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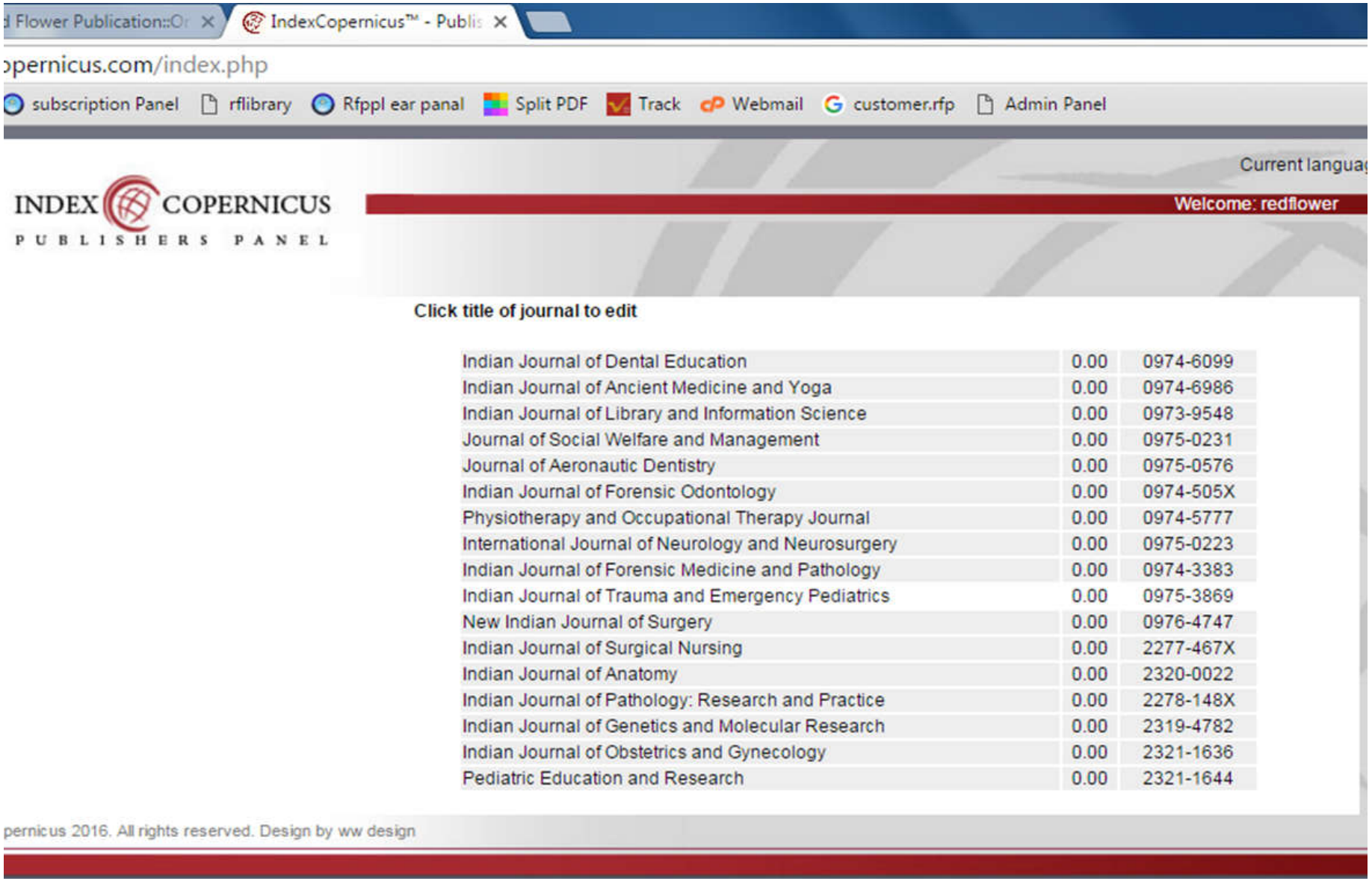

Original Article

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Effect of Mirror Therapy in Improving Hand Function in Subacute Stroke Patients

Charu Chopra*, Daksha Davey Mehta*, Savita Tamaria*

Abstract

Aims and Objective: The purpose of the study was to find out the effect of mirror box therapy in improving hand function in stroke patients. *Method:* Fifteen stroke patients were recruited in the study, all within 12 months after the stroke. The patients underwent thirty minutes of mirror therapy program a day in addition to 50 minutes of conventional stroke rehabilitation program, 5 days a week, for 4 weeks. The assessment was done pre intervention and post-intervention using Upper limb score of Fugl Meyer Test. *Results:* Fugl Meyer Assessment mean score of the Group (pre intervention: 21.53, post intervention 40.26). *Conclusion:* Mirror therapy is effective in improving hand function in stroke patients.

