increases awareness of the accessibility for people with disability which ultimately helps to create a barrier free environment in newly infrastructures.

Limitation:

• Small sample size

• Limited time duration

Direction for Future Study:

• The study can be done with larger sample size in each categories

• To evaluate accessibility of the public infrastructures and transportation for people with individual disability

• To evaluate accessibility of newly built public infrastructures and transportation

• Comparison study of old and new infrastructures to evaluate if accessibility for people with disability has improved in new infrastructures

Acknowledgement: Nil

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Ethical permission has been taken from the ethical committee and Institutes.

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Effectiveness of Quadriceps Strengthening Exercises in Reducing Extensor Lag, Pain and Improving Functional Activity in Patients of Knee Osteoarthritis

Rutika Thakur[1], Mrunmayee Mande[2], Mahesh Mitra[3]

[1]Assistant Professor, [2]B.P.Th, [3]Professor, NDMVP College of Physiotherapy, Nashik

Background: Osteoarthritis is a degenerative joint disease prevalence increases with age, woman being more symptomatic especially seen in post menopausal women. Quadriceps muscle weakness leads to functional dysfunction in knee osteoarthritis. Rehabilitation includes quadriceps exercises static as well as dynamic exercises for improving range of motion and strength. Biofeedback can be combined with isometric exercises to increase the awareness of the muscle work done by quadriceps. **Purpose**- Purpose of the study was to find the effectiveness of Quadriceps strengthening exercises in reducing extensor lag, pain and improving functional activity in patients of osteoarthritic knee. **Aim:** To compare the Effectiveness of Quadriceps strengthening exercises in reducing extensor lag, VAS and improving functional activity in patients of osteoarthritic knee. **Objective:** To find out the Effectiveness of Quadriceps strengthening exercises and modified quadriceps strengthening exercises with or without biofeedback in reducing extensor lag, VAS and improving functional activity in patients of osteoarthritic knee. **Method:** This experimental study was conducted on 60 Osteoarthritic knee patients and they were divided into 3 groups, 20 patients were included in each group. Patient aged 50-75 years were taken from NDMVP Hospital and research centre and physiotherapy clinic in an around Nasik. Convenience sampling method was used for study. WOMAC scale, VAS and terminal extensor lag was assessed. **Results:** P value: 0.036, 0.001 and less than 0.05 for extensor lag, VAS and WOMAC respectively as the mean difference value is more in group 3 therefore group 3 i.e. Modified Quadriceps sets with biofeedbackis clinically and statistically more effective than group 2 and 3. **Conclusion:** All three groups were effective in reducing extensor lag, pain and improving functional activity in patients with knee osteoarthritis. It was also seen that in group 3 i.e. Modified Quadriceps sets with biofeedback clinically more improvement was seen as compared to the other groups.

Keywords-*Osteoarthritis, Quadriceps Strengthening, Extensor lag.*

INTRODUCTION

Knee osteoarthritis (OA) is becoming a major public health problem. It is more prevalent in women over the age of 60yrs and increases in percentage of people older than 55 years in western countries[1]. Knee osteoarthritis is degenerative joint disease and most common form of disability affecting both women and men, woman being more symptomatic[2]. Knee osteoarthritis is inflammatory joint disease that affects the cartilage between bones thereby restricting movements causing joint pain and leads to muscle weakness, periarticular muscle atrophy, tenderness, swelling. Majorly affects large weight bearing joints such as hips and knees[3]. Knee OA is classified as primary and secondary OA. Primary OA is result of age and secondary OA is result of complication of a disease or an injury leading to degeneration of joint[3].

Quadriceps lag is a condition when patient cannot actively extend knee fully using muscle contraction, but can be passively extended by the therapist[2]. Knee pain is associated with weak quadriceps and thus it increases the loading at knee leading to joint degeneration. OA patient can easily perform isometric exercises as it produce low articular pressure and also improves muscle strength and static endurance thus preparing the joint for more dynamic movement[4]. VMO originates from the medial intramuscular septum, adductor longus and majority of fibers arising from the tendon of the adductor magnus, based on this anatomical finding simultaneous activation of the knee extensors and the hip adductors might

provide the VMO with more the quadriceps strength also the lowermost fibers of VMO attach to the anteromedial aspect of tibia through the medial extensor aponeurosis and may resist external rotation of tibia thus VMO can be recruited through active medial rotation of tibia[5]

Exercise is important in osteoarthritis management. It seems that supervised exercises sessions are superior to home exercises for pain reduction[1]. Considering all these factors the aim of study is to compare the effectiveness of different quadriceps strengthening exercises in improvement of extensor lag, pain and functional activity in osteoarthritic knee.

AIM: To compare the Effectiveness of Quadriceps strengthening exercises in reducing extensor lag, VAS and improving functional activity in patients of osteoarthritic knee.

OBJECTIVE

▪To find out the Effectiveness of Quadriceps strengthening exercises in reducing extensor lag, VAS and improving functional activity in patients of osteoarthritic knee.

▪To find out the Effectiveness of Quadriceps strengthening exercises with biofeedback in reducing extensor lag, VAS and improving functional activity in patients of osteoarthritic knee.

▪To find out the Effectiveness of Modified Quadriceps strengthening exercises in reducing extensor lag, VAS and improving functional activity in patients of knee osteoarthritis

MATERIAL AND METHOD: It was an experimental study conducted on 60 osteoarthritic knee patients aged from 50-75 yrs taken from NDMVP hospital and physiotherapy clinic in and around nashik and they were divided into 3 subgroups and each group consisted 20 patients.

INCLUSION CRITERIA:

● Male/female patients between the age group of 50-75yrs

● Confirmatory x-rays showing osteophytes, joint space narrowing (grade ii,iii).

● Patient having Extensor lag.

● Patients with complain of unilateral knee pain, stiffness, difficulty climbing stairs, in walking and sitting crossed leg

● Occupation- sedentary job, housewife, sitting job

EXCLUSION CRITERIA:

●Patients with knee OA surgery, recent knee injury.

●Patients having psychological, neurological, cardiac, vascular and sensory problems

PROCEDURE: 60 patients suffering from unilateral OA meeting inclusion criteria were included in the group and were randomly divided into 3 different groups: **Group 1** (Quadriceps sets), **Group 2** (Quadriceps sets with biofeedback) **Group 3** (Modified Quadriceps sets with biofeedback).Demographic data of the patient, degrees of extensor lag with the help of goniometer , VAS and functional activity by WOMAC SCALE was obtained and informed consent form was duly filled by the patients. Protocol was followed for 2weeks after first 3days one day rest was given to avoid exertion and treatment was followed for 2weeks.pulsed ultrasound was given to patient with a frequency of 1MHz, power-2W/cm^2 with a pulsed mode duty cycle-1:4.[6]

To Measure Extensor Lag: Patient position high sitting leaning 45 degrees backwards to minimize any resistance from hamstring during procedure. Patient is then asked to extend knee actively and extensor lag is measured with goniometer[7].

Group 1-Ask the patient to sit on plinth with knee flexed to 60-85° and then hold an isometric contraction of quadriceps

GROUP 2-Ask the patient to sit on plinth place inflated sphygmomanometer cuff below the distal end of femur then patient is asked to maintain mercury level by holding an isometric contraction of quadriceps.

FIGURE 1: Patient performing Quadriceps sets with biofeedback

Group C-Ask the patient to sit on plinth with knee flexed to 60-85° place inflated cuff between thigh and press on the cuff from thigh and asked to perform isometric contraction of quadriceps.

FIGURE 2: Patient performing Modified Quadriceps sets with biofeedback

RESULT

Table 1: Comparison of Pre and Post treatment value of Extensor Lag and VAS in Group 1, 2 and 3

		EXTENSOR LAG			VAS		
		Group 1	**Group 2**	**Group 3**	**Group 1**	**Group 2**	**Group 3**
Pre Treatment							
	Mean	10.40	11.15	10.95	6.30	6.75	7.05
	SD	1.82	1.63	2.11	1.30	1.29	1.18
Post Treatment	**Mean**	5.35	5.60	4.85	4.20	3.80	2.55
	SD	1.14	1.76	1.9	1.32	0.95	0.65
	t value	18.96	21.65	23.41	14.65	12.56	16.18
	P value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Table 2: Comparison of Pre and Post treatment for WOMAC Score in Group 1, 2 and 3

		GROUP 1	**GROUP 2**	**GROUP 3**
PRE TREATMENT	**MEAN**	54.75	51.10	48.75
	SD	8.60	4.53	7.83
POST TREATMENT	**MEAN**	29.35	23.10	17.4
	SD	7.94	4.79	5.29
	t value	14.39	30.5	26.01
	P value	<0.0001	<0.0001	<0.0001

Table 3: ANOVA FOR: EXTENSOR LAG and VAS Comparison between group 1, 2 and 3

	EXTENSOR LAG			VAS		
	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
Mean	5.05	5.55	6.05	2.1	2.9	4.4
SD	1.19	1.14	1.23	0.64	1.05	1.4
F value	3.5250			24.26		
P value	0.036			<0.0001		

Table 4: ANOVA FOR: WOMAC SCORE comparison between group 1, 2 and 3

	Group 1	Group 2	Group 3
Mean	25.4	28	31.8
SD	7.89	4.10	4.43
F VALUE	6.39		
P VALUE	0.0031		

Group 1, 2 and 3 all the three groups are statistically significant. Group 3 i.e. Modified Quadriceps sets with biofeedback is clinically more effective compared to the other two groups.

DISCUSSION

In the present study, mean value of extensor lag in group 3 ie modified quadriceps sets with biofeedback was effective clinically in reducing extensor lag compared to other two groups.Brownstein et al, 1985 suggested that simultaneous activation of knee extensors and hip adductors might provide the VMO with more force of Quadriceps,VMO muscle originates in part from fascia overlying adductor magnus muscle. Exercising larger muscle first may generate tension within it and thereby VMO muscle has mechanical advantage in reducing lateral shearing[8].Relative activity of VMO and VL during knee extension has been conducted by Hanten,1990 reported proportionally greater VMO activity during maximal hip adduction with knee extension exercises in both weight bearing and non weight bearing condition[9].Bose et al,1980 suggested that VMO oblique portion of vastus medialis muscle function primarily as an active medial stabilizer of the patella and primarily function in final 20 degree of extension training this muscle teaches the patient to contract vastus medialis muscle isometrically and isotonically thus increases strength in VMO and increases support and stabilization of patella[5]

Group B and C ie Quadriceps isometrics and Quadriceps isometrics with biofeedback also showed decrease in percentage of extensor lag. Study conducted by et al, 2003 concluded that isometric quadriceps exercises brought significant gain in strength of the quadriceps muscle after 5 week training sessions and therefore increasing stability of knee joint.[10] Shahnawak Anwer, et al, 2003 reported that subjects having stronger Quadriceps strength showed a reduction in knee pain and better functional activity as compared with those with least strength. Another study reported that subjects having stronger quadriceps strength has less knee pain because Strong muscle stabilize the joint in proper alignment, attenuate shocks that are transmitted to the joint and decrease effect of impact by spreading the forces over greater area . So it may be concluded that improvement in quadriceps strength improves extensor lag, reduces pain and disability and increases stability.[11]van barr, dekker et al, 2001concluded that isometric contractions can improve muscle strength and static endurance and prepare the joints for more dynamic movements[12]

In the present study biofeedback showed positive results in reducing extensor lag, pain and improvement in WOMAC SCORE seen in group B and C. Mortatini and deveris et al, 2000 describe neural factors as a facilitation occuring as a result of neurological reorganization and it increases the number of motor units with help of biofeedback and thus increases motor unit recruitment and muscle strength.[13]Work of basmajian 1999 suggest that amount of muscle tension produced during training sessions increases because of more fibers

fires at faster rate .[14]

In the present study group 3 was more effective clinically in reducing pain and improving functional activity of the patients.study suggested that VMO exercises reported a modest 8-10% improvement in pain and functioning scores among their sample of knee OA patients [15]In the present study pulsed ultrasound with intensity of 2w/cm2 with duty cycle 1:4 was applied to the patient and showed reduction in VAS. Falconer et al,2008 indicates that therapeutic US reduces pain in knee OA i.e. when applied over tender point around the knee joint prior to exercise decreases soft tissue pain as US increases blood flow to the muscle in spasm and causes muscle relaxation.[16]Centin et al 2008 concluded that exercises and physical agents can reduce pain and improve function in patients with knee OA.[17]

CONCLUSION

All three groups were effective in reducing extensor lag, pain and improving functional activity in patients with knee osteoarthritis. It was also seen that in group 3 i.e. Modified Quadriceps sets with biofeedback clinically more improvement as compared to the other groups.

LIMITATIONS OF THE STUDY

Small sample size

Small study duration

Dominant and non dominant sides are not included in study. Bilateral knee pain was not included

Conflict of Interest: None

Ethical Adherence: Yes

Disclaimers: None

Source of Funding: Self

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Comparison of Acapella® Versus Active Cycle of Breathing Technique in Post- Operative Pulmonary Complications after Valve Replacement Surgeries

Shilpa Naswa[1], Ruchika Tuteja[2], V P Gupta[3], Rajeev Aggarwal[4], Jamal Ali Moiz[5]

[1]Physiotherapist, Institute of Liver and Biliary Sciences, New Delhi, [2]MPT Orthopaedics, Physiotherapist, [3]Chief Physiotherapist, [4] Sr. Physiotherapist Neurosciences, AIIMS, New Delhi, [5]Assistant Professor, Jamia Milia Islamia, New Delhi

Background: Patients undergoing valve replacement surgery frequently suffer from Post operative Pulmonary complications as compared to the other population undergoing cardiothoracic surgey. Respiratory complications remain a leading cause of post cardiac surgical morbidity and prolongs hospital stay.

Purpose: To determine the efficacy of Acapella® over Active cycle of breathing technique in treating post-operative pulmonary complications after valve replacement surgeries.

Materials and method: 30 subjects were selected for the study on the basis of inclusion and exclusion criteria. Group A patients underwent Acapella protocol, and group B patients underwent ACBT protocol till the time patients were in hospital.

Outcome measures were postoperative pulmonary complications, chest x rays, hospital length of stay and total number of treatment sessions.

Results: Within group comparison of group A(Acapella) and B(ACBT) by using Friedman test revealed a significant difference in PPC's. Where as with in group comparison of group A by using Friedman test revealed a significant difference in CXR's and in group B revealed no significant difference.

Conclusion : The results of this study suggest that Acapella is as effective as ACBT in reducing postoperative pulmonary complications after cardiac valve replacement surgery. Although with in group analysis has shown that PPC's and CXR's both have improved in gp. A than in gp. B

Keywords : *Acapella, ACBT, Valve replacement surgery, cardiothoracic surgery.*

INTRODUCTON

Respiratory complications remain a leading cause of post cardiac surgical morbidity and prolong hospital stays.[2] Though, it has been seen that patients having mitral valve disease are at a greater risk for respiratory complications after going through cardiac surgery as compared to patients having coronary artery disease.[3] The Post operative Pulmonary Complications (PPC) has been defined as "Any pulmonary abnormality occurring in the post-operative period producing identifiable diseases or dysfunction which is clinically significant and is adversely affecting the clinical course.[4]Increased hospital stay period is also an indirect measure of PPC.[6]

ACBT is the treatment of choice in New Zealand and Australia in post operative thoracotomy patients as observed in a survey done in 2007.[7] It is considered as a standard technique of secretion removal by 96% of physiotherapists working in cardiothoracic units in England.[8] Hence chest physiotherapy including ACBT and PEP forms an integral component for the management of cardiothoracic patients Intensive Care Unit (ICU) postoperatively.[9]

Acapella is a recently introduced small handheld device which combines the resistive features of flutter valve to mobilize the secretions in the airways[11,10]. It works by using a pressurized breath to splint open up the airways.[10] Positive expiratory pressure creates a back

pressure to stent the airways open during exhalation and promotes collateral ventilation, allowing pressure to build up distal to the obstruction. This method of airway clearance prevents collapse of the airways, which eases the mobilization of secretions from the periphery towards the central airways[14].It aids self treatment to the patient, requires less therapist time and can be used effectively in any position[12].

METHODOLOGY AND STUDY DESIGN

Subjects : 30 subjects were recruited from All India Institute of Medical sciences they were determined to be eligible according to the inclusion/exclusion criteria and then they were randomly assigned as Group - A and Group - B, consisting of 15 subjects each.

Randomization was done by a Computerized Random number generator.

Inclusion criteria

- Age group: 20-50years
- Both sexes
- Post operative, extubated cardiac valve replacement surgery patients, who were able to follow the instructions and sign the consent form.
- Patients presenting with Postoperative pulmonarycomplications (Grade-2) on postoperative day one (POD 1)

Exclusion criteria

- Post operative long term intubation period (more than 48 hours).
- Reintubation in post operative period.
- A known case of underlying respiratory disorders preoperative.
- Known or suspected tympanic membrane rupture or other middle ear pathology

Study design

The study was designed as a two-group pre-test, post-test, interventional, randomized, parallel assignment, efficacy study. The experimental design includes measurement of

Dependent variables - Post operative pulmonary complications (P.P.C's), Chest x- rays and Hospital length of stay(H.L.O.S), and Total number of treatment sessions.

Independent variables - Acapella® and Active cycle of breathing technique.

Procedure

With in two hours after extubation following valve replacement surgery, the patients were evaluated for haemodynamic status, consciousness and were also assessed regarding inclusion and exclusion criterion

A written institutional consent form was secured.

Protocol

On day 1: Around half an hour of assessment , training session Education and determination of the correct Acapella settings (group A) or ACBT (group B) was given to each of the subjects of both the groups respectively.

Both the interventions were given in sitting upright position only.

In group A (Acapella) : During initial treatment sessions, patients were taught to exhale through the device having frequency and resistance dial set at minimum setting in a 3-4 second time frame.

Components of Acapella® treatment include :

- Breathing control
- 10 breaths through the Acapella® device
- Inhaling upto approximately three – quarter maximum breathing capacity,
- 2-3 second breath hold
- Active exhalation to Functional residual capacity
- Cough or forced expiration in a set cycle. .

In group B- (ACBT) The standardized A.C.B.T study regimen consisted of

- Breathing control,
- 3-4 thoracic expansion exercises,
- Breathing control,
- 3-4 thoracic expansion exercises,
- Breathing control,

• 1-2 forced expirations (Huffs and breathing control)

On rest of the days: Group A used Acapella® and Group B performed A.C.B.T in same position for rest of the days in I.C.U's and wards. Patients were instructed to undertake the respective intervention at least 1 hour after the medication and at same time on all the study days. End point of the intervention in each group was determined by either when the patient was treated for a maximum of 15 minutes or the patient became too tired to continue treatment or he/she becomes haemodynamically unstable..

At the time of Discharge: Patients were taught remedial deep breathing exercises, self performed coughing and huffing maneuvers and correct procedure for steam inhalation.

DATA ANALYSIS

Data analysis was done by using Scientific Package for Social Sciences. The descriptive variables are expressed as mean + standard deviation.

The outcome measures post operative pulmonary complications (PPC), chest X rays (CXR) and hospital length of stay were analyzed and compared using Mann Whitney U test and the total number of treatment sessions were analyzed and compared using Independent t test.

Within group Statistical analysis was done by using Friedman's test and Wilcoxon signed rank test.

Pre treatment readings were taken for both the groups at the 0^{th} session as baseline readings. The PPC's were compared at the intervals of day 1 morning (D1M), day 1 evening (D1E), day 3 evening (D3E) and day5 evening (D5E) and chest x rays were analyzed on daily basis from D1 to D5. The hospital length of stay and total number of treatment sessions were calculated at the time of discharge. The data was analyzed at 95 % Confidence interval (CI) and the results were considered statistically significant when the p value was ≤ 0.05.

RESULTS

Thirty patients were analyzed for the study (n=15 in each group) and were allocated in to two groups, group A (Acapella) and group B

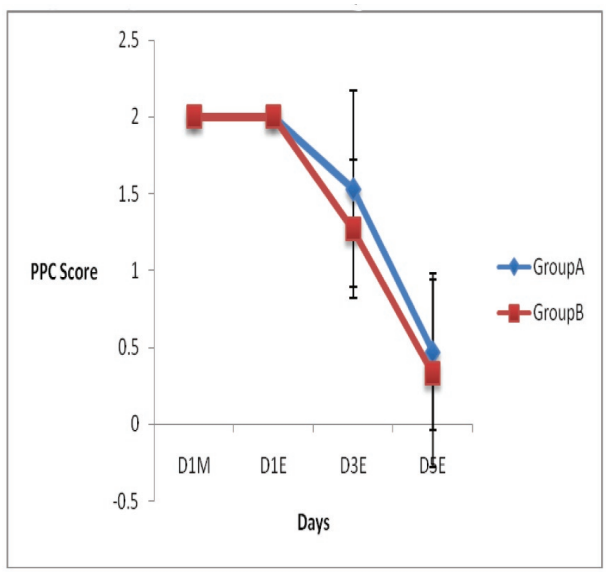
The total sample consisted of 60% males and 40 % females. The demographic data is as shown in table 1.

Table 1. Baseline Characteristics of the Experimental Group A and Control Group B.

mean ± SD)	(mean ± SD)	
Age (years) 0.49	33 ± 7.8	31.67 ± 8.11
Height (cm)* 0.91	168.86 ± 8.546	169.20 ± 7.73
Weight (kg) ** 0.21	67.13+ 8.66	63.73+7.91
BMI 0.17	23.56 +2.66	22.26+2.42
CPB time (min)*** 0.62	105.73+38.18	112+32.73

V*cm:centimeters; **kg:kilograms, *** min: minutes

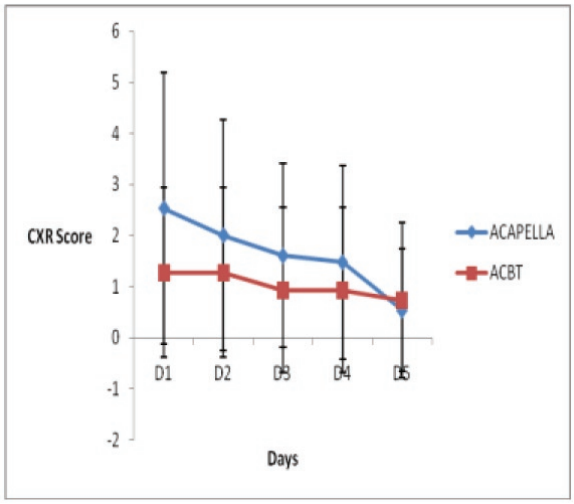
Between group analysis revealed no significant difference in both the groups, it was done by using Mann Whitney U test and p > .05 at (PPC D1M, PPC D1E, PPC D3E and PPC D5E). Graphical presentation in Graph 1



Graph 1 : Between group comparison of PPC

Chest X rays

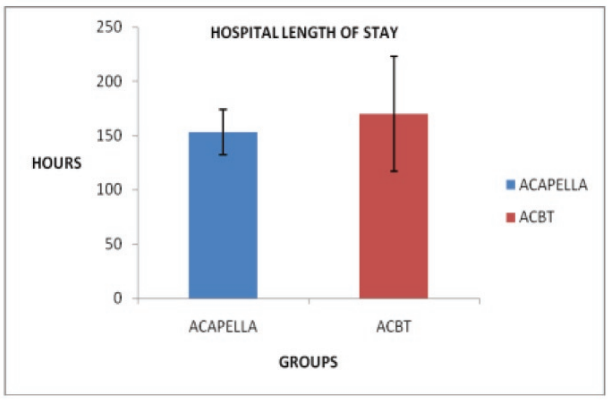
With in group comparison of group A by using Friedman test revealed a significant difference in CXR's at (χ^2 = 23.44, p < .05). Where as with in group comparison of group B by using Friedman test revealed no significant difference in CXR's at (χ^2 = 9.0, p >.05). Graphical presentation in graph 2.



Graph 2 : Between group comparison of CXRPost operative hospital length of stay (hrs)

Table 2 : Mann Whitney U test for LOS

	GroupA (Acapella) (Mean ± S.D)	GroupB (ACBT) (Mean ± S.D)	P value
HLOS (hrs)	153.332±0.87	169.875±2.83	0.801

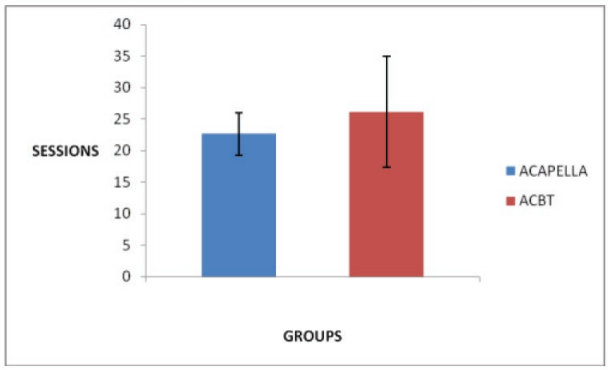


Graph 3 : Between group comparison for LOS

Total number of treatment sessions

Table 3 : Between group comparison for TNS

	GroupA (Acapella) (Mean ± S.D)	GroupB (ACBT) (Mean ± S.D)	P value
TNS (hrs)	22.67±0.35	26.13±8.83	0.166



Graph 4 : Between group comparison for TNS

DISCUSSION

Grade 2 PPC patients as defined by Kroenke et al are very specific group of patients who are on borderline of reintubation i.e requiring intensive respiratory care so as to improve lung status. pulmonary pathology, which was often being used in patients of cardiac valve surgeries post-operatively.

Results obtained on within group comparison of PPC's are suggesting that there was significant improvement in both the groups at ($p < .001$). Thus the patients in both the groups have been benefitted up to same extent. Where as intergroup analysis for PPC's showed that there was no significant improvement ($p > .05$), suggesting that there is no marked difference in improvement for both the groups. These findings are in concordance with the results obtained by Richter Larsen etal, who investigated the effects of conventional chest physiotherapy, PEP and IR-PEP on PPC's after thoracic surgery and they concluded that there was no significant difference between the three groups, however a tendency to decreased risk of PPC was observed in groups having PEP and IR-PEP.[19]

Three patients were diagnosed with pneumonia post operatively which influenced their length of stay at the hospital. All of whom incidently fell in ACBT group through the randomization which might be the reason for the high standard deviation in hospital length of stay in group B patients. The average number of hours for hospital stay in group A was 153.3 + 20.8 days and in group B was 169.87+ 52.8. Length of stay in ICU or in hospital has important implications for costs. These outcomes are comparable with the results of Hulzebos et al who showed that inspiratory muscle training reduces the incidence of PPCs and postoperative hospitalization in patients at high risk of developing pulmonary

complications undergoing coronary artery bypass graft surgery.[13]

The patients of group A were having higher atelectasis score of 2.53+2.66 in chest x ray grading score on day1 morning (baseline) because of which there was a significant improvement seen on day 5, when the chest x ray grading score was 0.53+1.2 where as the baseline score for group B was not much higher on day 1 morning it was 1.27+1.66, so the improvement was lesser on day 5 which was 0.73+1.53 because of which within group analysis for CXR was considered to be insignificant. Statistically the results obtained on inter group comparison were still insignificant since the analysis was done through non parametric test.

A clinically significant difference was noted at the baseline in group A patients, this also signifies the presence of massive airway secretions or congested lung fields in group A patients because of which a significant improvement has been noted with the physiotherapeutic intervention.

The atelectasis can also be caused by reduction of FVC due to reflex inhibition of intercoastal muscles and alterations in ribcage movement post sternotomy. Atelectasis of left lower lobe is a well known post operative complication. The decrease in lung function postoperatively occurs because of reflex inhibition of the diaphragm, the supine position and immobilization. Impairment of mucociliary clearance occurs by anaesthesia and intratracheal tube[19]. Charris Roussos et al has described that the slight expiratory resistance may improve the length-tension relationship of the diaphragm, thus optimizing the condition for next inspiration.[19,27]

Results obtained on within group comparison of PPC's are suggesting that there was significant improvement in both the groups at $p < .001$. Thus the patients in both the groups have been benefitted up to same extent. On between group comparison for PPC's there was no significant improvement noted as $p > .05$ suggesting that there lies no marked difference in improvement for both the groups. These findings are supported by the results obtained by Richter Larsen et al.[19]

Ingwersen et al have investigated the incidence of PPC's after thoracic surgery. He postulated the underlying mechanism for PEP, as the bronchioles with a diameter less than 1 mm have no cartilage supporting their walls and are normally kept open by the transmural pressure gradient, which decreases postoperatively, this may be a significant cause for developing atelectasis. Deep breathing alone is not sufficient to resolve the atelectasis. The increase in pressure created by expiratory air via expiratory resistance connection in PEP raises the intrapulmonary pressure thus increasing the transpulmonary gradient.[20]

More over both the modalities work on similar principles of equal pressure point theory, alveolar interdependence and collateral ventilation i.e why their effects were not drastically different.

Few other possible reasons for the statistical insignificant results might be due to small sample size, Small trials are less likely to identify rare events and intervention related adverse effects.[21] Lack of statistical power to demonstrate a treatment effect. The variation in practice may be due to the lack of a gold standard method for chest physiotherapy.[22]

The PEP increases ventilation by applying a positive pressure of 10-20 cms H_2O at the mouth. FRC is increased during breathing through the device and air moves behind secretions by use of collateral ventilation.

Oscillating devices such as Acapella has been shown to decrease the viscoelastic properties of mucus hence making it easier to mobilize up the airways.

Clinical Relevance :

As Acapella and ACBT are equally effective in treating postoperative pulmonary complications after cardiac valve replacement surgeries, thus they can be safely administered as an airway clearance adjunct to routine chest physiotherapy regimens followed in Intensive Care Units and postoperative wards for cardiothoracic patients.

Ethical Clearance - Taken from Jamia Hamdard committee

Source of Funding - Self

Conflict of Interest - Nil

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Effect of Dynamic Versus Isometric Resistance Exercise on Pain and Functional Ability in Elderly Patients with Osteoarthritis of Knee

Mukesh Yadav[1], Pooja Attrey[1]

[1]Assistant Professor, T.D.T.R D.A.V Institute of Physiotherapy and Rehabilitation, Yamunanagar

ABSTRACT

Objective- To compare the effect of dynamic and isometric resistance exercise using theraband on pain and functional ability in Elderly patient with OA knee in which the subject were challenged to perform the functional tasks including the joints to move over a wide range of motion as an outcome. **Design**: Design of study was experimental. **Subjects**: 30 subjects having OA knee with mean age (58.3±5.8) at AIIMS New Delhi were included in the study. **Materials and Method :** Subjects were randomly allocated in two groups performed Dynamic or Isometric resistance exercises using Theraband (Total 6 exercises) for 6 muscle group of lower limb i.e. ankle planterflexors and dorsiflexors ,knee flexors and extensors ,hip flexors and extensors bilaterally. 1 set of 8 repetitions in 1st and 2nd week and 3 set of 12 repetitions in 3rd and 4th week for 4 weeks. Isometric resistance exercise group performed the exercise by positioning the joint at a predetermined angle i.e. 0˚ of Dorsi flexion and planter flexion when performing ankle planter flexion and dorsi flexion, 10˚ of knee flexion when performing knee flexion and extension and 10˚of hip extension when performing hip flexion and extension. **Data Analysis:** Data was analysed using SPSS 11.5 software. Independent t test was used to compare the difference between groups. The significant level set for the study was p value ≤ 0.05.with in group analysis comparison was done using one way ANOVA for VAS and Time difference at 0th, 2nd and 4th week. Post hoc analysis of VAS and time has been done using LSD at 0th, 2nd and 4th week. The level of significance was set at $p<0.05$. **Results:** Study found a significant time difference between groups while performing activities that need wider ROM which are standing from tailor position and raising from low stool and no significant difference in decline in pain between the 2 groups whereas pain declines significantly in both groups. **Conclusion:** Both the groups showed meaningful improvement in pain while dynamic exercise group results in greater gain in functional ability that require wide ROM isometric exercise group. This suggest that dynamic resistance exercises are more beneficial in improving the function ability of the patient.

Keywords : *Isometric resistance Exercise, Dynamic resistance exercise, pain, functional ability.*

INTRODUCTION

Osteoarthritis is the most common joint disorder with the prevalence that increases with age.[1]In age of 14-15 years only 3% males and 2% of females are found to be affected and in age group of 45-54 years 25 % of male population and 30% of female population suffered from OA and over the age of 65% of males and 68% of females are affected. Osteoarthritis of knee is the third in frequency behind that of spine, ,hip and has greater cost and more associated disability than OA of any other joint. Therefore Lawrence reveals that OA of knee was the second ranking (after cardiovascular disease) of permanent incapacity in people over 50 years of age.[3]

Osteoarthritis is a chronic degenerative disorder primarily affecting the articular cartilage of synovial joints, with eventual bone remodelling and overgrowth of margins of joints.It is characterized by pain ,swelling ,stiffness for less than 30 minutes, crepitus, bony enlargement ,limitation of range of motion ,instability and tenderness. The common physical impairments associated with knee OA are pain, decreased range of motion and quadriceps muscle weakness an addition to the episodes of knee instability.[5]

It has been reported that dynamic resistance training correlates with improved knee strength[6], increased neuromuscular performance[7]and improved performance of functional tasks. Krebs[8] et al reported that Elastic resistance training produced moderate gains in strength along with improvement in gait characteristics in patients with functional limitations. Finally, Damush & Damush[9] reported that elastic resistance training which use elastic bands as the mode of resistance resulted in 14% to 26% improvement in in strength among the community dwelling older women. It might therefore be reasonable to expect that OA patient who undergo dynamic resistance training using theraband will show decline in knee pain and improvement in functional ability.

Rober Topp and Sandra[10] compared the effect of dynamic versus isometric resistance training on pain and functioning among adults with OA of knee and concluded that isometric resistance training is more effective but the limitation of study was the functional tasks selected as outcome had required subject to move over limited range of motion which was similar to the joint angle at which isometric group was trained rather then to move over a broader anatomic range of motion.

Previous investigators [11,12]have reported that by using elastic resistance devices, older adults can gain strength similar to the gains achieved by more traditional mode of resistance without attending any special supervised dynamic resistance training classes. Milkesky [13]et al determined that a home based resistance training program foe older adults using elastic tubing could serve as a practical and effective means of improving muscle strength. The elastic band is used to generate a consistent and controlled force that can be customized to the needs of the patient to provide a resistive force for exercise or to provide a low or high load stretch.

Rita M Patterson [14]etal has found that the quantification of generating properties of the material is important because on a therapeutical basis in appropriate use of material could be harmful. Too much force, torque or pressure may cause inflammation, scarring or deformity and too little force actually may prevent the patient from reaching full rehabilitation potential. Amount of tension generated is dependent completely on the physical properties of elastic resistance. The force generated potential of theraband in turn depends mainly on two aspects. Firstly the effect of prestretching and secondly effect of loading. It has been observed that prestretching as little as 20 times appeared to stabilize the material so that it exhibits consisted force generating properties. And cyclic loading should not be more than 5,700 cycles. It means that a patient could use same piece of theraband for only 5,700 times after that the elastic band loose its property to give same amount of resistance as before.

No study has compare the effects of dynamic versus isometric resistance training in which subjects were challenged to perform the functional tasks which include the joints to move over a broad range of motion as an outcome.

MATERIALS AND METHOD

Sample: 30 subjects with mean age (58.3±10.4) were selected for the study and they were randomly allotted in 2 groups consisting of 15 subjects in each group and written informed consent was taken before participation.

Group A: Dynamic resistance training group

Group B: Isometric resistance training group

Inclusion Criteria:

- Age:45-80 years
- Moderate degree of knee pain because of OA or evidence by a score of 64 or lesse on WOMAC pain subscale.
- Symptomatic primary OA for atleast 3 months.
- Fulfilment of Altman and colloquies criteria of idiopathic OA

Exclusion Criteria:

- Any medical condition that prevent participation in an exercise program or completion of study. e.g. cardiac disease or stroke in past 3 months ,major psychiatric disease.
- Inflammatory arthritis e.g. rheumatoid or psoriatic arthritis
- Exercised regularly defined as an aerobic activity or resistance training 1 time/week for 20 mins or longer.
- Knee arthroplasty or planned knee arthroplasty

in study period.

- Intraarticular steroid injection within two weeks of screening visit.

- Recent (3 months) fracture of lower extremity.

Instrumentation: VAS scale was used for measurement of pain and Time readings using stopwatch was taken to complete the 6 functional tasks on 0,2nd and 4th weeks.

Resistance was given with theraband. It was given according to the strength of patient. Patients were asked to perform 10 repetitions with highly resisted theraband and if was not able to perform then shifted to next level of resistance.

Procedure: Both resistance training groups undergo

- 5 mins of warm up consist of mild unweighted movements

- 30 mins of Dynamic/ Isometric resistance exercises (Total 6 exercises) of 6 muscle muscle group of lower limb i.e. ankle planterflexors and dorsiflexors ,knee flexors and extensors ,hip flexors and extensors.

1 set of 8 repetitions in 1st and 2nd week and

3 set of 12 repetitions in 3rd and 4th week.

- 5 mins of cool down stretching exercises.

Subjects performed these 6 resistance training exercise bilaterally for 3 times a week for 4 weeks .

Resistance was given with theraband whose resistance was selected according to patient's ability. Theraband was stretched 20 times prior to the treatment so that it generate consisted force. Resistance exercise training include resistance exercise of 6 muscle groups of lower limb.i.e. anle planterflexors and dorsiflexors, knee flexors and extensors ,hip flexors and extensors.

Group A: Isometric resistance exercise group-

Positioning the target muscle and joint at a predetermined angle i.e. 0˚ of Dorsi flexion and planter flexion when performing ankle planter flexion and dorsiflexion, 10˚ of knee flexion when performing knee flexion and extension and 10˚of hip extension when performing hip flexion and extension.Resistance of elastic band was such that movement was not possible against the resistance offered by the band.

a.) Hip Extensors

b.) Hip Flexors

c.) Knee Extensors

d.) Knee Flexors

e.) Ankle Planterflexors

f.) Ankle Dorsiflexors

Group B: Dynamic Resistance exercise group-

Subjects performed 6 exercises i.e. Ankle Planter flexion-Dorsiflexion , Knee Flexion-Extension and Hip Flexion –Extension. Resistance of elastic band was adjusted to allow movement against its offered resistance.

a.) Hip Extensors

b.) Hip Flexor

c.) Knee Extensors

d.) Knee Flexors

e.) Ankle Planterflexors

f.) Ankle Dorsiflexors

FINDINGS

Data Collection- VAS scale was used for measurement of pain and Time readings using stopwatch was taken to complete the 6 functional tasks on 0,2nd and 4th week.

Subjects were asked to perform 5 functional task to check the functional ability. These are Standing from tailors position, Rising from Low stool, Rising from chair ,Ascending and Descending stairs(8 Stairs) and Walking(6 Meters).Time taken to complete each task was recorded.

Data Analysis: Data was analysed using software package SPSS 11.5.Independent t test was used to compare the VAS and time readings between the two group at 0th,2nd and 4th week The significant level set for the study was p value ≤ 0.05.With in group analysis comparison was done using one way ANOVA for VAS and Time difference at 0th,2nd and 4th week. Post hoc analysis of VAS and time has been done using LSD at 0th, 2nd and 4th week.

Results: Comparison between VAS score of two groups revealed that there is no significant difference in perceived pain perception of patients of two groups at 0th, 2nd and 4th week. Only the perception in ascending and descending stairs and in 2nd week of standing from tailor position, there is significant difference between

the two groups.

Comparison between the scores of time difference between 2 groups indicates that there is significant time difference between groups while performing activities that need wider ROM which are standing from tailor position and raising from low stool at 0^{th}, 2^{nd} and 4^{th} week . However in the other 3 functional activities those require only limited ROM there is no significant difference in time taken to perform activities at 0^{th}, 2^{nd} and 4^{th} weeks .

Within group comparison of VAS using LSD reveals that pain declines significantly in both the exercises given better result between the 0^{th} to 2^{nd} week comparative to the 2^{nd} to 4^{th} weeks .

Within the group comparison of time difference using LSD found that there is significant time difference in functional task of standing from tailor position , rising from low stool, walking and rising from chair. There is significant difference in time while ascending and descending stairs. Reduction in time period to perform the activities in 2^{nd} to 4^{th} weeks.

Within group comparison using one way ANOVA for VAS indicates that pain declines significantly in both the groups. (Table 1)

Table 1 Within Group Comparison of VAS Using one-way ANOVA

VARIABLES	GROUP	F value	P value
Standing from Tailor Position	A	100.43	.00*
	B	220.60	.00*
Rising From Low Stool	A	118.67	.00*
	B	213.64	.00*
Rising From Chair	A	88.01	.00*
	B	187.48	.00*
Ascending & Descending Stairs(8 stairs	A	168.87	.00*
	B	251.36	.00*
Walking	A	141.06	.00*
	B	152.64	.00*

*Significant Difference

Within group comparison using one way ANOVA for time difference indicates that time is significantly reduced in performing the task in both the group but the Group B are more significant as comparative to Group B. (Table 2)

Table 2 Within Group Comparison of Time Using one-way ANOVA

VARIABLES	GROUP	F value	P value
Standing from Tailor Position	A	.29	.74
	B	12.85	.00*
Rising From Low Stool	A	5.32	.00*
	B	3.61	.03*
Rising From Chair	A	4.53	.01*
	B	19.40	.00*
Ascending & Descending Stairs(8 stairs	A	3.09	.05*
	B	1.13	.03*
Walking	A	6.09	.00*
	B	19.26	.00*

*Significant Difference

DISCUSSION

In this study five functional tasks were include out of which two functional tasks require only limited range of motion while other three functional tasks challenged the patient to perform activity require wide range of motion. The present study found that Dynamic resistance training is more effective than isometric resistance training in performing the functional tasks that require wide ROM while both training are equally effective in reducing perceived knee joint pain and activities that require limited range of motion.

Previous study done by Robert Topp[10]found that isometric resistance training is more effective than dynamic resistance training but they have included functional tasks that require limited ROM. The result is consistent with the result of present study.

The result are consistent with Krebs[8] et al and Jette [15] et al and Damush[9] et al who proposed that dynamic resistance exercise are beneficial and are proved to be effective in reduction of knee pain, increasing muscle strength and improving functional ability. The Dynamic resistance training is more effective than isometric resistance training in performing the functional tasks that require wide ROM because dynamic resistance exercise training improve strength of trained muscle over entire ROM at which resistance taken place whereas in

isometric resistance strengthening occurs at particular joint angle at which training takes place which may explain the limited improvements in functional ability.[10]

Future Research:

Future research can be done to find the effectiveness of isometric over dynamic resistance exercise training in patients with OA on functional ability by incorporating isometric resistance exercise at different joint angles.

Limitation of Study:

In this study only patients having mild to moderate degree of pain were included. There is no evidence regarding the effect of elastic resistance training on the patient having severe pain.

CONCLUSION

The result of the present study support the efficacy of isometric and dynamic resistance training program with theraband elastic bands to patients with OA knee as a method to enhance their ability that require limited range of motion and also to reduce the perceived perception of knee joint pain.

Dynamic resistance exercise training is proved to be more effective than isometric resistance training in improving functional ability that require wide range of motion.

CLINICAL IMPLICATION

As this study significantly support the efficacy of resistance training program with theraband in OA patient. Theraband resistance program can be used in our daily clinical practice in OA patients.

Ethical Clearance: Taken

Source of Funding: Self

Conflict of Interest: None

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Biomechanical Analysis of Lower Extremity Kinematics During Different Types of Stair Locomotion Patterns in Patients with Osteoarthritis of Knee

Ruturaj Shete[1], Twinkle Dabholkar[2]

[1]MPT, [2]Professor, School of Physiotherapy, D.Y. Patil University, Nerul, Navi Mumbai

ABSTRACT

Purpose: To study and compare lower extremity joint kinematics of the affected limb in patients with unilateral knee osteoarthritis during SOS, SBSA1, SBSNA1, SWA1 and SWNA1 stair locomotion patterns.

Method: 15 patients participated in this study. The stair ascent and descent were performed by patients using different stair locomotion patterns i.e. SOS, SBSA1, SBSNA1, SWA1 and SWNA1. Kinematic data was collected using Noraxon motion analyser.

Results: On kinematic comparison of the different types of stair ascent locomotion patterns, the observed trend of the highest to the least movements at the affected knee joint was: SWascA1 > SBSascA1 > SOS ascent > SBSascNA1 > SWascNA1. During stair descent, the observed trend was: SBSdscNA1 > SOS descent > SWdscNA1 > SBSdscA1 > SWdscA1.

Conclusion: All five types of stair locomotion patterns differ kinematically from each other with respect to certain joint angles. Based on the results, the preferred patterns for stair ascent could be SWascNA1 and SBSascNA, and for stair descent could be SWdscA1 and SBSdscA1, due to lower kinematic demands at the knee joint.

Keywords*: Osteoarthritis, Kinematics, SOS, SBSA1, SBSNA1, SWA1 and SWNA1 patterns of stair locomotion.*

INTRODUCTION

Osteoarthritis (OA), also known as degenerative joint disease, is one of the commonest form of arthrit is.[1]Osteoarthritis is primary cause of disability seen in adults over the age of 45 years.[2] In India occurrence of OA reported to be in the range of 17 to 60.6%.[3]

The primary risk factors for osteoarthritis at the knee joint are old age[6], obesity[2] and sex where females have higher probabilities to have osteoarthritis of knee than men[7]. The secondary risk factors are internal derangements such as meniscal or ligament tear caused due to trauma to knee joint, almost 50% of people with meniscus or anterior cruciate ligament tear develop osteoarthritis at the knee joint.[6-13] Joint mal-alignment is known to be an etiological factor for occurrence and development of knee osteoarthritis, due to increase in joint stress [4,5]

Symptoms of knee osteoarthritis include pain, stiffness, and muscle weakness in and around the knee[14]. Symptomatic osteoarthritis of the knee joint considerably limits the activities of daily living[14] and quality of life in affected individuals.[15] Walking, squatting and stair case locomotion are a few commonly performed activities of daily living. As compared to level walking, stair case locomotion demands greater knee range, muscle effort and consequently a higher load on lower extremity joints.[16] The peak joint reaction forces acting on hip and knee joints during these common activities of daily living are higher in stair locomotion as compared to level walking.[17]

Usually, individuals use SOS pattern; however patients having knee pain, older adults and disabled

populations alter their stair locomotion pattern due to reduced muscular strength[18-21], decreases in proprioception and affection in balance mechanisms[20,21]. Individuals with reduced motor function frequently adopt alternate stair locomotion patterns, such as a SBS pattern that deviate from the traditional SOS gait pattern [22,23].

Previous studies on stair activities using motion analysis are mostly limited to knee joint kinematics, with limited emphasis on the the hip and ankle joint kinematics.

Therefore the purpose of this study was to investigate lower extremity joint kinematics of patients with unilateral knee osteoarthritis during SOS, SBSA1, SBSNA1, SWA1 and SWNA1 locomotion patterns to further probe into the biomechanical analysis of stair ambulation.

STUDY PROCEDURE

15 patients diagnosed with unilateral Grade II osteoarthritis of knee joint were recruited in the study. The exclusion criteria were patients with any other type of arthritis, excessive knee pain, history of injury to lower limb in previous 6 months, any pathology of back or pelvis, patients who have undergone any lower extremity surgery, patients with any other systemic, neurovascular disease. Baseline assessment was done in patients which consisted of bilateral lower limb length, foot posture and tightness assessment.

Table 1: Demographic variables of the study group.

Gender	Total number	Age	Height (cm)	Weight (kg)	BMI (kg/m^2)
Male	5	52.2 ± 7.4	173.6 ±6.3	75.4 ±9.2	25.02
Female	10	49.1 ±5.7	161.3 ±2.9	64.1 ±5.8	24.64

The included patients were assessed for lower limb kinematics during 3 types of stair locomotion. The stair case consisted of 4 steps, with all stairs of standard dimension. The step height of each step was 15 cm and tread was of length of 27 cm, selected using the guidelines of previous research in stair ambulation[23]. All patients were instructed to ascend and descend the stairs bare feet at a self-selected speed without any assistive device.

Noraxon motion analyser (3D Inertial Sensor System USA) was used to objectively record the kinematic data from lower extremity bilaterally. Sensors were affixed to pelvis, thighs, shanks and foot bilaterally. Hip movements were assessed in 3 planes i.e sagittal, frontal and transverse planes, knee movements were assessed in sagittal plane and ankle and foot movements in sagittal and frontal planes.

Each individual was asked to ascend and descent the stairs using three different stepping patterns:

I. Step over step (SOS).

II. Step by step (SBS) with placement of both the feet on the same step. The SBS pattern of stair locomotion was done in 2 patterns. In the first pattern of stair locomotion, the affected leg is placed first followed by non-affected leg abbreviated as SBSA1. In the second pattern of stair locomotion the non-affected leg is placed first followed by affected leg abbreviated as SBSNA1.

III. Side stair (SW) with placement of both feet on the same step. The SW pattern of stair locomotion was done in two patterns. In the first pattern of stair locomotion, the affected leg is placed first followed by non-affected leg abbreviated as SWA1. In the second pattern of stair locomotion the non-affected leg is placed first followed by affected leg abbreviated as SWNA1.

These patterns are similar in both SBS and SW ambulation except in SBS, the individual walks facing the stairs and in SW patterns the patient walks sideways.

RESULTS

Repeated measure ANOVA test was used for statistical analysis.

All the numbers show in table-2 and table-3 are presented as Mean (+/- SD). *indicates significant difference between the values in that row. Values with

similar superscripts are not statistically different. (e.g. two values having superscript of [a] are not different)

Table 2: The mean of maximum angles for the hip, knee, and ankle during different types of stair ascent patterns.

Movement	SOS ascent	SBSascA1	SBSascNA1	SWascA1	SWascNA1	p-value (<0.05)
Hip Flexion	53.7 (9.6)b	52.7 (8.4)b	27.3 (4.6)a	50.1 (7.8)b	30.7 (7.8)a	0.0003*
Hip extension	3.7 (2.9)a	4.9 (2.8)a	3.0 (2.2)a	6.2 (3.7)a	3.3 (2.6)a	0.11
Hip Abduction	10.5 (6.9)b	5.2 (6.3)a	10.8 (7.2)b	5.3 (4.4)a	21.0 (6.6)c	0.0004*
Hip Adduction	21.5 (11.9)b	20.3 (11.3)b	6.6 (2.1)a	20.8 (11.4)b	8.4 (4.6)a	0.0006*
Hip Internal Rotation	13.4 (6.3)a	15.8 (8.5)a	14.4 (5.8)a	16.1 (6.8)a	13.8 (6.5)a	0.80
Hip external rotation	20.0 (9.0)b	13.2 (12.9)a	21.2 (15.7)b	12.7 (10.9)a	27.6 (11.2)c	0.0008*
Knee Flexion	63.7 (11.8)c	69.5 (13.5)d	42.1 (10.8)b	72.6 (15.1)d	32.8 (8.61)a	0.0005*
Knee Extension	3.2 (2.4)a	3.2 (2.3)a	3.0 (1.9)a	2.30 (2.1)a	3.8 (1.7)a	0.179
Ankle Dorsiflexion	22.2 (6.0)b	23.1 (5.2)b	16.4 (4.8)a	24.3 (4.3)b	16.2 (4.0)a	0.0004*
Ankle Plantarflexion	24.7 (14.5)a	23.7 (17.9)a	21.6 (12.2)a	24.3 (12.6)a	23.6 (11.6)a	0.240
Ankle Inversion	22.7 (15.4)a	19.6 (9.1)a	29.0 (17.2)b	21.3 (11.1)a	29.3 (13.4)b	0.001*
Ankle Eversion	17.1 (10.1)a	15.8 (11.2)a	14.7 (7.8)a	16.2 (8.2)a	16.4 (13.5)a	0.165

SOS: step over step Ascent

SBSascA1: step by step ascent when affected extremity is placed first

SBSascNA1: step by step ascent when non affected extremity is placed first

SWascA1: Sideways stair ascent when affected extremity is placed first

SWascNA1: Sideways stair ascent when non affected extremity is placed first

Table 3: The mean of maximum angles for the hip, knee, and ankle during different types of stair descent patterns.

Movement	SOS descent	SBSdscA1	SBSdscNA1	SWdscA1	SWdscNA1	p-value (<0.05)
Hip Flexion	37.3 (5.3) a	30.4 (3.8)a	40.6 (7.8)b	27.4 (4.8)a	49.1 (9.1)c	0.0004*
Hip extension	3.5 (3.9)a	4.7 (3.9)a	5.3 (3.9)a	4.4 (3.9)a	5.8 (3.9)a	0.175
Hip Abduction	12.4 (7.2)b	12.5 (8.9)b	6.8 (5.8)a	17.5 (7.2)b	7.1 (5.1)a	0.0007*
Hip Adduction	16.0 (8.5)b	6.7 (3.1)a	16.6 (8.3)b	9.5 (3.9)a	18.4 (11.2)b	0.0005*

Cont... Table 3: The mean of maximum angles for the hip, knee, and ankle during different types of stair descent patterns.

Hip Internal Rotation	14.1 (5.4)a	13.4 (7.3)a	14.2 (9.3)a	15.7 (9.1)a	16.2 (11.1)a	0.663
Hip external rotation	23.6 (12.4)b	24.9 (14.9)b	15.3 (13.1)a	24.1 (14.8)b	16.1 (11.3)a	0.002*
Knee Flexion	68.1 (10.4)d	35.1 (8.5)b	68.2 (9.2)d	27.3 (4.8)a	61.8 (12.1)c	0.0006*
Knee Extension	4.8 (4.1)a	4.3 (2.4)a	3.9 (3.4)a	3.6 (1.4)a	3.9 (2.2)a	0.712
Ankle Dorsiflexion	24.1 (5.2)b	15.8 (4.9)a	22.5 (5.2)b	22.0 (3.0)b	24.8 (3.5)b	0.0008*
Ankle Plantarflexion	33.4 (11.3)c	32.8 (11.8)c	20.8 (13.4)a	26.7 (7.4)b	21.1 (16.6)a	0.0009*
Ankle Inversion	27.7 (13.4)b	26.8 (13.2)b	20.5 (8.5)a	28.6 (10.9)b	20.8 (8.9)a	0.001
Ankle Eversion	19.1 (10.3)b	10.9 (9.1)a	19 (9.7)b	12.2 (11.5)a	18.7 (10.5)b	0.0004*

SOS: step over step descent

SBSdscA1: step by step descent when affected extremity is placed first

SBSdscNA1: step by step descent when non affected extremity is placed first

SWdscA1: Sideways stair descent when affected extremity is placed first

SWdscNA1: Sideways stair descent when non affected extremity is placed first

DISCUSSION

Stair ascent

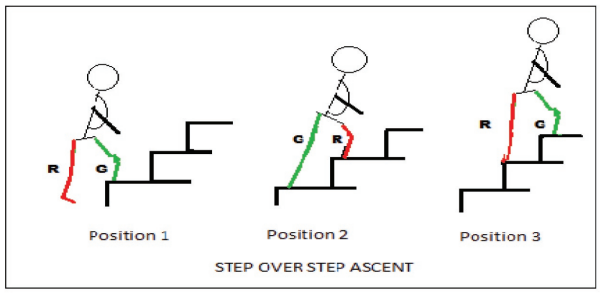

Figure 1:- Each limb red and green coloured alternately performs the function of the lead leg and trail leg.

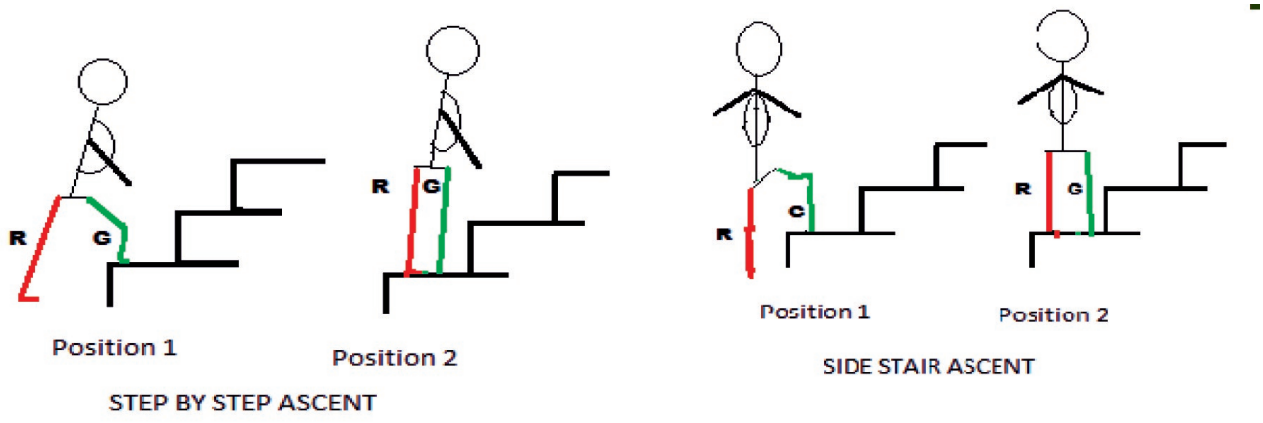

Figure 2:- In both types of stair ascent patterns, the red coloured leg is trail leg and the green coloured leg is lead leg.