Keywords: Mirror Therapy; Hand Function; Stroke.

Introduction

Stroke is the leading cause of serious long-term disability in adults [1,2]. The high incidence and high prevalence of stroke have a major impact on society [3]. Treatment of upper extremity of people with hemiplegia continues to be a challenge [4]. Several methods of exercise therapy for the rehabilitation of stroke patient are in common use today [5]. Mirror therapy have been used in therapy for stroke and hemiparesis [1,6-9], complex regional pain syndrome [10,11], following fractures [10,11], and brain tumour [10,13], and experimentally for the control of pain from a real stimulus [10]. This study focuses on mirror therapy for improving hand function in stroke patients.

Methodology

A sample of convenience of 15 patients (males- 8 and females- 7) with first episode of unilateral stroke confined to territory of middle cerebral artery with hemiparesis during the previous 12 months [1,6,7], with no severe cognitive disorders [1,6,13], Brunnstorm score between stages I and IV for the upper extremity [6] having age between 50 - 65 years [15] were included in the study. Patients with previous strokes, major hemorrhagic changes, increased intracranial pressure, hemicraniectomy or orthopedic, rheumatologic, or other diseases interfering with their ability to sit or to move upper limb [7], Patients with unilateral neglect, apraxia [7] and severe psychiatric disorders such as major depression [16] were excluded from the study.

Procedure

An informed consent was taken from the subjects and detailed explanation of the procedure was given. The patients underwent 30 minutes of mirror therapy program [6,13] a day in addition to 50 minutes of conventional stroke rehabilitation program, 5 days a week, for 4 weeks [6,13,14,17]. The study was conducted at Banarsidas Chandiwala Institute of Physiotherapy. The assessment was done pre intervention and post-intervention using Upper limb score of Fugl Meyer Test [7,13]. The FMA uses a 3-point ordinal scale to assess the level of sensorimotor function in the affected UE. We used only the UE motor function items. The maximum total motor score is 66, with higher scores indicating better motor recovery.

Results

On comparing Fugl Meyer Assessment mean scores pre and post intervention of the group (pre

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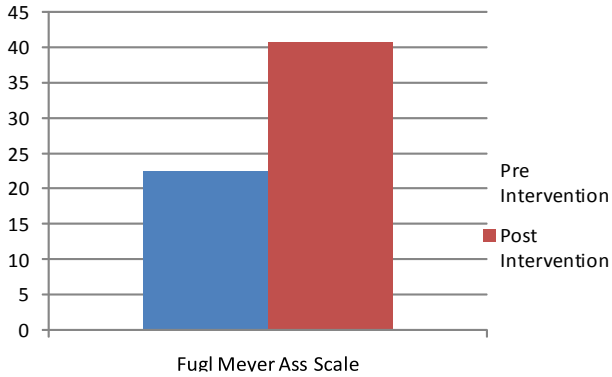
intervention: 21.53, post intervention 40.26) it was found that there was post intervention improvement in Group.



Discussion

The results show that all the patients performed better on Fugl Meyer scale post intervention.

Several underlying mechanisms for the effect of mirror therapy on motor recovery after stroke have been proposed. It is thought that Mirror therapy uses mirror visual feedback which increases neural activity in areas involved with allocation of attention and cognitive control (dorsolateral prefrontal cortex, post cingulated cortex, S1 & S2 precuneus).

There is also little evidence that mirror visual feedback activates the mirror neuron system. Mirror visual feedback increases the excitability of the ipsilateral primary motor cortex that projects to the untrained hand/ arm. There is also evidence for ipsilateral projections from the contra lateral M1 to the untrained/ affected hand as a consequence of training with mirror visual feedback. It has been shown that functional organization of the motor system, including the primary motor cortex, can be modulated by both ipsilateral limb movement and passive observation of movement of movement of the contra lateral limb.