The results of our kinematic analysis indicate that the knee flexion of the affected limb was relatively lower in SWascNA1 followed by SBSascNA1 as compared to rest of the types.

Also the maximum hip flexion, hip adduction, and ankle dorsiflexion angles of the affected limb showed significant differences between stair ascent patterns, with relatively lesser maximum amplitude of movement seen in SBSascNA1 and SWascNA1 as compared to rest of the types. Whereas, the maximum hip abduction, hip external rotation and ankle inversion angles of the affected limb were significantly larger in SWascNA1 and SBSascNA1 compared to the SBSascA1 and SWascA1. The reduced amplitude of hip, knee flexion and ankle dorsiflexion were compensated by hip during abduction and external rotation and ankle inversion during these patterns for completing stair ambulation.

In a study done by Samantha M. Reid et al[18] they found that, during stair ascent different peak antero-posterior (AP) forces were observed across all three stepping patterns (SOS > SBSL > SBST, $P < 0.05$).

This supports our study where we have found that during stair ascent peak knee flexion angles were different across all three stepping patterns (SOS > SBSL > SBST, $P < 0.05$). The kinematic demand placed on the trail leg are relatively less compared to the demand placed on the lead leg during SBSascNA1 and SWascNA1.

A study done by Patrick A Costigana et al[24] have found that during traditional SOS pattern of stair climbing the peak distal–proximal tibiofemoral and patello-femoral joint contact force was on average 3 times body weight and could be as high as 6 times body weight. Higher contact forces occurred during greater knee flexion, where there is a smaller joint contact area resulting in high contact stresses.

Results from our study suggest that in SWascNA1 type of stair ascent there was less kinematic demand placed at the knee joint of the trailing leg /affected leg compared to SBSascNA1. But, in SWascNA1 there was more kinematic demand placed at the hip joint while abducting and placing the leading leg/non-affected leg on the stair compared to SBSascNA1.

Stair descent

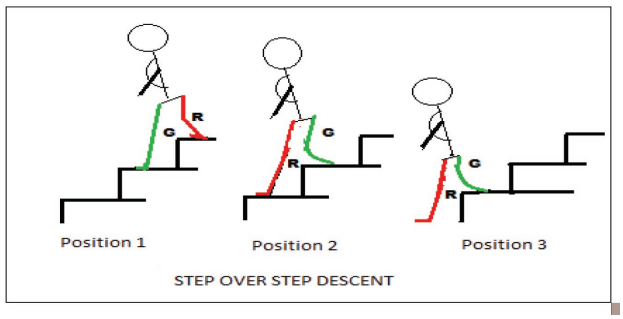

Figure 3:- Each limb red and green coloured alternately performs the function of the lead leg and trail leg.

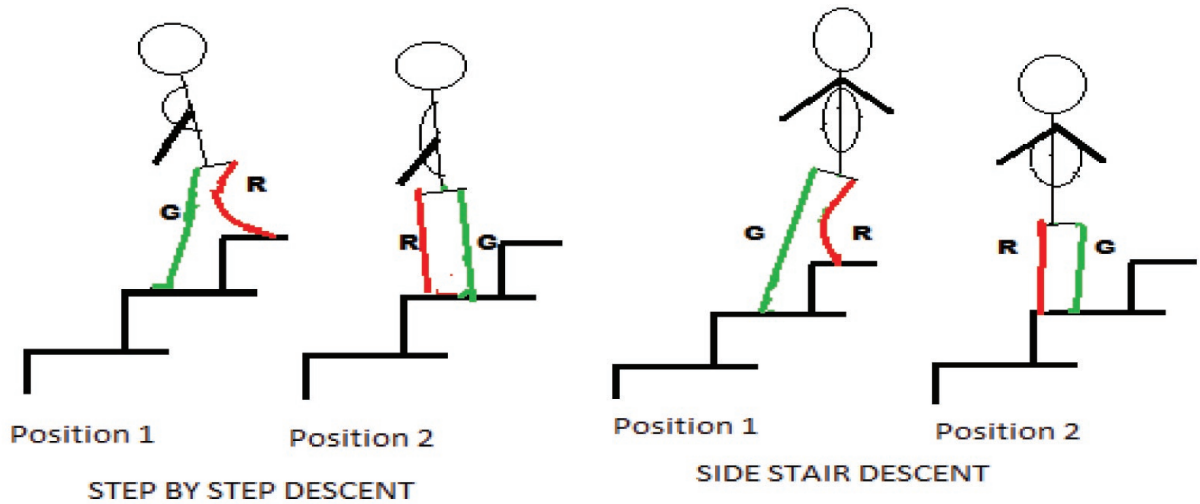

Figure 4:- The red coloured leg in both types of stair descent patterns is trail leg and the green coloured leg is lead leg.

The results of our kinematic analysis indicate that the knee flexion of the affected limb was relatively lower in SWdscA1 followed by SBSdscA1 as compared to the rest of the types.

The mean of hip abduction, hip external rotation, ankle inversion and ankle plantarflexion angles of the affected limb were significantly larger in SWdscA1 and SBSdscA1compared to SBSdscNA1 and SWdscNA1. This shows that the movements which were decreased at hip, knee and ankle joint in were compensated at hip during abduction and external rotation and at ankle during inversion and plantarflexion.

In a Study done by SAMANTHA M. REID[18] they found that, during stair descent different peak antero-posterior forces were observed across all three stepping patterns (SBST >SOS >SBSL, $P < 0.05$).

This supports our study where we have found that during stair descent the sagittal-plane peak knee flexion angles were different across all three stepping patterns (SBST >SOS >SBSL, $P < 0.05$). The kinematic demand placed on the leading leg are relatively less compared to the kinematic demand placed on the trailing leg during SBSdscA1 and SWdscA1.

A study done by Masakai Hasegawa et al[26] have found that during traditional step over step type of stair descent knee joint forces were increased by 3.67-4.78 times body weight.

Results from our study suggest that in SWdscA1 type of stair descent there was less kinematic demand at the knee joint of the leading leg, compared to SBSdscA1, which was approximately 8° higher.

Results from our study suggest that in SWdscA1type of stair descent there was more frontal plane kinematic demand at the hip joint while abducting and placing the leading leg on the stair compared to SBSdscA1 type of stair descent.

CONCLUSION

All five types of stair locomotion patterns i.e. SOS, SBSA1, SBSNA1, SWA1 and SWNA1 differ kinematically from each other with respect to certain joint angles. Based on the results, the preferred patterns for stair ascent could be SWascNA1 and SBSascNA1, and for stair descent could be SWdscA1 and SBSdscA1, due to lower kinematic demands at the knee joint. This can have clinical relevance in patients with knee pain, knee osteoarthritis and patella-femoral pain where they can use these patterns to minimize knee flexion movements, which can reduce joint reaction forces at the knee joint.

Ethical Approval:- DY Patil University School of physiotherapy Ethical Committee.

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Conflict of Interest:- Nil

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Effectiveness of Kinesiotape Versus Counterforce Brace as an Adjunct to Occupational Therapy in Lateral Epicondylitis

Saurabh Phadke[1], Snehal Desai[2]

[1]M.O.Th (Mumbai), [2]Associate Professor, Seth G.S. Medical College and KEM Hospital

ABSTRACT

Objective: The purpose was to investigate and compare effectiveness of Kinesiotaping and counterforce brace as an adjunct to Occupational Therapy in lateral epicondylitis.

Methodology: It is a prospective, comparative and interventional randomized study.

The study was conducted on 26 patients with a total of 14 males and 12 females diagnosed as a case of Lateral epicondylitis as per the inclusion criteria. In Group A, (kinesiotaping): 12 subjects, 7 males and 5 females. In Group B (counterforce brace): 14 subjects, 7 males and 7 females. Jamar dynamometer. Visual Analog Scale were used to quantify grip strength, pain. Interventional protocol was of 6 weeks. Re-evaluation was done on the 1st day, end of 2nd week, end of 4th week and finally end of 6th week. Mann Whitney U test was used for comparison of mean between two groups and repeated measures ANOVA test was used for comparison within group. The results showed significant pain reduction and improvement in grip strength but no statistically significant difference seen in between two groups ($p>0.05$). The study concludes that Kinesiotape as well as Counterforce brace is equally effective in respect to pain, grip strength and decreasing disability in patients with lateral epicondylitis.

Keywords: *Lateral epicondylitis, kinesiotaping, counterforce brace.*

INTRODUCTION

'Tennis elbow' also known 'lateral epicondylitis' is a name used for a painful condition at or about the lateral epicondyle of the humerus. The structure most commonly affected in this condition is the origin of the extensor carpi radialis brevis (ECRB).[6] The most frequently used term is probably Tennis elbow, implying a relationship with repetitive mechanical load while using a forceful grip, as in playing tennis.[2,7,17]

The main cause of Tennis elbow is the exertion, repetitive[8,6,7] or over-use[2,6,7] of the finger and wrist extensors or alternating pronation - supination[5,10,2,17,7] which originate from lateral epicondyle of the humerus which leads to degenerative condition.[2,5,17,7] Lateral epicondylitis can be characterized by a spectrum of severity from mildly irritating to a debilitating condition.[4] Most lesions are not acquired through playing tennis (Nirschl, 1973).[5,16] Once the condition has started even simple daily activities such as shaking hands, turning a door handle, washing clothes, utensils and lifting a teapot etc. can become excruciatingly painful.

Lateral epicondylitis often has a chronic course lasting from several months to years, with frequent recurrences[22,39] in spite of a number of different treatments. It often persists becoming a disability (World Health Organization, 1980) as it often restricts the ability of workers to do their job, resulting in decreased productivity.[9,29] It also restricts the ability to pursue chosen leisure activities. At the extreme, patients with lateral epicondylitis can become a handicap (World Health Organization, 1980) as they are prevented entirely from performing certain activities inherent in roles which are important to them.[9]

Prevalence rate for Lateral epicondylitis was found out to be 1% to 3 % in both sexes.[2,5,7,11,16,] Systematic reviews from the Cochrane collaboration have summarized the evidence for conservative management and found evidence to support a number of interventions, including the short-term benefits of exercise, education, and ultrasound.[19] Many authors found weak evidence to support use of orthosis.[11,18,19,6] Conversely, better results with the use of brace with greater grip strength has also

been found in literature. However well designed studies on the effectiveness of treatments and their outcomes are lacking.[7,9,16,19]

One of the methods supplementing the therapy is 'Kinesiotaping®'. It is a non – invasive therapy developed by Dr. Kenzo Kase, Japanese born, American trained chiropractor and propagated in the World since 1963.[12,20] Based on literature, Kinesiotaping is used for pain relief, supporting muscle during movement, decreasing lymphatic congestion by increasing lymphatic motility, correction of joint mis-alignment by balancing agonist and antagonist muscles, improve propriocetive and kinesthetic awareness.[20]

The use of splints or braces is a widely accepted treatment modality for Tennis elbow (Nirschl & Groppel, 1986).[9] Splints are designed to reduce the stress concentration on the tendo-osseous junction. This could occur because some of the tensile forces generated by the wrist extensors which is absorbed by the circumferential strap by 'counterforce effect'. Thus, the name 'Counterforce brace'. This brace worn on the proximal insertion of the wrist extensors on the lateral epicondyle.[18] It leads to decrease in inflammation and facilitates healing[6] By using these splints it helps to reduce symptoms while using the affected arm for self-care, leisure and productive activities. It is used as standard form of treatment in several hospitals.

Studies have been conducted using Kinesiotape and Counterforce brace individually and both have achieved good results. Thus the research question was: Is Kinesiotaping – a newer method as an adjunct to conventional Occupational therapy more effective than traditional counterforce brace as an adjunct to conventional Occupational therapy.

Aim:

To study and compare the effectiveness of Kinesiotape versus Counterforce brace as an adjunct to Occupational Therapy in lateral epicondylitis.

Objectives:

- To measure pain and grip strength in individuals with lateral epicondylitis.
- To remediate the effects of the same using Kinesiotape and Counterforce brace.

Hypothesis:

H_0: Kinesiotape as well as Counterforce brace both will not be effective as an adjunct to Occupational Therapy.

H_1: Kinesiotape will be more effective as compared to Counterforce brace as an adjunct to Occupational Therapy.

H_2: Kinesiotape and Counterforce brace both will be effective as an adjunct to Occupational Therapy.

MATERIAL & METHOD

It was a prospective, comparative and interventional randomized study.

Simple Random Sampling using Lottery Method with replacement was used. Initially 30 patients were selected for the study, out of those 30 patients, 4 cases dropped out.

Table 1: Demographic data showing the number of patients, gender and mean age.

Group	N	Male	Female	Mean Age
Group A	12	7	5	44.66
Group B	14	7	7	40.42

Conventional protocol was of 6 weeks.

Phase 1 (0 to 2 weeks) – Rest.

Phase 2 (3^{rd} to 4^{th} week) – stretching exercises.

Phase 3 (5^{th} to 6^{th} week) – resistive exercises.

Re-evaluation was done on the 1^{st} day, end of 2^{nd} week, end of 4^{th} week and finally end of 6^{th} week.

Group A: Kinesiotape plus conventional occupational therapy program.

Initial 3 weeks with Inhibitory and Space corrective method and last 3 weeks with Facilitatory method.

Group B: Counterforce brace plus conventional occupational therapy program.

Initial 3 weeks with continuous bracing (only removed while exercising and ADL) and in last 3 weeks, brace was released and patients were asked to identify

the painful activities and wear the brace accordingly.

Material used for Treatment

1. Ultrasound given to both group as a part of conventional Occupational therapy program for 1 week.
2. Kinesiotape given to Group A.
3. Counterforce Brace given to Group B
4. Half Kg weighted cuff and 1 Kg dumbbell

Inclusion Criteria

1. Age: 20 to 50 years.
2. Gender: males and females will be included.
3. Diagnosed as lateral epicondylitis by physician.

Exclusion Criteria

1. Patients with age less than 20 and more than 50.
2. Patients with cervical radiculopathy, proximal neurovascular entrapment and radial tunnel syndrome. Referred pain from proximal upper quarter structures.
3. Other musculoskeletal conditions.
4. Neurological affectations.
5. Hypertension.
6. Pregnant females.
7. Congenital anomalies.

Outcome Measures

1. Grip strength by Jamar dynamometer.
2. Pain by Visual Analog Scale.

RESULTS AND TABLES

Table 2: Comparison of VAS between Group A and Group B

Weeks	Group A				Group B				Mann Whitney test	P value
	Mean	SD	Median	IQR	Mean	SD	Median	IQR		
1 Day	7.08	1.24	7.50	2	7.43	1.60	8	3	-0.766	0.444
2 week	5.75	2.14	6.50	3.50	5.86	1.75	6	2	0.000	1.000
4 week	4.00	1.95	5.00	3	3.64	1.86	4	3	-0.528	0.597
6 week	2.17	1.80	2.50	3.50	1.71	1.77	1	3	-0.555	0.579

P value less than 0.05 is considered as significant difference

No Statistical Significant difference seen in any weeks when compared between Group A and B.

One way repeated test done for comparison of VAS within Group A as well as Group B. Difference was significant

Table 3: Comparison of Grip Strength between Group A and Group B

Weeks	Group A				Group B				Unpaired T test	P value
	Mean	SD	Median	IQR	Mean	SD	Median	IQR		
1 Day	20.33	17	16	10.92	19.86	21	12	8.39	-0.126	0.901
2 week	22.00	19	14	11.09	22.43	24	14	9.74	0.105	0.917
4 week	22.83	22	12	8.84	26.14	25	12	9.78	0.899	0.378
6 week	28.00	28	13	10.20	29.43	28	10	10.21	0.480	0.635

P value less than 0.05 is considered Significant

No Statistical Significant difference seen in any weeks when compared between Group A and B.

One way repeated test done for comparison of Grip strength within Group A as well as Group B. Difference was significant.

DISCUSSION

On comparing Visual analogue scale (VAS), more pain reduction was seen in Group B than Group A. This can be attributed to wearing of brace continuously for 3 weeks and in latter 3 weeks patients were asked to identify their painful activity. The above finding co-relate well with counterforce brace, a study done by P.A.A. Struijs[11] on Brace versus Physical Therapy or a combination of both. They hypothesized that working mechanism of the brace is that it reduces the forces on the common extensor tendon and will therefore decrease the patient's pain during activities in which the extensor muscles contract. This was supported by their outcome measure 'inconvenience during daily activities'. The brace-only group was superior on this outcome measure when compared to physical therapy. The combination group showed a similar trend, but the difference was not statistically significant. This outcome showed a major advantage for use of the brace, with implications for daily practice and patient education.[11]

Whereas Group A were given Kinesiotaping with inhibition and space corrective technique in first 3 weeks but later 3 weeks they received facilitation technique only. Inhibition and Space corrective technique, both were used for reducing pain and inflammation which they didn't receive in later phase. And inhibition and facilitation techniques being opposite to each other cannot be used simultaneously on the same person and on the same part of the body. But still the differences between both groups were less and both methods can be said to be effective individually.

Mean values of Grip strength was found to be consistently more in Group B than Group A. Counterforce brace affects joint proprioception and increases the pain threshold to passive stretching of muscles as it compresses the musculotendinous region limiting muscle expansion during muscle contraction. Biomechanical studies have shown that a forearm orthosis can decrease the forces acting at the ECRB origin if the pressure is over the belly of the ECRB, but tends to be more effective if the pressure is distal to the lateral epicondyle[18].

Counterforce brace results were similar to the study by Fahimeh Jafarian[18] on immediate effect of orthoses in grip strength in patients with lateral epicondylosis. Results indicated that application of counterforce orthoses at the elbow improved pain free grip strength in individual with lateral epicondylosis. These results are in agreement with those reported by P.A.A. Struijs[11], they found that counterforce strap alone had greater effect on activities of daily living than physical therapy alone.

On the other hand Kinesiotaping (Group A) also showed significant improvement within group this can be due to the type of technique used that is inhibition method based on Newton's 3rd law of motion and also only stretching exercises were given to patients, which caused decrease in pain but also decrease in muscle contraction which was needed for inflammation to subside. Drastic change in mean scores was seen in 4th week which can be said because of pain and inflammation subsided and facilitation technique along with resistive exercises given in Phase 3.

A powerful grip requires activation of wrist extensors to stabilize the wrist joint and allow extrinsic finger flexors to function efficiently. In patients with lateral epicondylitis, grip strength is often reduced because of pathological involvement of the common tendon of the wrist extensor muscles.[20] The rationale was that possible changes in wrist extensors strength resulting from KT application may be accompanied by changes in grip strength. In contrast, Lee et al[11] observed a significant increase in grip strength after application of a single strip of KT on flexor muscles of the forearm from origin to insertion (Facilitation technique). Moreover, tapes were also applied to the biceps brachii. In our study, regardless of the targeted wrist extensor muscle group and the application direction, the application of a single strip was insufficient to simultaneously influence agonists and synergists for gripping. Thus, the grip strength results can be reasonably explained by the taping done only on wrist extensors and not on wrist flexors. A possible explanation for difference in the results of our study and the study by Lee et al[11], is the forearm position during measurement of grip strength. We measured grip strength with the forearm in the neutral position, whereas Lee et al[11] measured grip strength with the forearm supinated. Grip strength is stronger in forearm supination than in the neutral position.

Kinesiotaping as well as Counterforce brace proved to have significant ($p<0.05$) changes seen within groups but when compared between two groups, they showed no significant difference. This means that both modes of treatment had beneficial effects along with conventional Occupational Therapy program and thus H_2 hypothesis is proved.

CONCLUSION

Kinesiotaping as well as Counterforce brace has been proved to be equally effective in respect to Pain, Grip strength.

Limitations

1) Small sample size
2) Limited time period.

Source of Funding: Self

Ethical Clearance: Approval from the Ethics Committee of Seth G.S. Medical College and KEM Hospital was taken before intervention.

Conflict of Interest: There is no conflict of interest.

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Effect of Body Position on Heart Rate Recovery after Sub-maximal Test in Normal Subjects

Tiwari Gyan Prakash[1], Raghav Deepak[2], Tiwari Pooja[3], Sharma Nidhi[4], Rani Priyanka[5]

[1]Senior Physiotherapist, Way to Fitness Clinic, Ghaziabad, [2]Principal, Santosh Medical College, [3]Assistant Professor, [4]HOD, [5]Assistant Professor, Adhunik Institute of Education and Research, Ghaziabad

ABSTRACT

Gyan et al worked to study the effect of body position on heart rate recovery after sub-maximal six minute walk test in normal subjects. The subjects were tested in two sessions on two consecutive days. The base line values of the subjects were recorded, i.e. the Heart rate. Then they performed the 6-minute walk test and were made to be positioned in the randomized test positions, namely, supine with legs raised to 70 degrees and supine with legs raised to 90 degrees position. Post test measurements of Heart rate were taken with the help of a pulse oximeter, starting from 0 minute to the end of 5th minute. The conclusion of the study was that Supine with legs raised to 70^0 leads to a better recovery when compared to Supine with legs raised to 90^0 position at the end of 1st minute, however further studies are necessary to establish it for the rest of the recovery duration.

Keywords: *Heart Rate Recovery, Leg raise, 6 Minute walk test.*

INTRODUCTION

Civilization and industrialization make our life pleasant, jubilant and luxuriant. But automation and other technologies have contributed to lessen the physical activities at work place and home[4], and this sedentary lifestyle i.e. the lack of exercise is contributing to reduced cardiorespiratory fitness[18]. Exercises are good method to improve the cardiorespiratory fitness[19]. The assessment of cardio respiratory fitness is very important and can be done by the use of various exercises[4].

Exercises are characterized by a decrease in parasympathetic tone and an increase in sympathetic tone, resulting in an increase in heart rate (HR) [14]. Heart rate is a good measure of general health[10]. During exercise, heart rate (HR) and myocardial contractility increases to meet the energy demands of working muscles. With the cessation of exercise, the decrease in HR immediately after exercise is mainly the function of a reactivation of the parasympathetic nervous system[17] and sympathetic tone withdrawl[14].

Postexercise Heart Rate Recovery (HRR) is commonly used in noninvasive assessment procedures for the determination of cardiovascular parasympathetic function. Evaluation of cardiovascular parasympathetic function is important because various researches have documented that a delay in parasympathetic reactivation is an indicator of cardiovascular disease[20]. Recovery of heart rate is defined as the reduction in the heart rate from the rate at peak exercise to the rate one minute after the cessation of exercise[10]. The rate of decrease in heart beat frequency and the length of time to recovery after exercise are commonly used as indicators of cardiovascular fitness[13, 16].

Recent studies have highlighted the prognostic value of heart rate (HR) recovery. While earlier physiologic studies suggested a rapid HR recovery response to exercise to be a marker of physical fitness, only recently its prognostic value has been reported[6]. A delayed decrease in heart rate during the first minute after exercise has been suggested to be a powerful and independent predictor of all-cause mortality[13]. The rate of HR return to baseline after exercise is theorized to be due to high vagal tone associated with fitness and good health[6].

It has been found that higher heart rates lead to an increase in arterial stress and therefore an increased prevalence of occurrences such as atherosclerosis and cardiovascular disease[5]. Thus Heart rate recovery is an important diagnostic tool to determine the cardiac health

of a person. Heart rate recovery as a marker of prognosis has been validated in both asymptomatic persons and patients being evaluated for chest pain[15]. These studies found that patients with a reduced HR recovery possess greater risk of death as compared to patients with heart rate that shows rapid recovery [15].

Heart rate recovery can be measured in various body positions. Previous studies have been conducted to search the favorable body position for the heart rate recovery; some determined that supine is a good position for heart rate recovery[2]. Some studies were conducted in supine with leg raised position to 90 degrees[1] and with 70 degrees[2]. But there is lack of literature regarding the favorable position for heart rate recovery among these positions.

Furthermore studies have measured heart rate recovery after initial few minutes[3] but none of the study, to the best of our knowledge has measured the recovery at the end of each minute starting from 1 to 5. Thus the present study aims to find out which of the two recovery position, i.e. 90^{o} or 70^{o} proves to be better for heart rate recovery after a sub-maximal test.

METHOD AND METHODOLGY

Instrumentation:

- Pulse oximeter[3,8]
- Stop watch
- 30 meter straight corridor[8,48,49,50]
- Inch tape
- Goniometer
- Chairs
- Tilt table

METHODOLGY

Study design: Randomized same subject design.

Study setting: All the subjects were the student of Santosh medical college and were recruited randomly after signing the consent form.

Study sampling: Simple randomized sampling technique.

Sample Size: 30 subjects were recruited.

Inclusion criteria:

- Age: 20-25 years
- Gender: Males

Exclusion criteria[4,7,11]:

- Subjects with acute systemic condition which may hinder the test.
- Subjects with physical training.
- Significant drop (20 mm Hg) in systolic blood pressure or a failure of the systolic blood pressure to rise with an increase in exercise intensity.
- Excessive rise in blood pressure: systolic pressure > 260 mm Hg or diastolic pressure > 115 mm Hg.
- Signs of poor perfusion: light headedness, confusion, ataxia, pallor, cyanosis, nausea or cold and clammy skin.
- Subject requests to withdraw from the test.
- Physical or verbal manifestation of severe fatigue.
- Failure of the testing equipment.

Variables:

Independent variables:

- Supine with legs elevated at 70 degrees
- Supine with legs elevated at 90 degrees

Dependent variables:

- Heart rate recovery.

PROCEDURE

The subjects were tested in two sessions on two consecutive days. The Subjects were well rested, and were advised to avoid any unusual activity the day before and they were also asked to refrain from unusual exercise, undue stress on the day of data collection session to minimize the effect of these variables on hemodynamic and respiratory status.

On arrival of hospital, the base line values of the subjects were recorded, i.e. the Heart rate. Then they performed the 6-minute walk test and were made to be positioned in the randomized test positions, namely, supine with legs raised to 70 degrees and supine with legs raised to 90 degrees position. Post test measurements were taken with the help of a pulse oximeter, starting from 0 minute to the end of 5^{th} minute.

STATISTICAL ANALYSIS

The data of this study was analyzed by applying paired "t- test" using SPSS 11.5 version. P value was set at ≤ 0.05

RESULT

Table 1: Shows the pre test and post test values of supine with legs raised to 70 degrees and its standard deviation

Supine with legs raised to 70 degrees (Within group) Heart Rate		
Pre test	Post test	P-Value
92.43±7.98	124.87±16.43	0.001(*)
92.43±7.98	104.93±14.69	0.001(*)
92.43±7.98	98.40±12.70	0.005(*)
92.43±7.98	93.30±9.72	0.625
92.43±7.98	90.20±9.37	0.223
92.43±7.98	86.30±8.78	0.062

*indicates that the value is significant. Significance is P < 0.05

Table 2: Shows the pre test and post test values of supine with legs raised to 90 degrees and its standard deviation

Supine with legs raised to 90 degrees (Within group) Heart Rate		
Pre test	Post test	P-Value
89.00±6.73	123.70±15.22	0.001(*)
89.00±6.73	110.70±16.43	0.001(*)
89.00±6.73	102.27±14.19	0.001(*)
89.00±6.73	95.20±11.16	0.056
89.00±6.73	91.03±10.61	0.263
89.00±6.73	87.23±9.99	0.321

*indicates that the value is significant. Significance is P < 0.05

Table 3: Shows the pre test and post test values of supine with legs raised to 70 and 90 degrees and its standard deviation

Supine with legs raised to 90 degree + Supine with legs raised to 70 degree (between group) Heart Rate			
	90 degree (Mean+SD)	**70 degree (Mean+SD)**	**P-Value**
Pre test	89.00±6.73	92.43±7.98	0.060
Post-test 0 min	123.70±15.22	124.87±16.43	0.582
1 min	110.70±16.43	104.93±14.69	0.023(*)
2 min	102.27±14.19	98.40±12.70	0.086
3 min	95.20±11.16	93.30±9.72	0.303
4 min	91.03±10.61	90.20±9.37	0.601
5 min	87.23±9.99	86.30±8.78	0.517

***INDICATES THAT THE VALUE IS SIGNIFICANT. SIGNIFICANCE IS P < 0.05**

DISCUSSION

In the present study we evaluated the effects of different body positions on Heart Rate Recovery measured at rest (baseline) and after Submaximal exercise test (6 min walk test). The rise in heart rate during exercise is considered to be due to the combination of parasympathetic withdrawal and sympathetic activation whereas the fall in heart rate immediately after exercise is considered to be a function of the reactivation of the parasympathetic nervous system as suggested by Christopher R. Cole et al (2004) they also suggested that recovery of the heart rate immediately after exercise is an important prognostic marker and thus this study tried to find out a body position which will lead to a quicker and efficient recovery of the person after the

submaximal exercise test in young and healthy subjects who were untrained and all the subjects had a similar lifestyle thus eliminating a possibility of the effect of endurance on the results.

The positions that were evaluated were Supine with legs raised to 70^0 and Supine with legs raised to 90^0. The Heart rate recovery was studied in both the position starting from 0 minute till the end of 5th minute. At the end of 1st minute there is a significant difference between the two positions, the subjects in 90^0 leg raised position recovered by 13 beats in a minute whereas the subjects in 70^0 leg raised position recovered by 20 beats in a minute which is a significant difference and thus indicates that the 70^0 leg raised position has an advantage over the 90^0 leg raised position these findings are similar to M. Buchheit et al (2009), they found that Supine and Supine with legs raised to 70^0 leads to HRR of 23.2±8.0 and 22.7±12.1 respectively thus stated that both positions are equally good whereas the study conducted by Otto F. Barak et al (2009) stated that Supine position had an advantage over the 90^0 so in our effort to find out that weather 70^0 legs raised position is better than 90^0 leg raised position, we found out that similar to M. Buchheit et al (2009) Supine with legs raised to 70^0 lead to a quicker recovery at the end of the 1st minute as compared to the legs raised to 90^0. But after the 1st minute although the recovery per minute till the 4th minute is more in 90^0 leg raised than the 70^0 leg raise with the last minute recovery equal in both but the results are not significant so further studies are required to establish any further difference.

As stated by M. Buchheit et al (2009) The present findings may, however, be of particular importance for clinicians wishing to choose the most appropriate (i.e. safe) post exercise body position for their patients. Although evaluation of the influence that body position has on autonomic function is important as there might be some difference it the way it influences the trained and untrained subjects.

Future Research Suggestions: Because this study included only the untrained, healthy and young subjects, the effect of these legs raised positions must also be studied on the trained subjects with different age group and health status.

Also we studied the effect of the legs raised positions after a sub maximal test so these positions may also be studied after a maximal test.

Relevance in Clinical practice: This study tells us that the Supine with legs raised to 70^0 is the better position for Heart Rate Recovery as compared to Supine with legs raised to 90^0 and can be used to recover quickly after a physical exertion of any kind.

CONCLUSION

In this study we tried to find out the better position for Heart rate recovery among Supine with legs raised to 70^0 and Supine with legs raised to 90^0 positions after a Submaximal test, we conclude that the Supine with legs raised to 70^0 leads to a better recovery when compared to Supine with legs raised to 90^0 position at the end of 1st minute, however further studies are necessary to establish it for the rest of the recovery duration.

Ethical Clearance- Taken from Santosh Medical College committee

Source of Funding- Self

Conflict of Interest - Nil

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Evidence Based Practice: Knowledge, Attitude and Practice of Physiotherapy Students in Maharashtra

Atiya A Shaikh[1], Akshaya Gad [2]

[1]Assistant Professor, [2]Intern Student, Deccan Education Society's Brijlal Jindal College of Physiotherapy, Pune

ABSTRACT

Aim: To find information regarding knowledge and practice of Evidence based practice(EBP) by undergraduate physiotherapy students in Maharashtra.

Methodology: Information was gathered using a Questionnaire which was filled by 225 undergraduate BPTh students .Collected data was presented in descriptive form.

Conclusion- Participants had poor to fair knowledge of Evidence Based Practice. They have a positive attitude towards it but, are unable to implement it in patient care due to lack of knowledge, time and communication skills.

Keywords- *evidence based practice, physiotherapy, students, Maharashtra.*

INTRODUCTION

The primary goal of physiotherapy is to provide highest degree of quality care to achieve the best outcomes for the clients. This requires sound decision making which is based on appropriate assessment and choice of treatment modality. Validity, reliability of assessment tools, feasibility, usefulness of any approach should be considered before using on it patients [1].

Evidence Based Practice (EBP) helps the clinician to achieve above mentioned goal. It is a multi-disciplinary approach to clinical practice which, has been gaining popularity since 1992. It is the integration of best research evidence with clinical expertise and patient's values which when applied by practitioners will ultimately lead to improved patient's outcome. It encourages professionals to pay attention to evidence that can form their decision making and making use of the best and appropriate evidence available. [2]

Corresponding author:
Akshaya S Gad,
Intern, Decaan Education Society Brijlal Jindal College of Physiotherapy, Pune. Email: akshayagad@gmail.com
Ph No: 9892818413

Many researchers and successful clinicians advocate EBP use for effective patient care. Although, EBP has been in existence since many years, it has been observed that it is limited to only few professionals. Many studies have been done in western countries on awareness and practice of EBP by health care professionals [3] but, no such study data is available for their counterparts in India.

Physical therapists are in contact with patients for maximum time. Their ability to decide and deliver the most appropriate treatment strategy and counseling skills can directly affect the patient's recovery. Physiotherapy students are the future decision makers for betterment of patients. Keeping in mind all these aspects, this study was designed to find, the awareness and practice of EBP in Physiotherapy Students of Maharashtra.

MATERIALS AND METHOD

- Type of study: Survey
- Study Population: Physiotherapy students
- Study setting: Physiotherapy Colleges in Maharashtra
- Sample size:225
- Inclusion criteria: 4th year BPTh students ,

Interns

- Exclusion Criteria : Practicing therapists, students outside Maharashtra
- Materials: Questionnaire
- Statistical analysis: Descriptive analysis

METHOD

- Ethics clearance from college ethics committee was taken.
- Permission to conduct study was obtained from Physiotherapy college authorities.
- Participants were selected as per the inclusion and exclusion criteria.
- Participants were explained about the study and their consent was taken.
- Questionnaire was distributed which was modified from questionnaire given by Jette et al in 2003[4]
- Necessary details were filled by the participants. Data collector was present and attended queries of the participants while filling the questionnaire.

RESULTS

Table 1: Participant's view about the most important point to consider for practicing EBP.

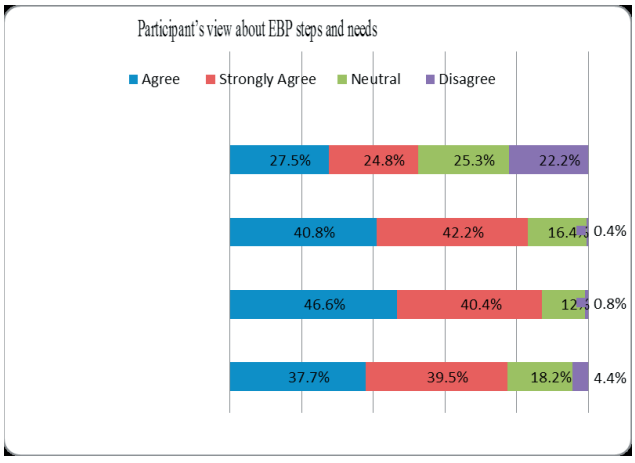
What according to you is the most important need for EBP?

Options	No. of students	Percentage
Better patient care	46	18%
Avoid errors/ misinterpretations	19	7%
Insurance	7	3%
Government Polices	20	8%
Accuracy of assessment	29	11%
Uniformity in assessment/Rx	137	53%

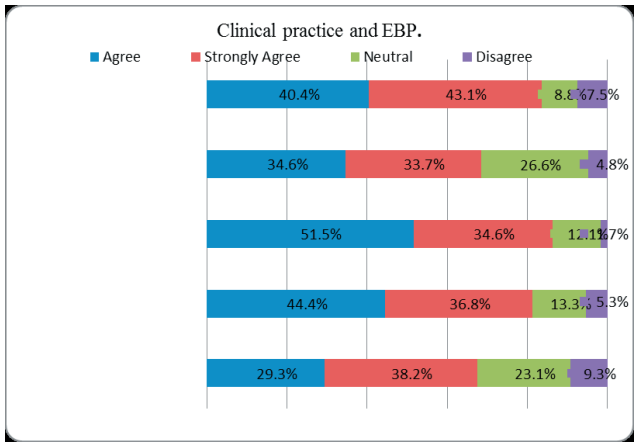
Table 2: Participant's view about their understanding of statistical terms.

Understanding of statistical terms:

Options	Meta-Analysis	Percentage	Statistical Sig	Percentage	RCT	Percentage
Have heard but don't understand	139	62.5%	82	31.5%	60	29.5%
Have some understanding	65	27.5%	100	42%	81	35.5%
Understand quite well	15	6%	30	20%	47	19%
Understand and can explain others	9	4%	13	6.5%	37	16%



Graph 1-Participant's view about EBP steps and needs



Graph 2-Participant's Clinical practice and EBP

Table 3-Highest degree of evidence according to participant.

Options	No. of students	Percentage
RCT	78	35%
RT	20	9%
Comparisons	95	42%
Descriptive Analysis	32	14%

Table 4- Factors affecting implementing EBP (Participants's view)

Options	No. of students	Percentage
Education	72	21%
Attitude	33	10%
Belief	22	7%
Interest	42	12%
Availability of resources	116	35%
Time	27	8%
Support from seniors	22	7%

Table 5- Trend to gain knowledge about recent advances in field

Options	No. of students	Percentage
Teachers	98	34%
Internet	103	35%
Journals	46	16%
Texts	21	7%
Discussions	22	8%

Table 6- Scientific papers/articles read/referred in a typical month

Options	No. of representatives	Percentage
None	99	44%
1 to 5	87	39%
6 to 10	31	14%
11 to 15	8	3%
16 or more	0	0%

DISCUSSION

Table 1 shows that, 53% of the participants consider uniformity in treatment to be the most important need for following EBP. It's proved that, when a uniform treatment is given to patients, it ultimately reflects on patient's outcome and gives equally effective treatment and more accuracy for appraising the evidence behind it [5].

Participants were asked about, their understanding of basic terms required to analyze a research. Following are their answers as shown in Table 2:

- Meta-analysis: It is a systemic method that takes data from a number of independent studies and integrates then using statistical analysis. Meta-analysis is conducted to assess the strength of evidence present on a disease and treatment. It improves precision of estimating effects, answering questions not posed by individual studies, settles controversies arising from apparently conflicting studies and generate new hypothesis and predicts risks of major outcomes [6].62.5% of the participants had heard about meta-analysis but they did not understand it.

- Statistical Significance: It is a result that is not likely to occur randomly but rather is likely to be attributable to a specific cause. The level at which one can accept whether an event is statically significant is known as the significance level or p-value. [6] 42% of the participants had some understanding about statistical significance.

- RCT: It is a method of randomly assigning patients to groups that do or do not receive the intervention of interest. Thus, it reduces the chances of error and bias [5]. 35.5% of the participants answered that, they had some understanding about RCT.

When asked for, attitude of the participants regarding EBP, following results were obtained, which are also shown in graph 1,

- As we know, Evidence Based Practice is integration of best research evidence with clinical expertise and patient's values for a better patient's outcome. Thus, it encourages the health professionals to practice EBP along with the traditional methods for enhancing patient care [7].39.5% of the participants strongly agreed that, they understood the term EBP.

- One of the steps of EBP is to find the best available evidence. Thus, this is possible by literature research and findings which will help to find best evidences from different literature research there by helping to implement the evidence from it. [8] 46.6% of the participants agreed that, literature research and findings are important.

• 42.2% strongly agreed that, application of EBP is necessary in work. When EBP is applied, a better patient outcome is made and unsound and risky practices are eliminated. This may be due to lack of training in EBP and lack of exposure to find literature in student's life [1].

• 27.5% agreed that, evidence seeking is not very practical.

When asked about, participant's clinical practice of EBP, following answers were obtained, (as shown in graph 2):

• 58.2% of participants strongly agreed that, they used EBP guidelines in their day-to-day life.

• 44.4% of the participants agreed that, they felt confident in their ability to find research to answer clinical questions.

• 43% of the participants agreed that, clinical experience is most reliable way to know what really works.

According to APTA guidelines, RCT is considered as highest degree of evidence because the patients are randomly assigned to groups that do or do not receive the intervention of interest which ultimately decreases the chances of bias and errors. [5] When participants were asked about their knowledge of highest degree of evidence, 42%answered it to be comparisons(as shown in table 3).

Table 4 shows, attitude of EBP of participants regarding important factor for the implementation of EBP of which, 35% of the participants considered availability of resources as an important factor for implementation of EBP. It's been proved that, execution of treatment is easy and apt when adequate resources are available. [5]

Table 5 shows, common trend of participants for gaining knowledge about recent advances in field. 35% of the participants gain knowledge about research through internet.

Table 6 shows, how many scientific research papers are read by participants in a month for clinical decision making. 44% of the participants do not read any scientific articles in a typical month.

Thus, from this study we can conclude that, there is poor to fair awareness about EBP in PT students of Maharashtra and they have a positive attitude about it. They are unable to practice it in day to day life. All the these findings are similar to the findings of Nina O, Peter B, Kristen L et al where they studied trends of EBP practice and perception in undergraduate physiotherapy of US and concluded that, students attempt to apply EBP but fail to do so due to lack of EBP culture. They also expressed a need of EBP role models during clinical placements.[1] Awareness of such training and use of EBP should be encouraged in health care practitioners and students.

Physical therapists are in contact with the patients for more time as compared to their other health care counterparts. Physiotherapy students are the target population who will treat the patients in future hence; their awareness about best health care options will affect the patient directly. EBP incorporated in academics can help to ensure most appropriate healthcare delivery. [7] Policy makers and college authorities should consider these findings to make appropriate changes in teaching and training in order to yield maximum patient benefits.

CONCLUSION

There is poor to fair knowledge of Evidence Based Practice in Physiotherapy students of Maharashtra. They have a positive attitude to Practice EBP but, they are unable to practice EBP in day to day life. They feel it is due to lack of time and lack of communication skills.

IMPLICATION

The study indicates that, sensitizing the students during their academics about EBP, incorporating basic steps about EBP in their curriculum, encouraging them to practice EBP in clinical practice and policy making will be helpful to thus enhance their knowledge, clinical practice and patient care.

LIMITATIONS OF STUDY

a) Small sample size

b) Students only from colleges in Maharashtra were included.

c) Psychometric properties of the revised questionnaire were not established.

FUTURE SCOPE OF THE STUDY

1) Similar study can be done by including :

- Students from all physiotherapy colleges in India
- MPT students, Physical therapists
- Other health care faculties

2) Study can be done to Explore factors affecting practice of EBP in above mentioned professionals.

DISCLOSURE

No potential Conflicts of Interest.

Source of Funding: Self

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Comparison of Functional Capacity of Smokers V/s Non-smokers by Using a Sub-maximal Test in Young Healthy Subjects

Tiwari Rani Pooja[1], Raghav Deepak[2], Tiwari Gyan Prakash[3], Sharma Nidhi[4], Rani Priyanka[5]

[1]Assistant Professor, Adhunik Institute of Education and Research, Ghaziabad, [2]Principal, Santosh Medical College, [3]Senior Physiotherapist, Way to Fitness Clinic, Ghaziabad; [4]HOD, [5]Assistant Professor, Adhunik Institute of Education and Research, Ghaziabad

ABSTRACT

Pooja et al worked to study the comparison of functional capacity of smokers v/s non-smokers by using a sub-maximal six minute walk test in young healthy subjects. Subjects were asked to perform the test after taking their pre-test measurements of Blood Pressure, Heart rate, Oxygen saturation, Fatigue, Dyspnoea. Then they performed a 6-minute walk test and same post test measurements were taken. The conclusion of the study was that the Non smokers possesses a better functional capacity than the Smokers, we also conclude that there is a significant difference with higher pre test and post test levels of Heart rate, Blood Pressure, Fatigue and Dyspnoea levels in the Smokers.

Keywords: *Smokers, Non-Smokers, Functional capacity, Six-minute walk test.*

INTRODUCTION

Health related behaviors, especially smoking and tobacco use, are major determinants of health and lead to health inequities.[8] Smoking is one of the most common forms of recreational drug use. Cigarette smoking is practiced by over one billion people in the majority of all human societies[8].

Worldwide, about 3 million people currently die each year from smoking, half of them before the age of 70, an enormous human cost[16]. In both rural and urban India, among men between the ages of 30 and 69 years, the rate of death from any medical cause in smokers was 1.7 times than in nonsmokers of similar age, educational level.[8] In addition other available literature suggests that the smoking probably caused about 700 000 deaths in India during the year 2000, including about 550 000 among middle-aged men and about 110 000 among older men (which is much smaller numbers among women, due to their low prevalence of smoking). The annual number of deaths from smoking and must be expected to be doubled between 2000 and 2025.[9]

It is assumed that adolescent cigarette smoking does indeed raise risk for adult smoking and these potential adolescent smokers would actually become long-term regular adult smokers. Once cigarette smoking is initiated, processes of physical and psychological dependence would ensure that a majority of adolescent smokers would remain smokers into adulthood. In addition, if the factors that motivate adolescent smoking also continue into adulthood, smoking behavior should similarly show a high degree of stability[17].

According to the available data the cigarette smoking is a major modifiable risk factor for cardiovascular disease, including coronary heart disease, stroke, atherosclerosis, peripheral vascular disease, and congestive heart failure. The relationship between cigarette smoking and many established risk factors for cardiovascular disease has been studied. Cigarette smoking has been associated with higher serum levels of cholesterol, coronary vasomotor reactivity, platelet aggregation, and a prothombotic state, such increases in platelet aggregation are an important step in the genesis of atherosclerosis[18]. And a few data are available on the relationship between cigarette smoking and newly emerging risk factors for cardiovascular disease.[14] Smoking also leads to acute respiratory diseases, tuberculosis and asthma in younger age groups and non

communicable diseases such as chronic lung disease, cardiovascular diseases and cancer in middle and older age. Smoking significantly correlated with prevalence of coronary heart disease and hypertension.[8]

Some studies provide the evidence that cigarette smoking reduces exercise tolerance of healthy individuals and people with existing coronary artery disease. Such reduced exercise capability is one of the landmarks of acute compromises to the coronary circulation[18]. A study was conducted on the effects of habitual smoking on cardiorespiratory responses to Sub-maximal exercise to find out the level up to which their subject's cardiorespiratory status is compromised[1] and several other studies mentioned the same and also stated that the sub-maximal exercise testing is a good measure of cardiorespiratory fitness, and the most popular method of exercise testing is 6 Minute Walk Test and is extensively used, it has demonstrated good reliability and validity as a measure of functional capacity and its utility has been enhanced by its easy achievability [19,20] .

Due to the already discussed hazardous effects of smoking there is always a need of such a work which spread the awareness among the individuals to enlighten them about the outcome of this addiction and to possibly scare them enough to leave it or minimize it at the very least. There is much work done on either long term smokers[1] or the smokers who are physically trained like sportsmen[2], but to best to our knowledge no work has been done on the young people who have started smoking recently[2] and are physically untrained, i.e. sedentary, so this present study aims to evaluate the functional capacity using a sub-maximal test among the young and healthy but untrained smokers and non-smokers.

METHODS AND METHODOLGY

Instrumentation:

- Pulse Oximeter[1.10]
- *Sphygmomanometer*
- Stop watch
- Inch tape
- 30 meter straight corridor[10]
- Cones
- Chairs

Scale: Borg Scale (Modified)

METHODOLGY

Study design: Experimental study design.

Study setting: All the subjects are the student of Santosh medical college and are recruited randomly after signing the consent form.

Study sampling: Simple randomized sampling technique. Subjects were asked for their smoking habits and are recruited accordingly.

Sample size: 50 subjects were recruited, 25 were smokers and 25 were non smokers.

Inclusion criteria:

- Age: 20-26 years
- Gender: Males
- Smokers[2]
- Non-smokers

Exclusion criteria [3, 4,5,12]:

- Subjects with cardio and respiratory diseases like Asthma, Hypertension, etc.
- Subjects with acute systematic illness which may hinder the performance of test.
- Subjects with physical training.
- Significant drop (20 mm Hg) in systolic blood pressure or a failure of the systolic blood pressure to rise with an increase in exercise intensity.
- Excessive rise in blood pressure: systolic pressure > 260 mm Hg or diastolic pressure > 115 mm Hg.
- Signs of poor perfusion: light headedness, confusion, ataxia, pallor, cyanosis, nausea or cold and clammy skin.
- Subject requests to withdraw from the test.
- Physical or verbal manifestation of severe fatigue.
- Failure of the testing equipment.

Independent variables:

- 6 min walk test

Dependent variables:

- 6 min walk distance
- Heart rate
- Oxygen saturation
- Systolic Blood Pressure

- Diastolic Blood Pressure
- Dyspnoea
- Fatigue

PROCEDURE

Subjects were well rested, and were advised to avoid any unusual activity the day before and they were also asked to refrain from unusual exercise, undue stress on the day of data collection session to minimize the effect of these variables on hemodynamics and respiratory status. The subjects came after a night and following morning of abstinence from smoking[7]. Subjects ate the breakfast and were allowed only water thereafter[5].

Subjects had the breakfast at least 1 hour prior to the arrival at the hospital. Subjects were seated in a quiet and well aerated room to settle down and become accommodated. Then subjects were called one by one and their pre test measurements were taken, i.e. Blood Pressure, Heart rate, Oxygen saturation, Fatigue, Dyspnoea. Then they performed a 6-minute walk test and Post test measurements were taken.

STATISTICAL ANALYSIS

The data of this study was analyzed by applying paired "t- test" using SPSS 11.5 version. P value was set at ≤0.05

RESULT

Table 1: Shows the pre test and post test values of non-smokers and its standard deviation

NON SMOKERS (Within group)			
Variable	**Pre test**	**Post test**	**P-Value**
S.B.P.	119.44±5.80	129.92±4.92	.001*
D.B.P.	81.68±4.85	82.64±4.36	.172
SpO_2	97.96±2.21	97.80±1.35	.731
HR	89.96±5.59	102.52±6.00	.001*
Fatigue	.00±.00	2.72±0.74	.001*
Dyspnoea	.00±.00	3.08±0.64	.001*

*indicates that the value is significant. Significance is $P < 0.05$

Table 2: Shows the pre test and post test values of smokers and its standard deviation

SMOKERS (Within group)			
Variable	**Pre test**	**Post test**	**P-Value**
S.B.P.	123.04±2.54	146.28±10.21	.001*
D.B.P.	90.80±5.20	91.68±3.54	.177
SpO2	97.52±2.12	98.48±1.05	.068
HR	99.28±9.49	139.36±13.47	.001*
Fatigue	.00±.00	3.88±0.73	.001*
Dyspnoea	.00±.00	4.04±1.10	.001*

*indicates that the value is significant. Significance is $P < 0.05$

Table 3: Shows the pre test and post test values of smokers v/s non-smokers and its standard deviation

Smokers v/s Non smokers (Between group)				
	Variables	**Smokers (Mean+SD)**	**Non smokers (Mean+SD)**	**P- Value**
Pre test	S.B.P.	123.04±2.54	119.44±5.80	.008*
	D.B.P.	90.80+5.20	81.68+4.85	.001*
	SpO2	97.52±2.12	97.96±2.21	.486
	HR	99.28±9.49	89.96±5.59	.001*
	Fatigue	0	0	0**
	Dyspnoea	0	0	0**
Post test	S.B.P.	146.28±10.21	129.92±4.92	.001*
	D.B.P.	91.68+3.54	82.64+4.36	.001*
	SpO2	98.48±1.05	97.80±1.35	.074
	HR	139.36±13.47	102.52±6.00	.001*
	Fatigue	3.88±0.73	2.72±0.74	.001*
	Dyspnoea	4.04±1.10	3.08±0.64	.001*

*indicates that the value is significant. Significance is $P < 0.05$

Table 4: Shows the walk distance values of smokers v/s non-smokers and its standard deviation

Walk Distance		
Smokers Mean ± SD	Non- Smokers Mean ± SD	P- Value
466.80 ± 42.50	614.40 ± 50.59	.001*

*indicates that the value is significant. Significance is $P < 0.05$

DISCUSSION

Active cigarette smoking has long been known to predispose people to atherosclerotic vascular disease and it is also evident that exposure to tobacco smoke also have deleterious cardiovascular effects, with enormous public health implications as stated by David S. Celermajer et al (1993). In this study the Smokers who had smoked one cigarette for one year with mean age of 23.76+1.67 were compared to Non smokers with mean age of 22.00+1.63 and both the groups had the similar lifestyle and were non-athletes. The subjects had similar Height, Weight and BMI thus eliminating any chances that the difference between the functional capacities is due to difference in the physical status of the subjects and therefore standing them all on the same physical level.

The results shows that there is a significant difference between the distances covered by the subjects and shows that Non smokers covered a greater distance as compared to Smokers thus proving that Non smokers when compared to Smokers possess a better functional capacity than Smokers who were in this case, the recent smokers[2] these findings are similar to those of George Papathanasiou et al (2006).

This study also shows that Smokers have a higher resting and Post test Heart rate and Blood pressure these findings are in association with those of Yoshio Kobayashi et al (2004), George Papathanasiou et al (2006) and Estela Kristal-Boneh et al (1997) who also stated that the elevated HR of smokers at night may be caused not only by the residual effects of nicotine and carbon monoxide but also by changes in vagal control of the heart, which has been found to be reduced in Smokers. The smokers also tend to possess a greater Fatigue and Dyspnoea level as compared to Non smokers as also founded by Rufus A. Adedoyin et al (2010) and Panagiota Tzani et al (2008) who also stated that Smoking can affect oxygen kinetics and uptake at different levels. The particulate substances released during tobacco burning increase airway resistance and decrease diffusion capacity for oxygen through the alveolar capillary membrane. Carbon Monoxide binds to haemoglobin 225 times more avidly than oxygen. Thus, oxygen release to the tissues may be diminished by elevated Carbon Monoxide levels leading to an increased level of Fatigue and Dyspnoea as compared to Non smokers.

Future Research Suggestions: Because this study included only the untrained, healthy and young subjects, the effect of Smoking must also be studied on the trained subjects with different age group and health status.

Also we studied the effect of Smoking on functional capacity after a sub maximal test so it may also be studied after a maximal test.

Relevance in Clinical practice: This study tells us that even the recent smoking[2] like one cigarette a day for one year can also lead to the decreased functional capacity thus the patients coming to the doctor with an illness related to smoking can be warned about how quickly even the recent smoking can lead to decreased functional capacity.

CONCLUSION

In this study we tried to find out that Non smoker possesses a better functional capacity than the Smokers, by evaluating them with a Submaximal test (6 minute walk test), We conclude that the Non smokers possesses a better functional capacity than the Smokers, we also conclude that there is a significant difference with higher pre test and post test levels of Heart rate, Blood Pressure, Fatigue and Dyspnoea levels in the Smokers.

Ethical Clearance- Taken from Santosh Medical College committee

Source of Funding- Self

Conflict of Interest -Nil

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Comparison of Hamstring Tightness in Skinfit Clothing Users Versus Loose Clothing Users

Smita Bhimrao Kanase[1], Devayani Mukund Moghe[2], Suraj Bhimrao Kanase[3], Sandeep Babasaheb Shinde[4]

[1]Lecturer, [2]BPT Student, [3]Assistant Professor, [4]Assistant Professor, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad, Satara, Maharashtra

ABSTRACT

Background: Tightness of hamstring muscle may lead to many biomechanical alterations within the pelvis and lower limbs which gives rise to many problems. Fashion is become a factor for many disorders within the individuals. So the present study was conducted to find out degree of hamstring tightness in individuals wearing skinfit clothing and compare it with individuals wearing loose clothing.

Method: Comparative study was conducted at Krishna College of Physiotherapy, Karad. 100 female participants with age group between 18-23 years were taken. Group A (50) were participants wearing skinfit clothing and Group B (50) included participants wearing loose clothing for past 6 months. Exclusion criteria of the study was: 1. Gender- male. 2. Hamstring tightness due to any trauma.3. Participants with prolong lower limb immobilization.4. Participants with mechanical low back pain. Active knee extension was measured to rule out hamstring tightness.

Results: statistical analysis was done using paired and unpaired"t" test. The results showed statistically significant hamstring tightness in group A (skinfit clothing) as compared to group B ($p<0.001$).

Conclusion: The study shows prevalence of greater hamstring tightness in participants wearing skinfit clothing. Thus it concludes fashion as one of the causative factor of hamstring tightness in young adults.

Keywords: *hamstring tightness, skinfit clothing, females, fashion, young adults.*

INTRODUCTION

The hamstring muscles located in posterior compartment of thigh originates from ischial tuberosity. It comprises of semitendinosus, semimembranosus, and biceps femoris. They act as extensors of hip and flexors of knee. [1]

Flexibility is a factor that helps an individual to move smoothly. It optimizes the physical activity of an individual. The hamstrings is a group of muscle which has high tendency to go for shortening[2]. This tightness of hamstring will cause posterior pelvic tilting and decrease in lordotic curvature of lumbar region which leads to low back pain. It also results in reduced pelvic mobility.[3-4]

Reduction in ability of muscle to deform leads to muscle tightness which in turn causes decrease in range of motion at the joint where is performs its action.[5]

With hip positioned in 90 degrees of flexion there is Inability to achieve greater than 160° of knee extension then it is considered as hamstring tightness.[6]

Several tests are used to measure Hamstring tightness which includes active knee extension test, active unilateral SLR test, the passive unilateralSLR test, the sit and reach test [7-11].

Up to the present, no researches have been conducted comparing the prevalence rate of hamstring tightness among the individuals wearing 2 different types of clothing which may affect them. Many researches are been conducted finding the prevalence

Corresponding author:
Dr. Smita Bhimrao Kanase
Lecturer, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad- 415110, Satara, Maharashtra.
Email id: smitakanase@gmail.com

of hamstring tightness among the athletes and risk of injury found in them. But this study is first of its kind focusing on the daily usage of clothes and its risk. The findings may also differ from person to person and country to country. Today's world is the world of fashion with younger generation getting attracted to this era. With the increasing tendency of fashion divergence in young individuals it is the need to find out whether the fashion of today's world is harmful or beneficial to the individuals who are under such an influence of fashion world. Having an idea about the prevalence of hamstring tightness will be important to them in preventing hamstring tightness, which may lead to risk of hamstring injuries in future.

MATERIALS AND METHOD

This was a descriptive study which was conducted to assess the prevalence of hamstring tightness among 2 groups of individuals. The participants who meet the inclusion and exclusion criteria and willing to participate in the study were included. We had approached and assessed 100 female individuals as our study population. The participants were explained about the study and the evaluation procedure. The informed consent was obtained from the individuals. The inclusion criterion of the study was: 1. Age 18-23 years. 2. Gender- female. 3. Participants wearing tight clothing for 6 months prior to study. 4. Participants wearing loose clothing for 6 months prior to the study. The exclusion criterion of the study was: 1. Gender- male. 2. Participants with hamstring tightness due to any trauma.3. Participants with prolong lower limb immobilization.4. Participants with mechanical low back pain.

Hamstring tightness was assessed using the active knee extension test. Subject position was supine with the hip and knee flexed to 90 degree. Strap was tied around the pelvis for stabilization and the testing was done on both the lower extremities of every individual. The fulcrum of the goniometer was placed over the lateral condyle of the femur, fixed arm was aligned with the long axis of femur using greater trochanter as a reference and the movable arm was aligned with the lower leg using the lateral malleolus as a reference, the subject was then asked to extend the lower extremity as far as possible until a mild stretch was felt. Three repetitions were taken and average of three repetitions was taken as final active knee extension angle. The measurements were taken on both the lower extremities of same individual.

STATISTICAL ANALYSIS

Statistical analysis was done manually as well as using the statistics software INSTAT so as to verify the results obtained. Various statistical measures such as mean, standard deviation (SD) and paired and unpaired test of significance were utilized for this purpose. Probability values less than 0.05 were considered statistically significant and probability values less than 0.0001 were considered statistically extremely significant.

RESULTS

Age of the participants in this study was between 18-23 years. There was no statistically significant difference between mean age and standard deviation of the participants in two groups. Mean age of Group A was 20.6 years and that Group B was 20.12 years. (Table 1)

Table 1: Baseline characteristics of participants

Groups	Gender	Mean Age
Group A	Females = 50	20.6 years
Group B	Females = 50	20.12 years

The degree of hamstring tightness in group A shows that the mean angle for right lower limb was 31.4±5.718 and for left lower limb was 30±4.949. The within group analysis showed no significant difference between the angle of both the lower limbs (p=0.1637), which implies both the limbs showed equal hamstring tightness. (Table 2.)

Table 2: Comparison of means of degree of hamstring tightness within the groups

Groups / Side	Group A (skin fit clothing)		Group B (loose clothing)	
	right	left	right	left
Mean ±SD	31.4±5.718	30±4.949	19.6±5.330	20.2±5.147
't' value	1.414		0.6509	
'p'value	0.1637		0.5182	

The degree of hamstring tightness in group B shows that the mean angle for right lower limb was 19.6±5.330 and for left lower limb was 20.2±5.147. The within group analysis showed no significant difference between the angle of both the lower limbs (p=0.5182), which implies both the limbs showed equal hamstring tightness. (Table 3)

Table 3: Comparison of means of degree of hamstring tightness between the groups

Side (type of clothing)	Right (skin fit clothing)	Right (loose clothing)	left (skin fit clothing)	Left (loose clothing)
Mean ±SD	31.4±5.718	19.6±5.330	30±4.949	20.2±5.147
't' value	10.674		9.705	
'p'value	<0.0001		<0.0001	

The between group analysis showed that right lower limb of group A showed more tightness as compared to right lower limb of group B. the difference was found to be statistically extremely significant with p<0.0001, which implies that more tightness was exhibited in right lower limb of Group A participants (skin fit clothing) as compared to group B (loose clothing). The left lower limb of Group A showed more tightness as compared to Group B participants which was statistically extremely significant (p<0.0001)

DISCUSSION

Hamstrings are group of three muscles, namely the semi-membranous, semi-tendinous and biceps femoris. The hamstrings are located in the back of the thigh and connect the lower pelvis to the lower leg. They help in hip extension and bending of the knee. The individuals having active knee extension of less than 160 degrees is criteria for hamstring tightness.

The aim of present study was to find out prevalence of hamstring tightness in 2 group of participants. In present study Active knee extension was measured among 100 healthy female subjects, out of which group A had 50 subjects and group B had 50 subjects to rule out prevalence of hamstring tightness. There active knee extension was measured by goniometer in supine lying position with hip and knee flexed to 90^0

The prevalence rate was ruled out in both the groups A & B and statistical analysis was done to find out prevalence rate within group and between groups. The findings of present study show that there was more prevalence of hamstring tightness in group A subjects (skin fit clothing) as compared to group B subjects (loose clothing).

Min heekim, won gyu yoo[12] in their study on effect of tight clothing on cervical and thoracic spine muscles during shoulder abduction proved that there was limitation of movements in upper extremities caused by wearing tight fitting suits which leads to muscle imbalances and shoulder pain. The findings of present study also correlates the same indicating that tight clothing also alters the hamstring length leading to imbalance in form of tightness.

In relation to wearing of tight clothing, a study done by wichaiEungpinichpong et al[13] states that there is restriction on hip mobility due to tight clothing which leads to compensatory response of increased lumbar motion and reduced lower trunk muscle activation. The findings of present study also shows that the group wearing skinfit clothing showed greater hamstring tightness than the group wearing loose clothing. Thus it shows that type of clothing affects the muscle and joint mobility.

Many studies have also shown correlation between occurrence of hamstring tightness and back pain

CONCLUSION

Participants wearing skin fit clothing shows greater hamstring tightness and compared to those wearing loose clothing. This tightness can lead to back pain problems in younger individuals.

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Conflict of Interest: There is no conflict of interest.

Ethical Clearance: Taken from institutional ethical committee of KIMSDU.

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Comparison of the Sensory Integration of Balance in School Going Fullterm and Preterm Children Aged 7-10 Years

D'souza Denissia[1], Writer Hutoxi[2]

[1]Neuro-Physiotherapist, Pediatric Neurodevelopmental Therapist, Alumni Physiotherapy Department at TNMC; [2]Professor and Head of Department, PhD Guide, Physiotherapy Department at Topiwala National Medical College and BYL Charitable Hospital, MUHS, Mumbai

ABSTRACT

Background and Objective: Postural behavior in preterm children after maturation of motor responses at 7 years of age is yet to be explored. The study was intended to assess and compare the sensory integration of balance in school going preterm and fullterm children in the 8th, 9th and 10th year of life.

Method: Official permission was obtained from the local schools. Questionnaires and information forms were submitted to parents. Children were selected after screening the inclusion and exclusion criteria. Age and gender-wise matched fullterm and preterm children were assessed and compared for strategies of balance (Ankle, Hip, Suspensory and stepping) using Pediatric Clinical Test of sensory integration for balance test (P-CTSIB)

The comparison was done using the 4 conditions:

1. Eyes open, feet together on floor;
2. Eyes closed, feet together on floor;
3. Eyes open feet together on foam;
4. Eyes closed feet together on foam.

Results: There was no significant difference in performance for all three age groups in condition 1. In Conditions 2 and 3, $p < 0.05$; significant difference in performance of preterm children at the 8th and 9th year of life compared to the fullterm counterparts was noted; with $p > 0.05$ in the 10th year of life. In condition 4, $p < 0.05$ for 8th year of life suggesting a difference in performance and no significant difference in the 9th and 10th year of life.

The intergroup comparison of the strategies was done using the Pearson Chi-Square test. The $p < 0.05$ with a significant difference and an overuse of compensatory strategies noted in the preterm age group for conditions 1 and 2. In conditions 3 and 4, $p > 0.05$ indicating no significant difference in the strategies used between the preterm and fullterm children in all three age groups.

Conclusion: Preterm children were poorer in resolving inter-sensory conflicts than their fullterm counterparts in the 8th and 9th year of life; with equivalent performance noted in the two groups at 10th year of life. There was a significant difference in the movement strategies used by the two groups for inter-sensory conflict resolution on the firm surface with no difference noted on the foam. The study will aid in identifying the early clumsy behavior noted in preterm children to incorporate physical therapy specific to balance as early intervention in schools.

Keywords: *Preterm, Intersensory conflict, P-CTSIB, Hip strategy, ankle strategy, suspensory strategy, stepping strategy.*

INTRODUCTION

Postural control is the ability to maintain and control the COM in relation to BOS, prevent falls and complete the desired movements[1]. It enables goal directed movements with mastery in co-ordination, anticipation and adaptive strategies through ontogeny from infancy to teenage [2-4]. According to Bernstein postural control has neural and musculoskeletal components which

mature at 7 years of age known as the 1st transitional phase and at 10 years of age known as the 2nd transitional phase[5].

Infants born between 33-37 weeks of gestation are termed as late preterm infants and those born post 37 weeks are fullterm exhibiting complex and variable movements fit to explore the environment .[2, 6, 7]

Preterm infants show immature nervous system adaptability to extra uterine stimuli[8]. During the 33-37th week the reflex co-ordination and tactile system are evolving; with a vulnerable sensory and motor system with inadequate postural control[9]. The preterms show unregulated patterns of tactile, auditory and vestibular stimuli with poor multimodal integration [10, 11].

DeGroot et al in a comparative analysis of preterm and fullterm infants showed significant delays in walking patterns with persistence in the postural control dysfunction through toddler and school age with a delay in crawling, dynamic balance and independent walking in low risk preterms [12-15].

McGowan showed an increased risk of adverse developmental outcomes in late preterms till 7 years of age[16]. Few studies have explored the postural behavior in preterm children post the proposed beginning of maturation of motor responses after 7 years if age.

The Pediatric Clinical test of sensory integration and balance (P-CTSIB) is an inexpensive test evaluating the balance and strategies used by children in conflicting sensory conditions ranging from age groups 4-10 years[17].

This study was aimed at comparing the sensory integration for balance in preterm and fulllterm children between the age groups of 7-10 years of age. The null hypothesis for the study was there is no difference in inter-sensory conflict resolution even with a difference in gestational age at birth to maintain postural control from 7-10 years of age. The hypothesis was the difference in gestational age at birth will result in persistence of deviations in resolving sensory conflicts to maintain postural control from 7-10 years of age.

MATERIAL AND METHOD

The study was approved by the College Ethical committee. A written consent was taken from the principals of 6 community based schools. All the students from age groups of 7-10 were given a parental information sheet, consent form and a questionnaire for the Date of birth and Expected date of delivery.

Students born between 33-37 weeks of gestation and after completion of 37 weeks of gestation via normal delivery were selected in the study. The students who were born before 33 weeks or after 42 weeks of gestation; those with associated neurological or orthopedic impairments; students who participated in extracurricular sports or dance events; students with any known symptoms of attention deficits or developmental co-ordination disorders were excluded from the study.

Purposive sampling was used and the students were equally distributed in the three age groups. The study was designed as a nested study with duration of 1 year taken for completion of the study.

The division for the study was done as follows:

	Full term (FT)		**Pre term (PT)**	
	Boys	**Girls**	**Boys**	**Girls**
8th year of life	15	15	15	15
9th year of life	15	15	15	15
10th year of life	15	15	15	15

Numbers were assigned to children in random order and children were called for the assessment numerically, to limit the bias. The equipment used for the P-CTSIB were

- 45x30x12 cm^2 medium density foam
- a blindfold for eliminating visual information
- masking tape
- stopwatch
- A pen and notebook for records[18].

The visual conflict dome had to be avoided due to restrictions from the school authorities.

Condition 1: standing quietly on the floor, eyes open

Condition 2: standing quietly on the floor, eyes closed

Condition 3: standing quietly on the foam, eyes open

Condition 4: standing quietly on the foam, eyes closed

The child was explained that duration of each trial as 30 seconds and asked to keep on standing with each foot in position until the examiner said "stop".

The movement strategies were observed and scored.

For time record, if the child could stand over 30 seconds on 1st trial in each condition, the total time score of 90 (30x3) was assigned and next condition was tested.

In case that the child could stand for longer than 30 seconds on the 2nd trial, the level of 60 (30x2) plus the number of seconds that he stood in the first trial was recorded as the total time.

A trial was terminated when the subject changed foot positions or opened eyes for closed eyes conditions.

Examiner recorded the p-CTSIB variables which consisted of:

- Duration - Total time following all 3 trials

- Movement strategy for controlling balance during each condition were observed and documented.

1. Ankle strategy: distal (ankle) to proximal (hip or trunk) response.

2. Hip strategy: movement response from proximal to distal parts.

3. Suspensory strategy: knee flexion response.

4. Stepping strategy: stepping by foot or hand.

The scores obtained from P-CTSIB were totaled and the data obtained was summarized.

RESULTS

Data analysis was done with the help of SPSS Software ver.15 and Sigmaplot Ver.11. Quantitative data was presented with the help of Mean, Standard deviation (SD), Median and IQR. Comparison between study groups was done with the help of Unpaired T test or Mann-Whitney test and Oneway ANOVA or Kruskal-Wallis One Way Analysis as per results of Normality test.

Qualitative data was presented with the help of Frequency and Percentage table. The association among study group was assessed with the help of Chi-Square test. P value less than 0.05 is taken as significant level. There was equal distribution among the study groups in the 8th, 9th and 10th year of life with the frequency of fullterm and preterm children at 50%.

Comparison of the duration in four conditions between preterm and fullterm children showed a significant difference in performance in conditions 2 and 3 ($p<0.05$) in the 7 and 8 year olds; and a significant difference among the 7 year old preterm and fullterm children in condition 4 (Table 1).

The preterm children showed a significantly higher use of hip strategies in conditions 1 and 2; and a higher use of suspensory and stepping strategies in condition 2 over the fullterm children. (Table 2).

Table 1: Comparison of duration in 4 conditions between the preterm and fullterm children from the three age groups.

Study parameter		Condition 1			Condition 2			Condition 3			Condition 4		
Age groups		7	8	9	7	8	9	7	8	9	7	8	9
Mean	PT	87.47	88.67	89.47	66.33	74.47	86.10	52.97	62.97	81.33	37.40	44.0	58.73
	FT	88.30	89.77	89.9	73.77	84.57	87.57	63.5	77.17	71.20	42.67	46.03	58.57
SD	PT	3.21	2.15	1.25	7.28	6.38	3.782	6.91	8.79	9.54	4.85	9.95	12.55
	FT	2.69	0.57	0.40	8.99	2.67	2.67	9.99	5.71	8.58	5.38	10.1	12.6
T Value	PT	1.089	2.703	1.805	3.52	7.12	1.734	4.75	7.42	1.39	2.978	0.786	0.051
	FT												
P value	PT	0.226	0.058	0.068	**<0.001**	**<0.001**	0.173	**0.0**	**<0.001**	0.139	**0.004**	0.435	0.959
	FT												

Table 2: Comparison of startegies used in 4 conditions between the preterm and fullterm children.

Strategy used		**Ankle**				**Hip**				**Suspensory**				**Stepping**			
conditions		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Count (%age)	PT	100	100	100	100	70	70	76.7	83.3	43.3	70	54.4	72.2	37.8	37.8	45.6	65.6
	FT	100	100	100	100	47.8	47.8	64.4	80	23.3	47.8	46.7	68.9	21.1	21.1	43.3	55.6
Fisher's exact test	PT	-	-	-	-	0.028	0.004	0.1	0.7	0.405	0.007	0.37	0.74	0.57	0.02	0.88	0.22
	FT																
P value	PT	-	-	-	-	**0.019**	**0.002**	0.07	0.5	0.27	**0.004**	0.29	0.62	0.39	**0.014**	0.76	0.17
	FT																

DISCUSSION

Postural control involves inter-sensory conflict resolution and sensory reweighting. Peterson M et al in a study found that the process of sensory reweighting develops through 7-10 years of age with near to adult like maturational strategies [19]. This study was designed to note the difference and compare intersensory conflict resolution in preterm children and fullterm children between 7-10 years.

On individual group analysis however there was no statistically significant difference noted in the performance between preterm and fullterm children in condition 1, which could be due to a smaller sample size in each age group.

The preterm children showed statistically significant, higher use of hip strategies to maintain postural stability. These findings are supported by Adolph K et al in a review on motor development stated that performance for 7 year olds in a narrow base of support and walking show lower scores with gradual stabilization in performance which is noted in older children [20]. Bernstein's systems model also suggested 7 years of age to be the 1st transitional stage and 10 years to be the 2nd transitional stage[5]. Poor early sensory and motor exploratory behavior in late preterms may result in deviations noted through school age which minimize in later years[21].

In individual group analysis for conditions 2 and 3, there was statistically significant difference in performance. These findings suggested that preterms in 7 and 8 year age group showed higher reliance on visual cues for stability using the open feedback loop system. By 9 years of age preterm children showed no difference in performance indicating maturation and shift to use of closed feedback loop which was already adopted by the fullterm children by 7 years of age. This indicated that intersensory conflicts are equivalently matured by 9 years of age (10th year of life) [22].

Postural strategies used by preterms in condition 2 showed a significantly higher use of hip, stepping and suspensory strategies. This supported the findings by Elaine et al who studied that deviations noted in early infancy persist through higher use of compensatory strategies in preterm infants [5]. No significant difference in movement strategies were noted between preterm and fullterm groups for condition 3 which indicated that there was no difference in the ability to resolve the combined somatosensory and visual conflicts in the two groups (Graph 2). However the preterms still showed a higher percentage of compensatory hip, suspensory and stepping strategies.

In Condition 4 the children in 7 year age group showed a statistically significant difference in performance with a poorer ability for sensory integration and postural stability in comparison to the age matched fullterm counterparts. There was no statistically significant difference noted in the performance between the two groups in the 8 and 9 year olds. The movement strategies used among the preterm and fullterm children also did not show any statistically significant difference. Intersensory conflict resolution showed a delay at 7 years of age due to the transitional phase, with the preterm children showing a delay in attainment of maturation equivalent to those of fullterm children [23]. In both preterm and fullterm children poor performance noted at 8 and 9 years of age indicated lack of vestibular system maturation and lack of myelination which is to

complete at 12 years of age[19] .

Thus the study supported findings of Cook S and Woollacott who stated that by 7 years of age a fullterm child would show better intersensory conflict resolution[1]. It also supports the study by Hadders-Algra etal that the postural deviations noted in the form of compensatory strategies in very late preterms are used in isolated components of postural stability, which minimize with age[21].

The results and discussion from the study support the hypothesis of difference in gestational age at birth resulting in persistence of deviations in resolving sensory conflicts to maintain postural control from 7-10 years of age rejecting the null hypothesis.

The study could be further elaborated with determining the effect of training in intersensory conflict resolution for balance and postural stability in preterm children and fullterm children from 7-10 years.

Conflict of Interest: There is no conflict of interest.

Source of Funding : Self.

Ethical Clearance: Ethical clearance was sought from the ethics committee of Topiwala National Medical college.

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Resisted Backward Walking to Improve Gait Synergism in Children with Hemiparetic Cerebral Palsy

Rashij M[1], H R Rai[2], Sivapriya R[3], Nahal Rintu[4], Linshina T[5]

[1]PhD Scholar, [2]Professor and Head, Orthopedics, Nitte University, Mangalore, [3]Faculty, Gulf Medical University, Ajman, [4]Nahal Rintu, Occupational Therapist, Calicut Medical College, Kerala, [5]Linshina T, Physiotherapist, Al Amal Medical Centre, Othukkungal, Kerala

ABSTRACT

Objectives: To study the effectiveness of resisted backward walking on gait parameters of children with spastic hemiparesis. **Design:** Informal Experimental Setting: Roshi Special School & Research Centre, Kozhikode Methodology: 11 children with spastic hemiparesis with GMFCS score 1 and mean age of 9.8 years participated in this study. Following the primary screening, the subjects were trained for reverse walking and later trained using resisted reverse walking for 10 - 12 weeks. Post intervention data were collected at the end of 10 weeks. Outcome measures: Cadence, Foot angle, Speed, Step length and Step width. **Results:** Obtained data were treated with MS Excel for descriptive statistics. Comparisons of progression in the outcome measures between week 1 & 14 were done. **Conclusion:** Resisted back ward walking is an ideal method of gait training to improve gait synergism among children with hemiparesis. This is inexpensive, safe and practical among children aged above 7 years to treat issues of step length, width and speed in children with spastic hemiparesis.

Keywords: *Cerebral Palsy, Back Walking, Spastic Hemiparesis.*

INTRODUCTION

Children with cerebral palsy have difficulty in walking independently and often they adopt themselves to a atypical pattern of gait. The objective of therapeutic training here is to bring the gait and movement skill near to normal and conserve energy.[1,2] Independent ambulation remains as the major necessity of anyone and gait training is indeed the major challenge of the therapist. Clinical therapists generally stick to conventional methods of gait training including indoor walking, treadmill training and soon.[3]

Recently, backward walking techniques or reverse walking has gained attention in clinical side and is widely used training among adults. Backward walking is simply forward walking in reverse. The neuro muscular control of both forward and backward walking are basically from the same.[4]

Backward walking techniques are comparatively easier training method and adding resistance to this pattern would be beneficial than the strenuous strength training methods to improve gait patterns.[4] However, its effectiveness in children is not concluded or documented so far. We believed that it would be ideal to do a pilot study on evaluating the efficacy of backward walking technique in children with hemiparesis.

MATERIALS AND METHODOLOGY

Study design: Before and after no control group (Informal - Experimental)

Sampling design: Simple convenient sampling.

11 diagnosed cases of infantile hemiparesis (4 Females and 7 Males) with GMFCS 1 aged between 7.7 and 11.9 years ROSHI Special School and Research Centre, Kozhikode, India participated in this study.

Corresponding author:
Rashij M.,
PhD Scholar, Nitte University, Mangalore,
E mail: rashij@outlook.com

Exclusion Criteria: Children with cognitive or perceptual dysfunctions, fixed orthopaedic deformities, sensory issues corrective surgeries within 1 year, Botox therapy within 6 months, GMFCS 2 or above, children with irregular therapy follow ups.

Participation consents were obtained from the guardians before recruitment to the study. This study extended for 18 months, i.e. Feb 2015 - August 2016.

Research Process: A structured clinical evaluation chart was adopted to obtain the subjective and objective data. each subject was assessed to analyse the gait mechanics and identify the movement patterns. Stained foot print test and stopwatch were used to evaluate the outcome measures including cadence, foot angle, speed, step length and step width.

Materials Used: Activeband - Green & Blue (Resistance Band), Stop watch, Foot stain, Newsprints.

Participants were then trained for reverse walking for 7 - 14 days under the supervision of parents and intern therapists. Once the subjects gained confidence in backward walking at a comfortable speed along 10 meters safe stretch looking straight ahead, each subjects were made to practice this for 30 - 60 minutes daily for 6 weeks under parent's supervision. Later, the therapists applied resistance force to this walking pattern using a resistance band across the trunk. Gait training on a treadmill was avoided purposefully due to parent's apprehension on risk of fall. This resistance sessions were continued for 6 - 8 weeks as per National Strength and Conditioning Academy (NSCA).

Changes in the gross motor patterning was studied by periodic slow motion videos and clinical evaluations. The data collected after the intervention were documented, tabulated and processed statistically.

Data Management: The data availed were processed using MS excel for descriptive analysis.

RESULTS

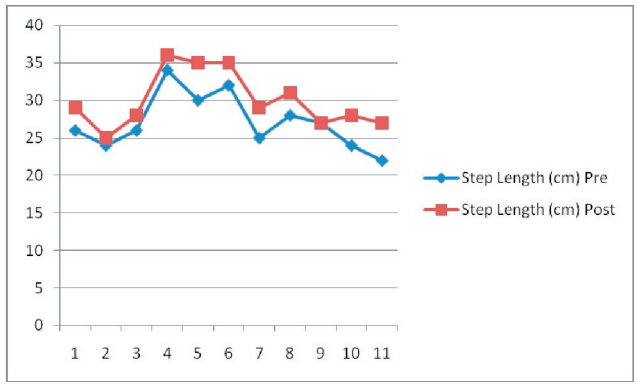
11 children with infantile hemiparesis, including 7 males and 4 females, with a mean age of 9.8 years completed this study. 7 among them were left side affected. Average height and weight recorded were 1.01 m (+/- 0.16) and 26.1 Kg (+/- 8.10) respectively. The demographic data explaining the age, gender, GMFCS status are presented here as a table 1.

Table 1, Demographic data of the participants

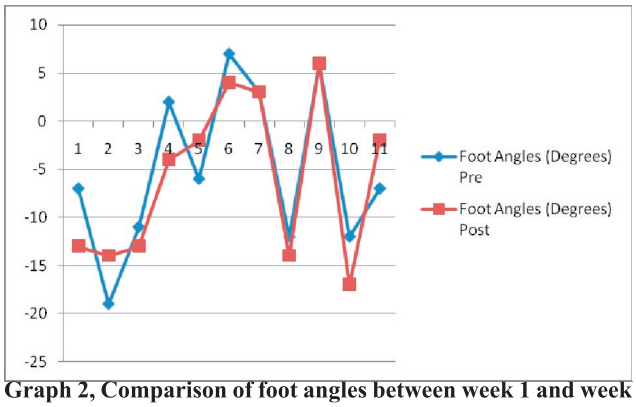
Number of subjects	**11**
Mean age of the subjects	9.8 years (+/- 2.1)
Gender Male Female	 7 4
Affected Side Right Left	 4 7
Mean weight of the subjects	26.1 Kg (+/- 8.10)
Mean height of the subjects	1.01 m (+/ - 0.16)
GMFCS	1
Patient underwent surgical procedure within 1 Year 2-3 Years 3 or above	 0 1 3
Patient underwent Botox Injection within 6 months 6 months - 1 year	 0 1

The subjects had mild spasticity on their affected side (Grade 1 or 1+ on Modified Ashworth Scale for grading spasticity) and all of them fell into the category of GMFCS Grade 1; i.e. they could walk indoor and outdoors and climb stairs without using hands for support but has decreased speed and balance.

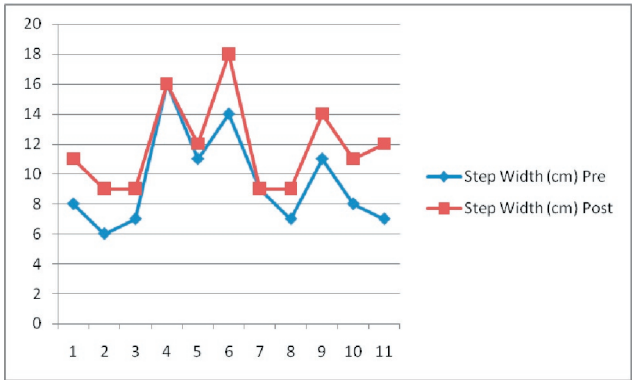
3 female and 1 male subjects have had a history of orthopaedic surgical correction. One male child had Botox injection within a year but more than 6 months.



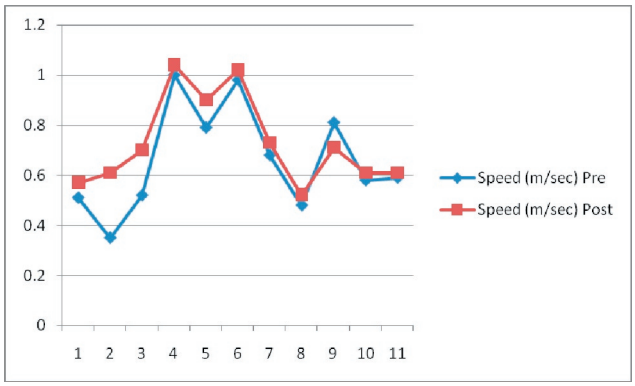
Graph 1, Comparison of step length between week 1 and week 14 of intervention



Graph 2, Comparison of foot angles between week 1 and week 14 of intervention



Graph 3, Comparison of step width between week 1 and week 14 of intervention



Graph 4, Comparison of speed between week 1 and week 14 of intervention

Comparison between pre and post intervention data were done by descriptive statistis and we noted clinical improvements in step length, width and speed. However, no significant changes were observed in cadence. The changes in foot angle varied among the subjects. Only 3 among the 11 subjects had a little improvments in foot angles whereas 2 subjects maintained status. 6 subjects moved to negative foot anglulation after the intervention. The changes in the variables are presented as graphs 1 - 4.

DISCUSSION

Evaluation and management of gait issues among children with cerebral palsy require high concerns. Most of the time, the earlier signs of muscular imbalance and weakness are neglected. This often leads to major patho-mechanical adaptations of major functional movements including gait. At this point, a child with cerebral palsy spends 3 times higher energy cost for walking.

A wide variety of gait training methods are available for the clinicians, however most of these have limitations in clinical set ups. These training often require customised aids, sophisticated equipments and gait lab facilities. That is why only, clinicians generally follows conventional ambulatory training methods for children with cerebral palsy.

Backward walking technique is one among the common practices while treating patients with adult hemiparesis and the results availed are remarkable, (Hreljac et al, Takami A et al).[6,7] Weng CS et al observed backward walking facilitates activation hip extension and knee flexion and this synergy favours the hemiparesis patients. However, this practice is not generally followed in paediatrics due to risk of fall, inability to follow the comments, lack of confidence etc.[8]

While reviewing the kinetic physiology, 'Backward walking' is simply forward walking in reverse. The neuro muscular control of both forward and backward walking are basically from the same neural circuitry. Studies done on the kinematics of backward walking have supported this, especially for the proximal joints.[6]

Can a child with spastic hemiparesis do backward walking? Most therapists and care takers doubted on this. During this study, we faced absolutely no difficulties in training the children aged between 7 - 12 years and our subjects were habituated in backward walking on 10 - 15 meters indoor tracks within two weeks of training. However, our trials of reverse walking on treadmill failed.

Consistent with earlier studies, our subjects showed that gains in lower trunk and limb muscles with resistance banding across the trunk, although some subjects achieved larger gain than others. It would be difficult to explain why a few did not respond well for the resistance training. Agonist insufficiency, pre-existing adaptations, neurological factors are the

possible explanations. Further studies are recommended on this.

Strengthening exercise techniques in children with spastic cerebral palsy have gained popularity these days among the researches and many studies recommend strengthening exercises in clinics. However, the clinicians still worry that resisted exercise might increase the tone or spasticity of subjects thereby decrease the efficiency of the movement and gait. In this study, we observed that spasticity remained unchanged even after 14 weeks of resisted movement training. Earlier studies by Dodd KJ et al, Lee JH et al, Olaf Verchuren had similar observations. [9-11]

The subjects while walking tends to hold their affected lower limb in extension and plantar flexed. this in turn lead to apparent limb lengthening and circumduction. Also, reduced speed and longer stance phases on unaffected side are another observation we made. However, these are only clinical observations in this study. Earlier studies done by Sandra J Olney and Carol Richards have reported similar observations. [12]

Cadence, however did not change much after 14 weeks of interventions. However, earlier studies by Jung JW et al noted significant improvements in cadence of children with spastic cerebral palsy after 6 weeks of strength training.[13] More studies shall be done in this with better lab facilities.

Step Length, width and speed showed better clinical improvements after the resisted reverse walking training. The gain in the lower trunk and limb muscle strength provided better motor control and balance to the subject. Also, the reverse gait training improved the eccentric contractions of lower limb gait muscles there by improved the movement ranges. Erlier studies by Jung JM[13], Kim CY et al.[14] observed similar changes in their studies.

The changes in foot angle varied among the subjects. Only 3 among the 11 subjects had a little improvments in foot angles. 2 of them maintained the status. The resistance offered might have put additional torque on the lower limb muscles, especially at the hip region and this might have caused the internal rotators to gain much power in turn the in toeing. Also, we observed this changes in foot angles were seen in taller children with higher age group. The relationship between foot angle and resited gait training shall be studied much in detail in labs with higher facilities.

Limited lab facilites, basic clinical evaluation tools and small subject size were the limitations of this study. However, this study shall be done as a major thesis with higher number of subjects, objective outcome measures and gait lab facilities.

CONCLUSION

Resisted back ward walking or reverse walking is an ideal method of gait training to improve gait synergism among children with hemiparetic cerebral palsy. This is inexpensive, safe and practical among children aged above 7 years to treat issues of step length, width and speed in children with spastic hemiparesis.

Conflict of Interest: None

Source of Fund: Self

Ethical Clearance: Obtained from Nitte University, Mangalore - NU/CEC/PhD 31/2011 (Part Study of PhD Dissertation)

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Physical Performance and Balance in Active and Sedentary Older Adults – A Comparative Study

Jaspreet Kaur[1], Parul Sharma[2]

[1]Department of Physiotherapy, Guru Jambheswar University of Science and Technology, Hisar, Haryana,
[2]Assisstant Professor, Department of Physiotherapy, Guru Jambheswar University of Science and Technology, Hisar, Haryana

ABSTRACT

Purpose of the Study : The objective of this study was to compare the performance of active and sedentary older adults on Modified Physical Performance Test and Fullerton Advanced Balance Scale .

Material and Method: 130 subjects comprising 80 males and 50 females participated in the study. Subjects were categorized into 2 groups, Group -A (active older adults) and Group B (sedentary older adults). The physical performance was measured using Modified Physical Performance test and fall status was measured using Fullerton Advanced Balance Scale.

Data Analysis and Result: In the present study, statistical analysis was done by using unrelated – t test for both groups (group A and group B). The performance of active older adults was significant on modified physical performance test and fullerton advanced balance scale ($p< 0.01$) as compared to sedentary older adults.

Conclusions: The results indicate that significant performance of active older adults on modified physical performance test and fullerton advanced balance scale as compared to sedentary older adults. Therefore, active older adults are more physically fit and have better balance than sedentary older adults.

Keywords*: ageing, balance, fitness, sedentary older adults.*

INTRODUCTION

Aging is a natural process[1,2] and progressive functional decline[3]. Gradually, biological impairement of normal function as a result of changes in cells (fibroblasts and nerve cells), structural components (bones and muscles), functional impairements of organs(heart, kidney and lungs), biological systems (nervous system, digestive system) and ultimately the organism in a natural way. These impairements and other various factors contribute to physical frailty in older adults such as declines in strength, loss of range of motion, slowness and paucity of movement, poor balance and reduced muscular and cardiovascular endurance[4]. Physical exertion is also associated with a relatively low and transient increase in risk of cardiac events. This risk is significantly higher for older and sedentary individuals. Various physiological changes occur in elderly due to alterations in neuroendocrine control of homeostasis(neuroendocrine theory of aging)[10]. Age related changes in musculoskeletal system can be observed in elderly as they are directly related to increase in falls risks and limited mobility. Loss of muscular endurance is directly related to fatigue in elderly[11]. Recent studies have shown that apoptosis (programmed cell death) is greater in human osteoarthritic cartilage than in normal cartilage viral theory of aging[12]. As neurogenic process progresses, denervation of muscle fibres results in "ageing atrophy[13] alongwith disturbed sensory integration, vision, hearing, taste, smell and touch occur in elderly[11]. Further

Corresponding author:
Mrs. Jaspreet Kaur
Assisstant Professor, Department of Physiotherapy
Guru Jambheswar University of Science and Technology, Hisar, Haryana.
Ph, No- 9466092657
Email :- jaspreet_malik16@yahoo.co.in

neural stem cells in the hippocampus involved in memory and neural stem cells function decreases with increasing aging[14]. Age related neurodegenerative and neurochemical changes are responsible for decline in motor and cognitive functions[15]. Inshort , these physiological changes with age attributed to increase in falls risks, balance and coordination impairements, reduced muscular endurance and flexibility. Therefore, Intervention strategies like balance training and strength training programs should provide to older adults to reduce balance deficits and increase flexibility and endurance.

Fear of falling and balance are thought to be more persuasive problems in older adults. Various scales have been devised to measure fall , balance and gait status such as fullerton advanced balance scale, berg balance scale, functional independence measure, eight functional mobility test, FICSIT (Frailty and injuries: cooperative studies on intervention techniques) and early mobility scales in elderly[5].and balance can be assessed using Various tests and scales to measure the balance confidence in elderly such as: activities of specific balance scale, berg balance scale[6], tinnetti performance oriented mobility assessment for balance. Activities specific confidence scale, dynamic gait index and get up and go test, gait abnormality rating scale (GARS)[8]. Maintainance of balance requires the coordination of sensory, neural and musculoskeletal systems[9]. Alteration in the sensory and neural information leads to postural instability and lack of proprioceptive inputs in older adults and ultimately falls[5]. Therefore in the present study, modified physical performance scale and fullerton advanced balance scale have been used as these are easy scales to incorporate .

METHODOLOGY

One hundred and thirty subjects, aged 40-60 years old comprising 80 males and 50 females volunteered to participate in the study. only those subjects were included who met inclusion criteria .subjects were explained the methodology and risks involved in the study. then they were asked to sign informed consent form. Subjects were categorized into 2 groups- group A (active older adults) and group B (sedentary older adults). Active older adults defined as: who can perform moderate intensity routine activities. For e.g. housework, walking to the local shop instead of driving, gardening, raking leaves and perform leisure and structured activities like woodwork, various types of dancing, walking groups, strength training, tai chi or other group activities, hydrotherapy and yoga[16]. Sedentary older adults are those who engaged in activities at the rest and includes activities at the resting level of energy expenditure such as: sleeping, sitting down, lying down, playing on the computer and engaging in no leisure time physical activities(exercise, sports, physically active hobbies)[17].Written consent was obtained from all the subjects. Prior to intervention, the procedure was explained to each subject. All the measures were administered by using a standard protocol. On first day, readings were taken for the Modified Physical Performance Test and then scores were recorded. After 24 hours, the readings of Fullerton Advanced Balance Scale were taken of the same subjects the gap of 24 hours was kept to prevent the errors in the result due to fatigue and scoring was done . These two scales were taken in the study due to easy to incorporate, less time consuming and economic beneficial.

Modified physical performance test was described by REUBEN AND SIU consists of 7 or 9 functional tasks correlated well with degree of disability, loss of independence and early mortality. Each of 9 items on the modified physical performance test scored as 0-4 and maximum score is 36. This test measures the physical frailty by using modified physical performance test.

Fullerton advanced balance scale (appendix 2) was developed by ROSE AND LUCCHESE, 2003. Fullerton advanced balance scale (FABS) is a performance based measure that addresses the multiple dimensions of static and dynamic balance performed in different sensory environments. FAB scale has shown high test- retest reliability as well as intra and inters rater reliability. The scale was specifically designed for measure of faller status used with independently functioning older adults.The FAB scale is easy and quick to administer and requires 10 to 12 minutes to complete. An older adult who scores 25 or lower on the FAB scale is at high risk and in need of immediate intervention.

RESULT

The present study was done to evaluate the performance of active older adults and sedentary older adults on modified physical performance test and fullerton advanced balance scale. statistical analysis for group- A (active older adults) was done by using unrelated T-test . This test calculated the mean values

of the scores of active older adults on modified physical performance test which came out to be 26.8. with $p<0.01$ as shown in table 1.1, whereas the mean values of the scores of active older adults on fullerton advanced balance scale was found to be 34.69 with $p<0.01$ as shown in table 1.1. So this analysis concluded that the active older adults performed better on Fullerton Advanced Balance Scale rather than on Modified Physical Performance Test.

Table 1.1 Comparison between active and sedentary older adults on modified physical performance test and FAB.

variables	Mean+SD		T value	Significance
	Active older adult	Sedentary older adult		
Modified physical performance test	26±1.65	20.6±2.4	17.01	<0.01
Fullerton advanced balance scale	34.69±2.66	30.6±5.1	5.7	<0.01

Similarly, by using the same test (unrelated T-test) for group B (sedentary older adults) , the mean values of scores on modified physical performance test was found to be 20.61 with $p< 0.01$ as shown in table 1.1, whereas the mean values of scores on fullerton advanced balance scale was found to be 30.61 with $p<0.01$ as shown in table 1.1. So this analysis concluded that sedentary older adults performed better on fullerton advanced balance scale rather than on Modified Physical Performance Test.

Similarly, the mean values of the scores of active older adults on fullerton advanced balance scale which came out to be 34.69 with $p<0.01$ as shown in table 1.1, Whereas the mean values of the scores of sedentary older adults on the same scale was found to be 30.61 with $p<0.01$ as shown in table 1.1 Therefore is specifies that performance active older adults was highly significant as compared to sedentary older adults on modified physical performance test.

After completing the analysis, it is obvious that the active older adults performed better on fullerton advanced balance scale rather than on modified physical performance test.

After analyzing the modified physical performance test between group i.e. Group A (Active older adults) and Group B (Sedentary older adults) , the results showed significant performance of active older adults than sedentary older adults.

DISCUSSION

To our knowledge, not much work has been done to compare the performances of active and sedentary older adults on modified physical performance test and fullerton advanced balance scale.

Overall, It was found that performance of active older adults was highly significant compared to sedentary older adults on Modified Physical Performance Test and Fullerton Advanced Balance Scale. On analysis where means of both the tests were compared for performance . only active older adults, the performance was found better on Fullerton Advanced Balance Scale.

It was observed that sedentary older adults while performing FAB were unable to turn 360 degrees properly and also found difficulty in climbing stairs (one flight and 4 flights of stairs) and standing static balance (feet together, semi tandem and tandem) due to sedentary lifestyle and lack of interest in physical fitness. Due to physically inactivity, they walked with slower step velocities and shorter step lengths whereas Active older adults performed better due to physical fitness as compared to sedentary older adults on modified physical performance test. This result was supported by the study done by Rosengren, Karl S et al who concluded that sedentary older adults adopted a more cautious walking style than active ones, exhibiting shorter step lengths and slower step velocities[18]. Our results are also supported by Luke S.Acree , Jessica et al (2006) and Nancy D Harada (2004) who concluded that improvement in active older

adults was highly significant as compared to sedentary older adults[19,20]. It was also observed that sedentary older adults were unable to stand on one leg (20 seconds), stand on foam with eyes closed (20 seconds), 2- footed jump, tandem walk, turn 360 degrees and tandem walk with head turning due to poor physical fitness and poor balance. whereas active older adults performed better due to physical fitness (running, jogging, strengthening exercises and yoga) and better balance.

Therefore it can be implied that Impairement in musculoskeletal system results in poor performance of sedentary older adults. decrease in muscle mass , muscle strength in combination with reduced endurance causes reduced physical activity and decreases the total energy expenditure in sedentary older adults results in an increased prevalence of obesity(fat accumulation), diabetes and hypertension[21].

Therefore, results were highly non- significant of sedentary older adults on modified physical performance test and fullerton advanced balance scale.

In the present study, it was observed that variations in the variables may be due to gender difference as it is generally seen that male population tend to be more active as compared to females. It was explained by Luke S acree, Jessica longfors et al shown that the HRQL scores in all eight domains were significantly higher ($p < 0.05$) in the group reporting higher physical activity[19]. Additionally, the more active group had fewer females (44% vs. 72%, $p = 0.033$), and lower prevalence of hypertension (39% vs. 60%, $p = 0.041$) than the low active group.

According to Solveig A Arnadottir, Elin D Gunnarsdottirs et al conducted a study including randomly selected participants, 65-88 years old and concluded that males were more physically active than females, and the 65—74-year-olds were more active than the 75—88-year-old[22]. Additionally, our exploratory analysis found that the performance of active older adults was highly significant on fullerton advanced balance scale ($p<0.01$) as compared on modified physical performance test because the tasks of fullerton advanced balance scale are less exertive as compared in modified physical performance test. Therefore we insist on doing a study in which scales taken measures the same variables so that study results are not varied.

Additional studies will be needed to compare the performance of active and sedentary older adults on measuring tools and to establish more intervention strategies (balance training and strength training programs) for sedentary older adults to reduce balance deficits and physical inactivity and improve flexibility, balance, co-ordination and muscular endurance.

Therefore, the results of present study indicate the importance of physical activity which is defined as the sedentary life style results in metabolic disoreders like diabetes, hypertension, musculoskeletal disorders and obesity. it has been proved that physical activity in form of walking, cycling, aerobic exercises and strengthening exercises is useful in improving activities of daily living of a person.

CONCLUSION

130 subjects who completed the study were analyzed. There was significant performance of active older adults as compared to sedentary older adults on Modified Physical Performance Test and Fullerton Advanced Balance Scale. Therefore, according to the study conducted that the active older adults are more physically fit and have better balance than sedentary older adults.

Ethical Clearance- all the ethical consideration have been taken care of. Also no intervention or drugs have been used in this study only performance on scales have been measured which was comfortable for subjects.

Source of Funding- Nil

Conflict of Interest :- Nil

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A Survey of Knowledge and use of ICF in Clinical Practice by Physiotherapists in India

Aditi Chaturvedi

Intern, JSS College of Physiotherapy, Mysore Karnataka

ABSTRACT

This study addressed the issue of use of ICF in the clinical practice by Physiotherapists in India.

Method- As it was a web-based survey, the Physiotherapists from India were approached through social media, Google forms & snow ball sampling. The questionnaire was given. Informed consent was obtained from cover letter through Google forms, all the participants were given questionnaire according to the inclusion criteria and were explained about the items of the questionnaire on demand and the data was analysed.

Results- Of the 2200 surveys emailed to Physiotherapists across India, 384 responses were received till the duration of study (two months), from which the completed surveys were 347, resulting in a 15.7% of response rate. Of those surveyed, 189 (54.4%) reported yes to knowing about the ICF.

Conclusion- the ICF has initiated a global conversation about function and health, moving the health care world beyond a focus on negative aspects of disability. Current literature and study participants suggest that physiotherapists should be part of this conversation. This study adds to the body of ICF knowledge by revealing the physiotherapists need to see the relevance and meaning of the ICF for their individual practices in order to consider integrating the ICF into busy practice environments.

Keywords- *Clinical Practice, Use of ICF, Physiotherapists, Assessment.*

INTRODUCTION

The ICF was endorsed by the World Health Assembly in May 2001 to create a common language of the full spectrum of human functioning and disability. The International classification of functioning, Disability and Health (ICF) (World Health Organization [WHO], 2001) was adopted by the WHO to provide an international and universal classification system of health and health related states. The ICF includes both a classification system and a conceptual model, both of which serve as a framework for considering health and disability (Leonardi et al., 2005).

Corresponding author:
Aditi Chaturvedi
Intern, JSS College of Physiotherapy, Mysore Karnataka, Address- 454 Devi clinic, Landmark- Mobile Palace, MG road Mysore 570001, Karnataka
E-mail: Chaturvedi.adity4@gmail.com, M:9731580731

The ICF system uses neutral language to promote universality amongst health care professionals (Stewart, 2002). The model of Functioning and Disability (WHO, 2001) is a graphic representation of the dynamic interactions between the various ICF components

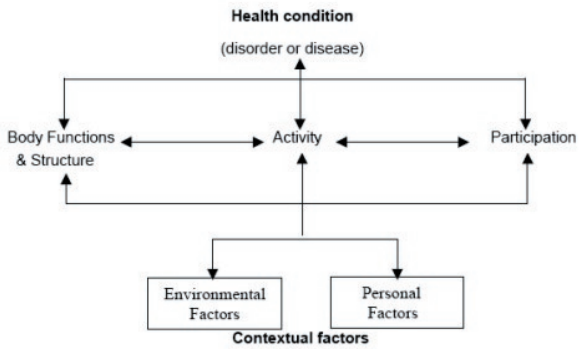

FIGURE 1

ICF Model of Functioning and Disability (WHO, 2001)

Internationally, the ICF is gaining prominence within health care, rehabilitation science, and physical therapy (Hemmingsson, & jonsson 2005; Machol, & Smolen 2006). The increasing international call for all health professionals to have knowledge & use the common language of the ICF to be applied within physical therapy practice (Reed et al., 2005)

Historically, Disability was defined within a medical or an individual model

DISABILITY MODEL	DRAWBACKS
Individual model	This model was criticized for neglecting the social & physical barriers experienced by individual with disabilities.
Social model	More concentrates on how society views disability & confusion of terms surrounding the phenomenon of disability
Medical model	Focuses more on limitations of persons with Disability.
ICIDH(international classification of Impairments, Disabilities, & Handicaps	ICIDH was criticized for the overlap between the specified levels, & for neglecting the impact of the environment on the PWD
Disability Creation Process (DCP)	It is not based on the functional state of patient

NEED FOR THE STUDY

ICF helps in the treatment as it gives importance to each factor, and to explore the use of ICF in clinical practice by physiotherapists in India.

Clinical significance

- ICF deals with the holistic approach in the treatment, as it talks about the multiple factors.
- And clinical guidelines in physical therapy practice have been linked to the ICF as a reference for the process of patient management.

Objective of the study:

To analyze the knowledge and use of ICF in clinical practice by Physiotherapists in India.

REVIEW OF LITERATURE: There is no study done to know the use of ICF in

Clinical practise by physiotherapists, But it explains the use of ICF for various health

Conditions.

Areas of review: ICF, use of the ICF in clinical practice.

Andersom Ricardo And Christiane Riedet al (2014): This study was done to propose the relationship between the QOL and the use of ICF in clinical practice for variety of conditions, after a retrospective study of medical records, the QOL were evaluated in co relation with ICF, The 36 item short form survey was used to assess QOL. And a high and significant co-relation was found.[1]

Sabrina Kohler And Reuben Escorpizo (2015) : conducted study regarding use of ICF corsets for various conditions in clinical practice mainly concentrating on vocational rehabilitation, this study is based on a previous systemic literature review, to the specific ICF categories, the results of this study could act as a guide for VR to integrate ICF corsets into everyday practice.[2]

Kathy Giannangelo And Sue Bowman(2005): ICF: representing the patient beyond a medical classification this study is done to evaluate the potential value of implementing ICF in daily clinical practice, with methods of previous systemic reviews and electronic health records, and concluded that ICF is useful in order to represent the health of population, more knowledge about the mental and social functioning of the population is required, and ICF fulfills this requirement.[3]

Reuben Escorpizo And Gerold Stucki (2010): This study creates an interface between the ICF and physical therapy practice, Although the support for the conceptual application of the ICF to clinical practice is evident from this article, a well defined documentation approach in physical therapy practice remains a challenge. If ICF based documentation could be developed, therapist would better communicate with each other by avoiding the use of vague terms in documentation[4]

M. Wegi, A. Cieza et al (2006): conducted a study to investigate whether the ICF comprehensively covers the spectrum of health problems encountered by PT in patients with MSK conditions. A worldwide email survey with questionnaires that requested lists of relevant areas in the ICF components was conducted, and concluded as The ICF covers comprehensively the spectrum of problems encountered in patients with MSK conditions[5]

Jenifer Jelsma (2009): done a study on use of the International classification of Functioning Disability and Health: A literature survey, a convenience sample of 243 papers was analysed. And concluded as the ICF has already made a major impact on the way in which data concerning disability are conceptualized, collected and processed [6]

Lara Allet, Elisabeth Burge et al (2009): ICF Clinical relevance for physiotherapy, a critical review. The aims of this review were to identify how the ICF is integrated in the clinical activity of physiotherapists, and to discuss advantages and limits of the use of the ICF. And it suggests ICF has a clinical relevance for physiotherapists [7]

METHOD

Study design: Survey

Sampling strategy: convenience

Sample size: 384 (Sample size determinant in health studies: A practical manual

S.K. Lwanga and S. Lemeshow WHO 2001)

Study setting- India

Study duration: 2 months

Inclusion criteria

Physiotherapists those who are in clinical practice.

Physiotherapists those who are practicing in India.

Exclusion criteria

Physiotherapists only with certificate course.

Physiotherapists those who are practicing in Abroad.

Physiotherapists those who are only in academics.

Outcome measures: Instrumentation

Physiotherapists from India were approached and the advertisement was given about the study, through social media, Google forms, and snowball sampling.

The need and procedure before the commencement of the study were explained and informed consent was obtained from the recruited participants through the cover letter, all the participants were given questionnaire and explained about the items of the questionnaire and the data was analyzed. The questionnaire was sent by email or hard copy.

Data Collection

An electronic mailing option was chosen for the web based survey to reach a large number of Physiotherapists across India. Consideration was given to the speed & efficiency of data collection and ability to maintain maximum control over data, thus providing more accurate data management (Weber, Yarandi, Rowe and Weber 2005.) The survey Questionnaire was developed closed questions included yes or no answer to knowledge or use of the ICF. Open- ended questions included identifying the supports & barriers to using the ICF in practice.

Data Analysis

Descriptive statistics were calculated using percentage, and chi-square analysis. Consistent with this study's purpose to obtain a preliminary level of knowledge and use of the ICF, chi-square analysis was used to examine associations between the knowledge and use data and the demographic information.

Selection of demographic variables for analyses was based on the hypotheses about the variables that might be associated with knowledge and use of the ICF. These variables included years of practice, current practice setting, and region. Significance was established at a p-value of less than .05.

After the analyses of the survey, the results were organised and reported under the original research question regarding knowledge and use of the ICF in clinical practice by Physiotherapists.

RESULTS

Demographic information

Of the 2200 surveys emailed to Physiotherapists across India, 384 responses were received till the duration of the study (two months), from which the completed surveys were 347, resulting in a 15.7% response rate. A demographic summary of the survey respondents is provided in Table-1

Table 1- Demographic summary of survey respondents- (N= 347)

Demographic characteristics	Frequency	%
#years of practice		
Less than one year	27	7.7
1-5 years	59	17.0
6-10 years	109	31.4
11-20 years	90	25.9
Greater than 20 years	62	17.8
Current practice setting		
Hospital based OP clinic	196	56.4
PT operated private clinic	74	21.3
Physician owned private practice	21	6.05
Inpatient	37	10.6
Others	19	5.4
Gender		
Male	246	70.8
Female	105	30.2
Current region		
East India	17	4.8
North India	187	53.8
Northeast India	51	14.6
South India	63	18.1
West India	29	8.3

Table-2 Chi-Square analysis for participant reported knowledge of ICF & demographic variables-

Demographic variables	Yes		No		Statistical findings
	n	Row%	n	Row%	
Years of practice					
Less than one year	15	55.5	12	44.4	
1-5 years	19	32.2	40	67.7	
6-10 years	47	43.1	62	56.8	(x2= 18.672, df= 4. p=0.009)
11-20 years	52	57.7	38	42.2	
Greater than 20 years	17	27.4	45	72.5	
TOTAL	150		197		
Current practice area					
Hospital based OP clinic	85	40.6	111	56.6	
PT operated private practice	27	31.3	47	63.5	(x2=14.919, df=4, p= 0.0049)

Cont... Table-2 Chi-Square analysis for participant reported knowledge of ICF & demographic variables-

Physician owned private Practice	14	66.6	7	33.3	
Inpatient	12	32.4	25	67.5	
Others	14	42.1	5	57.8	
TOTAL	152		195		
Current Region-					
East India	12	47.05	5	52.9	
North India	68	36.3	119	63.6	(x2=15.988, df=4, p=0.003)
Northeast India	19	37.2	32	62.7	
South India	37	58.7	26	41.2	
West India	14	48.2	15	51.7	
TOTAL	**150**		**197**		

Table-3 Chi- square analysis between demographic variables and reported use of the ICF-

Demographic variables	**Yes**		**No**		**Statistical findings**
	n	**Row%**	**n**	**Row%**	
Years of practice					
Less than one year	9	81.8	6	18.1	
1-5 years	14	73.6	5	26.3	
6-10 years	36	76.5	11	23.04	(x2=6.871, df=4, p=0.1429)
11-20 years	44	84.6	8	15.3	
Greater than 20 years	10	58.8	7	41.1	
TOTAL	119		27		
Current practice area					
Hospital based OP clinic	77	85.5	13	14.4	
PT operated private practice	20	64.5	11	35.4	
Physician owned private Practice	8	57.1	6	42.8	(x2=11.714, df=4, p=0.0196)
Inpatient	7	58.3	5	41.6	
Others	14	73.6	6	31.5	
TOTAL	107		29		
Current Region-					
East India	7	58.3	5	41.6	
North India	59	86.7	9	13.2	
Northeast India	12	63.1	7	36.8	(x2=13.263, df=4, p= 0.010)
South India	31	83.7	6	16.2	
West India	7	58.3	6	46.1	
TOTAL	**126**		**20**		

Table 4- Questions regarding knowledge of ICF-

Are you familiar with the ICF model?	**Percentage (n)**
Yes	43.2% (150)
No	56.7% (197)
Does the ICF classify people?	
Yes	39.1% (74)
No	60.8% (115)
To whom does the ICF apply?	
Persons with Disabilities	16.4% (31)
Persons with specific health conditions	22.7% (43)
Persons with impairment	9.5% (18)
All people	51.3% (97)
What data can be organized with the ICF?	
Qualitative data	10.05% (19)
Quantitative data	17.9% (34)
Pre- existing data	14.2% (27)
All of the above	57.6% (109)
What does the ICF domain Indicates?	
Area of functioning	40.2% (76)
Extent of functioning	49.2% (93)
Extent of disability	7.4% (14)
All of the above	3.1% (6)

Table 5- Vignette 1 response-

	(n = no. of respondents)% Percent=(n)
Which of the screening tests would you perform on this patient to assess body function?	83.0 % (157)
Would you perform body structure assessment on this patient?	93.1% (176)
How would you describe activities & participation for this patient?	85.1% (161)
Which ICF category would you use under Activities & Participation?	95.7% (181)
Which codes would you use under environmental factors?	94.7% (179)
Which of the therapeutic exercise interventions would you be likely to use to improve body function with this patient?	78.3% (148)
Which of the interventions would you be likely to use to improve Activity & Participation?	76.1% (144)
Which of the outcome measures would you use with this patient for assessing progress?	90.4% (171)

Table 6- Preferred Methods to learn about the ICF- (N= 256)*

Preferred methods to learn about the ICF	**Frequency**	**%**
Online/website	8	3.1
Newsletter	29	11.3
Journal Article	40	15.6
Workshop	98	38.2
Seminars	72	28.1
Other	9	3.5

DISCUSSION

Although 54% of survey respondents reported that they knew about the ICF, the depth of this knowledge appears to be limited. The study suggests that the number of years of practice may influence the therapist's knowledge and use of the ICF. Literature suggests that primary involvement with the ICF will lie within the newer generations of physiotherapy who learn about it as part of their university education (stewart 2002), emphasizing the importance for all physiotherapy programmes to actively incorporate this new learning.

The survey results indicate that the ICF is known within research but is not known as well in the clinical realm in India. While many participating physiotherapists are familiar with the idea of the ICF, most have less knowledge of the inner workings of the model and especially the classification system. Ultimately, many participants reflected that they did not know enough about the ICF to utilize or apply it in practice. Hemmingsson and Jonsson's (2005) concerns that the varying knowledge level of practitioners may promote different interpretations and unintended uses of framework. This inconsistency in knowledge levels needs to be addressed if the ICF is to be used appropriately by physiotherapists in India.

The uncertainty expressed by participants could be attributed to the ICF's relative newness, or it could reflect a perception that the ICF is just too big or daunting for the individual clinician to learn. Stucki et al. (2003) stated that ICF constructs are somewhat challenging to learn and the classification system lengthiness can further hinder learning.

Findings in this survey reveals that the physiotherapists need to find purpose and meaning in applying the ICF to their current practice. The utilization of the ICF as comprehensive tool could save clinicians time, with potential to create positive changes in delivery of service.

Study limitation

Some limitation exists in this descriptive exploratory study. The sample response rate was 15.7% , indicating that study results may not depict current levels of knowledge and use among all physiotherapists in India.

The response to the survey was higher than anticipated, and this influenced the allotment of time and other resources available for statistical analysis. Although future study could include more sophisticated analytic methods, the analysis was appropriate for an exploratory project, and answered the research questions.

CONCLUSION

The ICF has initiated a global conversation about function and health, moving the health care world beyond a focus on negative aspects of disease and disability. Current literature and study participants suggest that physiotherapists should be part of this conversation.

This study adds to the body of ICF knowledge by revealing the physiotherapists need to see the relevance and meaning of the ICF for their individual practices in order to consider integrating the ICF into busy practice environments. The findings provide suggestions for physiotherapists to apply the ICF in a meaningful way within practice. This appears to be the cases especially within interprofessional practice setting in which the ICF may help other professions to better understand the role and value of physical therapy.

Conflict of Interest- None

Source of Funding- Self

Ethical Clearance- Ethical clearance was obtained from the JSS College

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A Study to Compare the Efficacy between Active Self Stretching and Self PNF Stretching on Hamstring Flexibility among Normal Individuals

Rathish Manickam[1], Master Hiral Shailesh[1], Aditi Vyas[1]

[1]Assistant Professor, Srinivas College of Physiotherapy & Research Center, Pandeshwar, Mangalore, Karnataka, India

ABSTRACT

Objectives: To compare between active self-stretching and self PNF stretching on hamstring flexibility.

Study Design: Exploratory study design.

Study Setting: Research Laboratory of Srinivas College of Physiotherapy & Research Centre.

Participants: 80 female healthy subjects with age of 18 to 25 years having mild hamstring tightness were recruited for the study.

Methodology: Subjects were randomly assigned to two groups. Each group consisted of 40 subjects, Group A were trained for active self-stretching and Group B were trained for self PNF stretching for hamstrings at 1 session per day for a period of 6 weeks and each session was carried out for 10-15 minutes.

Results: The analysis was done by using Paired T test. Six weeks training of active self stretching and self PNF stretching showed significant improvement on hamstring flexibility by using modified back saver sit and reach test and 90-90 test.

However intergroup comparison showed varied results. The modified back saver sit and reach test showed no significant difference between the active self stretching and self PNF stretching group, as it was found that the average improvement in active self stretching was 8.1 and in self PNF stretching was 8.76.

Whereas the 90-90 test showed a significant difference between active self stretching and self PNF stretching group, as the average improvement in active self stretching was 18.6 while in self PNF stretching was 23.6.

Conclusion : It was found that by using Back saver sit and reach test both active self stretching and self PNF stretching techniques improved hamstring flexibility invariably. It was concluded that self-PNF stretching showed a greater improvement on hamstring flexibility than active self stretching by 90-90 test.

Keywords: *Hamstring, flexibility, self PNF stretching, active self stretching, modified back saver sit and reach test, 90-90 test.*

Corresponding author:
Rathish Manickam MPT
Assistant Professor, Master Hiral Shailesh P.T, Aditi Vyas P.T, Srinivas College of Physiotherapy & Research Center, Pandeshwar, Mangalore – 575001, Karnataka India, Email : rathish605@gmail.com

INTRODUCTION OR BACKGROUND

Stretching techniques are used in clinical practice to increase hamstring flexibility with some support for their use. The flexibility of hamstring muscles plays a substantial role in the prevention of injury, muscular & postural imbalance, maintenance of full range of

joint movement, optimal musculoskeletal function and enhanced performance in sports.[1]

Hamstring is two joint muscle, so the full stretch of the muscle is rarely achieved in everyday activities. The full length of the muscle as it changes length from contraction to stretching can only occur if the hip is fully flexed as the knee is simultaneously fully flexed. The hamstrings are not regularly used in common everyday motions like walking and standing, therefore, individuals who are not very active may not notice if they have weak hamstring muscles.[1,2]

The tightened hamstrings can pull the knee out of its natural alignment, thereby open to an array of injuries. The hamstring muscles are most commonly injured when working eccentrically while decelerating or landing.[3,4]

The hamstrings are predominantly composed of fast twitch muscle fibresabout 70%. and thus hamstrings are designed for high forces and high velocities.[5-7]Hamstring muscle strain represents a significant injury to the athlete participating in sporting activities. Lack of hamstring flexibility has been correlated to hamstring muscle injury[3].Hamstring stretching is therefore one of useful clinical exercises for increasing range of motion, muscle flexibility, improving muscle balance, and preventing the muscle from injury.[8]

Flexibility is a key component for injury prevention and rehabilitation. Stretching is important for reducing injury and improving the performance in sports and for overall physical fitness.[9]

PNF stretching is thought to have its effect through two mechanisms namely autogenic and reciprocal inhibition (Sharman et al., 2006). It has been suggested that secondary to these two mechanisms PNF stretching delivers greater short-term improvements in ROM (Funk et al., 2003; Sharman et al., 2006).[10]

According to Smith, static stretching has the least associated injury risk and is believed to be the safest and most frequent method of stretching. Static tension placed on the muscletendon unit has been shown to activate the GTO, which may produce autogenic inhibition of the muscle that is stretched. Static stretching has been shown to be very effective at increasing hamstring length.[11]

A number of previous studies have shown that proprioceptive neuromuscular facilitation(PNF) stretching techniques produces greater range of motion than passive or ballistic stretching methods.[12,13,14] However other studies have reported that the results achieved with static stretching and ballistic stretching techniques are comparable with those achieved with PNF stretching techniques.[15-17]

Even though there are several techniques to improve hamstring flexibility which is delivered successfully by physiotherapists, its not practically possible for the physiotherapist to deliver the stretching techniques every time hands on. Thus the imperative aspects of self stretching techniques which can be done by normal individuals for improving hamstring flexibility comes into play. As there are still inconclusive literatures regarding self stretching for improving hamstring flexibility among general population who are having hamstring tightness, and no study has been found to compare two self stretching protocols.The results of this study would serve as the base for improving hamstring flexibility even among patient population. Therefore, the purpose of the study is to find the effectiveness of active self-stretching and self PNF technique on hamstring flexibility among normal individuals.

MATERIAL AND METHOD

Pen/Pencil - To note down the readings

Paper - To record the readings found

Goniometer - To measure the angle of joint

Bench with Ruler- To measure the distance for modified back saver sit & reach test

SOURCE OF DATA

Data was collected from the undergraduate and post graduate physiotherapy students of Srinivas College of Physiotherapy, Mangalore, having mild hamstring tightness, after obtaining informed consent.

Inclusion Criteria

- Age between 18 to 25 years
- Subjects having mild hamstrings muscle tightness i.e. angle more than 20 degree of full extension while performing 90-90 test [18]
- Subjects with normal BMI– 18.5 – 24.9
- No history of impairment to the knee, thigh,

hip, or lower back for 1 year before the study.

Exclusion Criteria

- Age above 25 years
- Hamstring strain
- Moderate to severe hamstring tightness
- Knee or ankle joint pathology.
- Prolapsed intervertebral disc or any back pathology.
- Subjects with BMI greater than 25

RESEARCH DESIGN

Pre and post test experimental study.

SAMPLING METHOD

Random sampling method

METHODOLOGY

80 students who were having mild hamstring tightness were recruited for the study after obtaining informed consent. Subjects who fulfilled the inclusion and exclusion criteria were randomly assigned to one of two groups. Each group consisted of 40 subjects. Group A was trained for active self-stretching technique for hamstrings and Group B were trained for self PNF stretching technique for hamstrings.

Both groups trained for 1 session per day for 6 weeks, each session was carried out for 10-15 minutes. To prevent injury by stretching techniques, warm up exercises were given such as active knee extensions in standing and lying positions, which was repeated 10 times.Hamstring flexibility was measured using a double-armed Goniometer.

Procedures

A total of 100 subjects participated in the study during measurement of hamstring flexibility, out of which 80 subjects fulfilled the inclusion criteria and was divided into two groups each comprising of 40 subjects.

Group A consisted of 40 normal healthy subjects and they were trained for active self-stretching exercise for hamstrings in which the subject lie supine on the floor, with one leg through a doorway and the other leg (the one to be stretched) propped up against the door frame. For the effective stretch the pelvis and the opposite leg must remain on the floor with the knee extended. To increase the stretch, the subject was told to move the buttock closer to the frame, keeping the knee extendedthe subject was be told to hold it for 30 seconds then relax.[7] The same was repeated for 5 times.[19]

Group B consisted of 40 normal healthy individuals and they were trained for self PNF stretching exercise for hamstrings in which subject lie supine on the floor, with one leg through a doorway and the other leg (the one to be stretched) propped up against the door frame. For the effective stretch the pelvis and the opposite leg must remain on the floor with the knee extended. The subject was taught to perform the hold relax technique by pressing the heel of the leg being stretched against the door frame causing isometric contraction of the hamstrings for 5 counts, relaxing it then lifting the leg away from the frame.[7] The same was repeated for 5 times.[19]

Outcome measures:

Before beginning the rehabilitation protocol and after 6 weeks of training, all the subjects were evaluated by the following outcome measures.

Modified back saver sit and reach test [18]: Shoes were removed first. Subject sat on the plinth with one leg out straight and the other leg with the knee bent and its foot flat on the floor. The outstretched foot was placed with foot against the box. With hands placed on top of each other and palms facing down, the subject reaches slowly forward along the measuring line as far as possible. After three practice reaches, the fourth reach is held for at least one second while the distance is recorded. The subject repeated the test three times and the best score was taken.

90-90 test [18]: Subject was instructed to lie supine position with hip and knee flexed at 90 degree, landmarks were made over lateral malloeloi, lateral femoral condyle, greater trochanter. The hip was maintained at 90 degree verified with goniometer and subject was told to actively extend the knee as far possible. Once they were no longer able to extend the knee, or hip began to lose the 90° angle as determined , the angle of knee flexion was then obtained measured by goniometer. [20]

Mean value were found and Paired T test was used to compare the active self stretching and self PNF stretching.

FINDINGS

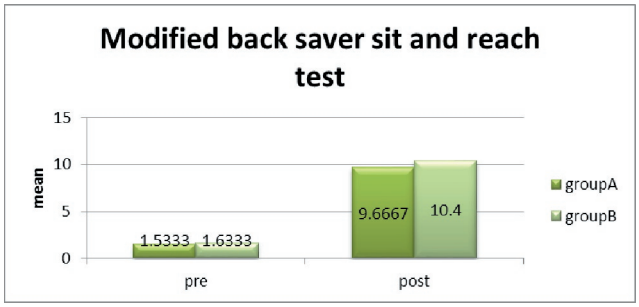
The analysis revealed that both stretching protocol were found to be effective in improving hamstring flexibility.

Active self stretching improved the hamstring flexibility. Modified back saver sit and reach test showed significant improvement after 6 weeks of training. The mean value increased from 1.533 cm to 9.67cm.90-90 test also showed significant improvement in hamstring flexibility. The value of knee extension lag decreased from 38.56 to 19.96 degree.

Self PNF stretching also showed significant improvement on hamstring flexibility. Modified back saver sit and reach test showed significant improvement after 6 weeks of training. The mean value increased from 1.63 cm to 10.40 cm. 90-90 test also showed significant improvement in hamstring tightness. The value of knee extension deficit decreased from 37.03 to 13.83 degree.

However for intergroup comparison showed varied results. The modified back saver sit and reach test showed no significant difference between the active self stretching and self PNF stretching group. As the average improvement in static stretching is 8.1 while in self PNF stretching in 8.76.

However the 90-90 test showed a significant difference between active self stretching and self PNF stretching group. As the average improvement in self static stretching is 18.6 while in PNF stretching in 23.6 degree.The possible reason for this could be the theoretical basis of the technique i.e. two physiological mechanisms are engaged during the application of PNF stretching which are autogenic inhibition via recruitment of the GTOs and reciprocal inhibition which causes inhibition of the target muscle following the contraction of the opposing muscle.[10]

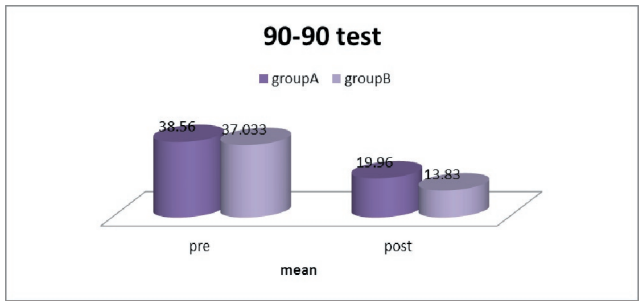


Graph 1: Pre and post values of active self stretching and self pnf stretching by using modified back saver sit and reach test

Table 1: PRE - POST COMPARISON BETWEEN TWO GROUPS BY MODIFIED BACK SAVER SIT AND REACH TEST.

	Average improvement	t-value	p-value	Result
Group-A	8.133	21.898	0.000	P<0.05 sig
Group-B	8.76	22.764	0.000	P<0.05 sig

It shows that hamstring flexibility was improved by using both the techniques significantly.



Graph 2: Pre and post values of active self stretching and self pnf stretching by using 90-90 test

Table 2: PRE POST COMPARISON BETWEEN TWO GROUPS BY 90-90 TEST.

	Average improvement	t-value	p-value	Result
Group-A	18.6	17.478	0.000	P<0.05 sig
Group-B	23.2	23.672	0.000	P<0.05 sig

Shows significant improvement in hamstring flexibility in static self stretching and PNF self stretching with P <0.05.

Table 3: COMPARISON BETWEEN GROUPS IN 90-90 TEST.

	Average improvement	t-value	p-value	Result
Group-A	18.6	2.967	0.0.004	P<0.05 sig
Group-B	23.2			

Shows significant improvement in hamstring flexibility by using PNF self stretching with P < 0.05

Therefore the results of this study can be correlated

with the popular belief that PNF stretching techniques lead to relaxation/inhibition of the stretched muscle (target muscle) via the two physiological mechanisms proposed by Sherrington (1940) namely reciprocal inhibition and autogenic inhibition.

As Hamstring is a two joint muscle the substantial aspect of its flexibility plays a significant role in correcting the mechanics of various knee and spinal conditions. As the results of this study emphasized on improvement in hamstring flexibility by self PNF stretching among normal individuals, the same stretching technique may have an impact on patient population also and can be done in future research as well.

Even though Physiotherapists can deliver effective hamstring stretching by various techniques, they cannot deliver it many times in a day due to time constraint, thus it has become mandatory to implement a self stretching manoeuvre. This study can serve as the base foundation for implementing self stretching among patient population who have hamstring tightness.

CONCLUSION

The results of the present study showed that there was a significant reduction in tightness of hamstring followed by active self stretching as well as self PNF stretching techniques. It was concluded that self PNF stretching showed greater average improvement on hamstring flexibility than active self stretching by using 90-90 test.

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Conflict of Interest: I invariably declare that there is no conflict with any of them related to the study including title selection, data collection, and other procedures which are included in this study

Source of Funding: I declare that there is no source of funding in this study and everything done in the study is through SELF

Ethical Clearance: This study is presented in front of the committee and got approved by scientific and ethical committee of the institution.

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Effect of Closed Kinetic Chain Exercises in Subjects with Proximal Femur Fracture Operated with Dynamic Hip Screw and Plate Fixation

Sonani Rupal Jagdishbhai[1], Sandeep Babasaheb Shinde[2]

[1]Physiotherapist, Krishna Institute of Medical Sciences, [2]Associate Professor, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad, Satara, Maharashtra, India

ABSTRACT

Background: Proximal femur fractures are a subset of fractures that occur in the hip region. They tend to occur in older patients, and in those who have osteoporosis, showing peak age 40-60 years. In this group of patients, fracture is usually the result of low-impact trauma although; in younger patients they are usually victims of high-impact trauma, usually during a road traffic accident.[3]

Method: An Comparative study was conducted at Krishna College of Physiotherapy, Karad. 30 subjects with age group between 40-60 years were taken. In Group A (15) subjects were treated with conventional physiotherapy treatment and In Group B (15) subjects were treated closed kinetic chain exercises and conventional physiotherapy treatment.

Results: Statistical analysis was done using paired and Unpaired't" test, Mann Whitney test and Wilcoxon matched pairs signed rank test. The results showed statistically significant improvement in muscles strength, pain, early ambulation and functional status of hip in Group B (experimental group) as compared to group.

Conclusion: Closed kinetic chain exercises are more improve muscles strength, cost effectiveness, convenience, and satisfaction in management of post operative proximal femur fracture conditions.

Keywords: *Closed kinetic chain exercises, Vignos scale and manual muscle testing.*

INTRODUCTION

Proximal femur fracture is among the most common injuries necessitating hospital admission. Occurs in the proximal end of the femur near the hip.[2] this injury can occur in both low-impact and high-impact trauma.[3] these fractures happen most often in patients 65 or older patients and those with osteoporosis can suffer from this injury during low-impact trauma[4] the most common cause is a fall. As we age, our bones lose strength and are more susceptible to injury and breaks. In young adults and children, hip fractures are usually caused by a sports injury or vehicle accident. [9]There are several different types of surgery for proximal femur fractures and which one you have depends on where the injury occurred. It's important to get surgery as soon as possible so other medical problems do not arise.[2]Physiotherapy treatment improve pain level, strength, standing balance, walking ability, speed of healing, speed of return to activity.

Closed kinetic chain exercises are physical exercises performed where the hand of foot is fixed in space and cannot move.[5] Closed kinetic chain exercises increased joint stability, increased joint compressive forces, decreased shear forces, decreased acceleration forces and stimulation of proprioception.

MATERIALS AND METHOD

Subjects who diagnosed as proximal femur fractures operated with dynamic hip screw and plate fixation conditions were selected. Further they will be

Corresponding author:
Dr. Sandeep Babasaheb Shinde
Associate Professor, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad- 415110, Satara, Maharashtra, India.
Email: drsandeepshinde24@gmail.com

screened clinically using various tests and diagnosis and were put in either of the groups Group A control group and Group B experimental group by simple random sampling using lottery method. Before proceeding to intervention a written consent was taken from subject. Ethical clearance was obtained from university's institutional review board. Inclusion criteria were both male and female, who are willing to participate in study, Age above 40 years. Exclusion criteria were subject having any other pathology other than proximal femur fractures operated with dynamic hip screw and plate fixation, uncooperative subjects, Subjects undergone any other surgery. Pre-treatment outcome measure of Vignos scale, manual muscle testing and shoulder range of motion using Goniometer was recorded.

PROCEDURE

Subjects who referred to physiotherapy department diagnosed by orthopedics of Krishna hospital, Karad, as proximal femur fractures operated with dynamic hip screw and plate fixation were selected. Further they were screened clinically using various tests and diagnosis was conformed. Considering inclusion and exclusion criteria they were requested to participate in the study. The nature of study and intervention was explained to the subjects and those willing to participate were included. Before proceeding to intervention a written consent was taken from subject. Pre-treatment outcome measure of hip pain using visual analogous scale and hip range of motion using Goniometer was recorded.

After 8 weeks the post treatment assessment for hip joint pain, range of motion and muscles strength will be taken with the help of assessment tools that is visual analogous scale for hip pain, goniometry of hip for range of motion, manual muscle testing for muscles strength and Vignos scale for lower extremity function. Pre assessment and post assessment tool score of both groups will be taken for statistical analysis.

FINDINGS

Statistical analysis for the present study was done by using the INSTAT. Various statistical measures such as Mann Whitney test, Wilcoxon matched pair test, paired't'test and Unpaired't' test were used for this purpose. Intra Group comparison (within Group) was analyzed statistically using Wilcoxon matched pairs test for VS Scale Score, inter Group comparison (between Group) was analyzed statistically using Mann Whitney test. MMT and ROM Score assessment was statistically analyzed by using paired' test and unpaired' test. Probability values less than 0.05 were considered statistically significant and probability values less than 0.0001 were considered statistically extremely significant.

RESULTS

Total 30 subjects were taken for study. The gender ratio of Group A was 10:4 (10 females and 4 males) and Group B was 8:6 (8 females and 6 males) and was statistically not significant.

A. Pain: Visual analogue scale (VAS)

Table No. 1: Comparison of VAS scale

Group	Pre mean ± SD	Post-treatment	P value
		Mean ± SD	
A	7.428 ± 1.742	1.857 ± 0.949	0.4081
B	7.928 ± 1.385	1.785 ± 0.801	0.8314
`p'	0.4264	0.8364	

Intra group analysis of VAS score revealed statistically reduction in pain scores post interventional for both the groups. This was done by using Wilcox on matched pairs test Group A (0.4264), Group B (0.8364). Pre intervention analysis showed no significant differences (p0.0.4264).

Inter group analysis of VAS score was done by using Mann-Whitney test. Post intervention analysis showed significant difference between Group A and Group B (p0.8314).

B. Mobility: Range of motion (ROM)

Table No. 2: Comparison of hip flexion ROM

Group	Pre Mean ± SD	Post Mean ± SD	P value
A	91.0714 ± 7.888	110.001 ± 8.771	0.4181
B	93.571 ± 8.187	117.142 ± 4.688	0.0124
`p'	0.3644	0.0118	

In the present study pre interventional mean hip flexion range was 91.0714 ± 7.888 in Group A and 93.57r1 ± 8.187 in Group B whereas post-interventional

mean of hip flexion range was 110.001 ± 8.771 in Group A and 117.142 ± 4.688 in Group B respectively.

Inter group analysis of hip flexion range was done by using unpaired t test.Pre intervention analysis showed no significant difference between Group A and Group B (p=0.3644). Post intervention analysis showed very significant difference between Group A and Group B (p=0.0118).

Table No. 3: Comparison of hip abduction ROM

Group	Pre-Mean ± SD	Post-Mean ± SD	P value
A	25.357 ± 10.089	43.571 ± 6.630	0.6000
B	27.142 ± 7.523	43.928 ± 7.888	0.8978
`p'	0.6105	0.9131	

Intra group statistical analysis revealed statistically extremely significant increase in hip abduction range post interventional for both the groups. This was done by using paired t test group A (p=0.6105), Group B (p=0.9131).

Inter group analysis of hip abduction range was done by using unpaired t test. Pre (p=0.6000) and post (p=0.8978) interventional analysis showed no significant difference between group A and group B.

C. Muscle strength: Manual muscle testing(MMT)

Table No. 4: Comparison of hip flexors muscles MMT

Group	Pre Mean ± SD	Post Mean ± SD	P value
A	2.5714 ± 0.5136	4.5714 ± 0.5136	<0.0001
B	2.642 ± o.6333	4.714 ± 0.4688	<0.0001
`p'	0.7457	0.4490	

Intra group statistical analysis revealed statistically extremely significant increase in hip flexors muscles post interventional for both the groups. This was done by using paired t test group A (p<0.0001, t= 19.079), Group B (p<0.0001, t= 9.352).

Table No. 5: Comparison of hip abductors MMT

Group	Pre Mean ± SD	Post Mean ± SD	P value
A	3.3571± 0.4972	4.9285 ± 0.2673	<0.0001
B	3.5714 ± 0.5136	4.9390 ± 0.2673	<0.0001
`p'	0.2723	>0.9999	

Intra group statistical analysis revealed statistically extremely significant increase in hip abductors muscles post interventional for both the groups. This was done by using paired t test group A (p<0.0001, t= 11.449), Group B (p<0.0001, t= 10.212).

D. Lower extremity function test: Vignos scale(VS)

Table No. 6: Comparison of VS scale

Group	Pre Mean ± SD	Post Mean ± SD	P value
A	5.4285 ± 1.222	2.000 ± 1.177	<0.0001
B	4.8571 ± 0.9493	1.2857 ± 0.4688	<0.0001
`p'	0.1789	0.0446	

Intra group statistical analysis revealed statistically extremely significant increase in Vignos scale post interventional for both the groups. This was done by using paired t test group A (p<0.0001, t= 7.560), Group B (p<0.0001, t= 8.771).

DISCUSSION

Proximal femur fractures are a subset of fractures that occur in the hip region. They tend to occur in older patients, and in those who have osteoporosis, showing peak age 40-60 years.[1] In this group of patients, fracture is usually the result of low-impact trauma although; in younger patients they are usually victims of high-impact trauma, usually during a road traffic accident.[2]

30 subjects clinically diagnosed with post operative proximal femur fracture conditions and fulfilling inclusion and exclusion criteria with age above 40 years were included in the study. They were allocated in two groups, Group A and Group B, each containing 14 subject. A baseline treatment of Hip and knee isometric exercises, thigh exercises, buttock exercises, ankle

isotonic exercises, weight bearing three-point gate, assisted and self- resistive exercise in Group A and hip and knee isometric exercises, thigh exercises, buttock exercises, ankle isotonic exercises, weight bearing three-point gate, assisted and self- resistive exercise with an addition of close kinetic chain exercises in Group B. the outcome was measured: visual analogue scale (VAS) for pain assessment, range of motion by goniometry, Vignos scale for lower extremity function and manual muscles testing for muscles strength. The baseline treatment of Hip and knee isometric exercises, ankle isotonic exercises, weight bearing three-point gate, assisted and self- resistive exercise was common for both group. All this intervention was common in both groups.

The average mean age participants in Group A was The mean age of the participants in group A was 49.928 ± 6.342 and group B 46.51 ± 8.346. There was no significant difference between the mean ages of the participants in both groups this was done using unpaired t test. The total numbers of participants included were as 30 out of which 18 were females and 10 are males. Group A contained 10 females and 4 males were as Group B contained 8 females and 6 males. This co-related with the study that females are more affected than males. Out of 30 participants 21 had right side post operative proximal femur fracture conditions. Wilcoxon matched pairs test were used to analyses the effect of conventional physiotherapy treatment on pain and fictional disability which showed that there was significant reduction in pain and functional disability (p=0.8314) post treatment.

Paired `t´ test was used to analysis the effect of conventional physiotherapy treatment on hip ROM which showed that there was significant improvement in flexion (t=2.687, p=0.0127), extension (t=2.110, p=0.0446) abduction (t=0.1297, p=0.8978) adduction (t=0.4249, p=0.6744) external rotation (t=0.7689, p=0.4489) internal rotation (t=2.540, p=0.0174) post treatment.

The statistical analysis revealed that there was a significant difference in pain and functional assessment in both groups. The Group B was more efficient in reduction of pain then Group A post treatment.

Comparison of hip muscles strength and range of motion between two groups was done using unpaired t test to find the effectiveness between two groups.

The statistical analysis revealed that there was significant difference in certain hip muscle strength in both groups. The Group B was more efficient in improving hip flexion (p=0.0118) and hip internal rotation (p= 0.02940) post treatment. There is no significant improvement in hip adduction (p= 0.6546) and hip extension (0.0548) post treatment.

The result from the statistical analysis of present study supported alternative hypothesis which started that there is significant effect in patients with post operative proximal femur fracture conditions by using CKC exercises.

Hence above results showed that Group B subjects treated with CKC exercises along with conventional physiotherapy treatment showed better pain relief, improve muscles strength and joint ROM on hip pain, manual muscles testing and improve hip range of motion.

Thus it can be stated from above study that physical therapy intervention CKC exercises are more efficacious and cost effective.

The wood J. study results is effectiveness of closed kinetic chain exercises in hip fractures, his study results also suggests that closed kinetic chain exercises protocol improves range of motion and strength.

The result suggests that closed kinetic chain exercises may offer additional advantage cost effectiveness, convenience, excellent subject's acceptance and satisfaction. This study also confirms that physiotherapy rehabilitation emphasizing immediate full range of motion, early ambulation and strength training reduced the incidence of post operative any major negative side effects. As a result of this study, we now use the closed kinetic chain exercises protocol for post operative proximal femur fracture conditions.

CONCLUSION

The results of this study support the premise that closed kinetic chain exercises, when used as part of a physiotherapy rehabilitation protocol, are a safe and more effective for early ambulation and recovery of muscles strength. The results also suggests that closed kinetic chain exercises may offer additional advantage cost effectiveness, convenience, excellent subjects acceptance and satisfaction. This study also confirms that physiotherapy rehabilitation emphasizing

immediate full range of motion, early ambulation and strength training reduced the incidence of post operative negative side effects.

Source of Funding: The source of funding for study is self.

Conflict of Interest: There is no conflict of interest.

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Effectiveness of Massage Therapy as an Adjunct to Kangaroo Mother Care on Physiological and Behavioural Status of Low Birth Weight Preterm Infants

Shaikh Afroz G[1], Namrata Patil[2]

[1]BPT Student, [2]Asissant Lecturer, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad, Satara, Maharashtra

ABSTRACT

Background: Massage therapy (MT) and kangaroo mother care (KMC) are both effective in increasing the weight and reducing length of hospital stay in low birth weight preterm infants but there effect on physiological and behavioral status have not been studied

Method: 40 LBWT infants using random sampling from Neonatal Intensive Care Unit, Krishna hospital, were randomly divided into 2 equal groups. Group1 received KMC and MT; Group2 received KMC for 15 minutes, twice daily for 15 days. Medically stable babies with gestational age < 37 weeks and birth weight < 2500 g were included. Those on ventilators and with congenital, orthopedic, or genetic abnormality were excluded. Outcome measures, heart rate, respiratory rate, oxygen saturation, temperature and neonatal behavioural assessment scale were taken before intervention day 1 and after intervention day 15.

Results: Statistical analysis was done using paired and unpaired"t" test.The results showed statistically significant improvement in physiological and behavioral status in group A as compared to group B ($p<0.001$).

Conclusion: The study shows effect of massage therapy as an adjunct to kangaroo mother care on physiological and behavioral status of low birth weight.

Keywords: *Low Birth Weight, Kangaroo Mother Care, Massage Therapy.*

INTRODUCTION

"Children are like buds in a garden and should be carefully and lovingly nurtured, as they are the future of the nation and the citizen of tomorrow."

- Jawaharlal Nehru

A newborn is an infant that is only hours, days, or up to a few weeks old. In medical contexts, newborn or neonate refers to an infant in the first 28 days after birth; the term applies to premature infants, post-mature infants, and full-term infants.[1] This is the phase in life with the greatest risk of mortality as well as the maximum potential for long-term physical and neuro cognitive development. Newborn health is indeed the key to child health and survival. In India every year 20.22 babies born per 1,000 population.[2]

Babies with a birth weight of less than 2,500 g, irrespective of the period of their gestation are classified as low birth weight babies[3].

Premature babies are babies born at less 37 completed weeks or 259 days of gestation. These infants are anatomically and functionally immature, and therefore, their neonatal mortality is high.[4]

Newborn deaths currently account for approximately 40% of all deaths of children under five years of age in developing countries—the three major causes being birth asphyxia, infections, and complications due to

Corresponding author:
Ms. Afroz G Shaikh
BPT Student, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad- 415110, Satara, Maharashtra. Email id: afrozshaikh684@gmail.com

prematurity and LBW.[5] Birth weight is a significant determinant of newborn survival. LBW is an underlying factor in 60–80% of all neonatal deaths. LBW infants are approximately 20 times more likely to die, compared with heavier babies.[6]Children who are born prematurely have higher rates of cerebral palsy, sensory deficits, learning disabilities, and respiratory illnesses compared with children born at term. The morbidity associated with preterm birth often extends to later life, resulting in enormous physical, psychological, and economic costs.[7]

Researchers have provided hospitalized preterm infants with various forms of supplemental stimulation in an effort to enrich the environment of the neonatal intensive care unit (NICU) or to accelerate development.[8,9] Two of the most widely studied interventions have been massage therapy and kangaroo mother care. In developing countries, financial and human resources for neonatal care are limited and hospital wards for LBW infants are often overcrowded.[10]KMC and MT are cost effective approaches that can be used by one and all irrespective of their financial status.

In 1978, Rey and Martinez proposed and developed Kangaroo mother care (KMC) at Instituto Materno Infantil in Santa Fe de Bogota, Colombia, as an alternative to the conventional contemporary method of care for LBW infants. The term KMC is derived from similarities to marsupial care-giving. The mothers are used as "incubators" and as the main source of food and stimulation for LBW infants while they mature enough to face extra uterine life in similar conditions as those born at term[11]. Kangaroo mother care regularizes heart rate and respirations, deepens sleep and alert inactivity, reduces crying, prevents infections, shortens the neonatal hospital stay, enhances weight gain, improves physical growth and breastfeeding rates, decreases pain from heel prick procedure, and lessens maternal depression.[10,12,15]

Massage therapy (MT) is referred to as "A methodological touch intended to stimulate the baby.[16]"A number of studies have shown the positive effects of massage therapy in preterm infants. These positive effects include weight gain, improved sleep/ wake states, decreased stress, early discharge from the NICU, improved skin integrity, increased development of the sympathetic nervous system, decrease mortality and enhanced parent-infant bonding[17-22]

Many studies have revealed that Kangaroo Mother care and massage therapy both are effective in improving weight gain and sleep wake pattern of premature babies. Alpanamayi Bera and Jagabandhu Ghosh studied effect of kangaroo mother care on vital physiological parameters of the low birth weight newborn[23]. Sneha Pitre studied effect of massage therapy on physiological and behavioral parameters among low birth weight babies[24]. But effect of massage therapy as an adjunct to kangaroo mother care has not studied.

MATERIALS AND METHOD

A comparative study was conducted with a convenience sample of 40 subjects at the NICU of Krishna Hospital. Infants born at gestational age of <37 weeks, having low birth weight, and medically stable were included and those who were medically unstable, had any congenital, orthopedic, or genetic abnormality, or were ventilated were excluded. Informed consent was taken from the parents. The infants were randomly divided in 2 groups with 20 infants in each group. Group 1 received 15 minutes of MT and 15 minutes of KMC twice daily for 15 days. Group 2 received 15 minutes of KMC twice daily.HR, RR, oxygen saturation, temperature and NBAS were taken before intervention on day 1 and after intervention on day 15.MT was given according to the Field massage therapy protocol. Infants were massaged for 15 minutes, 2 times each day, at least 1 hour after being fed. Each massage session consisted of 5 minutes of tactile stimulation, 5 minutes of kinesthetic stimulation, and another 5 minutes of tactile stimulation. During the tactile stimulation the infant was placed in a prone (face down) position and given moderate pressure stroking with the bottom of the fingers of both hands. During the kinesthetic stimulation, the infant was placed in a supine (on back) position and led through passive flexion/extension actions. During KMC the infant, wearing only a nappy (diaper), was placed between the mother's uncovered breasts. The mother was seated on a standard rocking chair, tilted at an angle of approximately 60.

FINDINGS

`Statistical analysis was done manually as well as using the statistics software INSTAT so as to verify the result obtained .Various statistical measures such as mean, standard deviation,and paired ,unpaired test of were utilized for this purpose. Probability values less than o.oo5 were considered statistically significant and probability values less than 0.0001 were considered statistically extremely significant.

RESULT

Gestational Age of the subjects in this study was <37 weeks. There was no significant difference between mean age and standard deviation of the subjects in two groups. Mean age group A was 29.9 years and that Group B was 30.25 .(Table 1)

Table 1: Baseline characteristics of subjects

Groups	Gender	Mean age	Mean Birth Weight
Group A	Male=9,Female=11	29.9 years	1.76
Group B	Male=8,Female=12	30.25 years	1.595

Table 2: Comparison of pre-pre and post-post HR in between groups.

Group	Pre- treatment	Post-treatment
	Mean ± SD	Mean ± SD
A	129.15±6.209	103.35±2.601
B	130.7±6.791	119.6±5.862
'p'	0.4559	<0.0001

In the present study pre interventional means of HR was 129.15±6.209 in Group A and 130.7±6.791 in Group B whereas post-interventionally means HR was 103.35±2.601 in Group A and 119.6±5.862 in Group B respectively. Inter group analysis of HR was done by using unpaired test.

Pre interventional analysis showed no significant difference between group A and group B (p=0.3942). Post intervention analysis showed significant difference between Group A and Group B (p<0.0001).

Table 3: Comparison of pre-pre and post-post RR in between groups.

Group	Pre- treatment	Post-treatment
	Mean ± SD	Mean ± SD
A	51.85 ± 3.200	41.7 ± 2.080
B	50.75 ±3.226	44.85±3.048
'p'	0.2858	0.0005

In the present study pre interventional means of RR was 51.85 ± 3.200 in Group A and 50.75 ±3.226 in Group B whereas post-interventionally means RR was in 41.7 ± 2.080 Group A and in 44.85±3.048 Group B respectively.

Inter group analysis of RR was done by using unpaired 't' test. Post intervention analysis showed significant difference between Group A and Group B (p 0.0005)

Table 4: Comparison of pre-pre and post-post SPO2 between groups.

Group	Pre- treatment	Post-treatment
	Mean ± SD	Mean ± SD
A	82.85 ± 2.183	91.55± 2.259
B	82.8 ±2.546	88.15±2.758
'p'	0.06667	0.0001

In the present study pre interventional means of SPO2 was 82.85 ± 2.183 in Group A and 82.8 ±2.546 in Group B whereas post-interventionally means SPO2 was 91.55± 2.259 in Group A and 88.15±2.758 in Group B respectively. Inter group analysis of SPO2 was done by using unpaired t test.

Pre interventional analysis showed no significant difference between group A and group B (p=0.06667). Post intervention analysis showed very significant difference between Group A and Group B (p=0.0001).

Table 5 Comparison of pre-pre and post-post Temperature between groups.

Group	Pre- treatment	Post-treatment
	Mean ± SD	Mean ± SD
A	35.99 ± 0.5495	36.765± 0.5518
B	36.26 ±0.5355	36.89±0.5160
'p'	0.1239	0.0001

Table 6 Comparison of pre-pre and post-post NBAS Score between groups.

Group	Pre- treatment	Post-treatment
	Mean ± SD	Mean ± SD
A	141.8± 16.609	195.75± 21.684
B	147.75±18.137	183.25±16.098
'p'	0.2861	0.0453

In the present study pre interventional means of NBAS score was 141.8± 16.609 in Group A and 147.75±18.137 in Group B whereas post-interventionally means was 195.75± 21.684 in Group A and 183.25±16.098 in Group B respectively. Inter group analysis of NBAS Score was done by using unpaired t test.

Pre interventional analysis showed no significant difference between group A and group B (p=0.2861). Post intervention analysis showed significant difference between Group A and Group B (p=0.0453)

DISCUSSION

LBW & preterm birth is a common problem in developing country like India. It's prevalence in India is 28%.Both are recognized risk factors for neonatal mortality. LBW infants have 2.3 times increased risk of mortality.

Preterm babies are more prone to develop disorders and so require immediate intensive care. In the conventional neonatal intensive care, the baby is kept in the incubator, separated from the mother which is costly method. In preterm infants the main problem is to maintain vitals (HR, RR, SPO2, Temp.)

So the present clinical trial was conducted to find out effect of Massage Therapy as an adjunct to Kangaroo Mother Care on LBW infants.

The study was conducted with 40 subjects. Many studies were carried out to find effectiveness of kangaroo mother care & massage on physiological status of low birth weight infants. But combine effect of kangaroo mother care & massage therapy has never studied. Those studies also show significant changes in their outcome with respective treatments.

In this study the subjects were divided into two groups. Pre consent was taken from them. They were divided into Group A (KMC &MT) and Group B (KMC). The interventions were carried out for 15 min twice daily for 15 days. The outcome Measures for this study were heart rate, respiratory rate, oxygen saturation, temperature & NBAS.

The pre & post treatment values were statistically analyzed by using 'Paired t- test' for within groups and 'Unpaired t-test' in between the groups.

The pre and post treatment values of HR show extremely significant difference in group A (t = 28.941) and group B (t = 22.177). The post treatment values of both the group also show significant difference.

The pre and post treatment values of RR show extremely significant difference in group A (t = 44.082) and group B (t = 26.762). The post treatment values of both the group show not quite significant difference.

The pre and post treatment values of Spo2 show extremely significant difference in group A (t = 45.006) and group B (t = 24.214). The post treatment values of both the group also show extremely significant difference.

The pre and post treatment values of temperature show extremely significant difference in group A (t = 27.698) and group B (t = 12.269). The post treatment values of both the group show not significant difference.

The pre and post treatment values of NBAS show extremely significant difference in group A (t = 13.287) and group B (t = 10.629). The post treatment values of both the group also show significant difference.

This study shows significant difference in the pre and post treatment values in both the groups. Group A (KMC &MT) showed significant improvement in the outcome variables concluding that it improving physiological & behavioral status compare to group B (KMC). In the present study, we found that after intervention there was significant improvement in the outcome with massage therapy along with Kangaroo mother care and we found that it is effective in improving vitals & behavior of low birth weight infants.

CONCLUSION

Both the group showed significant results post intervention but the group A Kangaroo Mother Care & Massage Therapy showed more significant than the group B Kangaroo Mother Care.

Thus the alternative hypothesis was accepted.

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Conflict of Interest: There is no conflict of interest.

Ethical Clearance: Ethical clearance was taken from institutional ethical committee of KIMSDU.

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Effect of Spencer Muscle Energy Technique and Myofascial Arm Pull Technique in Adhesive Capsulitis of Shoulder Joint – A Comparative Study

Sayali Eknath Chavan[1], Amrutkuvar Pawar[2], Trupti Warude[2]

[1]BPT Student, [2]Lecturer, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad, Satara, Maharashtra

ABSTRACT

Background: Adhesive capsulitis is characterized by the development of dense adhesions, capsular thickening and capsular adhesions in the dependent folds of the capsule. So the present study was conducted to find out effect of spencer MET and myofascial arm pull technique in adhesive capsulitis.

Method: An Experimental study was conducted at Krishna College of Physiotherapy , Karad. 20 subjects with age group between 40-70 years were taken. A total of 20 subjects were selected and were equally divided in to two groups. Both the Groups received Ultrasound and Maitland mobilization while Group A received Spencer MET, and Group B received Myofascial arm pull technique.

Results: Analysis using pairs't' test and wilcoxon matched pairs test found statistically significant improvement (p=0.0020) in pain and functional disability within the groups. Comparative Analysis using Unpaired 'T' test found no statistically significant difference in improving pain & functional disability in both the techniques. However Spencer MET group found significantly greater improvement in shoulder mobility compared with Myofascial arm pull technique.

Conclusion: Present study concluded that both the techniques shown to have equal effect on improving pain and functional disability. However Spencer MET is effective in improving shoulder mobility than Myofascial arm pull technique.

Keywords: *Spencer Muscle Energy Technique (MET), Myofascial Arm Pull Technique, Adhesive Capsulitis*

INTRODUCTION

Adhesive capsulitis is characterized by the development of dense adhesions, capsular thickening and capsular adhesions in the dependent folds of the capsule[1]. It occurs in 2-4% of the general adult population mainly affects individuals of 40 to 60 years of age.[2]Women are affected more than men with a ratio of 58:42[3]

The spencer technique is developed by spencer D. O. in 1916. This approach is a well-known osteopathic manipulative technique that focuses on mobilization of the glenohumeral and scapulothoracic joints. It helps the restricted joints to improve their functions, as well as positively affects other emotional, social and cognitive areas[4]. Spencer technique is an articulatory technique with 6 different procedures used to treat shoulder restriction caused by adhesive capsulitis. In this technique passive, smooth, rhythmic motion is designed to stretch contracted muscles, ligaments and capsules.

Myofascial therapy can be defined as "the facilitation of mechanical, neural, and psycophysiological adaptive potential as interfaced via the myofascial system"[5]fascia covers all structures of the body, including muscles & there individual myofibrils. Therefore, all "muscle stretching" is actually stretching of myofascial units.

Corresponding author:
Ms. Sayali Eknath Chavan
BPT Student, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad- 415110, Satara, Maharashtra. Email id: itssayalichavan@gmail.com

Myofascial release is a safe technique that prevents adverent over-stretching of the soft tissues of the body when feedback is accurately monitored. [6]

Studies have shown that both the Spencer MET and Myofascial arm pull technique are used effectively in the treatment of adhesive capsulitis. However there is paucity of literature which compare the effect of these two methods of Manual therapy.Hence, the purpose of the study is to compare the effectiveness of the Spencer MET versus Myofascial arm pull technique on improvement of pain,mobility and functional ability.

MATERIALS AND METHOD

It was an experimental study carried out at the Physiotherapy OPD of Krishna hospital, Karad from December 2016 to March 2017. A total of 20 subjects were selected and were randomly divided into two groups. The purpose of the study was explained and written consent was obtained from the subjects willing to take the treatment intervention for three weeks**.** Both the Groups received Ultrasound and Maitland mobilization while Group A received Spencer MET, and Group B received Myofascial arm pull technique Inclusion Criteria's **:** 1)Both male & female participants 2) Age group between 40 to 60 yrs 3)Subjects clinically diagnosed with Unilateral primary adhesive capsulitis. Exclusion Criterias:1) Recent history of surgery on particular shoulder 2) History of Rheumatoid arthritis, fracture around shoulder complex 3) History of Subjects with diabetes mellitus, osteoporosis or malignancies in shoulder region 4)Secondary adhesive capsulitis 5)Rotator cuff rupture & tendon calcification

Subjects with adhesive capsulitis were assessed by Visual Analogue Scale (VAS), functional disability using shoulder pain and disability index (SPADI) and shoulder range of motion using Half circle universal goniometer were made on all subjects on the first day before intervention and after 3 weeks of interventions

PROCEDURE

Both the groups received Ultrasound with a dosage of 1 MHz in frequency, continuous mode and 1.5 W/ cm2 of intensity for 10 minutes of treatment duration[7] and Maitland Mobilization with a dosage of Grade 2-3 Anterior-Posterior-Inferior glides at a rate of 2-3 glides per second for 30 seconds given for 5 sets.was given in common as a part of the conventional treatment[1]

Group A:-

Spencer Muscle Energy Technique[4] :- Subjects in this group received Spencer Muscle Energy Technique in Side-lying position. The technique was performed in the following sequence:-

- **Glenohumeral extension:-**

The subjects elbow was flexed and therapist held the elbow of the subject with one hand and shoulder with other hand. the patient is instructed to push further towards the direction of extension utilizing no more than 20% of available strength which is firmly resisted by the therapist, and after 7-10 sec.

- **Glenohumeral flexion**

The therapist grasped the patients elbow with one hand and stabilized the scapula with the other hand. The arm was then slowly taken into the available range of shoulder flexion

- **Circumduction with compression**

The subject's elbow was flexed and shoulder was abducted to 90^0. Subjects elbow was used as a pivot to rotate humerus clockwise and anti clockwise. Slight compression was applied on the glenohumeral joint

- **Circumduction with traction**

The subject's elbow was flexed and shoulder was maintained in abducted position. Traction force was applied on glenohumeral joint while rotating the humerus in clockwise and counter clock wise circles.. The therapist held the subject's shoulder with his caudal hand move the subject's arm in the same progressive concentric circles.

- **Abduction of shoulder joint**

The subject's elbow was flexed and the shoulder was abducted to 90^0 Therapist held the elbow of the subject with one hand and shoulder with the other hand and and exerted upward or cephalad pressure on elbow to increase abduction till the end range is felt and then the arm was brought back to the neutral position.[8]

- **Internal rotation:-**

The therapist cups the subjects shoulder with one hand and compress the scapula and clavicle to the thorax .now the elbow is taken forward to the chest so that it

can move both upward and medially, as the shoulder adducts and externally rotates this action is performed slowly till the resistance is noted. At the position where resistance is noted the subject is instructed to pull the elbow towards the celling utilizing more than 20%of available strength and hold this for 7-10 sec. A degree of active subject participation in the movement towards the new barrier may be helpful. [4]

Each procedure was repeated in 8-10 times and duration of intervention was carried for one session per day for 5 days a week for 3 weeks.

GROUP B

Myofascial arm pull technique[6]

- **Gleno-humeral Abduction**:-

Starting position was supine.The Therapist passively held arm of the subject firmly. Initial Stretch was applied equal to the arm weight of the patient and the arm was abducted until restriction was felt. The same position was held till the release and then continued for slow abduction in further range untill restriction was felt in full ROM. The arm was continued to abduct slowly in full ROM, allowing shoulder flexion and rotation, until the arm was brought proximal to ear.

- **Gleno-humeral fiexion and scapular protraction:-**

The handgrip and body position was changed to maintain traction while slowly moving the patients arm into more flexion at the shoulder joint and into scapular protraction. Shoulder joint was lifted off the treatment table, maintaining the stretch to the patients arm in 90°. Then, the patient's arm was pushed down towards treatment table. The release sequence was continued until all restrictions in the scapular retractors have been released. Upward traction was continued till full scapular protraction range without any end feel was reached.

- **Gleno-humeral Horizontal-adduction:-**

Horizontal adduction was increased by changing hand placement to push the upper arm in the line with the restrictions identified by feedback. Slight elbow flexion was allowed with full functional horizontal adduction to achieve an end-fell.

When the arm pull was completed, the subject's arm was returned to his side while maintaining traction.

Post intervention scoring were recorded after 3 weeks of treatment in the form of pain on VAS, functional disability on SPADI and range of motion using a goniometer

FINDINGS

Statistical analysis was done manually as well as using the statistics software INSTAT so as to verify the result obtained. Intergroup analysis of nonparametric data(pain,SPADI,scores) was done using Wilcoxon matched pairs test and Mann-Whitney test was used for the intergroup analysis of nonparametric data.Intergroup &Intergroup analysis of parametric data (shoulder ROM) was done using Paired & Unpaired T test respectively.

RESULT

Table no.1: Comparison of values of VAS

Group	Pre- treatment		Post-treatment		'p'
	Mean ± SD	Median	Mean ± SD	Median	
A	8.62 ± 0.5959	8.75	1.6 ± 0.3333	1.55	0.0020
B	8.63 ± 0.7528	8.75	1.73 ± 0.4165	1.70	0.0020
P	0.9395		0.4943		

Intra group analysis of VAS score revealed statistically reduction in pain post interventionally for both the groups. Group A (p=0.0020), Group B (p=0.0020). Pre interventional analysis showed no significant difference between group A and group B (p=0.9395). Post intervention analysis showed no significant difference between Group A and Group B (p=0.4943).

Table no. 2: Comparison of values of SPADI score

Group	Pre- treatment		Post-treatment		'p'
	Mean ± SD	Median	Mean ± SD	Median	
A	115.8 ± 1.874	116	15.8 ± 2.251	15.50	0.0020
B	114.3 ± 2.163	114	15.5 ± 2.369	15.00	0.0020
P	0.0956		0.8497		

Intra group analysis of SPADI score revealed statistically reduction in pain and functional disability scores post interventionally for both the groups.Group A (p=0.0020), Group B (p=0.0020) Pre interventional analysis showed no significant difference between group A and group B (p=0.0956). Post intervention analysis showed no significant difference between Group A and Group B (p=0.8497).

Table no.3: Comparison of values of shoulder flexion ROM

Group	Pre- treatment		Post-treatment		'p'
	Mean ± SD	Median	Mean ± SD	Median	
A	73.5 ± 6.570	72.00	157.4 ± 3.718	158.00	<0.0001
B	69.4 ± 8.972	71.00	116.1 ± 9.492	117.50	<0.0001
P	0.5444		<0.0001		

Intra group statistical analysis revealed statistically extremely significant increase in shoulder flexion range post interventionally for both the groups. Group A (t_9=60.211, p<0.0001), Group B (t_9=10.834, p<0.0001). Pre interventional analysis showed no significant difference between group A and group B (p=05444). Post intervention analysis showed extremely significant difference between Group A and Group B (p=<0.0001)

Table no.4: Comparison of values of shoulder abduction ROM

Group	Pre- treatment		Post-treatment		'p'
	Mean ± SD	Median	Mean ± SD	Median	
A	69.9±4.228	70.00	158.8 ± 8.390	160.00	<0.0001
B	67.9 ± 7.810	67.500	111.7 ± 7.945	110.00	<0.0001
P	0.7122		<0.0001		

Intra group statistical analysis revealed statistically extremely significant increase in shoulder abduction range post interventionally for both the groups. Group A (t_9=33.577, p<0.0001), Group B (t_9=10.967, p<0.0001). Post intervention analysis showed extremely significant difference between Group A and Group B (p<0.0001).

Table no.5: Comparison of values of shoulder external rotation ROM

Group	Pre- treatment		Post-treatment		'p'
	Mean ± SD	Median	Mean ± SD	Median	
A	31.4 ± 2.633	31.00	65.3 ± 3.653	65.00	<0.0001
B	30.4 ± 4.452	30.00	42.4 ± 5.758	42.00	<0.0001
P	0.5486		<0.0001		

Intra group statistical analysis revealed statistically extremely significant increase in shoulder external rotation range post interventionally for both the groups. Group A (t_9=21.541, p<0.0001), Group B (t_9=12.421, p<0.0001). Pre interventional analysis showed no significant difference between group A and group B (p=0.5486). Post intervention analysis showed extremely significant difference between Group A and Group B (p=<0.0001).

DISCUSSION

The purpose of this study was to compare the effect of spencer muscle energy technique and myofascial arm pull technique in adhesive capsulitis of shoulder joint

Application of Ultrasound penetrates into deep structures to produce its thermal or non-thermal effects[9], by the thermal effect of Ultrasound it increases the collagen and tendon extensibility thereby it increases the range of motion in patient with adhesive capsulitis[10]

Maitland's mobilization mainly consists of rhythmic oscillatory movements which stimulate the type-2 dynamic mechanoreceptors and by this way can inhibit the type-4 nociceptive receptors[11]Mechanical force during mobilization may include breaking up of adhesions, realigning collagen, or increasing fibre glide when specific movements stress the specific parts of the capsule[12].

Spencer technique is aimed to decrease pain by altering the circulatory pain biomarkers. Its passive rhythmic movement re-establishes the arthrokinematic gliding and rolling thereby restoring shoulder mobility .spencer technique increases pain free ROM by stretching the shoulder capsule and tight soft tissues, thus restoring specific joint motion this technique when applied increase the lymphatic flow from the treatment area.[13] The increased gliding will normalize the osteokinemaic rotation and enable the restoration of shoulder mobility.[14]

Myofascial release is powerful technique that treats soft tissue dysfunction that does not respond to other more traditional methods of treatment, it can minimize or eliminate the excess stress on the soft tissues, and can also removes tightness and restrictions that impede efficient movement. The ultimate goal of the treatment using Myofascial release is to achieve the most efficient movement patterns that the patient's body can maintain with the least amount of effort while minimizing or eliminating the patient's pain complaint.[6]

Comparison of pain and disability between two groups was done using Mann-Whitney test to find effectiveness between two groups.

The statistical analysis revealed that there was no significant difference in reduction of pain and disability in both groups. So, both the groups are equally effective in reduction of pain (p=0.4943.and disability (p=0.8497)

Comparison of shoulder ROM between groups was done using unpaired t test to find the effectiveness between two groups.

The statistical analysis revealed that there was a significant difference in shoulder ROM in both the groups. The Group A which received spencer MET are more effective in improving shoulder flexion (p=<0.0001), abduction (p=<0.0001),external rotation (p=<0.0001),than group B which received myofascial arm pull technique.

The result from the statistical analysis of present study supported alternative hypothesis which stated that there was beneficial effect of spencer MET & myofascial arm pull technique as an adjunct to conventional physiotherapy treatment in adhesive capsulitis of shoulder joint

Hence above result showed that subjects treated with Spencer MET and myofascial arm pull technique along with ultrasound therapy & Maitland mobilization showed better pain relief on VAS, improved functional ability on SPADI both the techniques are equally effective in improving shoulder range of motion, but statistically spencer muscle energy technique is more effective in improving shoulder range of motion than myofascial arm pull technique.

Thus it can be stated from above study that physical therapy interventions like spencer muscle energy technique and myofascial arm pull technique along with ultrasound therapy and Maitland mobilization are efficacious and cost effective.

CONCLUSION

In conclusion The present study provided evidence to support the use of spencer muscle energy technique & myofascial arm pull technique with conventionl treatment in reducing pain, shoulder disability and improving shoulder range of motion in adhesive capsulitis.

In addition Results Supported that spencer muscle energy technique given with conventional treatment was more effective in improving shoulder range of motion than myofascial arm pull technique in subjects with adhesive capsulitis.

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Ethical Clearance: Ethical clearance was taken from institutional ethical committee of KIMSDU.

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The Activities of Interest for the Jordanian Population from the Perspective of Occupational Therapy Students

Hashem Abu Tariah[1], Mohammad Jebril[1]

[1]Department of Occupational Therapy, School of Allied Health Sciences, The Hashemite University, Zarqa, Jordan

ABSTRACT

Purpose: The purpose of this study was to establish a list of interests/activities of Jordanians and to cluster those activities into main categories.

Method: Four activity groups (10 students each) were conducted. Participants were requested to list the interests/activities of the Jordanians from different age groups and from both genders.

Results: The Jordanians' list of interests involved 98 different activities. It was clustered into five main categories: Leisure activities, play/sports, cultural and educational activities, self-care and home-care, and social activities.

Conclusion: Similarities as well as differences between the Mastsutsuyu's list of interest and the Jordanian list were identified. Matsutsuyu's list need to be revised and modified to be compatible with the new interests/activities created by the advancement in technology, human needs, and the cultural differences.

Keywords: *Interest Checklist; Jordan; culture; occupational therapy.*

INTRODUCTION

According to the third edition of the American Occupational Therapy Association's (AOTA) Occupational Therapy Practice Framework: Domain and Process[1], the occupational therapy process starts with gathering information about the client's "occupational history and experiences, patterns of daily living, interests, values, and needs" (p.S10). Occupational therapists treat by using the activities that their clients are interested in as, "interests lead to active participation in satisfying occupational activities"[2].

Several assessment tools are used by occupational therapists to gather information about the clients' occupations and needs. These include interests, roles, and daily living activities such as: the Occupational Performance History Interview (OPHI) [3], Role Checklist [4], Volitional Questionnaire, Occupational Questionnaire [2,5,6,7,8] and Interest Checklist[9].

Kielhofner (2008)[8] reported that interests are recognized as one of the components of volition. The Interest Checklist is an assessment tool that is used by occupational therapists to gather information about a client's past and present interests in different activities, and whether he/she would like to pursue such interests in the future[10]. This checklist can be used with both adolescents and adults. Matsutsuyu's Interest Checklist (1969) was revised by Kielhofner in 1985[11]. The purpose of the Interest Checklist is to classify the intensity of interest for each of the 80 items as casual (some), strong, or no interest; as well as the client's ability to express personal preferences and examine the client's ability to discriminate between choices[2].

Interests are influenced by prevailing values and roles, local culture, social aspects, and competence to participate[12,13]. The 80 activities that are listed in the Interest Checklist can vary from culture to culture. These activities are appropriate for western

Corresponding author:
Hashem Abu Tariah, PhD, OTR,
Associate Professor, Department of Occupational Therapy, School of Allied Health Sciences, The Hashemite University, Zarqa, Jordan, P.O Box 711346 Amman 11171, Jordan,
Email: hashemsalman@hotmail.com,
Phone: +962-7-96040296, Fax: +962-5-3903368

culture, some of them might not be applicable in other cultures. Moreover, other activities can be of interest to people in other cultures might not be applicable to those in the western cultures. The original and revised Neuropsychiatric Institute Interest Checklist (NPIIC)[10] were translated to Japanese language, however, Wakamatsu and Tsuchizawa (1992) [14,15] found that some Japanese people misunderstood some items on the checklist.

Jordan, is a country in the Middle East where the profession of occupational therapy is relatively new. According to The World Factbook: [16]. Jordanians are considered conservative communities due to the influence of religion. The Jordanian population is nearly 8.1 million. The majority of them (97%) are Muslims. Jordan has a young population, more than half of the Jordanians (54.4%) are 24 years old or younger, 36.2% are 25-54 years old [16].

The Interest Checklist, in spite of its importance as a tool that can be used by occupational therapists, cannot be used with Jordanian clients by occupational therapists due to the fact that most of the current list of activities are not considered part of Jordanian culture and the list is missing relevant daily activities that Jordanians perform.

The purpose of this study was to establish a list of activities for Jordanians according to their interests and to cluster those activities into main categories.

METHODOLOGY

Participants and setting

This study was conducted among occupational therapy students at the Hashemite University in Zarqa/ Jordan after securing the ethical approval from the Institutional Review Board (IRB) of the Hashemite University. Occupational therapy students were recruited due to their understanding of the value, importance, and concept behind the Interest Checklist.

To be included in the study students should be: fourth year occupational therapy students, currently in their fieldwork, and Jordanian. Convenience sampling method was used in this study.

Forty occupational therapy students who met the inclusion criteria were included in the study. They were 8 male students and 32 females. All of them were between 21-23 years old. Participants were divided into four activity groups of 10 students as recommended by Krueger and Casey (2000)[17]. Each group consisted of two male and eight female students. Each of the four groups had students represented different geographical regions of Jordan. Each group, after spending about 1.5-2 hours working on the task, submitted a list of interests for male and female Jordanian adolescents, adults, and elderly.

Data Collection

Participants who chose to be in the study, signed a consent form and were assigned one of the two-hour activity groups. The participants met as a round table discussion in their four groups and were asked to list activities of interest to Jordanians from different age groups (adolescents, adults, and elderly) relevant to both genders. At the round table discussion, they were asked to list the activities individually, then they were asked to compile each groups' list into one cohesive list of activities. Finally, they were requested to cluster the list they established into main categories.

Data Analysis

Authors of this study facilitated the process of data collection and collected the work/lists of the four activity groups. Each of the four lists were reviewed and compared with each other for similarities and consistency. Finally, the items/activities were clustered into main categories first by each group then finalized as common categories by the researchers.

RESULTS

After reviewing the lists from the four groups, similarities among them were clear. The four lists were combined into one (table 1). The Jordanians' list of interests involved 98 different interests. Almost 80% of the interest items were common among all groups. Those interests, up to the knowledge of the students and the researchers, are representative to almost all Jordanian groups mentioned above.

Table 1. Jordanians' List of Interests

1- Watching TV
2- Sports (Soccer, basketball, etc.)
3- Video games/ Computer games
4- Browsing the internet
5- Swimming
6- Singing
7- Housekeeping (Laundry, ironing, etc.)
8- Cars (brands and models)
9- Home decorations
10- Barbequing
11- Family and friends trips
12- Reading
13- Hair styling
14- Billiard sports
15- Shopping
16- Family / social visits
17- Cell phones and applications
18- Watching movies
19- Cooking / making disserts
20- Gardening
21- Board games (Backgammon, chess, etc.)
22- Clothing/Fashion
23- Ladies morning visits to neighbors
24- Eating different types of food
25- Watching sport games
26- Playing cards
27- Rapid profit activities (e.g. Lottery, TV game shows, stock market)
28- Visiting malls
29- Cinemas / theaters
30- Listening to music
31- Education
32- Politics
33- Languages (English, French, etc.)
34- Radio listening
35- Body building / fitness
36- Feasts (preparation for and participation)
37- Writing
38- Poetry
39- Drawing
40- Fashion designing
41- Driving cars
42- Solving riddles / puzzles
43- Horoscopes
44- Coffee cup reading
45- Worshiping
46- Travelling
47- Festivals / Parties
48- Arts and crafts
49- Ranching / livestock
50- Farming
51- Cultural proverbs
52- Herbal medicine
53- Jokes and humor
54- Cultural games
55- Spinning wool
56- Wool knitting
57- Folklore
58- Fishing
59- Painting on glass
60- Sand art bottles
61- Cosmetics / make up
62- Childcare
63- Photography
64- Walking
65- Martial arts
66- Gatherings (men / women)
67- Bird / pigeon breeding
68- Collecting antiques, coins, etc.
69- Chatting through social media
70- Smoking Argila/ Shisha
71- Health and diet
72- Going to coffee shops
73- Horseback riding
74- Table tennis (Ping pong)
75- Fish breeding
76- Pet care
77- Dancing / Dabke
78- Playing musical instruments
79- Acting
80- Hand writing art
81- Wood working / carving
82- Hand tricks
83- Diving
84- Camping
85- Hunting
86- Calling / cell phone chatting
87- Imitating others
88- Designing dolls
89- Bee breeding
90- Sewing
91- Volunteering / fund raising
92- Arranging flowers
93- Reading newspapers and / journals
94- Flying Kites
95- Theme parks
96- Invitations and participations in home special meals (Ramadan Breakfast, lunch, and/or dinner)
97- Gatherings at tribe's Dewan (A designated place/chamber for members of a tribe)
98- Social problem solving

Table 2. Clustering of Jordanians' Interests

Leisure Activities		Play / Sports	Cultural and educational activities	Self-care and Home-care	Social Activities
1- Watching TV	30- Solving riddles/ puzzles	1- Sports (Soccer, basketball, etc.)	1- Reading***	1- Housekeeping (Laundry, ironing, etc.)	1- Barbequing*
2- Video games/ Computer games	31- Horoscopes	2- Swimming Billiard sports	2- Education	2- Home decorations**	2- Family and friends trips*
3- Browsing the internet	32- Travelling	3- Fishing	3- Politics	3- Shopping**	3- Family / social visits
4- Singing	33- Festivals / Parties *	4- Walking	4- Languages	4- Cooking / making disserts**	4- Ladies morning visits to neighbors
5- Cars (brands and models)	34- Arts and crafts*	5- Martial arts	5- Radio listening	5- Eating different types of food**	5- Coffee cup reading****
6- Home decorations**	35- Jokes and humor	6- Horseback riding	6- Feasts (preparation for and participation)	6- Body building / fitness	6- Gatherings (men / women)
7- Barbequing*	36- Cultural games	7- Table tennis (Ping pong)	7- Writing***	7- Cosmetics / make up**	7- Chatting through social media
8- Family and friends trips*	37- Spinning wool	8- Dancing / Dabke*****	8- Poetry***	8- Health and diet	8- Smoking Argila/ Shisha*
9- Reading***	38- Wool knitting	9- Diving	9- Coffee cup reading****		9- Going to coffee shops*
10- Hair styling	39- Painting on glass***	10- Hunting	10- Worshiping		10- Camping*
11- Shopping**	40- Sand art bottles***		11- Festivals / Parties *		11- Calling / cell phone chatting
12- Cell phones and applications	41- Cosmetics /make up**		12- Arts and crafts*		12- Volunteering / fund raising
13- Watching movies	42- Photography		13- Ranching / livestock		13- Invitations and participations in home special meals (Ramadan Breakfast, lunch, and/or dinner)****
14- Cooking / making disserts**	43- Bird /pigeon breeding		14- Farming		14- Gatherings at Tribe's Dewan (A designated place/chamber for members of a tribe)****
15- Gardening	44- Collecting antiques, coins, etc.		15- Cultural proverbs		15- Social problem solving****
16- Board games (Backgammon, chess, etc.)	45- Smoking Argila/ Shisha*		16- Herbal medicine		
17- Clothing/Fashion	46- Going to coffee shops*		17- Folklore		
18- Eating different types of food**	47- Fish breeding		18- Painting on glass***		
19- Watching sport games	48- Pet care		19- Sand art bottles***		
20- Playing cards	49- Dancing / Dabke*****		20- Childcare		
21- Rapid profit activities (e.g. Lottery, TV game shows, stock market)	50- Playing musical instruments		21- Hand writing art***		
22- Visiting malls	51- Acting		22- Reading newspapers and / journals		
23- Cinemas / theaters	52- Hand writing art***		23- Invitations and participations in home special meals (Ramadan Breakfast, lunch, and/or dinner)****		
24- Listening to music	53- Wood working / carving		24- Gatherings at Tribe's Dewan (A designated place/chamber for members of a tribe)****		
25- Writing***	54- Hand tricks		25- Social problem solving****		
26- Poetry***	55- Camping*				
27- Drawing	56- Imitating others				
28- Fashion designing	57- Designing dolls				
29- Driving cars	58- Bee breeding				
	59- Sewing				
	60- Arranging flowers				
	61- Flying Kites				
	62- Theme parks				

*Leisure + Social activities, ** Leisure + Self-care and Home-care activities, *** Leisure + Cultural and educational activities, **** Cultural and educational + Social activities ***** Leisure + Sports/play activities

The Jordanian activities of interest were first clustered by the participants as described above. Five main categories emerged: Leisure activities, play/sports, cultural and educational activities, self-care and home-care, and social activities (table 2). Some activities/ interests were fit under more than one category. For example, barbequing was categorized under both leisure as well as social activities, same as with family and friends trips. Some activities were categorized under both leisure and self-care and home-care such as home decoration, shopping, cooking, and cosmetics/make up. Activities such as reading, writing, and poetry were categorized under both leisure and cultural and educational activities (table 2).

The list identified 62 interests that were categorized under leisure activities representing about 63% of all interests. Followed by 25 cultural and educational activities (25%), 15 social activities (15%), 10 play/sport activities (10%), and 8 self-care and home-care activities (8%). Note that the total is more than 100% since 21 of the activities (21%) were fit under two different interest categories (table 2).

DISCUSSION AND IMPLICATIONS

The purpose of this study was to establish a list of interest/activities of Jordanians and to cluster those activities. The study was conducted on Jordanian Occupational Therapy Bachelor level students in their fourth year and on their clinical training.

Similar to the study that was conducted in Japan by Yamada et al. (2002)[13] ,differences were found between the interests of Jordanians and those listed in Matsutsuyu's Interest Checklist. It was expected that western cultures might have more chances, options, and ease of access to a wider variety of interests compared to the Jordanian culture. However, number of interest does not necessarily mean that a Jordanian individual has more interests than another person living in the western cultures.

Reasons behind why the Jordanians found to have a wider variety of interests (98 compared to 80), might be related to factors such as: the advancement of technology, inventions, and human needs. The Matsutsuyu's list was developed in 1969, while the Jordanian list according to this study was recently established (2016). Other reasons are cultural in nature. Interests/activities such as gatherings at tribe's *Dewan*, social problem solving, invitations and participations in home special meals are deeply engrained into Jordanian culture.

Similarities were found between the categories of both lists such as social recreation with leisure activities and social activities; activities of daily living with self-care and home-care; cultural/educational with cultural and educational; manual skills with leisure activities; and physical sports with play/sport.

The importance of this study is that currently the Interest Checklist is not used in any occupational therapy clinic in Jordan due to the fact that some interests in Matsutsuyu's list or the modified one are not compatible with Jordanians. The Jordanian interests/activities list identified in this study should be presented to Jordanian therapists and clients from different age groups. Other occupational therapists in the region such as the Arabic Gulf area, other African Arab countries, and Middle Eastern countries in general might use this suggested Interest Checklist due to cultural similarities.

A limitation of this study is that the participants were a homogenous group of young adult students; not from not from actual Jordanian adolescents; adults; and elderly from different regions of Jordan directly speaking about their interests. The suggested Interest Checklist needs to be empirically validated among Jordanians before claiming that it represents the Jordanian Interest Checklist.

Ethical approval through the IRB of the Hashemite University # 11/2/1402606

Conflicts of Interest: There are no conflicts of interest.

No funding source for this study.

CONCLUSION

The Interest Checklist is a well-known assessment tool that is used in most occupational therapy clinics all over the world due to its importance in the occupational therapy process. This useful assessment tool is not used in Jordan due to the cultural variations between the interests/activities that are listed in the formal list

of Matsutsuyu. Modifying the list was possible in this study.

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The Effect of Exercises with Relaxation Technique on Quality of Life Improvements in Cancer Haematology Patients Following Chemotherapy

Rupali Biswas (Sen)[1], Maitrayee Bhattacharya[2], Abhishek Biswas[3], Suraj Kumar[4]

[1]Lecturer, OT. NILD. BT Road Kolkata, [2]HOD of The Hematology Department, Medical College and Hospital, Kolkata, [3]Incharge Director, NILD, Kolkata, [4]Associate Professor, UPUMS, Saifai, Etawah, UP.

ABSTRACT

Aim:- To find out the effect of exercise on quality of life improvements in cancer (hematology) patients.

Objective:- To investigate the effect of exercise on quality of life improvements in cancer (hematology) patients.

Design: convenient sampling.

Setting: NRS Medical College and Hospital Kolkata.

Participants: A total of 30 Haematology cancer subjects with 15 each

in control and experimental group.

Interventions: Exercise program provide to experimental group and no intervention provide to control group.

Outcome Measures: WHOQOL BREF outcome measure used.

Result: Exercise program along with the relaxation techniques yields

Significant improvement in quality of life (QOL) in cancer.

Conclusion: The current study has shown that exercise program along With the relaxation technique improve QOL in cancer patients who prove our hypothesis.

Keywords: *Exercise program with relaxation techniques, QOL, cancer (Haematology).*

INTRODUCTION

Cancer is the second leading cause of premature death in India. Cancer in all forms are causing about 13 percent of deaths throughout the world (2.5 million). In India it is estimated that there are approximately 2-2.5 million cases of cancer in India at any given point of time with around 7,oo,ooo new cases being detected each year. The four most frequent cancers in males in India are blood cancer, mouth or pharynx, esophagus, stomach and lower respiratory tract.

Corresponding author:
Rupali Sen
Lecturer OT NILD KOLKATA
Phone no 9330973458
Email: rupalisen 83@gmail.com

Cancer and its treatment are often associated with adverse physical side-effects including muscular atrophy, decreased muscle strength and reduced aerobic capacity .These side-effects may contribute to the development of cancer-related fatigue. About 70% of cancer patients report fatigue complaints during chemotherapy and/or radiotherapy. Even years after the treatment, fatigue is still a problem for up to 30% of cancer survivors and has a great impact on the patient's quality of life[2].

When a person is diagnosed with cancer, oncologists will use treatments to enhance their survival. During and after their medical treatment, they also seek therapies to enhance their quality of life (QOL). Recent epidemiological reports state that exercise may be one of the most important lifestyle interventions for cancer prevention[1] Courneya[3] stated that exercise consistently demonstrates beneficial effects on a wide variety of

quality of life outcomes regardless of the specific intensity, duration, and method of exercise prescription, cancer site, cancer treatment, or intervention timing. Exercise is advancing as one of the primary interventions that may have important implications in enhancing physical function, improving quality of life, becoming an integral part of the support group process, and improving the odds for survival[3].

Cancer and its treatments often produce side effects that undermine quality of life[4]. For instance, physical activity in cancer survivors has been shown to improve aerobic capacity, muscle strength, body composition, and quality of life and to reduce fatigue. This is somewhat surprising since muscle atrophy is a common problem in cancer patients.

Skeletal muscle, however, has shown great adaptability with appropriate training stimuli even in cases of severe muscle atrophy and fatigue Progressive strength training has been shown to increase lean body mass, muscle protein mass and contractile force, and improves physical function in healthy, young and elderly subjects Considerable evidence now suggests that the ability to perform physical tasks in daily life is determined by a threshold level of muscular strength. As a consequence, strength training in cancer patients would seem to be a potent physiological intervention for regaining lost muscles and improving muscle quality and as a result improving the overall quality of life [2].

Relaxation training may be an effective procedure for helping cancer patients cope with the adverse effects of their chemotherapy[5]. Relaxation techniques have been used for palliation of uncomfortable symptoms, mental support and self control of patients with cancer. Though few studies have seen its effect on fatigue, sleep,anxiety and Q.O.L Managing for the problems of pain and fatigue among cancer patients can help a lot to improve their Quality of life. cognitive behavioral coping strategies are recommended as an adjuvant to analgesic medicines.Moreover patients also prefer non pharmacological methods for management of problems over pharmacological methods. Progressive muscle relaxation (P.M.R) being one of the non invasive techniques, can be of great help. P.M.R, is one of the cognitive behavioral coping strategies which have been found beneficial in cancer patients also Relaxation is a state of freedom from anxiety and skeleton muscle tension[6]. Cancer patients often have to deal with severe side effects and psychological distress during cancer treatment, which have a substantial impact on their quality of life. Among psychosocial interventions for reducing treatment-related side effects, relaxation and imagery were most investigated in controlled trials[7].

Therefore it is seen that after prolong bed rest, sedentary lifestyle and chemotherapy there is overall degradation in quality of life .So, this topic is carried out to see the effect of exercises in quality of life in haematology cancer patients. This study hypothesesised that the effect of exercises on quality of life improvements in cancer (hematology) patients.

METHODOLOGY

STUDY AREA:

1. NRS Medical College and Hospital Kolkata. STUDY POPULATION:

Cancer patients (haematology)

STUDY PERIOD: 12 months

SAMPLE SIZE:

- Total no.of subjects are 30
- Among them 15 subjects in experimental group and 15 subjects in control group

. STUDY DESIGN: convenient sampling, control-experimental group design.

INCLUSION CRITERIA:

1. Subjects with carcinoma (haematology) having following criteria:

- Total count-4,000-11,000/cmm
- Hb-8 gm/dl
- Platelet count –over 50,000/cmm
- Endurance level-minimum 50% (50 ft walk test-25ft in front and 25 ft in back)

2. Age group: 18 -55 years

3. Ability to understand and follow the command as well as cooperative.

4. Hematological cancer patients will be grouped according to the underlying diseases:

1. Acute leukemia

a) Acute Lymphoid Leukemia

b) Acute Myeloid Leukemia

2. Chronic leukemia

a) Chronic lymphocytic leukemia

b) Lymphoma & MM

EXCLUSION CRITERIA :

Subjects having :

1. Any other associated problems like Cardiac disease

2. Surgical intervention on other reasons

3. Any other type of cancer other than haematology

OUTCOME MEASURES:

WHO-BRE QoL

TECHNIQUE:

CONTROL GROUP:

- No intervention

EXPERIMENTAL GROUP :

A. Relaxation

a) Cognitive Behavioral Therapy

-Cognitive behavioral approaches like meditation,assertive training etc

b) Somatic methods of relaxation

I. Progressive relaxation training.

II. Breathings

B.Exercise therapy:

- Active movements
- Flexibility exercises
- Resistive exercises

DURATION OF INTERVENTION:

Alternate days in a week (Monday,Wednesday and Friday)

Control group: no intervention

Experimental group:30 minutes for relaxation and 30 minutes for exercises

(total 1hour)

Data is analyzed by using Statistical package for special sciences (SPSS) version 20.

RESULT

A total number of 30 haematology cancer patients were recruited for the study with age range from 18 to 55 years. There were 26 male and 4 female patients in the study. There was no drop out during the study. Data was collected at the 1st day visit and after the completion of study.

Table 1a.Within group analysis of QOL

DOMAIN	GROUP	PRE MEAN(SD)	POST MEAN(SD)	Z	P
D1	CNTRL	19.80(5.493)	20.20(4.648)	-.577	0.554
	EXP	14.93(4.480)	36.87(4.882)	-3.530	0.000
D2	CNTRL	26.67(6.38)	27.87(6.128)	-1.342	0.180
	EXP	13.20(4.554)	47.53(5.668)	-3.432	0.001
D3	CNTRL	50.07(8.3888)	52.53(10.398)	-1.511	0.131
	EXP	51.67(16.994)	85.87(10.882)	-3.413	0.001
D4	CNTRL	11.60(2.898)	12.80(4.263)	-1.732	0.083
	EXP	12.40(3.906)	29.53(5.514)	-3.470	0.001

DISCUSSION

The present study examined the effect of exercises on quality of life improvements in cancer haematology patients. Haematology patients often complains of fatigue and reduced physical performance. It was hypothesized that there is effect of exercises on quality of life improvements in cancer (hematology) patients.

The results was significant with the ($p<0.05$) for the WHO QOL-BREF .

After analysis of the obtained data, findings

support the experimental hypothesis. The WHO QOL-BREF contains four domains physical health, psychological,social relationship and environment. The self-reported questionnaire is the most common instrument in physical activity records, because it is easy-to-use, short to perform, inexpensive.

The psychological aspects of haematological patients improved in the present study, this can accord with Eyigor et al (2014) study they concluded that Exercise is not merely safe and feasible for breast cancer patients, but is moreover a complementary treatment for one to achieve physiological and psychological improvements. There is increasing evidence that regular exercise after the diagnosis of breast cancer might have a substantial positive impact in mortality, morbidity, prognosis, and quality of life.[9]

Results from Kolden et al. show that participants in group exercise training (not self-administered) experience significant health benefits over the course of the intervention in multiple dimensions of fitness/ vigor as well as QOL (increased positive affect, decreased distress, enhanced well-being, and improved functioning).[10]

In rebecca et al (2011) study they concluded that overall, exercise interventions increased QOL, but this tendency depended to some extent on exercise and patient features.[11]

Many cancer patients undergoing treatment have severe fatigue and depression. Being physically active can counter these negative effects and give patients more energy,which can be used to keep a healthy immune system and ward of cancer recurrence.[12]

CONCLUSION

The current study has shown that exercise program along with the relaxation technique improve QOL in cancer patients which proves our hypothesis.

Ethical Clearance: Taken from the ethical committee of NRS Medical college and hospital ,Kolkata under WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

Source of Funding- Self

Conflict of Interest- Nil

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Effect of Gluteus Medius and Maximus Muscle Strengthening on Hemiplegic Gait

Mansi A Patel[1], Namrata R Patil[2]

[1]BPT Student, [2]Asissant Lecturer, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad, Satara, Maharashtra

ABSTRACT

Background: As gait is the major hurdle in quality of life in hemiplegic, this project emphasizes on the effect of gluteus medius and maximus muscle strengthening exercises on hemiplegic gait. So, the present study was conducted to find out the combined effect of conventional exercises with gluteus medius and maximus muscle strengthening on hemiplegic gait

Method: 20 subjects of clinically diagnosed hemiplegic having impairment of gait were recruited. They were allocated into 2 groups and treated with conventional exercises along with gluteus medius and maximus muscle strengthening for hemiplegic gait regularly for 5 weeks. Exercises were given in progression. Primarily passive exercise followed by active assisted in progression for the affected lower limb of that subject was asked to do it actively. The objective outcome measure 2 minute walk test was used to assess the gait pre- treatment and at the end of 5 weeks.

Results: Statistical analysis was done using paired and unpaired't" test. The results showed statistically excellent significant improvement in gait in group A as compared to group B ($p<0.001$).

Conclusion: This study found that conventional therapy along with gluteus medius and maximus muscle strengthening is effective in improving gait in hemiplegics. Gluteus medius and maximus muscle strengthening along with the conventional treatment shows speedy recovery than the only conventional therapy when given at the sub-acute stage of hemiplegia

Keywords: *hemiplegia, 2 minute walk test.*

INTRODUCTION

Stroke or brain attack is the sudden loss of neurological function caused by an interruption of the blood flow to the brain.[1]

Stroke is the third leading cause of death and the most common cause of disability. It affects approximately 700,000 individuals each year, about 500,000 are new strokes and 200,000 are recurrent strokes. The incidence of stroke is about 1.25 times greater for males than females.[2]

Corresponding author:
Ms. Mansi APatel,
BPT Student, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad- 415110, Satara, Maharashtra, Email id: mansipatel301094@gmail.com

Cerebrovascular diseases is the leading cause of disability in the population age between 40-60 years and due to that each year millions of stroke survivors have to adapt to a life of restrictions in activity of daily living as a consequences of hemiplegia .

There are many risk factors that can cause cerebrovascular diseases. At the population level, blood pressure and tobacco use are the two most important modifiable risk factor for stroke due to their strong association and high prevalence.

Some of the other common risk factors for stroke are:

- Hypertension
- Heredity
- Diabetes mellitus

- Transient ischemic attack
- Cardiac abnormalities
- Carotid bruit
- Hyperlipidemia
- Estrogen contraceptive pills
- Cigarette smoking
- Alcohol
- Elevated hematocrit

Symptoms of special significance include:

- Disturbance of memory and concentration
- loss of vision
- Double vision
- Facial pain or weakness
- Difficulty with speech
- Difficulty in swallowing
- Weakness
- Wasting
- Pain or numbness in limb
- Abnormal movements
- Trouble with walking
- Disturbance of bladder control

All this symptoms has a range of possible cause which is need to be considered.[3,4]

Early warning signs of stroke: [5]

- Sudden numbness or weakness of the face, arm, or leg, especially on one side of the body.
- Sudden confusion, trouble speaking or understanding.
- Sudden trouble seeing in one or both eyes.
- Sudden trouble walking, dizziness, loss of balance or coordination.
- Sudden, severe headaches with no known cause.

The patients having hemiplegia suffering from stroke experiences restriction in mobility and having difficulty in independent walking. Thus it is important in hemiplegic patients of gait improvement because gait is the important component for functional independence.[6]

Hemiparesis is the most common impairment observed at 6 months after stroke in the individuals between 35-65 age group these individuals have difficulty bearing weight on the paretic lower extremity this difficulties leads to asymmetry in standing and also in walking, during ambulation there is greater proportion of weight distribution on non-paretic limb than on the paretic limb.[7,8]

Muscle weakness in the affected lower limb of stroke patients is a major factor inhibiting gait ability[9]Muscles surrounding the hip joint play a role in maintaining the stability of the trunk in the stance phase and control the lower limb in the swing phase. Therefore, the weakening of these muscles may become a main cause of abnormal gait. Particularly, hip joint extensor strength is related to gait velocity and is the dominant muscle in stability control and posture maintenance of the knee joint. Therefore, when the extensor of the hip joint is weakened, anterior weight shift of the lower limb becomes difficult and the flexor of the hip joint is used to increase the velocity of the lower limb in gait initiation and the stance phase. However, it is a small muscle compared to the extensor. Hip joint extensors and flexors are considered to be very important muscles throughout the stance phase and they are essential for safe and functional gait.[10]

Variability in oxygen consumption after a stroke reflects gait deviations. Moreover, gait pattern alterations contribute to worsening self-image perception, lowering self-esteem and, in turn, restricting participation. Finally, gait deficit contributes to increased risk of fractures. Therefore, gait recovery may improve overall functioning and well-being, and it represents a key goal in stroke rehabilitation.[18,19]

Gait is observed from the different planes of motions and deviations are identified. Quantitative measures of distance and time, cadence, velocity, and stride times should also be obtained using measured walkways and a stopwatch. (e.g., the 2 minute walk test)

The degree of recovery depends on a number of factors, including lesion location and severity and capacity for adaptation through training. Like the upper extremity may be more involved than the lower extremity as it is seen in middle cerebral artery syndrome .[20]

For this study there are two articles supporting that strengthening of hip muscles in hemiplegics shows improvement in gait so in this present study there is specific gluteus medius and Maximus muscle strengthening for knowing the improvement in temporal

variables that is cadence by taking 2 minute walk test.

MATERIALS AND METHOD

20 Subjects with clinically diagnosed paraplegia willing to take treatment for 5 week were recruited for study. The subjects were screened and were put in either of the group A conventional exercises along with additional transverse abdominal muscle strengthening exercises regularly for 5 weeks Group B conventional treatment alone for 5 weeks by using lottery method. A written informed consent was taken from each participant. Ethical clearance was obtained from university's institutional review board. Inclusion criteria were both male and female subjects with impairment of trunk control Age group is between 20-35 years. Exclusion criteria are history of non-traumatic spinal cord injury, Patients who are having bed sore and cognitive impairment. Both the groups were given regular conventional Physiotherapy treatments for 5 weeks. Group A was given Strengthening of transverse abdominal muscle for trunk control in additional to the conventional treatment and the group B was given conventional treatment alone. The post treatment improvement was noted with the outcome measures.

STATISTICAL ANALYSIS

Statistical analysis was done manually as well as using the statistics software INSTAT so as to verify the result obtained .Various statistical measures such as mean, standard deviation ,and paired ,unpaired test of were utilized for this purpose. Probability values less than o.oo5 were considered statistically significant and probability values less than 0.0001 were considered statistically extremely significant.

RESULT

1. Gender distribution

Table 1. Gender distribution

	Male	**Female**	**Total**
Group A	7	3	10
Group B	6	4	10

2. Age Distribution**:-**

Age group of all participants is between 35 to 65 years. The mean age of the participants in Group A was 53.7± 10.519 and in Group B was 48± 10.842 1there was no significant difference between the mean ages of the participants I both the groups. This was done by using unpaired t test (t=1.182& p =0.252)

Table 2. Mean age distribution

	Mean ± SD	**SEM**
Group A	53.7± 10.519	3.390
Group B	48± 10.842	3.429
't'	1.182	
'df'	18	
'p'	0.252	

Outcome measures:-

1) 2 minute walk test:

Table no 3: Comparison of pre and post 2 minute walk test (cadence).

Group	**Pre- treatment**		**Post-treatment**		**'p'**	**'t'**
	Mean ± SD	**median**	**Mean ± SD**	**Median**		
A	85.4±3.373	18.00	100.3 ± 2.908	21.500	<0.0001	25.429
B	84.6±4.061	17.500	85.4± 4.195	20.00	0.0107	3.207

Table no.4: Comparison of pre-pre and post-post 2 minute walk test (cadence) in between groups.

Group	**Pre- treatment**		**Post-treatment**	
	Mean ± SD	**Median**	**Mean ± SD**	**Median**
A	85.4±3.373	18.00	100.3 ± 2.908	21.500
B	84.6±4.061	17.500	85.4 ± 4.195	20.00
'p'	0.6375		<0.0001	

In the present study pre interventional means of 2 minute walk test was 85.4±3.373 in Group A 84.6±4.061 and in Group B whereas post-interventional means of 2 minute walk test was 100.3 ± 2.908 in Group A and 85.4 ± 4.195 in Group B respectively. Inter group analysis of 2 minute walk test was done. Post intervention analysis showed excellent significant difference between Group A and Group B.

DISCUSSION

The study "The Effect of gluteus medius and maximus muscle strengthening on hemiplegic gait was conducted to compare the two treatments and find out the best which improves the gait in hemiplegia it becomes the major limiting factor for subject's dependency. It increases the energy expenditure, reduces Biomechanical efficiency and effects self esteem. The objectives of the study are 1. To determine the effect of conventional exercises and effect of conventional exercises with gluteus medius and maximus muscle strengthening on hemiplegic gait.2. To compare the effect of gluteus medius and maximus muscle strengthening and conventional treatment with conventional treatment alone. The study was conducted with 20 subjects,

Many studies were carried out to find the best protocol for gait recovery after hemiplegia. Those studies also show significant changes in their outcome with respective exercises.

In this study the subjects were divided into two groups. Pre consent was taken from them. They were divided into gluteus medius and maximus muscle strengthening along with conventional treatment and Conventional group. The interventions were carried out for 5 weeks with 5 times per week. The outcome measures for this study was 2 minute walk test .This study shows significant difference in the pre and post treatment values in both the groups. Group A showed significant improvement in the outcome variables concluding that it improves the gait speed (cadence). This was confirmed using statistical analysis by using 'Paired t- test' for within group comparison and 'Unpaired t-test' for between the group comparisons. In the present study, we found that after intervention there was significant improvement in the outcome with gluteus medius and maximus exercises. It is effective in improving gait speed in the sub-acute stage of hemiplegic rehabilitation.

This suggests that – with interventions of gluteus medius and maximus muscle strengthening exercises in sub-acute stage of hemiplegia, subjects are able to improve gait.

CONCLUSION

Both the group showed significant results post intervention but the group A that is gluteus medius and maximus muscle strengthening and conventional therapy showed more significant than the group B conventional therapy.

Thus the alternative hypothesis was accepted.

Source of Funding: The source of funding for study is self.

Conflict of Interest: There is no conflict of interest.

Ethical Clearance: Ethical clearance was taken from institutional ethical committee of KIMSDU.

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Effectiveness of Pilates and Strengthening Exercise on Weight Loss and Quality of Life among Grade II Obese Adults – Comparative Study

Mayuri Dattatray Burungale[1], T Poovishnu Devi[2], Vaishalikrishnatjagtap[3]

[1]BPT Student, [2]MPT (Assocprofessor), [3]MPT (Lecturer), Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad, Satara Maharashtra

ABSTRACT

Background : As the prevalence of obesity is increasing and as there is awareness regarding its ill effects and health hazards in the society.Therefore, the purpose of the study is to find out effectiveness of Pilates and strengthening exercise on weight loss and quality of life among grade II obese adults –comparative study.

Method: Experimental study was carried out at Krishna gym of KIMSDU, Karad . 36 subjects were selected by convenient sampling and divided into two groups Group A received Pilates and diet consultation and Group B received strengthening and diet consultation. The duration of treatment is 1 hr /day for 5 days a week for 12 weeks.

Results: Statisticalanalysis was done by paired‘t’ test with in groups and unpaired‘t’ test between groups. Analysis score within GROUP A($p<0.0001$) and Group B ($p<0.0001$) was significant . Between Group comparison ,GROUP A ($p<0.0001$)was extremely significant than GROUP B($p=0.0018$) Hence group A is highly significant in weight loss and improve quality of life than group B

Conclusion: It was concluded that Pilates is more effective in weight loss and improve quality of life as compared to strengthening exercise .

Keywords*: Obesity, Weight loss, Quality of life.*

INTRODUCTION

Obesity is a medical condition with excess body fat accumulation to an extent that has negative effect on health.India has a major significant rise in obesity from 19th position for both men and women in 1975 to ranking 5th in 2011 and 3rd in 2014. There was high prevalence in higher socio economic adults.

Many scholars explained it in perspective of “nutritional transitions in developing countries or the shift from traditional diets and lifestyle to western diet and combination of reduced level of physical activity, transport facilities, better health care and increased stress, particularly in the rapidly growing urban population.

Physical activity improves muscle strength and muscle mass and has a key role in the management strategy for obesity[4].

There are several types of obesity .obesity of the male (android) type shows a dominant visceral and upper thoracic distribution of adipose tissue, whereas in feminine (gynecoid) type adipose is found predominantly in lower part of the body(hips and thigh).

People try different methods of weight reduction but the end result is not up to the mark. Every obese individual is suffering from various consequences like health related issues and cosmetic issues.

General obesity, is associated with a greater risk

Corresponding author:
Ms. Mayuri Burungale
BPT Student, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad- 415110, Satara, Maharashtra. Email id: mayuriburungale7@gmail.com

of disability or premature death due to type 2 diabetes mellitus[T2DM] and cardiovascular disease [CVD] such as hypertension, stroke and coronary heart disease, gall bladder disease , certain cancer [endometrial , breast , colon , prostate] and non- fatal condition including gout ,respiratorycondition,gastro –esophageal reflux disease , osteoarthritis and infertility

A central distribution of body fat is associated with a higher risk of morbidity and mortality than a more peripheral distribution.

It has been reported that physical problems in obese individual affects HRQL.

PILATES EXERCISE

Pilates is a mind body exercise program that is well recognized and taught worldwide. Originally called contrology by its creator, Joseph Pilates (1880-1967), this program of mind –body exercise is based on six key principles centering, concentration, control, precision, flow and breath. These principles recognized the inter-relationship among physical and cognitive processes to produce an outcome of improved life satisfaction, self-concept and health.

Recent research have explored the effect of Pilates-based method of exercise on various heath related outcomes , demonstrating improvements in self efficacy ,positive mood and sleep quality and improve quality of life

Pilates have shown great effect on weight loss which includes different exercise which includes specific muscle group[7].Pilates works by combining breathing technique with special stretches and core strengthening.

STRENGTHENING EXERCISE

Strengthening exercise or strength training exercise are used to develop muscular strength, endurance and reduce muscle fat. Strengthening exercise can be performed individually or group muscle training.[1]Resistance exercise has great effect on weight loss.

Studies in adults have demonstrated increased strength and muscle mass in response to resistance exercise programs.

Resistance training increases fat free mass and increases loss of fat mass and is associated with reduction in health risks

Studies have demonstrated that FFM (fat free mass) gains from strength. Strength training increases FFM (fat free mass) by 1-2kgs

Resistance training is also considered as an integral component of physical activity program and has shown effective component for weight management programs by means of increasing caloric expenditure, lean body mass and resting metabolic rate

Strengthening muscles gives you the ability to perform everyday activities and helps protect your body from injury, stronger muscles also lead to boost in your metabolic rate which indeed burns more calories even when your body is at rest.

HEALTH RELATED QUALITY OF LIFE:-

In both clinical and public health settings, measurement of HRQL may be more relevant for functioning and survival than physiological and clinical assessment. Numerous investigations have indicated that overweight and obese person, as well as underweight person have impaired HRQL.

Few studies have concluded that person with obesity had significantly lower HRQL than those who were normal weight and such lower score were seen even for persons without chronic disease known to be linked to obesity.

MATERIAL AND METHOD

It was a experimental study conducted in Krishna gym of Krishna Institute of Medical Sciences , karad from December 2016 to March 2017 .36subjects were equally divided into two groups. GROUP A received Pilates and diet consultation&GROUP B received resisted exercise and diet consultation Subjects were selected according to inclusion and exclusion criteria. Written informed consent was taken and the whole study was explained to them. Detailed neurological evaluation was done to screen the subjects .Inclusion Criteria were as follows: Sedentary adults, Obesity grade II adults (BMI of 30-39.9) kg/m2), Stable weight (1 or 2kg over the past 1 year). Exclusion criteria were as follows: Severe cardiopulmonary disease, diabetes mellitus, hypertension, musculoskeletal or neuromuscular impairments, Sensory or cognitive deficit, cancer diagnosis, within last 5 years, Use of corticosteroids,

androgen or oestrogen contains compound in last 1 year, Difficulty in diet compliance.

Obesity and Quality of life assessment were done using BMI, Waist hip ratio and Quality of life quostenniere. Group A received Pilates exercise:-1. Jack knife2.Scissors 3. The bicycle 4. The spine twist 5. Shoulder bridge And Group B received Strengthening exercise Curl up, Crunches, Push up, Side twist, Bridging,Pelvic tilting with adductor press, Boat exercise, Spinal exercise, leg press, Squats, Rowing.

FINDINGS

`Statistical analysis was done manually as well as using the statistics software INSTAT so as to verify the result obtained .Various statistical measures such as mean, standard deviation,and paired, unpaired test of significance.Probability values less than o.oo5 were considered statistically significant and probability values less than 0.0001 were considered statistically extremely significant.

RESULT

1. GENDER DISTRIBUTION:

36 subjects were taken, diagnosed with Grade II Obesity. Out of 36 subjects, Group A had 4 males and 14 females and Group B had 6 males and 12 females.

TABLE .1 GENDER DISTRIBUTION

	GROUP A	GROUP B	TOTAL
MALE	4	6	10
FMALE	14	12	26

2.Age determination :

Age group of all participants is above 18 years. The mean age of the participants in Group A 31.72±12.82and in Group B was 35.27±13.49 There was no significant difference between the mean ages of the participants in both the groups. This was done by using unpaired t test (t=0.8105&p = 0.4233)

TABLE 2 AGE DETERMINATION

GROUPS	Mean Age(Yrs)±SD
GROUP (A)	31.72±12.82
GROUP(B)	35.27±13.49

OUTCOME MEASURES

OBESITY WEIGHT LOSS AND QUALITY OF LIFE

TABLE.3 COMPARISON OF PRE AND POST VALUES OF OWLQOL BETWEEN GROUP A AND B

Group	Pre- treatment		Post-treatment		'p'	't'
	Mean ± SD	median	Mean ± SD	Median		
A	16.48±1.75	16.49	7.92±1.28	7.30	<0.0001	25.697
B	16.12±1.94	15.45	11.78±1.61	11.30	<0.0001	26.468

In the present study pre-interventional median of OWLQOL score 16.49 whereas post-interventional median at 12 week was 7.30 in Group A and pre-interventional median of OWLQOL score was 15.45 whereas post-interventional median at 4 week was 11.30 in Group B. Intra group analysis of OWLQOL score revealed statistically improvement in weight loss and quality of life post intervention ally for Group A. This was done by using,unpaired t test showed extremely significant difference for Group A ($p<0.0001$) and Group B ($p=<0.0001$)

WAIST-HIP RATIO:

TABLE 4: COMPARISON OF PRE AND POST VALUES OF WHR BETWEEN GROUP A AND B

Group	Pre- treatment		Post-treatment		'p'	't'
	Mean ± SD	median	Mean ± SD	Median		
A	0.874±0.072	0.870	0.746±0.075	0.740	<0.0001	99.938
B	0.881±0.086	0.865	0.877±0.086	0.8600	<0.0018	3.688

In the present study pre-interventional median of WHR score 0.870 whereas post-interventional median at 12 week was 0.740 in Group A and pre-interventional median of WHR score was 0.865 whereas post-interventional median at 12 week was 0.860 in Group B. Intra group analysis of WHR score revealed statistically improvement in weight loss and quality of life post interventionally for GROUP A. This was done by using unpaired t test showed extremely significant difference for Group A ($p<0.0001$) and Group B is considered as significant difference($p=0.0018$).

DISCUSSION

This Project was done in three month of duration with sample size 36 and age group 18-70 years. The subjects were taken randomly from KIMS gym. 36 subjects having Grade II Obesity were taken for study and were divided into two groups .Group A was given Pilates and Group B was given strengthening exercise. Measurements were taken by Waist-hip ratio

The following interpretations were noted:

According to score of OWLQOL subjects receiving Pilates exercise showed improvement in score compared to subjects receiving strengthening exercise.

According to score of WHR subjects receiving Pilates exercise showed marked improvement in score compared to subjects receiving strengthening exercise.

Obesity is one cause of many chronic conditions the impact of obesity on general health or HRQL among person who have not been diagnosed with any of the condition remains unclear. Obesity is a medical condition with excess body fat accumulation to a extent that has negative effect on health.India has a major significant rise in obesity from 19 position for both men and women in 1975 to ranking 5th and 3rd respectively in 2014. There was high prevalence in higher socio economic adults.General obesity, is associated with a greater risk of disability or premature death due to type 2 diabetes mellitus[T2DM] and cardiovascular disease [CVD] such as hypertension, stroke and coronary heart disease as well as gall bladder disease , certain cancer [endometrial , breast , colon , prostate] and non- fatal condition including gout respiratory condition gastro –esophageal reflux disease , osteoarthritis and infertility

So the present clinical trial was conducted to find out the effectiveness of Pilates and strengthening exercise on weight loss and quality of life among Grade II obese adults.

36 subjects clinically diagnosed with Grade II obesity and fulfilling inclusion and exclusion criteria with age between 18-70 years were included in the study. They were allocated into two groups, Group A and Group B, each containing 18 subjects.

Pilates exercise was given in Group A and strengthening exercises in Group B. The outcome was measured with inch tape i.e by WHR and OWLQOLquestionnaire

Group A receiving Pilates included Jack knife, Scissors, The bicycle ,shoulder bridge and Spine twist. Group B Received strengthening exercise Curl up, crunches, Push up, Side twist, Bridging, Pelvic tilting with adductor press, Boat exercise and Spinal exerciseThe average mean age of participants in Group A was31.72±12.82 and Group B was 35.27± 13.49, which showed there is no significant difference in age of subjects in both groups($t=0.8105$& $p= 0.4233$) which was done by unpaired t-test. The total number of participants included over 36 out of which 10 were males and 20 were females. Group A contained 4 males and 14 females and Group B had 6 males and 12 females.

Paired t test was used to analyse the effect of Pilates on weight loss and quality of life among Grade II obese adults. There was extremely significant and considered

very significant difference in weight loss and quality of life and score of OWLQOL post 3 months of treatment (p=0.0001) for A group and there was also extremely significant difference in weight loss and quality of life and score of OWLQOLquestionnaire 3 months of treatment (p=0.0001) for group B.Analysis score within GROUP A ($p < 0.0001$) and GROUP B ($p < 0.0001$) was significant Intra group analysis of WHR score revealed statistically improvement in weight loss and quality of life post interventional for GROUP A. This was done by using unpaired t test showed extremely significant difference for Group A ($p<0.0001$) and Group B is considered as significant difference (p=0.0018) The results from the statistical analysis of the present studysupported the alternative hypothesis which stated that there will be beneficial effect to the subjects treated with Pilates then strengthening exercise.

Hence above results showed that Group A subjects treated with Pilates showed better improvement in weight loss and quality of life then Group B.

Thus it can be stated from above study that physical therapy interventions like Pilates exercises are more efficacious, time saving and cost effective.

Source of Funding: The source of funding for study is self.

Conflict of Interest: There is no conflict of interest.

Ethical Clearance: Ethical clearance was taken from institutional ethical committee of KIMSDU.

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Effect of Intermittent Cervical Traction on Blood Pressure and Pulse Rate in the Subjects with Cervical Spondylosis

Sawantdesai Pranjali[1], Bathia Khushboo[2]

[1]Intern, [2]Assistant Lecturer, Faculty of Physiotherapy, Krishna Institute of Medical Sciences Deemed University, Karad, District -Satara, Maharashtra

ABSTRACT

Purpose of the Study: To find the effect of intermittent cervical traction on blood pressure and pulse rate in the subjects with cervical spondylosis.

Material and Methods: 31 subjects within the age group of 30-60 years, diagnosed with cervical spondylosis coming to Physiotherapy department of Krishna hospital, Karad were selected for the study.10% of total body weight of the subject was chosen for the application ofcervical traction. Systolic blood pressure (SBP), diastolic blood pressure (DBP) and pulse rate(PR) were measured before, during 5 minutes interval and after5 min of cessation of intermittent Cervical Traction (CT) in supine position.

Results: The data statistically analysed using Repeated Measures ANOVA. A decrease in SBPnoted during and post-application of cervical tractionwhen compared to pre-traction values and the results were extremely significant($p<0.001$). Significant ($p<0.001$)reductionwas seen in DBPduring and after traction compared to pre-traction values. However, PR values reduced significantly($p<0.001$) during traction than pre-traction but there was no significant ($p>0.05$) difference noted after traction compared to during traction PR values.

Conclusion: Significant reduction noted in SBP, DBP and PR values during and following cervical traction application. Thus as a precautionary measureapplication of CT requires careful assessment of cardiovascular parameters before application.

Keywords: *cervical spondylosis, intermittent cervical traction, supine position, blood pressure, pulse rate.*

INTRODUCTION

Cervical spondylosis(CS) is a common degenerative condition that affects the cervical spine in the general population with incidence rate of 83 per 100,000 population and prevalence of 3.3 cases per 1000 people and occurs mostly in fourth and fifth decades of life.[1, 2] In spite of being an age related degenerative condition, it can also occur early in individuals involved in 'white collar jobs' as a result of prolonged static positions while reading, writing, repetitive typing etc.[3] The pathology begins with intervertebral disc degeneration resulting in reduction of disc space, peripheral osteophytes formation and involvement of adjacent soft tissue structures.[3]

Clinical features of CS includes pain, stiffness in neck, occipital headache, pain radiating to the shoulder, muscle weakness, giddiness and decreased neck range of motion.[3] Radiological findings which are diagnostic for CS are narrowing of intervertebral disc space(most commonly between C_5-C_6), osteophytes at the vertebral margins and narrowing of the intervertebral foramen in cases presenting with radicular symptoms.[3] Majority of people over the age of 30 years shows such abnormalities on plain radiographs.[4]

The diagnosis of cervical spondylosis is usually based on clinical symptoms like pain, stiffness of

Corresponding author:
Dr. Khushboo Bathia, MPT, CMP, Cert. MDT
Faculty of physiotherapy, Krishna Institute of Medical Sciences Deemed University, Karad, District - Satara, Maharashtra. Pin Code - 415110
Email ID- bathiakhushboo@gmail.com.
Contact no- 9011015331

neck, limited range of motion.[3] Also Spurling's test, compression test, distraction test these are some clinical diagnostic tests for CS. Pain is predominant in cervical region; it can be radiate to arm, forearm and handwhich is characteristically exacerbated by neck movements.[3] CS can be complicated by neurological manifestations like myelopathy (symptomatic compression of spinal cord) or radiculopathy (compression of nerve roots) or combination of two that is myeloradiculopathy.[4] Thus, to avoid these complications timely management of cervical spondylosis is of prime importance.

Management of neck pain associated with CSis commonly by drugs, exercises and modalities.[5] Drugs include anti-inflammatory drugs, pain relievers and muscle relaxants.[6]Exercises include neck retraction, neck extension, deep neck flexor and scapular strengthening exercises.[7] Physiotherapy modalities commonly used for the management of cervical spondylosis are short wave diathermy, moist heat, cryotherapy, therapeutic ultrasound, Transcutaneous Electric Nerve Stimulation (TENS) and cervical traction.[8]It has been reported that analgesic drugs offered short term pain relief to most of the patients and pain usually relapses with increased severity, 2-3 weeks post drug administration.[5] But on the contrary, physiotherapy has been reported to offer long-term and better pain relief as compared with drug(NSAIDs).[5]

Cervical traction is a distractive force applied longitudinally to the cervical spine to cause cervical distractionand vertebral separation.[9]The physiological effects of traction include, separation of vertebral bodies, decrease paraspinal muscle spasm, increase opening of the intervertebral foramina, increased in the intervertebral disk space, stretching of spinal structures, improved vertebral alignment and improved disk herniation .[10,11,12] These physiological effects also causes some changes in the cardiovascular system such as alterations in blood pressure(BP), pulse and ECG variables.[13,14,15] Reported adverse effects related to altered BP were mild headache, dizziness, feeling of impending vomiting(nausea), sensation of lack of balance or equilibrium (vertigo); most of which suggest a perturbation of the patient's cardiovascular system[11,12,13]Application of CT may cause stretching of neck muscles along with the baroreceptors in the carotid sinuses and may equally stimulate the sympathetic nerve whichsends impulses to the vasomotor and cardiac regions in the medulla causing changes in blood pressure and pulse rate.[12,16]

Traction weight also plays an important role in occurrence of these side effects.[17] Traction weight of 10% of body weight is suitable than 20% as it leads to subtle perturbation in autonomic system.[18] It has also been stated that 10% of total body weight is ideal as it has minimal side effects and highest therapeutic efficacy with significant pain relief and increased neck mobility.[11,18]

Significant variation has been noted amongst results of various studies on the effect of cervical traction on BP and heart rate. Cardiovascular responses were observed during CT amongst healthy population showed decrease in SBP,DBP and PR.[19] On the contrary increase in SBP,DBP and PRwere noted during and after application of CT when administered in sitting position.[13]

Patient is maximally relaxed in the supine position than in sitting position thus supine position is preferred for the application ofCT.[12,16,20] Moreover no study till date has been conducted on CS subjects to observe the changes in BP and PR before, during and 5 minutes after cervical traction in supine position.Therefore, the study is expected to aid physiotherapists in the treatment of cervical spondylosis patients with unstable cardiovascular parameters, but require traction application.

PARTICIPANTS

31 CS subjects, 14 males and 17 females within age group of 30-60 years were included in the study. Convenience sampling method was used for data collection in this observational study. Subjects with a history of hypertension / hypotension, cervical spine injury / surgery, cervical spine pathology, Congenital anomalies of cervical spine or vertebro-basilar insufficiency were excluded. We had had excluded five subjects, three with hypertension and two were with vertebro-basilar insufficiency.

OUTCOME MEASURES:

BLOOD PRESSURE: SBP and DBP was taken by auscultatory method using manual sphygmomanometer (BPMR-120 Mercurial BP Delux; IS 3390). Measurement was taken with the subject lying in supine position with arm at subject's side. Deflated cuff was wrapped around arm at 1 inch (2.5cm) above the cubital fossa. An estimation of the systolic pressure was made

by palpatory method using the radial artery on the distal forearm and then valve of BP cuff was closed; cuff was inflated rapidly to 30mmHg above the level at which radial pulse is no longer felt followed by an estimation of maximum pressure was noted and air was released quickly. Then head of stethoscope (Pulse-wave ™) was placed over brachial artery slightly above cubital fossa. Valve of cuff was closed and inflated until the manometer shows approximately 20-30 mmHg above theestimated systolic pressure. Valve was released and the point at which Korotkoff's sound heard was noted as systolic BP. Air was released further till the first sound disappears and the value on manometer noted as DBP.[18,21]

PULSE RATE: PR was measured with three fingers placed over radial artery at distal wrist with wrist slightly flexed and semi prone position. Tips of the index, middle and ring finger were placed over the radial artery at wrist. Light pressure applied until the pulse was felt. Index finger used to occlude blood flow from radial artery. Ring finger used to occlude retrograde flow of blood from ulnar artery through palmar arch. Middle finger was used to assess the pulse and PR was measured for one minute.[22]

PROCEDURE

Study was conducted in Physiotherapy OPD of Krishna hospital and Medical Research Centre, Karad, after approval of Protocol committee and Institutional ethics committee. Written informed consent was taken from the participants willing to participate. 10% of total body weight used as a traction weight for 10 minutes of CT. Outcome assessment was done before application of CT, during (5 minutes interval) CT in supine position. Application of cervical traction patient was kept in same supine position for 5 minutes andoutcome assessment was repeated.

STATISTICAL ANALYSIS

Data was analysed using INSTAT software, version 3.10. Statistical analysis between three measures was done using Repeated Measures ANOVA. Comparison of outcome at any two instances was done using Tukey-Cramer Multiple Comparison test. The level of significance of $p<0.05$ was considered to be statistically significant with 95% confidence interval.

RESULTS

Mean values of SBP pre, during and post application of traction were119.48±5.12 mmHg, 114.83±5.04mmHg and 117.67±5.08 mmHg respectively. Mean DBP values were78.77±2.16mmHg, 76.87±2.08mmHg and 78.10±2.33mmHg respectively. Andmean PR values were 78.65±5.63 ppm, 77.81±5.73 ppm and 78.06±5.41 ppm respectively.As in table 2 extremely significant ($p<0.0001$, $F = 268.08$) difference exist in SBP values before, during and after application of traction also extremely significant ($p<0.0001$, $F = 43.552$) difference exist between DBP values and PR values ($p<0.0001$, $F = 12.607$).

As in table 3 reduction in SBPwas extremely significant ($p<0.001$) during traction than pre traction and also reduced significantly ($p<0.001$) after traction as compared to during traction. Significant ($p<0.001$) reduction was noted in post-traction SBP as compared to before traction.Reduction in DBP was extremely significant ($p<0.001$) during traction than prior traction, after traction as compared to during traction ($p<0.001$) and post-traction compared to before traction ($p<0.001$) as in table 4. Reduction in PR was also extremely significant ($p<0.001$) during traction than prior traction but no significant ($p>0.05$) difference seen in PR during traction compared to after traction. Significant($p<0.01$) reductionwas found in post-traction PR as compared to before traction given in table 5.

Table 1: Mean and Standard deviation

OUTCOME MEASURES (MEAN ± SD)	PRE	DURING	POST
SBP mmHg	119.48±5.12	114.83±5.04	117.67±5.08
DBP mmHg	78.77±2.16	76.87±2.08	78.10±2.33
PR Ppm	78.65±5.63	77.81±5.73	78.06±5.41

SD:standard deviation

Table 2: Comparison of outcomes pre, during and post

Outcome measure	p value	F value
SBP	<0.0001	268.08
DBP	<0.0001	43.552
PR	<0.0001	12.607

P: probability

Table 3: Comparison of SBP values

SBP	p value
Pre Vs During	p< 0.001
During Vs Post	p < 0.001
Pre Vs Post	p < 0.001

Table 4: Comparison of DBP values

DBP	p value
Pre Vs During	p< 0.001
During Vs Post	p< 0.001
Pre Vs Post	P< 0.001

Table 5: Comparison of PR values

PR	p value
Pre Vs During	p< 0.001
During Vs Post	p> 0.05
Pre Vs Post	p < 0.01

DISCUSSION

Studies proved that the cervical traction is more effective in relieving compression and pain in patients with cervical spondylosis[12], here it is necessary to note that some patients with alteration in cardiovascular parameters may require cervical traction. So it is important to study the changes in blood pressure in patients with CS taking treatment of cervical traction.

SBP decreased by approximately 3 mmHg during traction and 2 mmHg after traction as compared with pre-traction values, also post-traction SBP reduced by 2 mmHg as compared to pre-traction values.DBP reduces by 2 mmHg during traction than prior traction and after traction than prior to traction valuesbut no difference was noted in pre and post valueswhereas PR reduced by 1 ppm during traction as compared with pre-traction values and 1 ppm during traction than post-traction values. But, there was no significant difference seen in PR values obtained during and post application of traction.

Studies done to observe cardiovascular responses during CT amongst healthy subjects in supine and sitting position where, SBP, DBP and PR increased in former whereas SBP and DBP reduced in the latter.[13,19] A study done to observe immediate effect of intermittent cervical traction in supine versus sitting position showed that systolic BP decreases during traction in supine position.[12] Also SBP and DBP were reduced in two studies in which CT was administered in supine position where former was done amongst healthy subjects and latter amongst subjects with cervical spondylosis.[19,8] In our study SBP, DBP and PR decreased compared to pre-traction values and this change could probably be attributed to supine position adopted during traction application.

CT causes stretching of the baroreceptors located in the carotid sinuses, neck muscles and blood vessels.[23,24]Stimulation of the baroreceptors send impulses via the afferent nerves to the vasomotor and cardiac centres in medulla oblongata to cause slowing of the heart rate, reduction in cardiac contractility and dilatation of peripheral arteries veins.[8,25,26] These physiological changes lower the blood pressure by reducing cardiac output. This assertion was corroborated by the present study with the drop in SBP, DBP and PR during and following application of CT given in supine position.

It was observed that five minutes post CT application subject's blood pressure did not re-attain pre-traction levels. This finding suggests that all patients should not be allowed to leave the treatment area until vital signs (SBP, DBP and PR) have fully returned to stable values approximately the baseline as closely as possible.

CONCLUSION

SBP, DBP and PR reduced significantly ($p<0.0001$) during and following ICT application in supine position as compared to pre-traction values. In the recovery period that is 5 minutes after application of ICT blood pressure and PR did not return to baseline values. Thus application of traction requires careful assessment of the cardiovascular parameters of the patient before CT.

Conflicts of Interest: Nil

Source of Funding: Krishna Institute of Medical Sciences Deemed University, Karad.

Ethical Clearance: Study approved by Institutional Ethics Committee of Krishna Institute of Medical Sciences, Karad.

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Effectiveness of Proprioceptive Neuromuscular Facilitation as an Adjunct to Eccentric Exercises in Subacromial Impingement

Akshata Sanjeev Jain[1], S Anandh[2], Amrutkuvar Pawar[3]

[1]BPT Student, [2]Professor, [3]Lecturer, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad, Satara, Maharashtra

ABSTRACT

Background: Shoulder pain is the third most common musculoskeletal condition. Shoulder Impingement is the most frequent cause of pain and overhead limitation in the shoulder area which can hamper the activities of daily living of an individual. So the present study was conducted to find out effect of Proprioceptive neuromuscular facilitation as an adjunct to eccentric exercises in subacromial impingement.

Method: An Comparative study was conducted at Krishna College of Physiotherapy , Karad. 40 subjects with age group between 25-60 years were taken. In Group A (20) subjects were treated with Proprioceptive Neuromuscular Facilitation and Eccentric exercises along with conventional treatment and In Group B (20) subjects were treated only with Eccentric exercises and conventional treatment.

Results: Statistical analysis was done using paired and unpaired"t" test, Mann Whitney test and Wilcoxon matched pairs signed rank test. The results showed statistically significant improvement in pain ,overhead reach, endurance and functional status of shoulder in group A (experimental group) as compared to group B ($p<0.001$).

Conclusion: Present study concluded that PNF as an adjunct to eccentric exercises was more effective than eccentric exercises alone in reducing pain, improving overhead reach, improving endurance and improving functional status of shoulder .

Keywords: *Proprioceptive neuromuscular facilitation (PNF), Eccentric exercises, Subacromial Impingement(SAIS)*

INTRODUCTION

The term "Impingement syndrome" was popularised by Neer in1972 as a clinical entity in which the rotator cuff was pathologically compressed against the anterior structures of the coracoacromial arch, the anterior third of the acromion,the coracoacromial ligament and the AC Joint[2]. The prevalence of shoulder symptoms have been reported to range from 35%[3] and age and sex matched incidence of shoulder pain was 9.5 per 1000 .Shoulder pain is the third most common musculoskeletal condition. Rotator cuff injury is found to be more common in males[4].

Eccentric strength training,first introduced in 1984 by Stanish et al[5] have for many years been used successfully to treat other tendinopathies[6-8]. Eccentric exercises involves lengthening of the musculo-tendinous unit while a load is applied to it[9]. The current most common therapeutic exercise regimen for the treatment of tendinopathy involves mechanically loading the painful and abnormal tissue with the use of eccentric exercises. Eccentric exercises is found to increase the collagen synthesis in tendinopathies specially the peritendinous type I collagen which corresponds with the reduced pain levels.Other proposed mechanisms

Corresponding author:
Ms. Akshata Sanjeev Jain
BPT Student, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad- 415110, Satara, Maharashtra. Email id: akshatajain16@yahoo.com

include pain habituation as a result of several weeks of pain provoking eccentric exercises, Neuromuscular benefits through central adaptation of both agonists and antagonist muscles[10] and increase in tendon stiffness[11].

Proprioceptive Neuromuscular Facilitation is an approach to therapeutic exercise that combines functionally based diagonal patterns of movement with techniques of neuromuscular facilitation to evoke motor responses and improve neuromuscular control and function[12].These techniques are utilized to assist with initiating range of motion, increasing range of motion,decreasing pain, teaching a motion,strengthening,promoting stability,facilitating proprioception,increasing endurance and restoring function[13].These techniques include the proper manual contacts, resistance, quick stretch, irradiation, traction and approximation, verbal commands and visual cues[14]. PNF is a neurophysiologic approach to therapeutic exercises that can be used during all phases of shoulder rehabilitation to address multiple impairments and functional losses.PNF applies neurophysiologic principles of the sensory and motor system to coordinate and efficiently perform purposeful movements of the shoulder[15].

Thus there exists a need of incorporating regimens along with the strengthening exercises like eccentric exercises which may help in relieving pain and reducing functional disability along with improvement of endurance and long term effectiveness.

Thus this study is designed to find out whether Proprioceptive neuromuscular facilitation is beneficial in achieving additional therapeutic effects when applied with the eccentric strengthening exercises**.**

MATERIALS AND METHOD

This was a Comparative study which was conducted to evaluate effect of Proprioceptive Neuromuscular Facilitation among 2 groups of subjects. The subjects who meet the inclusion and exclusion criteria and willing to participate in the study were included.We had approached and assessed 40 subjects as our study population. The participants were explained about the study and the evaluation procedure. The informed consent was obtained from the individuals. Inclusion Criterias were as follows **:1)** Both male and female participants willing to participate in the study,2)Age Group - 25-60 yrs**, 3)**VAS score more than 5 during Arm Elevation. **4)**Pain in the shoulder for atleast 3 months **5)** Positive 3 tests out of the following:- a) Neer's impingement test**,** b)Hawkins test, c)Jobe's test, d)Speed's test **,**e) Painful arc – 60^{o}-120^{o}

Exclusion Criterias were as follows: **1)** Recent history of surgery on particular shoulder **2)** History of Rheumatoid arthritis, fracture around shoulder complex **3)** History of any Recent shoulder Injury **4)** Any congenital abnormalities around the shoulder

5) Frozen shoulder **6)** Uncooperative subjects.

Subjects with subacromial impingement were assessed by Visual Analogue Scale (VAS), Overhead reach by measuring tape, Endurance by modified pull up test and functional scores will be obtained by shoulder pain and disability index (SPADI).Measurement of pain, overhead reach and endurance were made on all subjects on the first day before intervention and after 3 weeks of intervention.

Procedure

The study protocol was presented in front of protocol and Institutional Ethics Committee of KIMSDU, Karad.Subjects with Subacromial Impingement were approached,purpose of the study was explained and written informed consent was taken from those willing to participate.

For Both the groups, Following treatment was given was given in common as a part of the conventional treatment:

1.Cryotherapy in the form of cryopack applied over the painful area of shoulder for 15 minutes.

2.Ultrasound: Pulsed ultrasound for 8 minutes with a device that was operated at a frequency of 1 MHz, and an intensity of 1.5 W/cm2

3. Eccentric exercise program

Eccentric exercises for Rotator cuff muscles and deltoid were given using theraband with subjects in standing position. The subjects were asked to hold one end of the theraband with the other end under the corresponding foot & then asked to perform the shoulder movements of flexion, extension, abduction, adduction and rotations against the desired resistance. During each exercise, the Subjects were asked to quickly move in the desired direction and consequently slowly returning to the starting position. Each movement was

performed for 3 Sets of 15 repetitions each with a rest period of 60 seconds between each set[16]

GROUP A (Study group)

Proprioceptive Neuromuscular facilitation was given:-

1.Scapular PNF

Scapular PNF was applied in two diagonal patterns, Anterior elevation and posterior depression with 3 sets of 10 repetition.

Anterior elevation

Subjects were in the side lying position. The scapula was gently be moved into a posterior depressed position taking up the slack and thus applying a quick stretch.The subject were asked to anteriorly elevate the scapula against appropriate resistance. Movement is a diagonal arc up towards the patient's nose[17].

Posterior Depression

The subject will be placed in side-lying position with the movement occurring down to the ipsilateral ischial tuberosity[17].

2. Contract Relax – Glenohumeral (GH) Flexion:

The limb was moved (active or passive) toward the point of limitation.
• The subject performs an isotonic contraction into available GH flexion.
• Isometric contraction for 7-9 seconds into the antagonist pattern (GH extension).
• Patient relaxes (2-3 secs).
• Passive movement into the new range of the agonist pattern (GH flexion) for a stretch of 10-15 seconds.
• Repeat until no further gain can be achieved.
• This technique was performed for other motions at the shoulder including GH abduction, GH internal rotation, GH external rotation.[18].Each movement was performed for 3 sets of 5 repetitions.

3. Subjects were instructed to actively move through the PNF flexion-abduction-external rotation diagonal pattern for 3 sets of 10 repetitons with manual facilitation at the end of the session.

GROUP B

Subjects in the Group B received Therapeutic Ultrasound,Cryotherapy And Eccentric exercises. The intervention was given for 5 days per week for a total duration of 3 weeks for both the groups. (Total- 15 sessions) After the end of the 15 sessions, the subjects were assessed for the outcome measures.

FINDINGS

Statistical analysis was done manually as well as using the statistics software INSTAT so as to verify the result obtained .Intragroup analysis of Nonparametric Data (Pain,Endurance, SPADI scores) was done using Wilcoxon matched pairs test and Mann Whitney test was used for the intergroup analysis of nonparametric data. Intragroup & Intergroup analysis of parametric Data(Overhead Reach) was done using Paired & Unpaired T test respectively.

RESULT

Age of the subjects in this study was between 25-60 years.There was no significant difference between mean age of the subjects in two groups .Mean age group A was 42.95 years and that Group B was 43.35.

Table1: Baseline characteristics of subjects

Groups	Gender	Mean age	Side affected
Group A	Male=12,Female=8	42.95 years	Left=7,Right=13
Group B	Male=11,Female=9	43.35 years	Left=5,Right=15

Table 2:Comparison of values of Visual analogue scale

Group	Pre- treatment		Post-treatment		'p'
	Mean ± SD	Median	Mean ± SD	Median	
A	6.9 ± 0.646	6.950	3.17 ± 1.018	3.200	<0.0001
B	6.83 ± 0.7116	6.850	5.30 ± 0.8395	5.350	<0.0001
P	0.7148		<0.0001		

Intra group analysis of VAS score revealed statistically reduction in pain post interventionally for both the

groups.Group A (p<0.0001), Group B (p<0.0001). Pre interventional analysis showed no significant difference between group A and group B (p= 0.7148). Post intervention analysis showed significant difference between Group A and Group B (p<0.0001).

Table 3: Comparison of values of Overhead reach

Group	Pre- treatment		Post-treatment		'p'
	Mean ± SD	Median	Mean ± SD	Median	
A	177.44 ± 4.487	176.55	187.02 ± 4.892	185.95	<0.0001
B	175.51 ± 3.128	176.20	179.585 ± 4.031	180.10	<0.0001
P	0.1238		<0.0001		

Intra group analysis of Overhead Reach values revealed statistically increase in Overhead Reach post interventionally for both the groups Group A (p<0.0001), Group B (p<0.0001).. Pre interventional analysis showed no significant difference between group A and group B (p=0.1238). Post intervention analysis showed significant difference between Group A and Group B (p<0.0001).

Table 4: Comparison of values of Endurance

Group	Pre- treatment		Post-treatment		'p'
	Mean ± SD	Median	Mean ± SD	Median	
A	8.1 ± 3.259	8.00	15.6 ± 4.248	16.00	<0.0001
B	6.7 ± 2.296	6.00	9.7 ± 2.940	9.00	<0.0001
P	0.1474		<0.0001		

Intra group analysis of Endurance score revealed statistically reduction in pain post interventionally for both the groups.Group A (p<0.0001), Group B (p<0.0001). Pre interventional analysis showed no significant difference between group A and group B (p= 0.1474). Post intervention analysis showed significant difference between Group A and Group B (p<0.0001).

Table 5: Comparison of values of SPADI

Group	Pre- treatment		Post-treatment		'p'
	Mean ± SD	Median	Mean ± SD	Median	
A	84.6 ± 8.905	83	34 ± 9.171	32	<0.0001
B	83.45 ± 7.451	82.50	62.3± 11.810	60.50	<0.0001
P	0.8817		<0.0001		

Intra group analysis of SPADI score revealed statistically reduction in pain and functional disability scores post interventionally for both the groups. Group A (p<0.0001), Group B (p<0.0001). Post intervention analysis showed significant difference between Group A and Group B (p<0.0001)

DISCUSSION

Subacromial impingement syndrome in the shouder is characterised by pain and overhead limitation due to encroachment of the subacromial space and subsequent inflammation of the tendon of the rotator cuff and subacromial bursa[1].It is one of the common causes of shoulder pain and disability and can severely hamper the daily living of an individual[19].The purpose of this

study was to evaluate the effectiveness of proprioceptive neuromuscular facilitation as an adjunct to eccentric exercises in subacromial impingement.

The average mean age of participants in Group A was 42.95 ± 13.30and Group B was 43.35 ± 11.35, which showed there is no significant difference in age of subjects in both groups (t = 1.1023 & p = 0.9190) which was done by unpaired t-test. The total number of participants included were 40,out of which 23 were males and 17 were females. Group A had 12 males and 8 females and Group B had 11 males and 9 females. Out of 40 subjects, 12 had left side SAIS and 28 had right side SAIS.

Overuse was the most common cause of shoulder pain and disability found in the subjects included in the study.

Wilcoxon matched pairs and Paired t test was used to analyse the effect of Ultrasound, Cryotherapy and Eccentric exercises which showed that there was significant improvement in Pain, Overhead Reach, Endurance, and Functional status of Shoulder Post treatment.

It is been suggested eccentric exercises expose the tendon to a greater load than concentric exercises and proposed an eccentric exercise program as the best mechanism for the strengthening the tendon. The possible mechanisms for pain reduction may be related to increase in fibroblast activity, increase in type 1 collagen fibres, Remodelling of the tendon by muscle lengthening, Increase of sarcomeres in series and neuromuscular adaptation[20]

Wilcoxon matched pairs & Paired t test was used to analyse the effect of Proprioceptive Neuromuscular facilitation as an adjunct to Eccentric exercises which showed that there was significant reduction in pain, Overhead Reach,Endurance , and disability ($p<0.0001$) post treatment.

Comparison of Pain, Overhead Reach, Endurance and functional disability between two groups was done using Mann-Whitney test & Unpaired T test to find effectiveness between two groups

The statistical analysis revealed that Group A was more efficient in reduction of pain, Overhead Reach,Endurance and functional disability ($p<0.0001$) than Group B post treatment.

Proprioceptive neuromuscular facilitation is an advanced form of flexibility training that involves both the stretching and contraction of the muscle group being targeted. PNF is effective in increasing the range of motion because of the reciprocal activation of agonist and antagonist. It provides the greatest potential for muscle tendon as it lengthens the Golgi organ. When PNF (contract relax technique) is applied, the patient is told to contract the muscle in internal rotation against the resistance. Therefore, as the muscle tension develops, the GTO fibers inhibit alpha motor neurons activity and decreases tension in the muscle tendon. Inhibition is the state of decreased neuronal activity and altered synaptic potential which reflexively diminishes the capacity of a muscle to contract. As the capacity of muscle to contract decreases, the arm is moved to external rotation. Likewise, the antagonists are contracted and agonists are relaxed and again, tension is developed. This GTO monitors the excessive tension during muscle contraction and thus inhibits the excessive contractions[21]. Similarly the scapular pattern acts in the similar way by reciprocal activation of the scapular stabilisers[16].

The result from the statistical analysis of present study supported alternative hypothesis which stated that there will be beneficial effect to the subjects treated with Proprioceptive Neuromusular Facilitation along with ultrasound therapy, Cryopack and Eccentric Exercises.

CONCLUSION

Subjects treated with proprioceptive neuromuscular facilitation as an adjunct to eccentric exercises was more effective than eccentric exercises alone in reducing pain, improving overhead reach, improving endurance and improving functional status of shoulder in subjects with subacromial impingement

Source of Funding: The source of funding for study is KIMSDU, Karad.

Conflict of Interest: There is no conflict of interest.

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Effect of Close Kinematic Chain Exercises on Upper Limb Spasticity in Hemiparetic Adult

Kavita Krishnamoorthy[1], GVaradharajulu[2], Smita Bhimrao Kanase[3]

[1]BPT Student, [2]Dean, [3]Lecturer, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad, Satara, Maharashtra

ABSTRACT

Background: As upper limb spasticity is the major hindrance in quality of life in hemiparesis, this project emphasizes on the effect of close kinematic chain exercises on upper limb spasticity.So, the present study was conducted to find out the effect combined effect of conventional exercises with close kinematic chain exercises on spasticity.

Method: Comparative study was conducted at Krishna College of Physiotherapy, Karad.20 subjects with age group between 40-60 years were taken. Participants of Group A (10) were treated with close kinematic chain exercises along with conventional treatment & GroupB(10)only with conventional treatment.Exclusion criteria of the study was:1.Associated psychological disorder.2.Perceptual disorders.3.Any visual & auditory impairment.4.Any orthopaedic disorder.

Results: Statistical analysis was done using paired, unpaired ”t”test, Mann Whitney test and Friedman statistics. The results showed statistically significant reduction in spasticity in group A as compared to groupB($p<0.001$).

Conclusion: The study shows that close kinematic chain exercises helps in normalizing tone, reducing spasticity in upper extremity hemiparesis.

Keywords: *Close kinematic chain exercises, upper limb spasticity, old stroke adults.*

INTRODUCTION

Stroke occurs when the blood supply to the brain is stopped or when a brain hemorrhage occurs, causing body motor disorders & a sudden disturbance of consciousness.[1] 30-60% of stroke subjects have upper extremity dysfunction & its recovery is important in daily living activities. Upper extremity dysfunction affects participation in social activities.[2] The upper extremity functions on a patient's stroke-affected side is most important factor in their prognosis &plays an important role in the course of treatment.[3]

There is a general pattern of recovery described by Twitchell[4]and Brunnstrom[5, 6]& confirmed by additional investigators.[7-10] In MCA syndrome the upper extremity may be more involved and demonstrate less complete recovery than the LE.[11]

Spasticity is a type of hypertonic motor disorder characterized by velocity-dependent resistance to passive stretch[12].The Modified Ashworth scale(MAS) measures resistance during passive soft tissue stretching & is used as a simple measure of spasticity.[13]

Up to the present,no researches have been conducted comparing the effect of close kinematic chain exercises on reducing the spasticity in upper extremity alone in hemiparesis adults. This study is first of its kind focusing on the upper limb spasticity.The findings may also differ from person to person and country to country. Having an idea about the effect of close kinematic chain exercises will be important in preventing delayed prognosis of hemiparesis,which may lead to poor quality of life of stroke subjects.

Corresponding author:
Dr. Kavita Krishnamoorthy
BPT Student, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad- 415110, Satara, Maharashtra. Email id: maildrkavita@gmail.com

MATERIALS AND METHOD

Study was conducted to assess the effect of close kinematic chain exercises on upper limb spasticity among 2 groups of individuals.The participants satisfying inclusion & exclusion criteria willing to participate in the study were included. 20 subjects of hemiparesis were approached and assessed as study population.The subjects were explained about the study & the evaluation procedure.The informed consent was obtained from the individuals.The inclusion criterion of the study was: 1.Age 40-60 years.2.Gender-both.3.Subjects belonging to stage 2 & above according to Brunnstrom stages of motor recovery.4.First episode of hemiplegia. The exclusion criterion of the study was: 1.Associated psychological disorder. 2.Perceptual disorders. 3.Significant visual & auditory impairment. 4.Any orthopedic disorder. Outcome measures was Modified Ashworth Scale.

GROUP A: Subjects were treated with close kinematic chain exercises along with conventional treatment.

GROUP B: Subjects were treated only with conventional treatment.

All the subjects were treated 5 days/week,for 6 weeks. Conventional exercises given were:1)Sensory reeducation2)Soft tissue/joint mobilization and Range of Motion exercises(Passive or Active Assisted exercises)3) Positioning4)Splinting5)Stretching6)Ele ctrical Stimulation7)Reaching activities8)Functional mobility exercises9)Locomotor training10)Balance training.

Study group was treated with conventional exercises in addition to the close kinematic chain exercises.Each position adopted during exercise was maintained for 10 seconds with 10 repetitions of each.The exercises were performed with assistance once a day, 5 days/week for six weeks.The exercises included: Quadripod(with legs crossed and lifted), Standing(facing towards the wall bearing the weight with the palms on the wall), Sitting(in arm chair,hold the chair and get up), Quadripod(with the unaffected forearm on the ball and bearing weight on the affected palm), Quadripod(affected palm on the pillow and unaffected palm pressing ball against the wall), Standing(move the ball in upward direction against the wall).

STATISTICAL ANALYSIS

Statistical analysis was done manually as well as using the statistics software INSTAT so as to verify the results obtained. Data was analyzed using paired and unpaired‘t’ test for within and between groups respectively. Probability values less than 0.05 were considered statistically significant & probability values less than 0.0001 were considered statistically extremely significant.

RESULTS

Age of the participants in this study was between 40-60 years.There was no statistically significant difference between mean age and standard deviation of the participants in two groups. Mean age of GroupA was 54.6years & that GroupB was 54.4 years(Table 1)

Table 1: Baseline characteristics of subjects

Groups	Gender	Mean Age	Side affected
Group A	Male=5 & Female=5	54.6 years	Left=7 & Right=3
Group B	Male=4 & Female=6	54.4 years	Left=6 & Right=4

Pre-interventional mean of MAS score of shoulder adductors was 1.8 ± 0.6325 in group A&2.3±0.8233 in groupB whereas post-interventionally mean of MAS score at 2week was 1.8 ± 0.632 in groupA &2.3±0.8233 in groupB,at 4week was 1.4±0.5164 in groupA and 2.2 ± 0.7888 in groupB & at 6week was 0.8±0.6325 in groupA &1.6±0.8433 in groupB.Intra-group analysis of MAS score of shoulder adductors revealed statistically extremely significant reduction in spasticity post-interventionally for both the groups GroupA($p<0.0001$),GroupB ($p=0.0003$).Inter-group analysis pre-interventionally showed no significant difference between GroupA&GroupB($p=0.2175$) .Post intervention analysis showed no significant difference($p=0.2175$) at 2week whereas there was statistically significant difference post-interventionally at 4week & 6week($p=0.0284$) & ($p=0.0434$) respectively(Table 2)

Table 2: Comparison of MAS score of shoulder adductors

Group	Pre	Post			'p'
	Mean ± SD	Mean ± SD			
		2 wk	4 wk	6 wk	
A	1.8± 0.6325	1.8± 0.632	1.4± 0.5164	0.8± 0.6325	<0.0001**
B	2.3± 0.8233	2.3± 0.8233	2.2± 0.7888	1.6± 0.8433	0.0003**
P	0.2175	0.2175	0.0284	0.0434	

**= extremely significant (p≤ 0.0001)

= significant difference (p < 0.001)

Pre-interventional mean of MAS score of shoulder internal rotators was 1.8 ± 0.6325 in groupA &2.3 ± 0.8233 in groupB whereas post-interventionally mean of MAS score at 2week was 1.8 ± 0.632 in groupA &2.3 ± 0.8233 in groupB,at 4week was 1.4 ± 0.5164 in groupA and 2.1 ± 0.8756 in groupB & at 6week was 0.8 ± 0.6325 in groupA &1.7 ± 0.6749 in groupB.Intra-group analysis of MAS score of shoulder internal rotators revealed statistically significant reduction in spasticity post-interventionally for in GroupA as compared to GroupB. There was extremely significant difference for GroupA(p<0.0001) whereas very significant difference for GroupB(p=0.0024).Inter-group analysis pre-interventionally showed no significant difference between GroupA & GroupB(p=0.2175).Post intervention analysis showed no significant difference(p=0.2175) at 2week whereas there was statistically not quite significant difference post-interventionally at 4week(p=0.0713) and there was statistically significant difference post-interventionally at 6week(p=0.0178)(Table 3).

Table 3: Comparison of MAS score of shoulder internal rotators.

Group	**Pre**	**Post**			**'p'**
	Mean ± SD	**Mean ± SD**			
		2 wk	**4 wk**	**6 wk**	
A	1.8± 0.6325	1.8± 0.632	1.4± 0.5164	0.8± 0.6325	<0.0001**
B	2.3± 0.8233	2.3± 0.8233	2.1± 0.8756	1.7± 0.6749	0.0024
P	0.2175	0.2175	0.0713	0.0178	

Pre-interventional mean of MAS score of elbow flexors was 2.1 ± 0.5676 in groupA and 2.5 ± 0.8498 in groupB whereas post-interventionally mean of MAS score at 2week was 2 ± 0.6667 in groupA and 2.4 ± 0.8433 in groupB,at 4week was 1.7 ± 0.6749 in groupA and 2.2 ± 0.9189 in groupB and at 6week was 0.9 ± 0.5676 in groupA and 2 ± 0.9428 in groupB.Intra-group analysis of MAS score of elbow flexors revealed statistically extremely significant reduction in spasticity post-interventionally for GroupA(p<0.0001) whereas there was not quite significant difference for GroupB(p=0.0576).Intra-group analysis pre-interventional analysis showed no significant difference between GroupAand GroupB(p=0.2833).Post intervention analysis showed no significant difference(p=0.3372) at 2week whereas there was statistically significant difference post-interventionally at 4week and 6week(p=0.2504) & (p=0.007) respectively(Table 4).

Table 4: Comparison of MAS score of elbow flexors.

Group	Pre	Post			'p'
	Mean ± SD	Mean ± SD			
		2 wk	4 wk	6 wk	
A	2.1 ± 0.5676	2± 0.6667	1.7± 0.6749	0.9± 0.5676	<0.0001**
B	2.5 ± 0.8498	2.4± 0.8433	2.2± 0.9189	2± 0.9428	0.0576
P	0.2833	0.3372	0.2504	0.007	

Pre-interventional mean of MAS score of forearm pronators was 2 ± 0.6667 in groupA and 2.6 ± 0.6992 in groupB whereas post-interventionally mean of MAS score at 2week was 2 ± 0.6667 in groupA and 2.6 ± 0.6992 in groupB,at 4week was 1.8 ± 0.6325 in groupA and 2.5 ± 0.7071 in groupB and at 6week was 1 ± 0.4714 in groupA and 2.3 ± 0.6749 in groupB.Intra-group analysis of MAS score of forearm pronators revealed statistically extremely significant reduction in spasticity post-interventionally for GroupA(p<0.0001) whereas there was not quite significant difference for GroupB(p=0.0612).Inter-group analysis pre-interventionally showed no significant difference between GroupA& GroupB(p=0.1152).Post intervention analysis showed no significant difference(p=0.1152) at 2week whereas there was statistically not quite significant difference post-interventionally at 4week(p=0.0644) and there was statistically extremely significant difference post-interventionally at 6week(p=0.0006)(Table 5).

Table 5: Comparison of MAS score of forearm pronators.

Group	Pre	Post			'p'
	Mean ± SD	Mean ± SD			
		2 wk	4 wk	6 wk	
A	2 ± 0.6667	2± 0.6667	1.8± 0.6325	1± 0.4714	<0.0001**
B	2.6 ± 0.6992	2.6± 0.6992	2.5± 0.7071	2.3± 0.6749	0.0612
P	0.1152	0.1152	0.0644	0.0006	

Pre-interventional mean of MAS score of wrist flexors was 1.9 ± 0.5676 in groupA and 2.7 ± 0.6749 in groupB whereas post-interventionally mean of MAS score at 2week was 2 ± 0.6667 in groupA and 2.7 ± 0.6749 in groupB,at 4week was 1.8 ± 0.6325 in groupA and 2.6 ± 0.6992 in groupB and at 6week was 1 ± 0.4714 in group A and 2.5 ± 0.7071 in group B.Intra-group analysis of MAS score of wrist flexors revealed statistically extremely significant reduction in spasticity post-interventionally for GroupA(p<0.0001) whereas there was no significant difference for GroupB(p=0.1940).Inter-group analysis pre-interventionally showed significant difference between GroupA and GroupB(p=0.0264).Post intervention analysis showed not quite significant difference(p=0.06) at 2week whereas there was statistically significant difference post-interventionally at 4week(p=0.0349) and there was statistically extremely significant difference post-interventionally at 6week(p=0.0004)(Table 6)

Table 6: Comparison of MAS score of wrist flexors.

Group	Pre	Post			'p'
	Mean ± SD	Mean ± SD			
		2 wk	4 wk	6 wk	
A	1.9 ± 0.5676	2± 0.6667	1.8± 0.6325	1± 0.4714	<0.0001**
B	2.7 ± 0.6749	2.7± 0.6749	2.6± 0.6992	2.5± 0.7071	0.1940
P	0.0264	0.06	0.0349	0.0004	

Pre-interventional mean of MAS score of finger flexors and thumb adductors was 2.1 ± 0.5676 in groupA and 2.8 ± 0.7888 in groupB whereas post-interventionally mean of MAS score at 2week was 2.1 ± 0.5676 in groupA and 2.8 ± 0.7888 in groupB,at 4week was 1.9 ± 0.5679 in groupA and 2.5 ± 0.7071 in groupB and at 6week was 1.1 ± 0.3162 in groupA and 2.3 ± 0.8233 in groupB.Intra-group analysis of MAS score of finger flexors and thumb adductors revealed statistically extremely significant reduction in spasticity post-interventionally for GroupA ($p<0.0001$) whereas there was significant difference for GroupB($p=0.0158$).Pre-interventional analysis showed not quite significant difference between GroupA and GroupB($p=0.0718$).Post intervention analysis showed not quite significant difference($p=0.0718$) at 2week whereas there was statistically no significant difference post-interventionally at 4week($p=0.1045$) and there was statistically very significant difference post-interventionally at 6week($p=0.0019$)(Table 7)

Table 7:Comparison of MAS score of finger flexors and thumb adductors.

Group	Pre	Post			'p'
	Mean ± SD	Mean ± SD			
		2 wk	4 wk	6 wk	
A	2.1 ± 0.5676	2.1± 0.5676	1.9± 0.5679	1.1± 0.3162	<0.0001**
B	2.8 ± 0.7888	2.8± 0.7888	2.5± 0.7071	2.3± 0.8233	0.0158
P	0.0718	0.0718	0.1045	0.0019	

DISCUSSION

20 subjects clinically diagnosed with stroke having hemiparesis and fulfiling inclusion and exclusion criteria with age between 40-60 years were included in the study. Randomization was done in two groups, Group A and B containing 10 subjects each. A baseline treatment was given to both groups.

The average mean age of participants in GroupA was 54.6 ± 7.260 & GroupB was 54.4 ± 6.310, which showed there is no significant difference in age of subjects in both groups ($t=0.06575$ & $p=0.9483$) which was done by unpaired t-test. Out of 20 subjects GroupA had 5 males and 5 females and GroupB had 4 males and 6 females. Out of 20 subjects 10 had left side affected and 10 had right side affected.

Friedman Statistics test was used to analyse the effect of close kinematic chain exercises on spasticity within the groups which showed that there was significant reduction on spasticity ($p<0.0001$) post treatment. Mann-Whitney test was used to analyse the effect of close kinematic chain exercises on spasticity between the groups. There was no significant difference for shoulder adductors, shoulder internal rotators, elbow flexors and forearm pronators post 2 weeks ($p=0.2175$), ($p=0.2175$), ($p=0.3372$), ($p=0.1152$) but there was quite significant, significant and extremely significant difference post 4 weeks and post 6 weeks, p value less than 0.0001 and upto 0.08.

Findings in this study may be due to the conceptual model of close kinematic chain exercises where the distal end of the extremity is fixed to something. The movement pattern is characterized by linear stress in the joint. Multiple joint movements occur with recruitment of multiple muscles. Movement patterns are functional creating compressive forces in a joint leading to co-contraction of the muscles surrounding the joint with movement occurring in multiple planes simultaneously; loading of muscles and joints provides normal proprioceptive or kinesthetic feedback. Movement causes compression of the joint surfaces, thereby increasing joint stability, and these exercises are more functional[14].

The above results also correlates with the previous studies which uses conventional treatment such as sensory stimuli where emphasis is on affected inputs facilitation and normal movement patterns, PNF are used to reinforce existing motor response. FES has been demonstrated to be beneficial to restore motor control, spasticity and reduction of hemiplegic shoulder pain and subluxation. Positioning can be therapeutic for tone control and neuro-facilitation of stroke patients. Passive mobilization is useful in gaining relief of pain and ROM. No shoulder support will correct glenohumeral joint subluxation. However, it may prevent the flaccid arm from hanging against the body during functional

activities, thus decreasing joint pain. Functional mobility helps prevent complications.

Many approaches to the physical rehabilitation of adults post-stroke exist that attempt to maximize motor skill recovery. However the literature does not support the efficacy of any single approach. Therefore above conventional therapy alone is not as effective as compared to the combined effect.

The CKC exercise positions mentioned in this study are different from those performed conventionally which progressively increases load on the affected upper limb, causing co-contraction of the agonist & antagonist muscles in a controlled manner thus normalizing the tone in the spastic muscle groups proving beneficial as single approach for upper extremity motor rehabilitationis not much effective.

CONCLUSION

Subjects treated with close kinematic chain exercisesalong with conventional treatment showed greater reduction in spasticity.It helped in normalizing tone in upper extremity in subjects with hemiparesis.

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Effectivness of Core Muscle Strengthening with Swiss Ball on Balance in Cerebellar Stroke

Sailee Chandrashekhar Wagh[1], T Poovishnu Devi[2], Vaishali Krishnat Jagtap[3]

[1]BPT Student, [2]Assoc Professor, [3]Lecturer, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad, Satara, Maharashtra

ABSTRACT

Background: Trunk imbalance in stroke patients results from proprioceptive sense impairments . Therefore, the purpose of the study is to find out effect of core muscle strengthening with Swiss ball on balance in cerebellar stroke patients.

Method: Experimental study was carried out at physiotherapy outpatient department of Krishna hospital , karad . 40 subjects were selected by convenient sampling and divided into two groups Group A received Core Muscle Strengthening with Swiss ball along with Conventional Stroke rehabilitation exercises and Group B received conventional stroke rehabilitation exercises. The duration of treatment is 45 minutes/day for 4 weeks

Results: Statistical analysis was done by paired 't' test with in groups and unpaired 't' test between groups. Analysis score within GROUP A($p<0.0001$) and Group B ($p<0.0001$) was significant . Between Group comparison ,GROUP A ($p<0.0001$)was extremely significant than GROUP B($p=0.0002$) Hence group A is highly significant in improving balance than group B

Conclusion: It was concluded that core muscle strengthening with Swiss ball along with conventional stroke rehabilitation exercises was more effective than conventional stroke rehabilitation alone in improving balance in cerebellar stroke.

Keywords: *Cerebellar stroke ,Swiss ball , Core muscle strengthening.*

INTRODUCTION

Stroke is one of the serious and disabling health problem that is common worldwide[1].Stroke is the rapidly developing loss of brain function due to disturbance in the blood supply to the brain this can be due to ischemia or heamorrhage[2]. Stroke affects approximately 700,000 individuals each year, about 500,000 are new stroke and 200,000 are recurrent strokes. There are an estimated 5,400,000 stroke survivors. The males are 1.25 times more affected than females[3]. The cerebellum is the area of the brain that regulates all movements and maintains balance and coordination Damage to the cerebellum can cause lack of balance or coordination on the same side of the body. Cerebellar Stroke patients with balance and gait problems are recognized by decrease in physical abilities . Its important for stroke patients to improve their muscle strength and balance for functional recovery and activities of daily living.[5] Balance and co-ordination are mainly affected in cerebellar stroke patients balance .Balance is a key component of normal daily activities such as walking, running and climbing stairs. Balance is defined as the ability to maintain the body's center of gravity within the limits of stability as determined by the base of support[6]. Core muscle strengthening is a beneficial therapeutic technique for the improvement of trunk balance in patients with acute, subacute or chronic hemiplegia[6,7] The core has been used to refer to the lumbo-pelvic-hip complex ,which involves deeper muscles ,such as internal oblique , transervus abdominis ,external oblique ,quadrates lumborum rectus abdominis, erector spinae , latissimusdorsi ,gluteus maximum [9,10,11] Core strengthening is most widely used method in trunk stabilization exercises core strengthening exercises strengthens the muscle associated with maintaining the posture of the limbs and give increased[12] trunk stabilization exercises on an unstable surface activates

the postural muscle around the abdomen and pelvis ,more that on a stable surface.it was reposted that stroke patients showed improvements of balance and gait ability after core strengthening on an unstable surface[13]The unstable surface of the Swiss ball may ease the stress around the hip and low back region and alter proprioceptive demands thereby enhance motor control of the local core muscles important for balance and stability.[14,15].Many recent studies have reported on Swiss ball improving balance in patients with hemiplegia [16] however, few studies on the relationship between core stability and balance ability in patients with cerebellar stroke have been reported. Therefore, the purpose of this study was to examine the effect of core strengthening exercise with Swiss ball on balance in cerebellar stroke patients

MATERIAL AND METHOD

It was a experimental study conducted in the physiotherapy dept. of Krishna college of physiotherapy, karad from December 2016 to March 2017 .40 subjects were equally divided into two groups. GROUP A received Core muscle strengthening along with conventional stroke rehabilitation exercises & GROUP B received Conventional stroke rehabilitation exercises Subjects were selected according to inclusion and exclusion criteria. Written informed consent was taken and the whole study was explained to them. Detailed neurological evaluation was done to screen the subjects .Inclusion Criteria were as follows: 1)Both male and female 2)Subjects with cerebellar stroke 3)Age between 40-60 4)Subjects able to stand with support 5) Adequate vision and hearing for completion of study protocol 6)Patients willing to provide informed consent. Exclusion criteria were as follows :1)Musculoskeletal problems that seriously affect the balance.2)Any other problem that affects the subjects balance like vertigo 3)Uncooperative patients 4)Weakness in the non paretic lower extremity that affect the activities of daily living . Balance assessment were done using Berg Balance Scale and Time Up And Go test. Group A received Supine: -1. pelvic bridging with Swiss ball 2.Unilateralbridging with Swiss ball 3.Trunk rotation with Swiss Sitting:-1. static balance on Swiss ball 2 .Trunk flexion extension on Swiss ball 3. trunk flexion extension with lower back on Swiss ball 4. Forward reach on Swiss ball 5 lateral reach on Swiss ball. And Group B received passive movement , bed mobility exercises ,transfer activities ,gait training ,weight bearing exercises ,balance training exercises, pelvic bridging Abdominal curl up.

FINDINGS

Statistical analysis was done manually as well as using the statistics software INSTAT so as to verify the result obtained.Various statistical measures such as mean, standard deviation,and paired ,unpaired test of significance, Mann Whitney test and Friedman statistics were utilized for this purpose. Probability values less than o.oo5 were considered statistically significant and probability values less than 0.0001 were considered statistically extremely significant.

RESULT

1 Gender distribution

40 subjects were taken, diagnosed with stroke. Out of 40 subjects, Group A had 5 males and 5 females and Group B had 4 males and 6 female

Table 1 Gender distribution

	Male	Female	Total
Group A	14	6	20
Group B	15	5	20

2. Age determination :

Age group of all participants is between 40 to 60 years. The mean age of the participants in Group A 52.2±6.693 and in Group B was 54.8±6.895. There was no significant difference between the mean ages of the participants in both the groups. This was done by using unpaired t test (t = 1.216& p = 0.2337)

Table 2 Mean age distribution

	Mean ± SD	SEM
Group A	52.2±6.693	1.497
Group B	54.8± 6.895	1.542
't'	1.216	
'df'	38	
'p'	0.2337	

In the graph, I = Subjects between age group of 40 to 50 years

II = Subjects between age group of 50 to 60 years

3.Side affected :

40 subjects were taken, diagnosed with cerebellar stroke

Out of 40 subjects, Group A had 13 subjects whose left side was affected and 7 subjects with right side affected and Group B had 10 with left side and 10 with right side affected.

Table 3: Side affected.

	Right-side	**Left-side**	**Total**
Group A	**7**	**13**	40
Group B	**10**	**10**	**40**

Outcome measures :

4. BERG BALANCE SCALE :-

Table 4: Comparison of pre & post values of BBS within the group A & B.

Group	**Pre- treatment**		**Post-treatment**		**'p'**	**'t'**
	Mean ± SD	**median**	**Mean ± SD**	**Median**		
A	18.25 ±5.562	19.00	29.35 ± 5.650	30.00	<0.0001	9.491
B	17.55±2.502	18.00	20.75 ± 2.173	20.50	0.0003	11.168

In the present study pre-interventional median of BBS score 19.00 whereas post-interventional median at 4 week was 30 in Group A and pre-interventional median of BBS score was 18.0 whereas post-interventional median at 4 week was 20.75 in Group B. Intra group analysis of BBS score revealed statistically improvement in balance function post interventional for GROUP A. This was done by using Friedman Statistics showed extremely significant difference for Group A ($p<0.0001$) and Group B ($p=0.0003$).

Table 5: Comparison of pre-pre and post-post BBS score in between groups.

Group	**Pre- treatment**		**Post-treatment**	
	Mean ± SD	**Median**	**Mean ± SD**	**Median**
A	18.25 ±5.562	19.00	29.35 ± 5.650	30.00
B	17.55±2.502	18.00	20.75 ± 2.173	20.50
'p'	0.6107		<0.0001	

In the present study pre interventional means of BBS score was 18.25 ±5.562 in Group A and in17.55±2.502 Group B whereas post-interventional means BBS score was in Group A 29.35 ± 5.650 and 20.75 ± 2.173 in Group B respectively. Inter group analysis of BBS score was done .Post intervention analysis showed significant difference between Group A and Group B ($p<0.0001$).

2 Time UP and GO TEST

Table 6 Comparison of pre and post – value of time up and go test within the groups

Group	**Pre- treatment**		**Post-treatment**		**'p'**	**'t'**
	Mean ± SD	**Median**	**Mean ± SD**	**Median**		
A	22.05 ±5.276	22.0	14.9±5.340	13.30	<0.0001	9.842
B	22.45 ±4.430	23.50	20.6±4.198	22.50	0.0002	5.072

In the present study pre interventional mean of trunk flexors for TUG was22.05 ±5.276 in Group A and in 22.45 ±4.430 Group B whereas post-intervention TUG was 14.9±5.340 in Group A and 20.6±4.198 in Group B respectively. Intra group statistical analysis revealed statistically extremely significant decrease in post interventional for both the groups. This was done by using paired t test Group A (t=9.842, p<0.0001), Group B (t=5.072, p=0.0002)

Table 7: Comparison of pre-pre and post-post TUG in between groups.

Group	Pre- treatment		Post-treatment	
	Mean SD	Median	Mean ± SD	Median
A	22.05 ±5.276	22.0	14.9±5.340	13.30
B	22.45 ±4.430	23.50	20.6±4.198	22.50
'p'	O.7967		<0.0001	

DISCUSSION

Stroke is the rapidly developing loss of brain function due to a disturbance in the blood supply to the brain .The cerebellum is the area of the brain that regulates all movements and maintains balance. It coordinates movements and balance.

Damage to the cerebellum can cause lack of balance or coordination on the same side of the body cerebellar Stroke patients have difficulty in balance and postural control for standing upright because they are impaired by asymmetric posture, abnormal body balance, and deficit of weight transfer.

Thus this study was conducted to find Effectiveness of core muscle strengthening with Swiss ball on balance in cerebellar stroke . Results of this study were focused on improved balance based on Berg Balance Scale and Time Up and Go test. It was analyzed that there was improvement in balance in both groups

Significant balance improvement was noted in both groups over sessions for 4 weeks .It is important to note that all the participants were given conventional stroke rehabilitation as a common mode of treatment method. The study was conducted on 40 subjects .In this study, the age group of the participants was in between 40 to 60 years Many studies were carried out to find the best protocol for improving balance in cerebellar stroke patients but no specific study was done that is targeting only on core muscle strengthening with an unstable surface i.e Swiss ball. Those studies also show significant changes in their outcome with respective treatments.

In this study the subjects were divided into two groups. Pre consent was taken from them .They were divided into Experimental group and Conventional group The interventions were carried out for 4 weeks with one times per day for 5 days per week. The outcome Measures for this study were Berg Balance Scale and Time Up and Go Test This study shows significant difference in the pre and post treatment values in both the groups. Experimental group showed significant improvement in the outcome variables concluding that there is early balance control as compared to control group. This was confirmed using statistical analysis by using 'Paired t- test' for within group comparison and 'Unpaired t-test' for between the group comparisons. In the present study, we found that after intervention there was significant improvement in the outcome with core muscle strengthening along with conventional stroke rehabilitation exercises and we found that it is effective for balance control in cerebellar stroke subjects.

The average mean age participants in Group A 52.2±6.693 and in Group B was 54.8±6.895. There was no significant difference between the mean ages of the participants in both the groups. This was done by using unpaired t test (t = 1.216& p = 0.2337)

The total numbers of participants included were 40 diagnosed with cerebellar stroke. Out of 40 subjects, Group A had 14 males and 6 females and Group B had 15 males and 5 females. This co-related with the study that men are more affected than females . Out of 40 subjects, Group A had 13 subjects whose left side was affected and 7 subjects with right side affected and Group B had 10 with left side and 10 with right side affected.

1.Berg Balance Scale

Mann-Whitney test were used to analyses the effect of core muscle strengthening exercises with Swiss ball on balance in cerebellar stroke patients which showed that there was significant improvement in balance (p= 0.0001) post treatment.

In Within Group Comparison

Group A : (p value <0.0001,t value =9.491)which is extremely significant and Group B ('p' value = 0.0003 ,t value= 11.168) which is significant this was done using un paired t test.

In Between Group Comparison

Pre values (p=0.6424,to.4719) and post values (p<0.0001.t=6.185) the post values shows significant difference which was done using paired t test.

Previous studies have reported the positive effects of CMS on unstable surfaces possibly due to stimulation of the proprioceptors of the joint and muscle Also, trunk stabilization training on an unstable surfaces activates the postural muscles around the abdomen and pelvis, more than that on a stable surface. It has been reported that stroke patients showed improvements of balance and gait ability after trunk stabilization exercise on an unstable surface.[15]

2. Time Up And Go Test

In Within Group Comparison

Group A : (p value <0.0001,t value =9.842)which is extremely significant and Group B ('p' value = 0.0002 ,t value= 5.072) which is significant this was done using un paired t test

In Between Group Comparison

Pre values (p=0.7967,t=3241) and post values (p<0.0001,t=3.121)the post values shows significant difference which was done using paired t test.

Hence above result showed that subjects treated with core muscle strengthening with conventional stroke rehabilitation exercises showed better balance improvement on BBS and TUG Test as compared to conventional stroke rehabilitation alone in cerebellar stroke patients.

Thus it can be stated from above study that physical therapy interventions like core muscle strengthening on Swiss are most efficacious and cost effective.

Source of Funding: The source of funding for study is self.

Conflict of Interest: There is no conflict of interest.

Ethical Clearance: Ethical clearance was taken from institutional ethical committee of KIMSDU.

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Acute Cardiovascular Response of Conventional and Swiss Ball Abdominal Stabilization Exercises in Normal Individuals -A Comparative Study

Vishvanath Pawadshetty[1], Uma Pawadshetty[2], G Varadharajulu[2], Pallavi Dangat[3]

[1]Assisstant Professor, MIP College of Physiotherapy, Latur, MH, [2]Professor & Principal, Krishna College of Physiotherapy, Karad, [3]Associate Professor, MIP College of Physiotherapy, Latur, MH

ABSTRACT

Background- Abdominal muscle stabilization is novel technique and benefits of abdominal muscle stabilization become more frequently accepted and employed in therapeutic setting to maintain proper posture and prevention of abnormal posture in normal and affected population. Since abdominal muscle stabilization is given to both normal and affected population, it is better to understand the physiological changes occurring in cardiopulmonary and cardiovascular system. This study was conducted to find out the acute cardiovascular response of conventional & swiss ball abdominal stabilization exercises in normal individuals.

Material and methodology- In present study, 100 subjects who were college students selected by simple random sampling method and screened as per inclusion criteria. The resting level systolic, diastolic blood pressure and heart rate were recorded. Then subject performed firm surface abdominal stabilization exercises for period of 3 minutes and post exercise values of systolic diastolic blood pressure and heart rate were recorded. It was followed by a 10 minutes rest period and then abdominal stabilization exercise was performed on Swiss ball, the pre & post exercise cardiovascular parameters were recorded. The values were tabulated on master chart and subjected to statistical analysis.

Conclusion- The current study after analyzing statistically strongly emphasizes that the Swiss ball abdominal stabilization exercise has significant effect on acute cardiovascular response than compared to the firm surface abdominal stabilization exercise of healthy individual and it also accepts the alternate hypothesis.

Keywords- *Abdominal stabilization exercise, Swiss ball, Core stabilization, Acute cardiovascular response, and vestibular ball exercises.*

INTRODUCTION

Therapeutic exercise ball have gained popularity in many rehabilitation setting therapist incorporate exercise ball into treatment plans to address limitation in range of motion. Strength, balance and co-ordination endurance, proprioception cardiovascular fitness and flexibility across many patient populations. The abdominal muscle necessary for trunk stabilization may be strengthened with exercise performed on such device[11].

Abdominal strengthening exercise incorporates both static and dynamic components as the subject performs repeated isometric contraction while maintaining their balance on ball. So muscular stabilization of spine has always been recognized as important in human function. All skeletal muscles of the trunk and pelvic region contribute to some extent to stabilization of spinal joints[1]. So the muscle surrounding the spine are primarily conserved with stability is ascribed. More central muscles will stabilized the spinal segment. These muscles of trunk categorized in to local and global muscles. These muscle system based on their main mechanical role in the stabilization[1].

The local muscle system includes the deep muscles and the deep portion of some muscles which have their origin and/or insertion on lumbar vertebrae. These muscles capable of controlling the stiffness and interverterbal relationship of spinal segments and the posture of lumbar spine.[1]

Local stabilization muscles are:

- Multifidus muscles with its vertebrae to vertebra attachments.
- Posterior fibers of oblique interns abdomens, which inserts in thoraco lumbar fascia.
- Deepest muscle the transverse abdominis with its direct attachment to lumbar vertebrae through thoracolumbar fascia and the desussation with its opposite in midline.[1]

The global stabilization muscle systems are the large more superficial muscles of trunk and includes the:

- Oblique internus abdominis and
- Oblique externus abdominis
- Rectus abdominis
- Lateral fibers of quadratus lumborum
- And portion of erector spinae.

These muscles are not only involved in moving the spine but are also responsible for transferring load directly between thoracic cage and pelvis.[1]

The main function of global muscles is to balance the external load applied to the trunk. So that the residual force is transferred to lumbar spine can be handled by local muscles. In this way the large variation in external loads that occurs with normal daily functions are accommodated by the global muscles so that the resulting load on the lumbar spine and its segment is continually minimized.

So the functional significance of these muscles are:

Local muscle system

Anatomically

- Deep muscles of local system are capable of making a major contribution to spinal stability and control the intersegmental motion.
- Lumbar Multifidus have the capacity and have been shown to efficient in stabilize the spinal segment.
- Transverse abdominis also contributes to this function of segmental stability.[1]

Therapeutic exercise is a systemic and planned performance of bodily movements, postures or physical activities intended to provide patient / client with means to:

- Prevent impairments
- Improve, restore, enhance physical functions
- Prevent or reduce health related risk factors.
- Optimize overall health status, fitness or sense of wellbeing.

Therapeutic exercise may include aerobic and endurance conditioning, balance, calisthenics, agility and gait training, muscle lengthening neuromuscular education and re-education. Postural stabilization, training for range of motion, soft tissue stretching and strengthening power and endurance exercises[2,3].

Therapeutic exercises embody wide variety of activities, action and techniques. These are selected based on physical therapist's diagnosis of his underlying pathology/ causes of his or her functional limitation or disability[2].

Cardiovascular response to demands of exercises, In exercise lasting longer them a minute or two, cardiac output and heart rate linearly increase with peripheral oxygen uptake.

The mean systolic arterial pressure increases and vascular resistance inactive muscle fall leading to a large increase in blood flow to the muscles. Blood is pumped back to the heart by muscular contractions and the cardiac output determined by the venous return. Cardiac output and heart rate recorded at maximal exercise have been viewed at maximum limiting values. But both increased when exercise by the abdominal strengthening, stabilization exercise or arms is added to maximal leg exercise. Thus, increasing energy demand dominates increase in cardiovascular response[5].

NEED FOR STUDY

Abdominal muscle stabilization is novel technique and benefits of abdominal muscle stabilization become more frequently accepted and employed in therapeutic setting to maintain proper posture and prevention of abnormal posture in normal and affected population. Since abdominal muscle stabilization is given to both normal and affected population, it is better to understand the physiological changes occurring in cardiopulmonary and cardiovascular system.

Even though, various studies shows that the physiological changes are seen in cardiovascular and cardiopulmonary system in exercising people or population. Cardiovascular responses for abdominal stabilization exercise are underreported.

Since abdominal stabilization exercises produce a significant increase in systolic, diastolic blood pressure and heart rate so when the abdominal muscle

strengthening is given, the exercise should be prescribed within the safety limit guidelines.

Respiratory and cardiovascular works in close co-ordination, hence its effects need to be monitored.

Also many types of therapeutic exercises recommended ranging from aggressive strengthening to stability, training on to enhance cardiovascular system function. The rationale of this study is to investigate and report, the cardiovascular response in abdominal stabilization exercise on Swiss ball and abdominal stabilization exercise on firm surface.

Thus it will be easy to decide the intensity, duration and frequency for the abdominal stabilization exercise according to the physiological changes occurring in cardiovascular system.

However no such studies have been done in normal individuals at particular age group 20-27 years. So, the present study is aim to find out the acute cardiovascular response of conventional & Swiss ball abdominal stabilization exercises.

METHODOLOGY

After obtaining the ethical approval for this study, a random sample of 100 subjects including males and females between age group of 20 to 27 years from Krishna Institute of Medical Sciences, University were taken for the study.

A written informed consent was obtained from these subjects. All the subjects performed both the exercise (firm surface and swiss ball abdominal stabilization) for a period of 3 minutes.

The subjects resting and immediate post exercise cardiovascular response (systolic blood pressure, diastolic blood pressure and heart rate) were recorded. Adequate recovery time was given before starting of each exercise. The above mentioned parameters were measured & recorded in data collection sheet.

PROCEDURE

After explaining about the entire procedure of study to the subject and matching them with appropriate inclusion & exclusion criteria their consent was obtained on the form duly signed by them. Height and weight was measured on a standard, calibrated medical scale. He was then assessed for his ability to perform a posterior pelvic tilt. The initial position required that the subject maintain heels, buttocks, scapula and occiput against a wall. They were asked to perform abdominal contraction pressing the low back flat against the wall .He were then asked to maintain this position while raising their arm overhead, if able to perform within 5 trials. Subject met inclusion criteria, followed by 5 minutes rest period.

In a comfortable sitting position his/her cardiovascular parameters were recorded using a semi-automated oscillometric monitor (OMRON REM-1).The subject was then asked to sit on firm surface (stool) with feet flat on the floor, shoulder width apart, subject laced their fingers together and placed his/ her hands at back of their head. Performed a chin tuck, set their pelvis in posterior tilt by looking forward. Subject then asked to roll forward on stool until the knee joint was flexed 90 degree. Then they were asked to recline to a point of perceived maximum contraction of abdominal musculature. While stabilizing the pelvis the piece of tape was placed on the floor anterior to subject's toes and verbal cues were given to maintenance of position for 3 minutes. The post exercise cardiovascular response was recorded immediately after exercise.10 minutes of recovery period was given.

The resting level cardiovascular response was recorded once again and the subjects were then asked to sit on Swiss ball & follow the same guidelines as on stool while stabilizing the pelvis. Once subject assumed the testing position a piece of tape was placed on the floor anterior to Swiss ball & another just anterior to the toes & maintaining this position for 3 minutes.

Table - 1: Comparison of cardiovascular response on firm surface and on Swiss ball abdominal stabilization exercises in all subjects (n=100)

	Mean	SD (+/-)	t value	Significance
SBP after 3 min firm surface exercise	110.72	9.412	15.050	P<0.0001
SBP after 3 min Swiss ball exercise	121.77	10.753		
DBP after 3 min firm surface exercise	71.23	8.267	11.314	P<0.0001
DBP after 3 min Swiss ball exercise	79.01	9.811		
HR after 3 min firm surface exercise	90.04	10.717	5.002	P<0.0001
HR after 3 min Swiss ball exercise	95.28	9.974		

The table shows comparison of mean values and standard deviation of post firm surface and Swiss ball abdominal stabilization exercise for 3 minutes in 100 subjects (males and females). Also t value can be seen. It shows that there is significant increase ($p<0.0001$) in all mean values after both the exercise but more seen in the Swiss ball abdominal stabilization exercise.

RESULT

The study analysis shows comparison of mean values and standard deviation of post firm surface and Swiss ball abdominal stabilization exercise for 3 minutes in 100 subjects (males and females). Also t value can be seen. Study shows that there is highly significant increase ($p<0.0001$) in all mean values after both the exercise but more seen in the Swiss ball abdominal stabilization exercise.

The study strongly support the idea that the swiss ball abdominal stabilization exercise performed for 3 minutes have produce a significant increase in the acute cardiovascular response compared to firm surface abdominal stabilization exercise of healthy individuals. Hence it may pose a risk for a patient with cardiovascular pathology or dysfunction.

DISCUSSION

The present study is conducted to assess and compare the cardiovascular response to firm surface and swiss ball abdominal stabilization exercise in healthy individuals. A total of 100 healthy subjects between age group 20-27 years were randomly selected from Krishna College of Physiotherapy. The resting level systolic, diastolic blood pressure and pulse rate (SBP,DBP &HR) were recorded. Then subject performed firm surface abdominal stabilization for period of 3 minutes and post exercise values of (SBP, DBP &HR) were recorded. It was followed by a 10 minutes rest period and then abdominal stabilization exercise was performed on swiss ball the post exercise cardiovascular parameters were recorded. The values were tabulated on master chart and subjected to statistical analysis. The results showed that the mean value of SBP (mean 121.77, $p<0.0001$). Mean value of DBP (mean 79.01 $p<0.0001$) and mean value of HR (mean 95.28, $p<0.0001$) on swiss ball abdominal stabilization exercise was significantly higher than mean value of SBP (mean 110.72 $p<0.0001$) mean value of DBP (mean 71.23 $p<0.0001$) and mean value of HR (mean 90.04, $p<0.0001$) on firm surface abdominal stabilization exercise, a direct measure of relative work intensity was monitored. During exercise, HR increased to accommodate the increased oxygen demands of skeletal muscles. The HR responses substantial the relationship between HR and work intensity with each of abdominal exercises there was significant increase in HR relative to resting values.

The increased HR for both exercises suggests that the work intensities were at level that elicited stress to the cardiovascular system.

Blood pressure was determined pretest and immediately post test of each exercise as work intensity increases, HR increases which result in increased cardiac output. The increase in cardiac output creates an increase in BP, which also indicates work load intensity. The immediate response of cardiovascular system is increased in sympathetic outflow and decrease in vagal tone. The SBP rises with increasing level of workload. DBP increases slightly within 10mmHg or remains the same or drop slightly within 10mmHg .SBP rises during exercise because increase in cardiac output is greater than decrease in peripheral resistance.

The normal response to exercise is vasodilatation of cardiac and skeletal muscle vasculature and vasoconstriction in renal, liver, gut and skin. Thus, there is re-distribution of blood away from non working muscle. It is also found from our result that at normal and sub maximal exercise the heart rate increases linearly as the workload increases.

We observe from our analysis that SBP, DBP & HR are considerably higher when work is performed with the swiss ball abdominal stabilization exercise than the firm surface abdominal stabilization exercise because greater work demand was placed on abdominal muscles. Thus, the result of study strongly support the idea that the swiss ball abdominal stabilization exercise performed for 3 minutes have produce a significant increase in the acute cardiovascular response of healthy individuals. Hence it may pose a risk for a patient with cardiovascular pathology or dysfunction.

CONCLUSION

The current study after analyzing statistically strongly emphasizes that the swiss ball abdominal stabilization exercise has significant effect on acute cardiovascular response than compared to the firm

surface abdominal stabilization exercise of healthy individual and it also accepts the alternate hypothesis.

Conflict of Interest: There is no conflict of interest between the authors

Source of Funding: Nil

Ethical Clearance: This research study is given clearance under Ethical committee headed by Prof Dr.G.Varadharajulu Principal, Krishna Institute of Physiotherapy, Karad.

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Ergonomics Design of Physiotherapy Equipment's

Mahesh S Harne[1], Sunil V Deshmukh[2]

[1]Research Fellow, Mechanical Engineering Department, Bapuro Deshmukh College of Engineering, Sevagram, Wardha, India, [2]Associate Professor, Mechanical Engineering Department, Bapuro Deshmukh College of Engineering, Wardha, India

ABSTRACT

The paper is about importance of ergonomics, in development of devices such as continuous passive motion machine. Also its effect on joint mobilization is discussed. Today the ergonomics science has broadened to every day's task right from spoon, hand tools, knife, chairs etc. Ergonomics is applied from industrial machine to daily work. It is the faith in ergonomics that has totally changed the design scenario. Continuous passive motion (CPM) therapy is normally use as first stage exercise in the postoperative treatment of joints in the first post orthopedic surgery. After surgery passive range of motion helps to prevent joint stiffness, Deep-vein thrombosis (DVT), edema, soft tissue contractures, muscle fiber atrophy, contractures, and osteoporosis. It is important, however, to begin physical exercising of the knee immediately to restore strength and full range of motion after postoperative treatment by CPM.

Keywords: *Ergonomics, CPM, Physiotherapy, House of Quality.*

INTRODUCTION OR BACK GROUND

Ergonomics is a science which is combination of many branches like engineering, human anatomy and social sciences etc. the objective is to improve the interaction between human and machine, what we talk about 'fit for purpose'. Now a day's ergonomics is applied to the product design, aviation (design of planes), the vehicle design etc.

It is observed that post orthopedic surgery most of doctors preferred physiotherapy for patient for fast and better recovery. Physiotherapy is also used to restores joint range of motions (ROM).

From survey it is observed that most of physiotherapy equipment are imported and not fit for the Maharashtra population. This paper is tried to reach the importance of ergonomics in building CPM user friendly.

Corresponding author:
Mahesh Shaligram Harne,
Associate Professor, Mechanical Engineering Department, Amrutvahini College of Engineering, Sangamner, Tal-Sangamner, Dist: Ahmednagar 422608

MATERIAL AND METHOD

Objective of Ergonomics:

The scope of ergonomics design means should be designed appropriate for human. The ergonomics is word derived from Greek ergo ie work and noms means by natural law. Ergonomics is sciences of fitting the job to employee and product to user. Approach is to consider not only design but also functional efficiency, ease to use comfort and health. Ergonomics is applied to many human activities from machine operation to daily work. It is fact that ergonomics changed the traditional design process of machine and instruments and the way we use them.

Industrial ergonomics has many significant implications for improving productivity, efficiency while considering the health and safety of individuals. It facilitates a smooth human interaction between human and machine. Ensuring this healthy interaction optimizes employee productivity quality and also insures comfort safety and health.[article]

Impotence of CPM in Physiotherapy:

The aim of physiotherapy is to improve health and physical wellbeing by maximizing mobility of joint

and functional ability. Physiotherapy is concerned with identifying and maximizing quality of life and movement potential within the circle of promotion, prevention, treatment and rehabilitation. It includes physical, social, psychological and emotional wellbeing.

Therapeutic exercise may be defined as "bodily movement to correct impairment, improve musculoskeletal function or maintain a state of well being." [1]The treatment principles of stretching and passive motion may be applied to decrease major limitations in ROM. Contractures of soft tissues can be decreased by the implementation of these principles.[1] With passive stretching, an external force stretches the contracture at the limited joint. Gentle stretching has been shown to be more effective than vigorous stretching for gaining ROM over a period of time.[1,3] Stretching must be performed daily to be effective. Tissue that has been immobilized must be stretched slowly and carefully.[1,3] The harmful effects of immobilization now can be minimized by a new concept involving continuous passive motion (CPM).[10] The usual CPM machine for the lower extremities (hip and knee) is rectangular and small enough to fit in the patient's bed. The device gradually, but continuously, flexes the patient's knee through a preselected arc of passive motion.5,6 Continuous passive motion has been shown to be beneficial in the healing and regeneration of articular cartilage and, subsequently, in the relief of arthritis. [4] Thus far, the CPM machine has been used primarily for 1Fractures involving the knee joint, knee reconstruction following athletic injuries and total knee replacement for advanced and painful arthritis of the knee. [7]

The continuous passive motion (CPM) device is a treatment modality in which knee joint motion is provided by a machine without causing active contraction of muscle groups [8]. Generally the modern machine is programmed to passively flex and extend the knee joint through a pre-selected range of motion and rate of repetition. This post-operative passive range of motion helps prevent joint stiffness, edema, soft tissue contractures and muscle atrophy [9]. Consequently many surgeons utilize CPM following knee articular cartilage surgery as their standard of practice [10]. After treatment with the CPM, physical exercises are consequently needed immediately to restore strength and full range of motion [11].

Integrating ergonomics in Design of Equipment's:

Design has traditionally been seen as a process of creating products that can out functions in accordance with an initial set of specifications or requirements. There are a number of different models of design. Most models of design assume that the design process consists of a relatively small number of stages such as problem formulation, conceptual design, realization design, and evaluation and testing. Designers need ergonomic information in a form that will help them make decisions. They want to know what is good, what is bad (inadmissible) and what the value of intermediate levels of usability or safety are in terms of the other evaluative criteria (e.g., costs, probability of error) that they work with [12]

Design and development of any product for the rehabilitation program has required knowledge of ergonomics, product optimization with physiotherapy requirement. J. Rasmussen et al. state the optimization is based on a detailed inverse dynamic analysis of the motion and forces of the human body. The problem of muscle recruitment calculation in inverse dynamics is introduced and solved via a min/max optimality criterion.[13] Introducing methodological tool at design level will enhance the ergonomic property of the product. Quality function deployment is one of tool that can introduce at design stage can improve the quality as well as ergonomics of the product in physiotherapy equipment

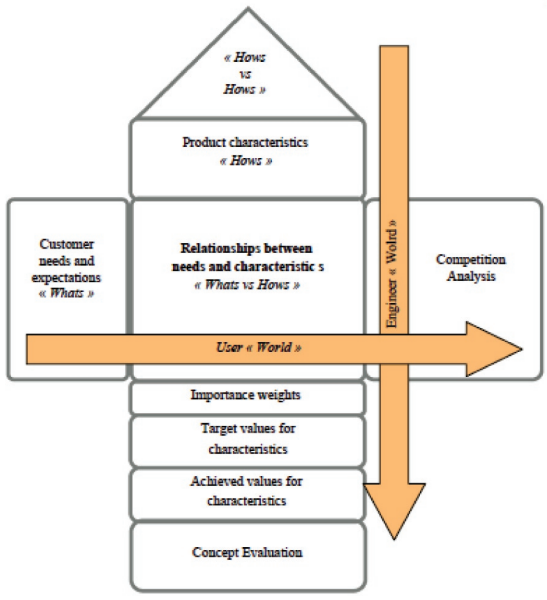

Figure.1. Introducing ergonomics at various design stages [13]

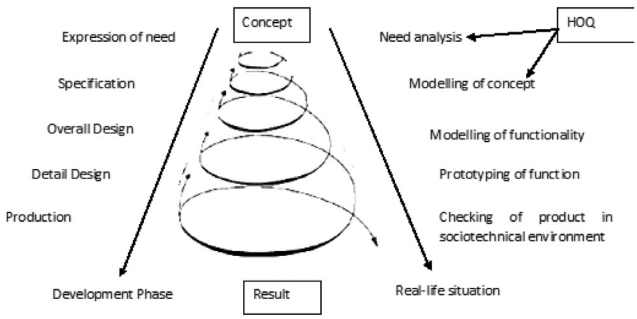

Figure.2. Introducing ergonomics at various design stages [13]

CONCLUSION

Ergonomics is most essential science in occupational and health safety were the Continuous passive motion is one of effective therapy after post orthopaedic surgery. In survey it is notice that physiotherapist is not concerned during design of physiotherapy equipments, Now he can take part in selecting design parameters by considering various ergonomics need. One should intervene the ergonomics parameters with design parameters. It is necessary to integrate ergonomics tools at various stages of design

Conflict of Interest –Nil

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Ethical Clearance – Not Applicable

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Validation of Gujarati Version of the Neck Pain and Disability Scale in Patients with Chronic Neck Pain

Bid Dibyendunarayan D[1], Thangamani Ramalingam A[2], Patel Asma S[3], Nakum Vijay M[3], Narola Shivani D[3]

[1]Senior Lecturer; [2]Lecturer; [3]Physiotherapists; Sarvajanik College of Physiotherapy, Rampura, Surat, Gujarat, India

ABSTRACT

Study Design: Cultural translation and psychometric testing

Objective: To translate and test the psychometric properties of Gujarati versions of the NPAD questionnaire

Summary of Background Data: Although commonly used, no previous reports exist in the translation process or the testing of the psychometric properties of the Gujarati version of the NPAD used in India.

Methods: Translation and cross-cultural adaptation of the original English version of the NPAD was performed according to published guidelines. A panel of 24 healthcare professionals completed the content validity form. A total of 150 patients with chronic neck pain participated in the study and were asked to complete the Neck Disability Index-Gujarati version (NDI-G), Neck Pain Disability Scale-Gujarati version (NPAD-G), Patient Health Questionnaire-9 (PHQ-9) and a visual analog scale(VAS-P, VAS-Fd, & VAS-Hd; 0–5). Psychometric evaluation included factor analysis, internal consistency, test-retest reliability, agreement, and construct validity. Test-retest reliability for the NPAD-G was examined in 30 patients. Patients completed the questionnaires twice with an interval of 48 hours.

Results: Factor analysis revealed a three-factor solution for the NPAD-G. Cronbach's α value for the NPAD-G was excellent 0.936. The three NPAD-G subscales ranged from 0.733 to 0.880. Good to excellent test-retest reliability was demonstrated for all measurements (Intra-class Correlation Coefficient range= 0.74–0.91, $P < 0.001$). NPAD-G was moderately correlated with the VAS-P, VAS-Fd, VAS-Hd ($r = 0.559$, 0.686, 0.681 respectively $P < 0.001$). NPAD-G scores were moderately correlated with PHQ-9 scores ($r= 0.642$). The minimal detectable change was 25.24 points for NPAD-G (scale range = 0–100).

Conclusion: The NPAD-G seems to be reliable instruments to measure functional limitation and disability in Gujarati patients with neck pain. However, further research is still needed to determine responsiveness of this questionnaire.

Keywords: *Neck pain and disability, Neck disability index, Neck pain and disability scale, Validity, Reliability.*

INTRODUCTION

Neck pain is a common musculoskeletal health problem in modern societies. Neck pain has a lifetime prevalence of approximately 70% in the general population [1, 2] and the 12-month prevalence of neck pain varies between 12.1% and 71.5%; its prevalence increases with age and higher in women than men [3, 4]. Functional status is a common outcome variable in neck pain investigations. Recently, there is a trend to supplement objective assessment of the cervical spine with subjective measurement of functional

Correspondent author:
Bid Dibyendunarayan D,
Senior Lecturer; MPT(Ortho), PGDSPT;
dnbid71@gmail.com; Mobile: 09427139711.

status using validated questionnaires.[5, 6] Among them, the most frequently used two cervical spine specific questionnaires inquired functional status are the Neck Disability Index (NDI) and the Neck Pain and Disability Scale (NPAD). The NDI is framed to measure activity limitations due to neck pain and disability[7], whereas the NPAD supposedly measures report of problems with neck movements, neck pain intensity, effect of neck pain on emotion and cognition, and the level of interference during life activities[8][9, 10],[11]

Translating a questionnaire instead of creating a questionnaire allows comparisons of different populations[12], permits researchers to examine functional status across a broad spectrum of people, and permits the exchange of information across cultural and linguistic barriers[11]. It is now widely recognized that questionnaires intended for use across cultures must not only be translated well linguistically but also adapted culturally in order to maintain the content validity of the instrument[13].

NPAD scale consists of questions related to symptoms of neck pain and associated physical disability [8, 14]. This questionnaire has been translated into thirteen languages namely, Hindi, French, Iranian, Brazilian-Portuguese, Italian, Korean, Finnish, Turkish, Greek, Chinese, Thai, Dutch and German other than English and these translated versions have shown good to excellent psychometric properties.[12, 15-30] As neck pain and disability questionnaires do not exist in Gujarati language and neither the NPAD have been investigated in Gujarati population with chronic neck pain, we opted to translate the NPAD questionnaires into Gujarati, as it is less costly and time-consuming than generating a new measure and to investigate their validity and reliability.

The aims of this study were to translate and test the psychometric properties of Gujarati version of the NPAD questionnaire. The methods of translation and validation were performed according to the accepted guidelines for cross-cultural adaptation [31, 32].

We hypothesized that Gujarati version of the NPAD-G questionnaire would demonstrate good psychometric properties, as this questionnaire has successfully shown similar psychometric properties in other cross-cultural studies. In the present study, we described the translation, cultural adaptation, and validation of a Gujarati version of the Neck Pain and Disability Scale.

MATERIALS AND METHOD

Participants

Native Gujarati patients with chronic neck pain were recruited for the study from 5 physiotherapy outpatient departments in Surat, Gujarat, India. Patients were excluded if they had neck pain related to vertebral fracture, myelopathy, neck surgery, brain surgery, clinically recognizable cognitive impairment, infectious disease, cardiovascular or respiratory problems, neurological deficits, cancer, or other systemic diseases with a possible effect on the musculoskeletal system.

Ethical clearance for the study was obtained from the Institutional Ethical Committee of Sarvajanik College of Physiotherapy, (VNSG University), Surat and all procedures were conducted in accordance with the declaration of Helsinki. Written informed consent was obtained from each patient before participation.

Questionnaires

Neck Pain and Disability Scale

The NPAD[8] is a multidimensional questionnaire to assess neck pain and disability. It consists of 20 items including the intensity of pain; its interference with vocational, recreational, social, and functional aspects of living; and the presence and extent of any associated emotional factors. Each item scores ranges from 0 to 5, along with a 10-cm continuous visual analog scale (VAS). The total score is the sum of the scores of all 20 items and can range from 0 indicating no disability to 100, the greatest disability.

Neck Disability Index

The NDI[33] measures self-reported levels of neck pain and disability. It consists of 10 sections designed to assess pain intensity, headache, concentration, sleeping, and activities of daily living including work, personal care, lifting, reading, driving, and recreation. For each section, the score ranges from 0 representing the highest level of function to 5, the lowest level of function. The total score is the sum of the 10 individual scores, which can be then expressed as a percentage. The NDI has been translated and validated in the Gujarati language [34].

Patient Health Questionnaire-9 [PHQ-9][35]

The PHQ-9 is the depression module, which scores each of the 9 DSM-IV criteria as "0" (not at all) to "3" (nearly every day). PHQ-9 scores of 5, 10, 15, and 20 represented mild, moderate, moderately severe, and severe depression, respectively. The PHQ-9 is a reliable and valid measure of depression severity.

Visual Analogue Scale

The VAS is a self-reported and simple method used to measure the intensity of pain (VAS-P), functional disability (VAS-Fd) and social disability (handicap) (VAS-Hd). It is a 100-mm horizontal line, with the left endpoint of the scale (0 mm) indicating (a)'no pain' and the right endpoint (100 mm) indicating the 'worst pain imaginable'; (b) 'no disability' and 'maximum disability'; and (c) 'no handicap' and 'maximum handicap' Patients were asked to assess their neck pain, disability, and handicap. The VAS-Hd was accompanied by the question, "What is your handicap level due to your neck pain?" The VAS-Fd was evaluated by the question, "How much does your neck pain bother you in your daily activities?" These three VASs were explained to each patient and were completed after the investigator was sure that the concept was understood.

TRANSLATION

The translation procedures were based on previously published guidelines [31, 32].Figure 1 shows the steps in the process of translation. The committee's considerations were around four areas: semantic equivalence (the meaning of words), idiomatic equivalence (equivalent expression for idioms and colloquialisms), experiential equivalence (the target cultural context), and conceptual equivalence (the validity of the concept).

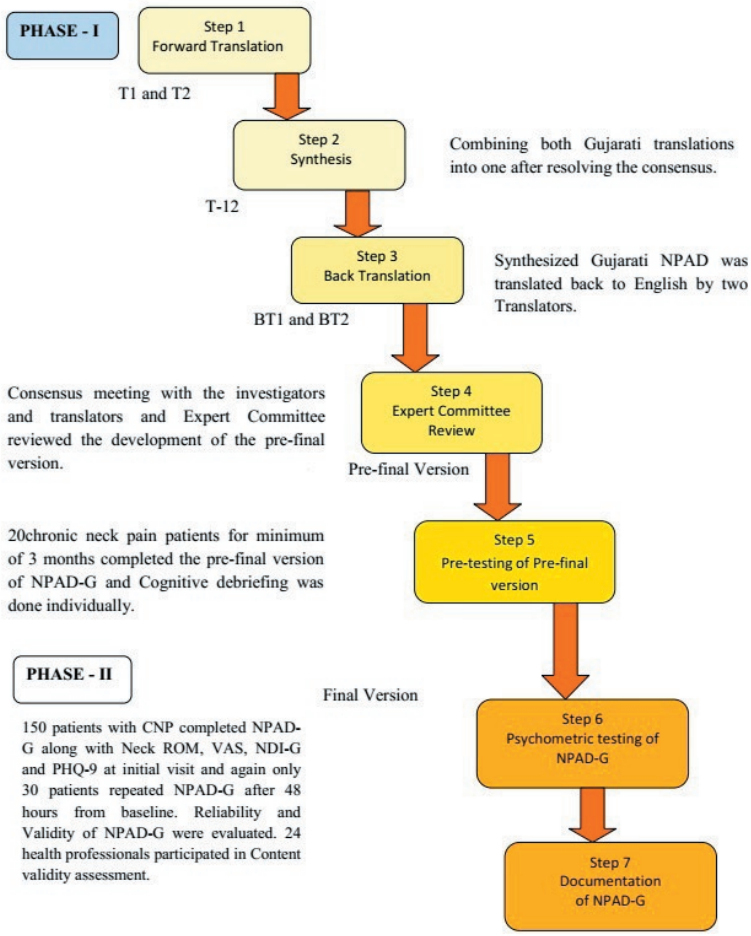

Figure 1: Flowchart of the study design

The committee reached consensus on any discrepancies and decided that it was necessary to rephrase item 7 about 'driving or riding in a car' was altered by adding other modes of transport, namely, bus, two-wheeler, and rickshaw.

Penultimate version of the NPAD-G questionnaire was applied on 20 patients with chronic neck pain to determine whether all questions were clear and comprehensible. No modification to the questionnaire was required at this phase and the final NPAD-G was then developed and subjected to further psychometric testing.

Psychometric Testing

Face Validity

Face validity is a subjective assessment of whether the measure appears relevant to the ones to be measured. Face validity was assessed by asking one question to each of the patients, 'Do you think this scale is relevant to your condition.' The answer was noted as 'yes' or 'no'. Face validity of the NPAD was established when all the 150 patients questioned about the relevance of the scale to their condition, all answered 'yes'.

Content Validity

Content equivalence was assessed under two headings:

1. Are the words in the translated Gujarati version presented fluently and correctly as in the original version? For this answers from 24 expert panel members fall between 'mostly agree' to 'strongly agree' (average=4.72).

2. Do the words and phrase in the translated Gujarati version have the same semantic meaning compared with the original version? For this answers from 24 expert panel members fall between 'mostly agree' to 'strongly agree' (average=4.77).

Content relevance is assessed by asking: How the Gujarati statement is relevant to assessing neck pain and disability in chronic neck pain patients? For this answers from 24 expert panel members fall between 'mostly agree' to 'strongly agree' (average=4.58).

Content representativeness was assessed by asking "How well is the content (Item no. 1 to 20) of NPAD-G scale is representing the entire domain of assessing the neck pain and disability of patients with CNP?" For this answers from 24 expert panel members falls between 'Good' to 'very good' on a 5 point Likert scale (average=4.57).

Additionally, the total scores were normally distributed and the percentage of missing items were <5%, also proves the content validity of this questionnaire. Floor /Ceiling effects were negligible in this study.

Factor Analysis

Exploratory factor analysis was performed to determine the dimensionality of the items of the questionnaires. Factor structure was analyzed using principal component analysis with varimax rotation method. Eigen-values greater than or equal to 1 were retained and items with loadings equal to or greater than 0.4 were considered satisfactory[36].

Internal Consistency

Internal consistency of the NPAD-G was examined with Cronbach's α coefficient. Cronbach's α values range from 0 to 1, where values above 0.7 indicate adequate internal consistency for a scale [37].

Test-Retest Reliability

Test-retest reliability of the questionnaire was undertaken by30 subjects for the NPAD-G. Subjects completed the relevant questionnaire twice with an interval of 48 hours to minimize any memory of previous answers and any variations in clinical status. Test-retest reliability was determined by Intra-class Correlation Coefficient (ICC). ICCs can vary from 0 to 1 and values above 0.8 are considered as evidence of excellent reliability [38].

Agreement

The standard error of measurement (SEM) was used to determine the measurement error. The SEM is derived from the square root of the within-subject variance obtained from the analysis of variance. The variance was computed with analysis of variance for random effects. The SEM was then converted into the Minimal Detectable Change (MDC), which expresses the minimal magnitude of change that likely reflects true change rather than measurement error. The $MDC_{95\%}$ was estimated from

the SEM and calculated as 1.96 √2 × SEM[39]. The agreement was also determined by the Bland-Altman method[40].

Construct validity

Construct validity is frequently measured as convergent and divergent validity and factor analysis. In this study, convergent validity was evaluated by a parallel questionnaire NDI-G.

Divergent validity was tested by Pearson correlation coefficients by showing that the NPAD-G measurement concept is different from that for severity of pain, disability, and handicap on VAS, disability (NDI-G), and depression (PHQ-9). In addition, factor analysis was done for construct validity.

Construct validity was assessed by calculating Pearson's correlation coefficients (r)[41] comparing the extent to which expected relationships between the various constructs were fulfilled using the NPAD-G. Expected relationships were based on the literature. The **r values** yield the degree of correlation between two measures where 0= no correlation between two scores and 1 or –1 = the absolute correlation between two scores. Pearson's correlation coefficients are interpreted as follows: 0.00 to 0.19 = very weak correlation;0.20 to 0.39 = weak correlation; 0.40 to 0.69 = moderate correlation; 0.70 to 0.89 = strong correlation; and 0.90 to 1 =very strong correlation [42, 43].

Based on previous studies with similar objectives and our clinical experience we hypothesized the following relationships between the various constructs a priori:

1. NPAD-G and NDI-G would have a high correlation.

2. VAS-P, VAS-D, and VAS-Hd would have moderate to high correlations with NPAD-G.

3. Cervical ROM would correlate the least with NPAD-G.

STATISTICAL ANALYSES

Descriptive statistics (percentages, means, and standard deviations) were used to describe demographic characteristics within the study. All analyses of reliability and validity described in the research methods were conducted using SPSS statistical package (version 20.0).

RESULTS

A total of 150 patients with chronic neck pain (male 66, female 84) participated in the study. The demographic and clinical characteristics of the patients are presented in Table-1.

Table 1: Baseline characteristics of Patients

Characteristics	**Values**
Subjects (n)	150
Male/Female	66/84
Age in Years –mean (SD)	37.27±14
Diagnosis	**n (%)**
Intervertebral disc prolapse	62 (41.3)
Cervical Spondylosis	45 (30.0)
Cervical strain	36 (24.0)
Other causes	7 (4.7)

*The values are expressed as the mean and standard deviation (SD).

Reliability

NPAD-G exhibited excellent internal consistency shown by a Cronbach's alpha value of 0.936. Test-Retest reliability of the NPAD-G analyzed on stable subjects (n=30) yielded excellent results with very narrow confidence intervals [ICC=0.936(95% C.I. = 0.866 - 0.970)] (see Table-2). The Bland and Altman plot indicated that the measure of with-in subject variation i.e. the bias was very minimal as the mean difference was close to zero [mean difference (d) = 5.133] and the limits of agreement were excellent (-5.904 to 16.033) with no outlier (see Fig.-2 and Table-2).

Table 2: Test-Retest Reliability Results of NPAD-G

Outcome Measure	**Baseline Score**	**Retest Score**	**ICC (95% CI)**	**Bland & Altman Analysis**	
				d (SD)	LOA
NPAD-G	36.30	31.17	0.866 - 0.970	5.133 (5.56)	-5.904 to 16.033

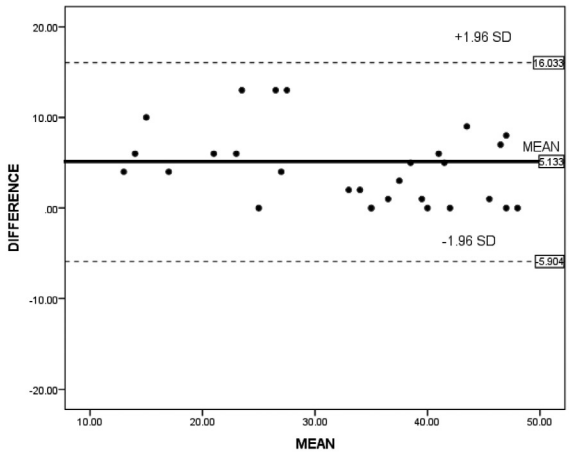

Figure-2: Bland and Altman Plot for measuring with-in subject variation and the limits of agreement

Agreement

The SEM for the NPAD-G was 9.11. Calculations revealed an MDC of 25.24 points for NPAD-G (scale range = 0–100). The Bland-Altman analysis showed that the mean difference was 5.13 ± 10.9 for the NPAD-G (Figures-2).

Construct Validity

All the correlations followed expected constructed relationships hypothesized a-priori. The NPAD-G scores correlated moderately with the NDI-G scores (r = 0.600), VAS-P (r = 0.599), VAS-Fd (r=0.686) and VAS-Hd (r=0.681) $p<0.01$ (See Table-3). NPAD-G scores were moderately correlated to flexion and extension ROM (r = -.43 and r = -0.40 respectively; $p<0.01$). Very weak inverse correlations were observed between NPAD-G scores and rotation ROM scores (r = -0.069 to -0.12). NPAD-G scores were moderately correlated to PHQ-9 scores (r= 0.642).

Table-3: Correlation between various constructs

	NDI_ Total	NPAD_ Total	VAS_P	VAS_ Fd	VAS_ Hd	FLEXION	EXTENSION	ROTATIONLEFT	ROTATIONRIGHT	PHQ9
NDI_Total	1	.600**	.494**	.520**	.428**	-.028	.040	.379**	.360**	.626**
		.000	.000	.000	.000	.731	.623	.000	.000	.000
NPAD_Total		1	.559**	.686**	.681**	-.434**	-.403**	-.069	-.120	.642**
			.000	.000	.000	.000	.000	.403	.143	.000
VAS_P			1	.528**	.493**	-.231**	-.167*	.000	.013	.439**
				.000	.000	.005	.041	.998	.875	.000
VAS_Fd				1	.551**	-.297**	-.297**	.110	.070	.516**
					.000	.000	.000	.180	.392	.000
					149	150	150	150	150	150
VAS_Hd					1	-.381**	-.410**	-.199*	-.220**	.543**
						.000	.000	.015	.007	.000
FLEXION						1	.755**	.486**	.481**	-.343**
							.000	.000	.000	.000
EXTENSION							1	.600**	.649**	-.290**
								.000	.000	.000
ROTATIONLEFT								1	.889**	-.050
									.000	.541
ROTATIONRIGHT									1	-.048
										.561
PHQ9										1

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

*. Correlation is significant at the 0.05 level (2-tailed).

Factor Analysis

The results of factor analyses of the 20 items of the NPAD-G are presented in Table 3. Three factors were extracted for the NPAD-G, which accounted for 66% of the total variance. The three factors were identified as pain (factor 1, items 1-5), Activity-specific (factor 2, items- 7, 10, 11, 13, 15, 16-19) and Disability (factor 3, items- 6, 8, 9, 12, 14). One item (item-20) of the NPAD-G failed to load into the factor solutions. After the factors were identified, further reliability and validation procedures were conducted on the NPAD-G subscales.

Table 4: Varimax Rotated Factor Loading Matrix of the NPAD-G

Item	Factor-1: Pain	Factor-2: Activity Specific	Factor-3: Disability
1	.951*		
2	.959*		
3	.973*		
4	.939*		
5	.940*		
6			.871*
7		.535	
8			.616*
9			.734*
10		.551	
11		.634*	
12			.857*
13		.590*	
14			.657*
15		.632*	
16		.840*	
17		.815*	
18		.692*	
19		.680*	
20	-	-	-
% of total variance explained	**24.19**	**23.96**	**17.84**
Factor loading of 0.4 or more was displayed here.			
*Factor upon which the item loaded most heavily.			

DISCUSSION

This study aimed to translate the original English version of the NPAD questionnaire into Gujarati and test the psychometric properties of the NPAD-G. The translation procedure was conducted according to the guidelines for cross-cultural adaptation [31, 32] and did not pose any problem. The results indicated that the NPAD-G was reliable instrument that could be used in the future to detect disability and functional limitations due to neck pain in Gujarati populations. The NPAD-G was easy to understand and simple to use.

Four patients (2.66%) did not answer item 7 (driving or riding in a car) in the NPAD-G. Thus missing values were relatively low when compared with one previous study [44]. One explanation for the discrepancies is because modifications to item 7 in the NPAD-G were made by the translation committee to account for the Gujarati cultural context. A substantial number of Gujarati people ride a motorcycle/scooter/autorickshaw, thus, modification of item 7 in the NPAD-G with an additional word "ride" was appropriate and relates well to the target cultural context. Five patients (3.33%) did not answer item 20 in the NPAD-G because they did not take medication. However, this number was very low.

The Cronbach's α value and ICCs for the NPAD-G indicated good-to-excellent reliability. Which is in accordance with coefficient in a previously reported study [8]. Test-retest reliability in the present study was performed on two occasions over a 48 hour period to minimize the changes in the clinical status. It was unlikely that patients could remember previous answers considering the high number of the items and as well, answers from the previous occasion were concealed.

Wlodyka-Demaille et al [44] also showed an excellent repeatability for the NDI (ICC = 0.93) and NPDS (ICC = 0.91) with a 24-hour interval. In summary, the internal consistency and test-retest results of this study indicated that the NPAD-G is reliable and useable instruments in the Gujarati culture.

The factor analysis was conducted to determine whether all items of the questionnaire would be grouped into pain, function and disability subscales. Three factors for the NPAD-G were extracted using principal component analysis with varimax rotation, in accordance with previous studies [8].

The three factors for the NPAD-G accounted for 66% of the variance and represented pain (factor-1), activity specific (factor-2), and disability (factor-3). It was notable that the factor "emotional and cognitive influences" from factor analysis of the original English version of the NPAD was not identified and considered as part of the disability subscale in either the present study or previous studies [8]. The factors on which the individual items loaded in the present study were close to those identified in the study by Bremerich et al [24] and Uthaikhup [29].

The Cronbach's α and ICC values for the NPAD-G subscales were good to excellent. The results of the factor analysis suggested that the NPAD-G is a multidimensional measure. The correlations between the NPAD-G (total) and NPAD-G subscales and the VAS were moderate to good (r values ranged from 0.540-0.703). Notably, the correlation values were similar to those reported in previous studies [19, 24, 29].

As the VAS measures pain intensity; and NPAD-G pain-related disability, the rather high correlations between VAS scores and NPAD-G scores were not expected. The limits of agreement for the measurements were quite large.

The SEM and MDC provide clinicians and researchers with some guidance for true changes in the measurements, which are not random measurement error. The results revealed an MDC of 25.24 points for the NPAD-G (scale range = 0-100). Scores at or above this MDC values are likely due to patient improvement rather than measurement error. Estimated minimal meaningful changes should be larger than the MDC values.

The high internal consistency value of the NPAD-G (0.936) was consistent with the original English version (0.93)[45] and other translated versions in Dutch (0.93) [46], German (0.97) [24], Thai (0.96)[29] and Turkish (0.94) [47]. The fact that the Cronbach's alpha was less than 0.95 supports the current format of NPAD-G, as a very high Cronbach's alpha would indicate redundancy of items[41].

The observed test re-test reliability value was high (ICC=0.936) which was comparable to the ICC reported for the original English version (0.93) [14]. This clearly supports the reproducibility of the results of the NPAD-G which is one of the essential measurement properties required for any instrument. The narrow confidence intervals that were obtained for the ICCs clearly indicate that this questionnaire can yield reliable results when administered on multiple occasions.

The fact that all measurement fell within the 95% CI around the mean difference during the Bland and Altman analysis points out to a very strong agreement between the scores obtained on the 2 occasions with very minimal with-in subject variation, strongly backing up the ICCs obtained.

The VAS-P correlation to the NPAD-G (r=0.56) was close to what was reported for other translations [Thai version (r=0.61 to 0.76) [29],Chinese (r=0.62 to 0.76)[30] and Dutch (r=0.54) [46]]. These results strengthen the consistency of the results of the NPAD across translations since other translations have included a higher proportion of chronic cases, sample differences may have contributed to the slight difference that was observed between versions.

Cervical range of motion values has been reported to correlate poorly with disability measures [47]. The NPAD-G demonstrated a low to moderate inverse correlation with the cervical range of motion values (r=-0.069 to-0.434). This is similar to the range of correlations (r = -0.33 to -0.39) reported by Kose G et al [47]. Overall, the similarity between correlations in this study and our constructed hypotheses based on previous translations provide support for the construct validity of the NPAD-G.

Overall, the observed psychometric properties were consistent with those reported both for the English and other translated versions. Combining the quantitative data with the evidence from the cognitive interviews supports our conclusion that the NPAD-G is a valid and reliable means of measuring the change in pain and disability in Gujarati speaking CNP patients.

A potential limitation of this study was that the sample consisted largely of patients with moderate neck pain and disability.

CONCLUSION

The results of this current study provide us with the preliminary evidence that the NPAD-G is a reliable and valid measure to assess disability in Gujarati-speaking CNP patients. Our study results suggest that the NPAD-G has been successfully translated and cross-culturally adapted from English to Gujarati. The preliminary evidence generated by the psychometric testing showed that the Gujarati version of the NPAD-G demonstrates psychometric properties similar to the English version. Responsiveness of the NPAD-G should be evaluated in further studies.

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Conflict of Interest: None

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Effect of Proximal Control Training on Quality of Hand Function in Hemiparetic Patients

Neha Prashant Tendulkar[1], G Varadhrajulu[2], Smita Bhimrao Kanase[3]

[1]BPT Student, [2]Professor/Dean/HOD, [3]Lecturer, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad, Satara, Maharashtra

ABSTRACT

Background: Hemiparetic patients have minimum proximal muscle control. Minimum proximal control may lead to decrease in quality of hand function in hemiparetic patients which gives rise to difficulty in activities of daily living. So the present study was conducted to find out effect of proximal control training on quality of hand function in hemiparetic patients.

Method: Comparative study was conducted at Krishna College of Physiotherapy, Karad. 20 subjects with age group between 40-60 years were taken. Group A (10) were subjects treated with proximal control training along conventional treatment and Group B (10) included subjects treated only with conventional treatment. Exclusion criteria of the study was: 1.Associated psychological disorders. 2. Perceptual disorders.3.Any orthopaedic disorder.4.Significant auditory and visual impairements.

Results: Statistical analysis was done using paired and unpaired"t" test, Mann Whitney test, Friedman statistics and Wilcoxon matched pairs signed rank test. The results showed statistically significant improvement in quality of hand function in group A (study group) as compared to group B ($p<0.001$).

Conclusion: The study shows effect of proximal control training on quality of hand function in hemiparesis.

Keywords: *proximal control training, hemiparesis, old stroke adults.*

INTRODUCTION

Stroke is a disease that occurs when the blood supply to the brain is stopped or when a brain hemorrhage occurs, causing body motor disorders and a sudden disturbance of consciousness[1]

Among stroke-related motor disorders, upper extremity dysfunction is one of the most common sequelae. Among stroke subjects 30-60% have upper extremity dysfunction, even six months after the onset of stroke in these cases complete recovery cannot be expected [2.] The recovery of upper extremity functions is important in daily living and occupational activities. Permanent upper extremity dysfunction affects participation in social activities[3]. The upper extremity functions on a patient's stroke-affected side are regarded as the most important factor in their prognosis and thus play an important role in the course of treatment.[4] Harris and Eng [5] found that the ability to perform upper extremity activities is closely correlated with upper extremity muscle strength ,grasping power and upper extremity muscle tone. Fisk and Goodale (1988) have shown that movements of the unpaired hand of subjects suffering from hemiparesis are slower than movements made by dominant hand of non-patients.[6] A stroke involving dominant hand may affect the patients ability to perform daily tasks.In fact ,activities of daily living that require the use of upper limbs are seriously limited in 80% of patients [5] Reaching movements are initiated by activity of the prime mover ,i.e the first activated arm muscle. That's why biceps brachii which act as prime mover has efficient reaching characteristics in proximal arm muscle control.[7] Reaching task can

Corresponding author:
Ms. Neha Prashant Tendulkar
BPT Student, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad- 415110, Satara, Maharashtra. Email id: neha.tendulkar31@gmail.com

improve proximal control of upper extremity. Motor control problems include: Delayed movement times, Loss of ability to adapt to changing task demands, Slowed reaction times(Shumway-Cook & Woollocott, 2012) that's why motor control training is important in hemiparetic patients. A variety of techniques and devices are used by rehabilitation therapists to treat patients with upper extremity dysfunction. In Proximal arm control training various techniques are included like bilateral arm training, robot-assisted training ,constraint –induced movement therapy and neuromuscular electrical stimulation to improve upper extremity function following stroke. Up to the present, no researches have been conducted in effect of proximal control on quality of hand function.

MATERIALS AND METHOD

This was a comparative study which was conducted to evaluate effect of proximal control training among 2 groups of subjects. The subjects who meet the inclusion and exclusion criteria and willing to participate in the study were included. We had approached and assessed 20 subjects as our study population. The participants were explained about the study and the evaluation procedure. The informed consent was obtained from the individuals. The inclusion criterion of the study was: 1. Age - 40-60 years. 2. Both genders. 3.Subjects in stage 4 and above according to Brunnstrom stages of recovery. The exclusion criterion of the study was: 1. Subjects with any secondary disease. 2. Subjects with congenital deformities of upper extremity.3.painful or subluxated shoulder.

The outcome measures used in this study were Fugl Meyer Assesment – Hand subtest (FMA-H) and box and block test.

Brunnstorm recovery stages used to determine the recovery level of the subjects which consisted of six stages. The Fugl Meyer Assesment (FMA) is a disease specific performance-based measure with three independent impairements sections voluntary movement of upper and lower extremities ,balance and sensation. This scale has been found to have good intrater reliability of 0.98 to 0.99 and validity 0.61 to 0.89[8].

Box and block test is use to evaluate the gross manual dexterity. The test has high reliability intraclass 0.89-0.97 and validity also significantly shown in upper limb performance and functional independence[9]

Procedure

The study protocol was presented in front of protocol and Institutional Ethics Committee of KIMSDU, Karad. Hemiparetic patients were approached, purpose of the study was explained and written informed consent was taken from those willing to participate. Subjects were then assessed as per inclusion and exclusion criteria.

Two groups were formed-

GROUP A (study group)-Subject were treated with proximal control training along with conventional treatment.

GROUP B (control group)-Subjects were treated only with conventional treatment.

All the subjects were treated once a day, 5 times a week, for 6 weeks. Control group subjects were treated with conventional exercises only. This includes sensory reeducation, soft tissue/joint mobilization and range motion exercises`, positioning ,splinting, stretching ,electrical stimulation ,Reaching activities ,Functional mobility exercises, Locomotor training ,Balance training

Study group was treated with all exercises given for control group in addition to the proximal control training. The exercises were performed with assistance once a day, five times per week for six weeks. The exercises are 1. The affected arm rest on the table, well forward, hand open, fingers extended. Patient should control Associated reactions while rubbing the affected arm with sound hand. Inhibitory control of flexor spasticity by the patient 2. Moving arm forward and up while flexing the elbow supinated to bring hand to mouth. This is first practiced without holding an object. Later it may be done with utensil such as a spoon.3. Controlling associated reaction using right hand (the normal one) while leaving affected one flat on a table,well forward, open hand. Position of hand on table is marked.4.Weight bearing on extended arm ,shoulder well forward.5.Dusting table top with affected arm.(Adduction of the arm is easier than abduction)6.Patient sits on table picking up objects with sound hand and transferring them across to the affected side .This gives necessary rotation.7. Bilateral activity training a) Pushing a roll with clasped hands b)Pushing a ball with clasped hands .But in this patient have to lift the arm to catch the ball before pushing it

back to the partners opposite.8.Grasping and holding an upright stick fixed to a table with affected hand, elbow straight and shoulder well forward. This is very useful reaction while writing, eating or drawing with sound hand.9.Patient holding a card board roll with extended arm while lifting weights with sound arm.10.Drawing with sound hand and affected arm on a table, shoulder well forward and hands open, finger extended flat on a table.

FINDINGS

`Statistical analysis was done manually as well as using the statistics software INSTAT so as to verify the result obtained .Various statistical measures such as mean, standard deviation,and paired ,unpaired test of significance, Mann Whitney test ,Wilcoxon matched pair test and Friedman statistics were utilized for this purpose. Probability values less than o.oo5 were considered statistically significant and probability values less than 0.0001 were considered statistically extremely significant.

RESULT

Age of the subjects in this study was between 40-60 years.There was no significant difference between mean age and standard deviation of the subjects in two groups .Mean age group A was 54.4 years and that Group B was 53.3(Table 1)

Table 1: Baseline characteristics of subjects

Groups	Gender	Mean age	Side affected
Group A	Male=5,Female=5	54.4 years	Left=7,Right=3
Group B	Male=6,Female=4	53,3 years	Left=6,Right=4

Table 2: Comparison of values of Fugl Meyer Assesment Scale

Group	Pre	Post			'p'
	Mean ±SD	Mean ±SD			
		2wk	4 wk	6wk	
A	5.3± 3.466	6.1±2.885	6.7±2.710	10 ± 2.261	<0.0001***
B	3.8±1.398	5.5 ± 1.780	6±1.491	7.5±1.354	0.0003
P	0.4260	0.7049	0.6223	0.0279	

In the present study pre-interventional mean and SD of FMA was 5.3± 3.466 in group A and 3.8±1.398 in group B. Inter group analysis of FMA pre score was done by using Mann-Whitney test. Pre interventional analysis showed no significant difference between Group A and Group B (p=0.4260). In the present study post-interventional mean &

SD of FMA at 2 week was 6.1±2.885 in group A and 5.5 ± 1.780 in group B. Inter group analysis of FMA post score was done by using Mann-Whitney test. Post interventional analysis showed no significant difference between Group A and Group B (p=O.7049) The post-interventional mean & SD of FMA of at 4 week was 6.7±2.710 in group A and 6±1.491 in group B. Inter group analysis of FMA post score was done by using Mann-Whitney test. Post interventional analysis showed significant difference between Group A and Group B (p=0.6223).The post-interventional mean & SD of FMA at 6 week was 10 ± 2.261 in group A and 7.5±1.354 in group B. Inter group analysis of FMA post score was done by using Mann- Whitney test. Post interventional analysis showed significant difference between Group A and Group B (p=O.O279). (Table 2)

Table 3: Comparision of values of box and block test.

Group	Pre	Post (at 6 wks)	'P'
	Mean± SD	Mean±SD	
A	34.4±11.853	34.4±11.853	<0.0001
B	33±5.812	33±5.812	0.0003
P	0.4260	0.1120	

In the present study pre-interventional mean and SD of Box and block test was 34.4±11.853 in group A and 33±5.812 in group B. Inter group analysis of box and block test pre score was done by using Mann-Whitney test. Pre interventional analysis showed no significant difference between Group A and Group B (p=0.4260). The post-interventional mean & SD of BOX AND BLOCK TEST at 6 week was 47.3 ± 12.074 in group A and 39.1±5.109 in group B. Inter group analysis of BOX AND BLOCK TEST post score was done by using Mann-Whitney test. Post interventional analysis showed significant difference between Group A and Group B (p=O.1120) (TABLE 3)

DISCUSSION

Stroke is a leading cause of serious long term disability in adults. More than 60 % of stroke survivals suffer from persistent neurological deficit. Stroke patient incidence rate range from 0.2 to 2.5 per 1,000 populations per year in India.[10] This illness costing millions in lost work as well as millions in medical state and insurance resources every year, represents a challenging area of management for physiotherapists[11]. So the present clinical trial was conducted to find out the effect of proximal control training along with conventional therapy on quality of hand function in hemiparetic adults. 20 subjects clinically and radiologically diagnosed with stroke having hemiparesis and fulfilling inclusion and exclusion criteria with age between 40 to 60 years were included in the study. Further they were classified according to Brunnstorm stages of Recovery as stage 4 and above. They were allocated into two groups, Group A and Group B, each containing 10 subjects. A baseline treatment was given with an addition of proximal control training in Group A and only baseline or conventional treatment in Group B. The outcome was measured by FMA.

Conventional treatment of sensory re-education, passive exercises, mobilization, functional mobility training, gait training, balance training, supportive devices, stretching, electrical stimulation was common for both the groups. Statistical analysis was performed by using Instat-Graph pad. The average mean age of participants in Group A was 54.4 ± 7.027 and Group B was 53.5 ± 6.961, which showed there is no significant difference in age of subjects in both groups (t = 0.3517 & p = 0.7292) which was done by unpaired t-test. The total number of participants included over 20 out of which 10 were males and 10 were females. Group A contained 5 males and 5 females and Group B had 4 males and 6 females. Out of 20 subjects 13 had left side affected and 7 had right side affected.

Friedman Statistics test was used to analyse the effect of proximal control training within the groups which showed that there was extremely significant improvement in quality of hand function (p<0.0001) post treatment. Mann-Whitney test was used to analyse the effect of proximal control training to improve quality of hand function between the groups. There was no significant difference for FMA and BOX and BLOCK TEST post 2 weeks but there was quite significant, significant and extremely significant difference post 4 weeks and post 6 weeks for FMA scale and for BOX AND BLOCK TEST there was significant difference at 6 weeks and Wilcoxon matched pair test is used for within group analysis and statistics showed very significant difference , p value was 0.0003.

The above findings may be due to the conceptual model of proximal control training exercises where proximal and distal motor control improved in the Group A. One may speculate that the more distal approach resulted in a more powerful activation of the sensorimotor cortex given their larger cortical representation[12].

The above results also correlates with the previous studies which uses conventional treatment such as sensory stimuli (eg. quick stretch, brushing, reflex stimulation) where emphasis is on affected inputs facilitation and normal movement patterns, PNF are

used to reinforce existing motor response. FES has been demonstrated to be beneficial to restore motor control, spasticity and reduction of hemiplegic shoulder pain and subluxation. Positioning can be therapeutic for tone control and neuro-facilitation of stroke patients. Passive mobilization can be useful in gaining relief of pain and ROM. No shoulder support will correct glenohumeral joint subluxation. However, it may prevent the flaccid arm from hanging against the body during. The results from the statistical analysis of the present study supported the alternative hypothesis which stated that there will be beneficial effect to the subjects treated with proximal control training along with conventional therapy. Hence above results showed that Group A subjects treated with proximal control training along with conventional therapy showed better improvement in quality of hand functions. Thus it can be stated from above study that physical therapy interventions like proximal control training are more efficacious and cost effective.

CONCLUSION

Subjects treated with proximal control training with baseline treatment showed greater improvement in quality of hand function than baseline treatment .It helped in improvement in activities of daily living in subjects with hemiparesis.

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Conflict of Interest: There is no conflict of interest.

Ethical Clearance: Ethical clearance was taken from institutional ethical committee of KIMSDU.

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Effect of Specific Transverse Abdominal Muscle Strengthening and Conventional Therapy for Trunk Control in Paraplegic Subjects

Palak M Khichadiya[1], Suraj B Kanase[2]

[1]BPT Student, [2]Associate Professor, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Satara, Maharashtra

ABSTRACT

Background: As trunk control is the major restraint in quality of life in paraplegia, this project emphasizes on the effect of specific transverse abdominal muscle strengthening exercises for trunk control. So, the present study was conducted to find out the combined effect of conventional exercises with specific transverse abdominal muscle strengthening on trunk control.

Method: 20 subjects of clinically diagnosed paraplegia having impairment of trunk control were recruited. They were allocated into 2 groups and treated with conventional exercises along with transverse abdominal muscle strengthening for trunk control regularly for 5 weeks. Exercises were given in progression. Primarily passive exercise followed by active assisted in progression for both the lower limb of that subject was asked to do it actively. The objective outcome measures Trunk control test and manual muscle testing were used to assess the trunk control pre- treatment and at the end of 5 weeks.

Results: Statistical analysis was done using paired and unpaired't" test. The results showed statistically significant improvement in trunk control in group A as compared to group B ($p<0.001$).

Conclusion: This study found that conventional therapy along with specific transverse abdominal strengthening is effective in improving trunk control in paraplegic subjects. Specific transverse abdominal muscle strengthening along with the conventional treatment shows speedy recovery than the only conventional therapy when given at the acute and sub-acute stages of traumatic spinal cord injury.(TSCI)

Keywords: *Paraplegia, Trunk control, Trunk control test(TCT) , Manual muscle testing(MMT)*

INTRODUCTION

Spinal cord injury is not a notifiable disease thus annual incidence is inaccurate and may vary according to the source. The estimated incidence of spinal cord injury worldwide is between 11 and 53 cases per million inhabitants.

Spinal cord damage resulting from either injury or disease may produce tetraplegia or paraplegia depending upon the level at which the damage has occurred, and the lesion may be complete or incomplete. Spinal cord injury can be traumatic or non-traumatic.

Traumatic spinal cord injury includes the road traffic accidents, fall, industrial accidents and sports injuries and the non-traumatic SCI includes results from disease or pathological conditions. Conditions that may damage the spinal cord are vascular dysfunction (arteriovenous malformation [AVM], thrombosis, embolus, or hemorrhage); vertebral subluxations secondary to rheumatoid arthritis or degenerative joint disease; spinal neospasm; syringomyelia; abscess of spinal cord; infections, such as syphilis or transverse myelitis; and neurological disease, such as multiple sclerosis and amyotrophic lateral sclerosis. Non-traumatic etiologies

Corresponding author:
Ms. Palak M Khichadiya
BPT Student, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad- 415110, Satara, Maharashtra. Email id: palak861995@gmail.com

accounts for approximately 39% of all SCI.[1,2]

Road traffic accident (RTA) are the most common causes (45.4%) followed by fall (16.8%), sports injury(16.3%) and violence.[3]

In SCI, 56% of patients experience cervical lesion resulting in tetraplegia, whereas 43% of SCIs result in paraplegia from thoracic, lumbar or sacral lesions. The most common type of injury is incomplete tetraplegia (39.5%), followed by complete paraplegia (22.1%), incomplete paraplegia(21.7%), and incomplete tetraplegia(16.3%).[4]

The majority of person with spinal cord injury are male (78.3% male vs. 21.7% female)[5]

The acute injury of spinal cord is among the most common cause of severe disability & death.[6]

Neurological complications and associate conditions of spinal cord injury are –

- Spinal shock
- Motor and sensory impairments
- Autonomic dysreflexia
- Spastic hypertonia
- Cardiovascular impairment
- Pulmonary impairment
- Bladder and bowel dysfunction
- Sexual dysfunction

After spinal cord injury patient may experiences-

Early complications:

- Chest complications
- Deep vein thrombosis
- Pulmonary embolism

Late complications:

- Contractures
- Oedema
- Osteoporosis
- Pressure ulcer[7]

Paraplegia: Paraplegia is the result of spinal cord injury. The common cause of spinal cord injury can varies in different geographical region. 80% are under the age of 45 years and the majority of people are males.[8]The term paraplegia refers to impairment or loss of motor and/or sensory function in the thoracic, lumbar or sacral segments of the spinal cord, secondary to damage of neural elements within the spinal canal.[9] Paralysis of the muscle below the level of injury can lead to limited and altered mobility, self-care, and ability to participate in valued social activities. With paraplegia, the trunk, legs and pelvic organs may be involved. Paraplegia is a condition in which a person develops weakness of both legs due to problems either in spinal cord or the nerves supplying the muscles of lower limbs or due to involvement of muscles directly. The person looses the ability to walk, stand or sit due to weakness of both lower limbs and trunk muscles.[10]

Paraplegia results from injury to thoracolumbar or sacral segments of spine. This includes injury to the conus medullaris and cauda equine.[11]

Life expectancy of person with spinal cord injury has increased in recent decades. Evidence of the benefits of medical treatment is documented by the reduction in disability of person and a reasonable degree of independence in the performance of daily living skills. Factors that influence life expectancy are age at onset and level and extent of neurological injury.[12]

Core muscles:

Core muscles of the body are the most important component for pelvic stability.A trunk muscle of the body helps to stabilize the pelvic and prepare the subjects to stand and walk independently. The main trunk muscles are the abdominal muscles and back extensor muscles. Abdominal muscle includes- transverse abdominals, rectus abdominis, internal and external oblique and multifidus, erector spinae and latissimus dorsi.[13]

Trunk control is the key point for the paraplegic patients and also prepares the patients for stand and walk. The pelvic control is maintained by the trunk muscles and it improves the sitting and standing balance and also improves the gait. Deep core muscles, gluteus medius, gluteus maximus and piriformis play the great role in pelvic stability.[14,15] Trunk control is assessing by the trunk control test and it includes the sitting equilibrium and dynamic equilibrium. Various components used to assess the equilibrium in trunk control test. It has 13 components and each component has scoring. Total scoring for trunk control test is 24.[16]

Conventional therapy for trunk control in paraplegic patients includes the pelvic bridging exercise,

single leg bridging, Abdominal curl up exercise, prone extension exercise[17], active assisted exercise for lower limb and trunk rotation exercises.[15]

Transverse abdominal strengthening includes the medicine ball rotation, Transverse abdominal recruitment exercise. In progression of the transverse abdominal exercise patient have to go in quadripod position. In quadripod position, ask the patient to do tummy tuck in with posterior pelvic tilt. These exercises strengthen the core muscles and it improves the trunk control and also helps in the stability of the spine. Muscle strength is check by manual muscle testing for trunk flexors, extensors and rotators. It has 0 to 5 grading according to the commands patients have to perform. [15]

For this study there are three articles supporting that strengthening of trunk muscle in paraplegic subjects shows improvement in trunk control so in my study there is specific transverse abdominal muscle strengthening for knowing the improvement in trunk control by taking score of trunk control test and checking grade of manual muscle testing.

MATERIALS AND METHOD

20 Subjects with clinically diagnosed paraplegia willing to take treatment for 5 week were recruited for study. The subjects were screened and were put in either of the group A conventional exercises along with additional transverse abdominal muscle strengthening exercises regularly for 5 weeks Group B conventional treatment alone for 5 weeks by using lottery method. A written informed consent was taken from each participant. Ethical clearance was obtained from university's institutional review board. Inclusion criteria were both male and female subjects with impairment of trunk control Age group is between 20-35 years. Exclusion criteria are history of non-traumatic spinal cord injury, Patients who are having bed sore and cognitive impairment. Both the groups were given regular conventional Physiotherapy treatments for 5 weeks. Group A was given 1. Transverse abdominal recruitment exercises, 2.medicine ball exercise along with conventional therapy. Group B was given conventional treatment like 1.abdominal curls, 2.prone extension, 3.Oblique curls, 4.pelvic bridging, 5. Single leg bridging, 6.passive movements followed by active assisted movements for both lower extremities. The post treatment improvement was noted with the outcome measures.

Statistical analysis:

`Statistical analysis was done manually as well as using the statistics software INSTAT so as to verify the result obtained .Various statistical measures such as mean, standard deviation,and paired ,unpaired test of were utilized for this purpose. Probability values less than o.oo5 were considered statistically significant and probability values less than 0.0001 were considered statistically extremely significant.

RESULT

1. Age Distribution:-

Age group of all participants is between 20 to 35 years. The mean age of the participants in Group A was 29.8± 4.938 and in Group B was 30± 3.171there was no significant difference between the mean ages of the participants I both the groups. This was done by using unpaired t test (t=0.3940 & p = 0.6982)

Table 1: Mean age distribution

	Mean ± SD
Group A	29.8± 4.938
Group B	30± 3.171
't'	0.3940
'df'	18
'p'	0.6982

2. Outcome measures:-

1) trunk control test:

Table 2: Comparison. of pre-pre and post-post TKT score in between groups.

Group	**Pre- treatment**		**Post-treatment**	
	Mean ± SD	**Median**	**Mean ± SD**	**Median**
A	17.9±1.663	18.00	21.2 ± 1.549	21.500
B	17.4 ±1.647	17.500	19.8 ± 1.549	20.00
'p'	<0.0001		<0.0001	

In the present study pre interventional means of TKT score was17.9±1.663 in Group A and 17.4 ±1.647in Group B whereas post-interventional means of TKTscore was 21.2 ± 1.549in Group A and 19.8 ± 1.549in Group B respectively. Inter group analysis of TKT score was done.Post intervention analysis showed significant difference between Group A and Group B ($p<0.0001$).

2) Manual muscle testing

1) Trunk flexors:

Table 3: **Comparison of pre-pre and post-post trunk flexors MMT in between groups.**

Group	Pre- treatment		Post-treatment	
	Mean SD	Median	Mean ± SD	Median
A	1.5± 0.527	1.5	4.1 ± 0.7379	4
B	1.5 ± 0.5270	1.5	3.3 ± 0.4830	3
'p'	>0.9999		0.0102	

Within group statistical analysis revealed statistically extremely significant increase in trunk flexors post interventional for both the groups. This was done by using paired t test. Between the group statistical analysis revealed statistically significant result in trunk flexors post interventional for both the groups.

Table 4: Comparison of pre-pre and post-post trunk extensor MMT in between groups.

Group	Pre- treatment		Post-treatment	
	Mean ± SD	Median	Mean ± SD	Median
A	1.5±0.5270	1.5	4±0.6667	4
B	1.9±0.3162	2	2.8±0.4216	3
'p'	0.0544		0.0001	

Within group statistical analysis revealed statistically extremely significant increase in post interventional for both the groups. This was done by using paired t test. Between the group statistical analysis revealed statistically extremely significant increase in trunk extensor MMT post interventional for both the groups. This was done by using unpaired t test.

Table 5: Comparison of pre-pre and post-post trunk rotators MMT in between groups.

Group	Pre- treatment		Post-treatment	
	Mean ± SD	Median	Mean ± SD	Median
A	1.7±0.6749	2	2.3±0.4830	2
B	1.3±0.4830	1.5	1.5±0.5270	1.5
'p'	0.1449		0.0023	

Within group statistical analysis revealed statistically extremely significant increase in trunk rotators MMT post interventional for both the groups. This was done by using paired t test. Between the group statistical analysis revealed statistically extremely significant increase in trunk rotators MMT post interventional for both the groups. This was done by using unpaired t test.

DISCUSSION

The study "Effect of specific transverse abdominal muscle strengthening and conventional therapy for trunk control in paraplegic patients was conducted to compare the two treatments and find out the best which improves the Trunk control. In paraplegia it becomes the major limiting factor for subject's dependency. It increases the energy expenditure, reduces Biomechanical efficiency and effects self esteem.

Many studies were carried out to find the best protocol for early recovery after paraplegia. Those studies also show significant changes in their outcome with respective exercises.

In this study the subjects were divided into two groups. Pre consent was taken from them. They were splitted into specific transverse abdominal muscle strengthening and Conventional group. The interventions were carried out for 5 weeks with 5 times per week. The outcome measures for this study were Trunk control test & manual muscle testing .This study shows significant difference in the pre and post treatment values in both the groups. Group A showed significant improvement in the outcome variables concluding that it improves the trunk control. This was confirmed using statistical analysis by using 'Paired t- test' for within group comparison and 'Unpaired t-test' for between the group comparisons. In the present study, we found that after intervention there was significant improvement in the outcome with trunk control exercises. It is effective in improving trunk control in the acute and sub-acute stage

non traumatic spinal cord injury rehabilitation. The recovery of the patients from this study was supported with the Neurophysiological changes in muscle.

Post training improvement in muscle strength in Trunk control can be supported by muscle strength mechanism. The neuromuscular activity taking place at one link of the chain can strongly influence other connected components during exercise, when the muscles perform muscle actions either eccentric, concentric or isometric, they create a tensile force that pulls on the bone and make them strengthen. When muscle produce certain tensile force number of times repeatedly thus the muscle learns the action and gets strengthen.

When a muscle cell is activated by its nerve cell, the interaction of actin and myosin generates force through so called power strokes. The total force depends on the sum of all the power strokes occurring simultaneously within all the cells of a muscle.

The neural basis of muscle strength enhancement primarily involves the ability to recruit more muscle cells- and thus more power strokes- in a simultaneous manner, a process referred to as synchronous activation. This is in contradistinction to the firing pattern seen in untrained muscle, where the cells take turns firing in an asynchronous manner. According to this mechanism muscle gets strengthen.

This suggests that – with interventions of Trunk muscle strengthening exercises in acute stage of paraplegia, subjects are able to improve trunk control.

CONCLUSION

Both the group showed significant results post intervention but the group A that is transverse abdominal muscle strengthening and conventional therapy showed more significant than the group B conventional therapy.

Thus the alternative hypothesis was accepted.

Source of Funding: The source of funding for study is self.

Conflict of Interest: There is no conflict of interest.

Ethical Clearance: Ethical clearance was taken from institutional ethical committee of KIMSDU.

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Effect of Early Physiotherapy in Post Operative Radical Mastectomy for Lymphedema

Amisha Anil Alande[1], Javid H Sagar[2], Sandeep Babasaheb Shinde[3]

[1]BPT Student, [2]Professor, [3]Associate Professor, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad, Satara, Maharashtra

ABSTRACT

Background: Breast cancer is the most common type of cancer and the leading cause of cancer-related to death among women worldwide. Lymphedema affects 6% to 30% of all patients who have had a radical mastectomy and is a life long risk after the procedure.

Method: Comparative study was conducted at Krishna College of Physiotherapy , Karad. 20 subjects with age group between 35-75 years were taken. Group A (10) were subjects treated with FUP, Compression garment and Shoulder exercises and Group B (10) included subjects treated only with conventional treatment. Exclusion criteria of the study was:1) Womens with bilateral mastectomy 2)Recurrent infection in the arm.3)Congenital lymph edema.4)Subjects for other reasons such as trauma , burns, damage to lymph masses of the region have been affected by lymph edema. **Results:** Statistical analysis was done using paired and unpaired"t" test. The results showed statistically significant improvement in Lymphedema reduction in group A (Experimental group) as compared to group B ($p<0.001$).

Conclusion: The present study provided evidence to support the use of combination therapy for reducing lymphedema ,also combination therapy showed more effect as compare to only conventional therapy.

Keywords: *FUP – Faradism under pressure, Lymphedema, Radical Mastectomy, Physiotherapy, Breast cancer.*

INTRODUCTION

Breast cancer is the most common type of cancer and the leading cause of cancer-related to death among women worldwide. Hormone receptor-positive tumors represent the most common form of this disease, with more than 70% of breast cancers expressing these receptors[1]

The radical mastectomy was introduced by Halsted[2] in 1882.

The operation embodied the concept of routine complete en bloc resection of the breast with pectoralis major muscle and the regional lymphatics.The technique of radical mastectomy espoused by Halsted embodied the following principles:

- Wide excision of the skin, covering the defect with Thiersch grafts.
- Routine removal of both pectorals muscles.
- Routine axillary dissection(levels I to III).
- Removal of all tissues in one block, cutting as wide as possible on all sides of the growth .

Breast-cancer-related upper extremity lymphede ma (BCUL), a common complication of mastectomy, can cause physical discomfort, psychological distress, cosmetic defects, functional disability in the affected arm[3].Lymphedema affects 6% to 30% of all patients who have had a radical mastectomy and is a life long risk after the procedure [4-7] .

Lymphedema occurs as a consequence of en bloc ablation of lymphatic routes(nodes and channels) within

Corresponding author:
Ms. Amisha Anil Alande
BPT Student, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad- 415110, Satara, Maharashtra. Email id: amishaalande6@yahoo,com

the field of resection of primary mammary tumor. The subsequent increase in plasma hydrostatic pressure that results with removal of this conduits may follow the surgical procedure, irradiation or uncontrolled progression of neoplasm.

Injury, capillary disruption, infection, obstruction to lymphatic or venous outflow, hyperthermia or exercise will accelerate protein leakage into these tissues. Less than 10% increase in arm volume is considered insignificant, whereas an increase of greater than 80% is classified as severe .Factors that have been identified independent risks for the development or progression of lymphedema include the extent of axillary dissection, the use of axillary radiography, pathologic nodal status,infection, and obesity.[8-11].

MATERIALS AND METHOD

This was a comparative study which was conducted to evaluate effect of early physiotherapy in post operative radical mastectomy for lympedema among 2 groups of subjects. The subjects who meet the inclusion and exclusion criteria and willing to participate in the study were included. We had approached and assessed 20 subjects as our study population. The participants were explained about the study and the evaluation procedure. The informed consent was obtained from the individuals. The inclusion criterion of the study was: 1. Age – 35-75 years.2) Womens with mastectomy surgery and chemotherapy (level 3to 5)3)Womens suffering with lymph edema post operatively. The exclusion criterion of the study was1) Womens with bilateral mastectomy 2)Recurrent infection in the arm. 3)Congenital lymph edema 4)Subjects for other reasons such as trauma , burns, damage to lymph masses of the region have been affected by lymph edema.. The outcome measures used in this study are DASH questionnaire and Girth measurement. Girth measurement was take at mid-arm and mid –forearm level. It is 30item ,self-report questionnaire design to measure physical function and symptoms in patients with any or several musculoskeletal disorder of upper limb.

Procedure

The study protocol was presented in front of protocol and Institutional Ethics Committee of KIMSDU, Karad. Post operative radical mastectomy subjects were approached, purpose of the study was explained and written informed consent was taken from those willing to participate. Subjects were then assessed as per inclusion and exclusion criteria.

Two groups were formed-

GROUP A(Experimental)- Subjects receivied Faradism under pressure, shoulder mobility exercises and compression garments.

GROUP B (Control)- Subjects will be receiving conventional treatment(manual lymphatic drainage, active assisted shoulder exercises, stretching exercises)

Experimental group was treated with.

1)Faradism under pressure[12]- Subjects were asked to lie down in supine comfortably and position the limb in elevation so that the gravity assists the venous and lymphatic return. The electrodes were placed at flexor aspect of forearm for 10min and10min on extensors muscles of forearm. Crepe bandage was applied starting distally, firm but not too tight. 'The faradism under pressure was given at frequency 30Hz,pulse width 300microseconds with hold time 2seconds and rest time 5seconds.

2)Shoulder mobility exercises and Compression garments [13-14] - Subjects were asked either to sit or stand comfortably, the therapist assisted the subject to perform shoulder exercises wearing compression garment. Exercises were performed in flexion and abduction and was repeated for 10times.All the above intervention was given 6days in a week for 3weeks.

Control group was treated with.

1)Manual lymphatic drainage[15] - The subject was asked to lie down in supine comfortably with elevated arm very light repetitive stroking and circular massage movements done. The direction of the massage was toward specific lymph nodes and usually involves distal-to-proximal stroking. Fluid in the involved extremity was then cleared , first in the proximal portion and then in distal portion of the limb.

2)Active assisted ROM exercises[15] -Subjects was given exercises for shoulder flexion ,extension ,abduction and adduction, and each exercise was repeated for 10times.

3)Selective Stretching[15] -Stretching exercises for levator scapulae, upper trapezius, pectoralis major, medial and lateral rotators muscles of shoulder. Three

stretches per muscle with 15seconds hold were given.

FINDINGS

`Statistical analysis was done manually as well as using the statistics software INSTAT so as to verify the result obtained. Various statistical measures such as mean, standard deviation, and paired ,unpaired test of significance. Probability values less than o.oo5 were considered statistically significant and probability values less than 0.0001 were considered statistically extremely significant.

RESULT

1) DASH Questionnaire

Table no 1: Comparison of pre and post DASH questionnaire between group.

GROUP	Pre- treatment	Post-treatment
	Mean ± SD	Mean ± SD
A	69.58±8.528	31.33±3.149
B	68.912±10.702	29.998±3.948
'p'	0.8790	0.4152
't'	0.1544	0.8341

In this study pre interventional mean for Group A was 69.58± 8.528 and post interventional mean was 31.33 ± 3.149 and pre interventional mean for Group B 68.912 ±10.702 and post interventional mean was 29.998 ± 3.948,data analysis was done unpaired t test . This t value for group A is t= 0.1544 and for group B t = 0.8341 and p value for group A is p = 0.8790 and for group B is p=0.8341.

2) Girth Measurement

Table no 2: Comparison of pre and post Girth Measurements [Mid arm] between the group.

GROUP	Pre- treatment	Post-treatment
	Mean ± SD	Mean ± SD
A	43±4.295	34±3.712
B	42.4±3.098	34.9±1.969
'p'	0.7243	0.5068
't'	0.3583	0.6773

In this study pre interventional mean for Group A was 43±4.295 and post interventional mean was 34±3.712and pre interventional mean for Group B42.4±3.098 and post interventional mean was34.9±1.969,data analysis was done unpaired t test . This t value for group A is t= 0.3583 and for group B is t = 0.6773 and p value for group A is p = 0.7243 and for group B is p=0.5068.

Table no 3: Comparison of pre and post Girth Measurements [Mid Forearm] between group.

GROUP	Pre- treatment	Post-treatment
	Mean ± SD	Mean ± SD
A	32.6±3.239	25.2±2.741
B	30.4±2.459	26±2.828
'p'	0.1043	0.5287
't'	1.711	0.6423

In this study pre interventional mean for Group A 32.6±3.239 was and post interventional mean was 25.2±2.741 and pre interventional mean for Group B 30.4±2.459 and post interventional mean was 26±2.828 ,data analysis was done unpaired t test . This t value for group A is t= 1.711and for group B t = 0.6423 and p value for group A is p = 0.1043 and for group B is p=0.5287.

DISCUSSION

Breast-cancer-related upper extremity lymphede ma (BCUL), a common complication of mastectomy, can cause physical discomfort, psychological distress, cosmetic defects, functional disability in the affected arm[3]Lymphedema affects 6% to 30% of all patients who have had a radical mastectomy and is a life long risk after the procedure [4-7].

The study was conducted with 20 subjects. Many studies were carried out to find the best protocol for reducing lymphedema in post operative mastectomy subjects but no specific study was done that involve the combination of faradism under pressure ,compression garments and shoulder exercises.

In this study the subjects were divided into two groups. Pre consent was taken from them .They were divided into Experimental group and Conventional group. The interventions were carried out for 3 weeks with one time per day for 6 days per week in Experimental

group and 4 weeks with one time per day for 6 days per week in Conventional group . The outcome Measures for this study were Girth Measurement and DASH questionnaire.

This study shows significant difference in the pre and post treatment values in both the groups. Experimental group showed significant improvement in the outcome variables concluding that it getting early reduction in lymphedema compare to conventional therapy that is control group. This was confirmed using statistical analysis by using 'Paired t- test' for within group comparison and 'Unpaired t-test' for between the group comparisons. In the present study, we found that after intervention there was significant improvement in the outcome with faradism under pressure ,compression garments and shoulder exercises, we found that it is effective for lymphedema in post operative mastectomy subjects.

1) DASH questionnaire:

Post training experimental group showed extremely significant improvement and conventional group also showed significant improvement.

Between Group Comparison

Pre test: p value = 0.8790

t value =0.1544

Post test: p value = 0.4152

t value= 0.8341

1) Girth Measurement.

Post training experimental group showed extremely significant improvement and conventional group also showed significant improvement.

Girth measurement at Mid arm level:

Between Group Comparison

Pre test: p value = 0.7243

t value =0.3583

Post test: p value = 0.5068

t value = 0.6773

Girth measurement at Mid Forearm level:

Between Group Comparison

Pre test: p value = 0.1043

t value =1.711

Post test: p value = 0.5287

t value = 0.6423

CONCLUSION

The present study provided evidence to support the use of combination therapy(faradism under pressure, compression garments and shoulder exercises) for reducing lymphoedema in post operative mastectomy subjectsl. In addition, result supported that combination therapy(faradism under pressure, compression garments and shoulder exercises) showed more effect as compare to only conventional therapy.

Source of Funding: The source of funding for study is self.

Conflict of Interest: There is no conflict of interest.

Ethical Clearance: Ethical clearance was taken from institutional ethical committee of KIMSDU.

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Effect of Functional Rehabilitation in Post Operative Knee Stiffness

Patil Monika[1], S Anandh[2]

[1]Intern, [2]Professor, Faculty of Physiotherapy, Krishna Institute of Medical Sciences Deemed University, Karad, District - Satara, Maharashtra

ABSTRACT

Purpose of the study: To find the effectiveness of functional rehabilitation in post operative knee stiffness subjects.

Material and Method: 30 subjects between the age group of 20-40 years, clinically diagnosed with post operative knee stiffness coming to Physiotherapy department of Krishna hospital, Karad were selected for the study. A total no.30 subjects were divided in two blocks by selective sampling method. Group A was given only conventional therapy and Group B was given functional rehabilitation with conventional therapy. VAS score is taken pre interventional and after 6 weeks post interventional. And goniometry of knee flexion and extension is taken pre and post treatment session and lower extremity functional scale is carried out first and last week.

Results: The data was statistically analyzed using paired-t test. A decreased in VAS score noted post-interventionally when compared to pre-interventional values and the results were extremely significant ($p<0.0001$). AROM and PROM was increased post-interventionally as compared to pre-interventional range of motion and the result was extremely Significant ($p<0.0001$). However, Lower extremity functional score was increased post-interventionally as compared to pre-interventional score and the result was extremely significant ($p<0.0001$).

Conclusion: Based on the results of the present study it can be concluded that the effects of functional rehabilitation with conventional therapy improves functional activities in post operative knee stiffness subjects, as there is a noticeable improvement in post- treatment score than pre-treatment score in group B as compared to group A subjects.

Keywords: *Post operative knee stiffness, functional rehabilitation, range of motion, visual analogue scale, and lower extremity functional scale.*

INTRODUCTION

The knee is a hinge joint formed between the tibia and femur the patella also glides over the front of femoral condyles to form patella-femoral joint. The stability of the knee depends primarily upon its ligaments. The functions of different ligaments of the knee are as follow:-

- Medial collateral ligament:- prevents medial opening-up.
- Lateral collateral ligament:- prevents lateral opening-up.
- Anterior cruciate ligament:- prevents anterior translation of the tibia on the femur.
- Posterior cruciate ligament:- prevents posterior translation of the tibia on the femur.[1]

Corresponding author:
Ms. Monika Balaso Patil,
BPT Student, Krishna Institute of Medical Sciences, Faculty of Physiotherapy, Karad- 415110, Satara, Maharashtra. Contact-7776819152
Email ID- monikapatil1993mp@gmail.com

Ligament injuries occurs most frequently in individuals between 20 to 40 years of age as the result of sport injuries but can occur in individuals of all ages.

The menisci of the knee are essential for proper knee function. They act in shock absorption, load transmission, stress reduction, joint stability, joint nutrition, and joint lubrication.[1] The bones of the knee joint consist of the distal femur with its two condyles, the proximal tibia with its two tibial plateaus, and the large sesamoid bone in the quadriceps tendon, the patella. The proximal tibiofibular joint is anatomically close to the knee but is enclosed in a separate joint capsule and functions with the ankle.[1]

The knee joint is designed for mobility and stability. It functionally lengthens and shortens the lower extremity to raise and lower the body or to move the foot in space. Along with the hip and ankle, it supports the body when standing, and it is a primary functional unit in walking, climbing, running, and sitting activities.[1]

Adhesion and bone impingement are the keywords. In all cases of post-traumatic stiffness, any fractures must be healed before release can be performed, thus, a 3–6-month waiting period is required. Stiffness can be caused by a flexion contracture, an extension contracture or a combined contracture. Various open and arthroscopic surgical techniques have been used over the past 30 years to treat all of the causes of stiffness while reducing morbidity. Prolong immobilization sometime as part of treatment and sometimes for the sake of soft tissue healing is one of the important causes of knee stiffness.[1, 2, 3]

Knee stiffness, or more accurately, a limitation in range of motion, is a potential complication after any intra-articular or extra-articular injury. In can be caused by a flexion contracture, an extension contracture or a combined contracture.

Functional Status: The patient was limited in all activities of daily living that involved flexion of knee or excess weight bearing on the lower extremity. These restrictions included, but were not limited to, rising from or lowering to squat positions, and stair ambulation. The patient avoided unilateral stance daily activities due to pain and feelings of instability.[6]

For group A I gave regular conventional therapy exercises. In my personal experience I was seen in post operative stiffness subjects there was mainly knee flexion range was affected, and without knee flexion there was mostly all the daily activities can not be performed easily. So, for improving knee flexion range I gave Hot moist pack.- 15 minute, ankle toe movement with resistance band, Swiss ball press 3 sets of 10 repetitions, Seated scoots- hold 20-30 seconds , 5 repetitions, Foam walking- 1 minute walk, 3 times a day, Sit to stand with partial lunges- 10 seconds hold,10 repetitions.

All home exercise activities were similarly designed to increase ROM and muscular control.

PARTICIPANTS

30 post operative knee stiffness subjects, 25 males and 5 females within age group of 20-40 years were included in the study. Convenience sampling method was used for data collection in this experimental study. Subjects with a history of any other systemic illness like. (HIV, TUBERCULOSIS), Spinal or disc pathologies, Un-co-operative patients and Patients those have undergone total knee replacement were excluded.

OUTCOME MEASURES:

- **GONIOMETRY-**

A Goniometer is used to measure the range of motion of various joints around the body. The aim of this test is to measure the flexibility of joints, which is important for injury prevention and execution of many sporting movements.

- **LOWER EXTREMITY FUNCTIONAL SCALE(LEFS)-**

The lower extremity functional scale is used to measure patients initial function, ongoing process, and outcome for a wide range of lower extremity conditions. The LEFS is a self-report questionnaire.

- **VISUAL ANALOGUE SCALE (VAS)-**

The visual analogue scale is a unidimensional measure of pain intensity, which has been widely used in diverse adult population.

PROCEDURE:

Study was conducted in Physiotherapy OPD of Krishna hospital and Medical Research Centre, Karad, after approval from Protocol committee and

Institutional ethics committee. Written informed consent was taken from the participants willing to participate. The subjects those have post operative knee stiffness were divided into two groups A and B. For group A was given only conventional therapy and group B was given conventional therapy with functional rehabilitation. Outcome assessment was done pre and post interventionally.

METHODOLOGY

The patients came to Krishna hospital physiotherapy OPD post operatively. Here they were clinically diagnosed as post operative knee stiffness after taking careful assessment by physiotherapist. There were total 30 subjects. Each of the subjects was screened as per inclusion and exclusion criteria and they were briefed about study and intervention.

Informed consent was taken from the subjects. Initial through musculoskeletal assessment of each subject was taken as per data collection sheet. VAS and GONIOMETRY was taken pre and post interventionally. LEFS was carried out first week and last week. A total no. 30 subjects were divided into two groups, group A and B by selective sampling method.

For group A I was given only conventional physiotherapy regimen and for group B I was given functional rehabilitation with additional exercises with conventional therapy. After treatment post outcome assessment was taken and scores were noted.

STATISTICAL ANALYSIS

Data was analysed using GRAPHPAD INSTAT software, version 3.10. Statistical analysis between three measures was done using paired-t test. Comparison between two group was done by using unpaired-t test. And comparison of outcome within two groups was done by using paired-t test.

RESULT

Table No. 1 Comparison of pre and post VAS values within the group A and B.

GROUP	PRE VAS	POST VAS
Group A	5.6 ± 1.799	3.8 ± 1.568
Group B	4.4 ± 1.805	3.0± 1.486

In the table no 1 pre-interventional mean and SD of VAS was 5.66± 1.799 in group A and 4.4±1.805 in group B. Post-interventional mean & SD of VAS is 3.8±1.568 in group A and 3.0 ± 1.486 in group B. Inter group analysis of VAS pre and post score was done by using Unpaired-t test. Pre (p=0.0645) and Post (p=0.1993) interventional analysis showed no significant difference between Group A and Group B.Intra group analysis of VAS score revealed statistically reduced pain and improved functional activities post interventionally for both the groups. This was done by using paired-t test showed extremely significant difference for Group A (p<0.0001) and Group B (p=0.0001).

Table no. 2: Comparison of pre and post treatment AROM values within group A.

Group	Pre treatment AROM	Post treatment AROM
Group A	65.46 ± 20.95	70 ± 20.73
Group B	70.33 ± 24.81	75.2 ± 25.08

Table no. 3: Comparison of pre and post treatment PROM mean values within the group A and B.

GROUP	Pre Treatment Mean	Post Treatment Mean
Group A	82.46	87.13
Group B	92.6	98.13

In table no 2 and 3 Intra group analysis of AROM and PROM score revealed statistically improved ROM and improved functional activities post interventionally for both the groups. This was done by using paired-t test showed extremely significant difference for Group A (p<0.0001) and Group B (p=0.0001).

Table no. 4: Comparison of pre and post treatment LEFS values within the group A and B.

GROUP	Pre treatment LEFS	Post treatment LEFS
Group A	29	47
Group B	35.93	58.26

In table no 4 pre-interventional mean and SD of LEFS was 29±11.276 in group A and 35.93 ± 19.429 in group B. Post-interventional mean and SD of LEFS was 47±11.759 in group A and 58.26 ± 14.854 in group B. Inter group analysis of LEFS pre (p=0.2420) and post

(p=0.2420) score was done by using Unpaired-t test. Pre and post interventional analysis showed not significant between Group A and Group B. Intra group analysis of LEFS score revealed statistically reduced stiffness and improved functional activities post interventionally for both the groups. This was done by using paired-t test showed extremely significant difference for Group A (p<0.0001) and Group B (p=0.0001).

DISCUSSION

Knee stiffness, or more accurately, a limitation in range of motion, is a potential complication after any intra-articular or extra-articular injury.

In my personal experience I have seen more subjects in our OPD for post operative knee stiffness. The stiffness was due to many types of knee injuries e.g. soft tissues injury, meniscal injury, tibial fracture, femoral fracture, patella fracture etc. In knee stiffness there was many researches done. But functional rehabilitation after post operative knee stiffness was mandatory.

So the present experimental study was conducted to find out the effect of functional rehabilitation in post operative knee stiffness subjects.

The Project was started with three month of duration with sample size 30 and age group 20-40 years. The subjects were taken conveniently from Krishna hospital, KARAD. 30 subject having post operative knee stiffness were taken for study. These subjects were divided into two groups, group A and group B. Each containing 15 subjects. First 15 subjects they were given functional rehabilitation with conventional therapy for reducing stiffness, pain and improving daily activities of life, And remaining 15 subjects were given only conventional therapy and measured by Goniometer, visual analogue scale and lower extremity functional scale. They were compared with each other with knee stiffness.

Conventional therapy was given to group A and group B I was given conventional therapy with functional rehabilitation.

Statistical analysis was performed by using Graph pad-Instat. The average mean age of participants in group A was 32.13±7.029 and group B 29.2±7.173, which showed there is no significant difference in age of subjects in both groups (t=1.131 & p=0.9405) which was done by unpaired-t test. The total number of participants included over 30 out of which 25 were males and 5 were females. In male subjects the recovery was faster than the female, because mostly female subjects was having fear of pain so they were not co-operate properly to the treatment protocol, but some of them co-operated properly and ready to do further exercise progression.

Commonly there was out of 30 subjects 27 subjects had right side affected and 3 had left side affected.

Intra group analysis of VAS score revealed statistically pain was reduced post interventionally for both the groups. This was done by using paired-t test showed extremely significant difference for group A (p<0.0001) and B(p=0.0001). In some subjects there was increasing the VAS score post interventionally mainly because of extra repetitions, but after some time the pain was reducing when the subject was taking rest or taking cryo therapy.

Statistically it was revealed that AROM was improved in both the groups. This was done by using paired-t test which showed extremely significant difference for group A (P<0.0001)Únd group B (P=0.0001). It was also observed that active range of motion was decreased in almost all the patients when they came to OPD on the second day of their treatment. This could have been due to less exercise, pain or because of any seasonal variation.Normaly the decrease in ROM is observed during winter season, as in winter season muscles and joints tend to become stiffer than normal.T. But when hot moist pack was given for extra 10-15 minutes and then exercises were started it was observed that then the range of motion came to previous day ranges.The statistical analysis revealed that the PROM improved in both the groups. This was done by using paired-t test showed extremely significant difference for group A (P<0.0001) and group B (P=0.0001). In passive range of motion there was same problem like active range of motion. For this range also i was given same treatment and same home exercise advised for better results.

Intra group analysis of LEFS score revealed statistically reduced stiffness and improved functional activities post- interventionally for both the groups. This was done by using paired-t test showed extremely significant difference for group A (P<0.0001) and B (P=0.0001). I was significantly seen the subjects those are not able to do any functional activity it was mainly due to the **decreased range of knee flexion.** In lower

extremity functional scale there was different problems with each subject. Because some subjects were doing few activities given in scale but others were not able to do because of reduced knee flexion range. For these patients who were having reduced knee flexion, different exercises were introduced which showed significant improvement in their knee flexion ROM. These patients were further prescribed with the progressive regime of exercises.

The results from the statistical analysis of the present study supported the alternative hypothesis which started that there will be beneficial effect to the subjects treated with functional rehabilitation with conventional therapy.

Hence, above results showed that group B subjects treated with functional rehabilitation with conventional therapy showed better results in reducing post operative knee stiffness.

Thus it can be stated from above study that physical therapy interventions like functional rehabilitation are more efficacious and cost effective.

CONCLUSION

Based on the results of the present study it can be concluded that the effects of functional rehabilitation with conventional therapy improves functional activities in post operative knee stiffness subjects, as there is a noticeable improvement in post- treatment score than pre-treatment score in group B as compared to group A subjects.

Conflicts of Interest: Nil

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Ethical Clearance: Study was approved by Institutional Ethics Committee of Krishna Institute of Medical Sciences, Karad.

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Associations between the Frequency of Smartphone Use, Psychosocial Aspects and Occupations among Undergraduate Occupational Therapy Students

Daniel Marinho Cezar da Cruz[1], Daniele Bianca Marques[2] , Daniela da Silva Rodrigues[2], Franciele de Sousa Franco[2], Jacqueline Denubila Costa[3], Lays Cléria Batista Campos[3], Taís Quevedo Marcolino[1]

[1]Associate Professor, Department of Occupational Therapy at the Federal University of São Carlos, São Carlos, São Paulo, Brazil, [2]OT by the Federal University of São Carlos, São Carlos, São Paulo, Brazil, [3]OT, Master Student- Departament of Occupational Therapy, Federal University of São Carlos, São Carlos, São Paulo, Brazil

ABSTRACT

Background/aim: Researchers have investigated the use of cell phone and its negative effects on psychosocial aspects of health, such as addition and anxiety. However, there are no records of research related to the impact of cell phone use on occupation. We aimed to describe the frequency of smartphone use in undergraduate occupational therapy students and to correlate the frequency of use with self-reports of psychosocial aspects and the areas of occupation.

Method: An online questionnaire with 30 closed-ended questions was applied. For each psychosocial aspect and occupation category, questions were aimed at calculating the frequency of mobile phone use over the course of a day. Respondents could select from five options using a Likert Scale. The Pearson correlation coefficient was used for statistical analysis.

Results: Seventy-two undergraduate occupational therapy students, aged 18–24 years, participated. The mean time spent using smartphones was 9.1 hours. Increased reports of psychosocial aspects correlated with longer durations of smartphone use during activities of daily living, sleep and rest, and education; all showed moderate positive correlations.

Conclusions*:* The research produced evidence about the impact of smartphone use on the occupations of the occupational therapy students.

Keywords*: cell phones, health occupations student, interpersonal relations, occupations, technology.*

INTRODUCTION

The mobile phone has become an important and integral part of contemporary life[1]. Generation Y (1980–1994), the generation that experienced an explosion of accessible technology, including computers, the internet and mobile phones, is labelled as being "techno-savvy" or "Digital" generation[2,3,4,5]. Students in higher education use mobile phones to support their learning, and are the largest group inclined to make exaggerated use of them[6,7,10] .

Notwithstanding the fact that mobile communication offers a number of advantages, many of them are associated with leisure occupations[11,9] or academic pursuits[6,,7,10], and researchers have evaluated the negative impacts of the use of mobile phones among college students[1,8]. Further, many cell phone users become highly dependent on the device and are extremely reluctant to be without it[8] . This has a negative impact on their use of time, family relations, and financial expenses[10,11,16]. Given the variety of

Corresponding author
Prof. Dr. Daniel Marinho Cezar da Cruz.
Mailing Address: Rodovia Washington Luís, km 235 - SP-310, Federal University of São Carlos, Department of Occupational Therapy, São Carlos, São Paulo, Brazil, CEP 13565-905. Telephone: 55(11) 98583-3356.
E-mail: cruzdmc@gmail.com

symptoms of dependent behaviour, there is no consensus regarding the definition of smartphone dependence or of the problematic results linked to such dependence[12] .Intensive cell phone use also has psychosocial effects, such as impulsiveness, inability or difficulty employing strategies to control cell phone use, and withdrawal symptoms[13,14,20,8,21,12,15,16]

Technology currently shapes our daily occupations and determines expectations about how much can be accomplished, and at what speed[17]. In the field of occupational therapy, this issue has been discussed from two main perspectives: 1) the potential use of smartphone technology for clinical practice with clients[18] and 2) the positive and negative impacts of the use of technology. Apart from some existing research about undergraduate medical students, no research was found with regard to occupational therapy and/or from the occupational therapy perspective. Our research considers the temporal context of activities that contribute toward patterns of daily occupation[17,19], focusing on those activities that are virtual[19].

The aim of this research was to describe the frequency of smartphone use among undergraduate occupational therapy students, and to correlate the frequency of use with self-reported psychosocial influences of smartphone use on activities of daily living (ADL), instrumental activities of daily living (IADLs), education, leisure, rest and sleep.

METHODOLOGY

This was a descriptive, cross-sectional, correlational study.

Sample

Convenience sampling was used, which, is the choice of a sample group with specific characteristics[20]. The sample included undergraduate occupational therapy students at a Public Brazilian Federal University who owned a smartphone. Of the 174 students attending the occupational therapy graduation course at the time, 72 (41%) completed the questionnaire.

Measurement instrument

An online questionnaire with 30 closed-ended questions about the length of time spent using smartphones was created by the researchers. The frequency of use was assessed in the following categories: psychosocial aspects, ADL, IADLs, education, leisure, sleep and rest. For each category, the questions related to the frequency of smartphone use in a day. Respondents had five Likert Scale[21] options to choose from, as per the example in Figure 1.

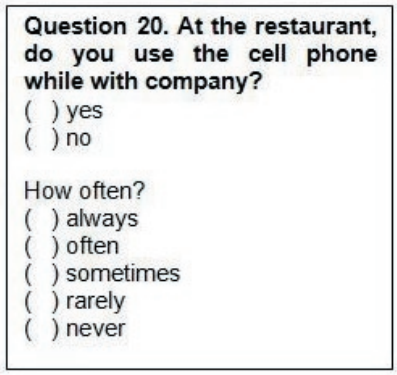

Figure 1. Structure of the questionnaire.

Items relative to the areas of occupations were based on the document "Occupational Therapy practice framework: Domain and process"[19] . The occupation "work" was not considered because the sample included just students.

Procedure

Contact with students was made via e-mail and Facebook, from a message included the objectives of the study and providing the link to the questionnaire. Data were collected within one month.

Data analysis

For each categorie, a sum of points was allocated based on frequency, which allowed scores for each individual variable. We used the Pearson Correlation Coefficient to assess correlations between time spent using a smartphone and daily occupations. The Statistical Package for Social Sciences (SPSS) software version 20.0 was used for all data analysis. Significance (α) was set at 5% .

RESULTS

The majority of participants 94% (n = 68) were female, 75% (n = 54) were 18–24 years old, 63.9% (n = 46) were enrolled in the first half of the course and 33.3% (n = 24) in the second half of the course. The average duration of cell phone use was 9.1 (standard deviation [SD] 4.8) hours per day.

The most used applicatives by students were Whatsapp (97.2%), Facebook (91.7%), email (90.3%). The network most cited by the students was the university wi-fi (86.1%), with 3G being used by 48.6% of participants and 4G by 16.7%.

The questionnaire items related to reported psychosocial aspects and occupations with their respective frequency and percentage are shown in Table 1.

Table 1. Description of emotional and occupational aspects (n=72)

Time-use category	Item	Yes n (%)	No n (%)
Psychosocial aspects	**Feels:**		
	- isolated from society by cell phone use	45 (63.4)	26 (36.6)
	- anxious when not receiving text messages within 5 minutes	68 (94.4)	4 (5.6)
	- distressed if the cell phone is not around	58 (80.6)	14 (9.4)
	- anxious when the cell phone battery is flat	65 (90.3)	7 (9.7)
	Realizes that should use the cell phone less	50 (69.4)	22 (30.6)
Activities of daily living	**Uses the cell phone**:		
	- in the bathroom	50 (69.4)	22 (30.6)
	- while eating	59 (81.9)	13 (18.1)
	- during meals hinders him/her from eating	54 (76.1)	17 (23.9)
	- during meals has already caused some discomfort	28 (41.8)	39 (58.2)
Rest and sleep	**Uses the cell phone**:		
	- as soon as wake up	54 (75)	18 (25)
	- while in bed, before sleeping	70 (97.2)	2 (2.8)
	Wakes up in the night to use the cell phone	10 (13.9)	62 (86.1)
	The cell phone disrupts sleep	25 (34.7)	47 (65.3)
Instrumental activities of daily living.	**Uses the cell phone**:		
	- while crossing the street	29 (40.3)	43 (59.7)
	- while on the bus	70 (97.2)	2 (2.8)
	- to communicate with someone in the same environment	55 (76.4)	17 (23.6)
	- in restaurants when accompanied	48 (66.7)	24 (33.3)
	Has been ignored by someone else who was using the cell phone	71 (98.6)	1 (1.4)
	Feels bothered when someone ignores him/her for using the cell phone	68 (94.4)	4 (5.6)
Leisure	Turns off the phone when is with friends	8 (11.1)	64 (88.9)
	Puts the phone in silent mode when is with friends	50 (69.4)	22 (30.6)
Education	The cell phone use disrupts the organization of studies	56 (77.8)	16 (22.2)
	Uses the cell phone use as an auxiliary device to academic activities	71 (98.6)	1 (1.4)
	Checks the cell phone in classroom	60 (83.3)	12 (16.7)
	The cell phone decreases academic productivity	57 (79.2)	15 (20.8)
	Put the cell phone on silent mode in the classroom	71 (98.6)	1 (1.4)
	Can wait for the end of the class to use the cell phone	33 (45.8)	39 (54.2)

The correlation among the variables demonstrates that the higher the phone usage time, the greater its use while moving around the community and for communication management (Table 2).

Table 2: Correlations between phone usage time and occupations and activities of daily living

	Hygiene and meals	Rest and sleep	Mobility in the community and communication management	Leisure	Study
P-value	0.53	0.19	0.13	0.04	0.22
Corr.	-0.07	-0.15	-0.17	-0.23	0.14
P-value	0.78	0.13	0.005	0.51	0.75
Corr.	0.03	0.17	0.32	-0.07	0.03
P-value	0.007	0.002	0.009	0.11	<0.001
Corr.	0.31	0.36	0.30	0.18	0.40

The higher the frequency of emotional aspects, the greater the use of the cell phone while performing acts of personal hygiene, eating, resting, sleeping, and during study activities. It should be noted that the opposite was true in all cases; a decrease in one value was associated with a decrease in the other.

DISCUSSION

The most used applications were WhatsApp, Facebook, and e-mail, which all require internet access, supporting the idea that there is a high correlation between smartphone and internet use[7,22]. Currently, the Facebook has become an integral part of everyday life for users. A research reported that 96% of surveyed students actively connect to this social network, and that 57% of the students who do not have a cell phone agree that accessing Facebook would be a good reason to buy a smartphone[10].

The wide use of the Wi-Fi network made available by the university can be related to its good infrastructure[7]. However, the use of this resource in the classroom for non-academic purposes is a cause for concern and may negatively affect the performance of this occupational role by the student. Evidences indicates the existence of high levels of anxiety in students who make frequent and excessive use of the Internet and mobile phones[13,14,20] .

The reports of anguish and feelings of anxiety identified when the cell phone is not nearby, when its battery power is low or has run flat, is in accordance with existing evidence indicating a high dependence ratio and reluctance to leave the device behind[8,9,21,15]. Anxiety related to not receiving an answer within a short time period, also identified in our study, may be related to the high levels of urgency experienced by these individuals; hence, they are more likely to show symptoms of dependence on the use of cell phones[16].

The use of cell phones related to the rest and sleep occupation was significant. Such data corroborate existing research findings, which classifying this habit as a strategy for checking tasks/commitments that have been done or to prepare in advance the occupations intended for the next day[21,15] .

Keeping the cell phone on during leisure occupations was also significant in our research, in agreement with the literature that shows a high usage rate during activities such as going to the cinema; hanging out with friends; going to restaurants, shopping malls, and parties[8,9]. With regard to academic activities, 83.3% students reported that they check their cell phones during class, 54.2% are unable to wait until the end of the class to use the device and Most students even recognized that such use reduces academic productivity (79.2%). Furthermore, 69.4% of participants felt they should use the cell phone less frequently. This shows that students have become aware of the harmful effects of excessive use of the device. However, they face difficulties in solving this problem. In contrast, almost all students (98.1%) stated that the cell phone was used as an auxiliary tool and a facilitator of academic activities, especially for those students in the initial years of the university course, similar to previous study findings[10] .

The low usage costs of smartphones, the wide range of special services available, and the ease of use of mobile learning resources can influence the high rate of use of smartphones for academic purposes[7] . The preference for using the internet as a primary learning resource is a feature of Generation Y[2,3,4,5,6] . The cell phone with internet access can be a powerful learning tool, demanding an educational process linked to its use, in an assertive and healthy way[6] .

This study presents as limitations the fact that it did not reach strong linear correlations between the variables, as well as the absence of standardized instruments to evaluate anxiety or emotional problems.

CONCLUSION AND RECOMMENDATIONS

This research provides evidence about the impact of smartphone use in the occupations of occupational therapy students; most impacts are negative. The results showed the relationships between time spent on daily occupations and frequency of cell phone use in the areas of mobility in the community and communication management, hygiene and meals, rest and sleep, and study. Further, impacts on psychosocial aspects were self-reported by the students.

The smartphone was positively evaluated as an auxiliary tool and facilitator of academic activities. This has potential for future research in order to investigate associations between cell phone usage and its interference in occupations, using standardized evaluation tools, and qualitative approaches that can understand in detail the use of cell phones in different occupations, assessing both positive and negative aspects and its effect on health.

Declaration of Conflicting Interest: None declared.

Research ethics: The study was approved by the Ethics Committee on Human Beings Research of the Federal University of São Carlos (Process Number 1.723.357).

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An essential journal for all Physiotherapists & Occupational therapists provides professionals with a forum in which to discuss today's challenges-identifying the philosophical and conceptural foundations of the practice; sharing innovative evaluation and treatment techniques; learning about and assimilating new methodologies developing in related professions; and communicating information about new practice settings. The journal serves as a valuable tool for helping therapists deal effectively with the challenges of the field. It emphasizes articles and reports that are directly relevant to practice. The journal is internationally indexed and is also covered by Index Copernicus (Poland).

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Editor : Dr. R.K. Sharma, Mobile: + 91 9971888542, Fax No: +91 11 3044 6500