Altschuler et al which suggested that the mirror illusion of a normal movement of the affected hand help to recruit the premotor cortex and assisting rehabilitation through an intimate connection between visual input and premotor areas; mirror neuron system , bilateral arm training [11].

Ching-Yi Wu et al support the results of this study by showing that mirror therapy can be effective in stroke patients since it is believed that these positive results post intervention could have been because of cortical reorganization. MT could provide "proper visual input" and, perhaps, "substitutes" for absent or reduced proprioceptive input from the affected body side. MT might also facilitate self-awareness and spatial attention by activating the superior temporal gyrus, precuneus, and the posterior cingulate cortex. Consequently, the experience during MT might help recruit the premotor cortex or balance the neural activation within the primary motor cortex toward the affected hemisphere to facilitate motor improvements. The visual illusion input of the mirror reflection in MT might especially activate the damaged hemisphere. All the possible explanation points out towards the effectiveness of mirror therapy in improving hand function in subacute stroke patients.

In country like India, where the follow up of the patient and treatment cost bearing capacity of the patient is quite difficult, a therapy like Mirror Therapy is recommended since it is cost effective and easy to carry.

Conclusion

The results revealed that mirror therapy helps in improving hand function in stroke patients.

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Chair Stretch Technique for Hamstring Flexibility in Office Workers

Davinder Kumar Gaur*, Savita Tamaria*, Sumit Kalra*, Nidhi Kalra*

Abstract

Hamstring flexibility has been a matter of concern for all age groups in society. Tight hamstrings are associated with back pain and many other clinical conditions. The reason is that tight hamstrings restricts the hip flexion during forward bending as a result compensatory movements are produced due to which spinal joints have to compensate & produce movement. Apart from low back pain, ergonomically long hours of sitting at work place, is also one of the common causes of tight hamstrings in general population. *Methodology:* 40 office workers were included in the study. Range of motion at hip joint by SLR test was measured just prior & immediately after the hamstring stretching in chair stretch position. 18-25 years male and female individuals working with minimum 6 hours of sitting job were assigned in to group A; chair stretch and group B; warm up. *Results:* Group A & Group B showed no significant difference (t=0.884, p=0.05) at the starting of experiment however after stretching was given in group A and control group B was given warm up, a significant difference (t=5.56, p=0.05*) was found between the two groups, as chair stretch group showed more significant improvement in range of motion. *Conclusion:* The study observed that chair stretch was found to be effective in office workers in increasing hamstring flexibility.

Keywords: Chair Stretch; Hamstring Muscle; Flexibility.

Introduction

Flexibility term has been defined in many ways depending on discipline or nature of research however the word has been derived from the Latin *flectereor flexibilis* means ability to bend. In physical education, sports medicine & allied health sciences the simplest meaning of flexibility is Range of Motion available in a joint or group of joints [1]. McGill in 1998 has recommended that sufficient knee & hip flexibility is imperative to spare spine excessive motion during tasks of daily activity [2]. Commonly used clinical tool to measure human body flexibility is sit and reach test which evaluates hamstrings and spinal muscles flexibility at hip, knee and spine.

The Hamstring muscle group consists of the Biceps Femoris, semimembranosus and the Semitendinosus, and posterior part of adductor magnus forming the bulk of the posterior thigh muscles. One of their major characteristics is that they cross two major joints, the hip and the knee. The hamstring muscles are the major flexors of the knee and also aid hip extension.

Tight hamstrings are associated with back pain. The reason is that tight hamstrings restricts the hip flexion during forward bending as a result compensatory movements are produced due to which spinal joints have to compensate & produce movement. This forces the lower back to bend beyond its strong middle range [3].

Apart from these causes, even sitting in the same place for longer hours, such as in office, is also one of the common causes of tight hamstrings in general people. While sitting, the hamstrings do not function and hence are inactive and stay at a shortened length. Persistent long hours of sitting work can increase the risk of hamstring tightness. Also people with sedentary lifestyle may suffer from this condition as it decreases the activity of muscles, while daily activities requires both hip flexion with knee extension such as dressing, therefore predisposing to risk of lower back pain [4]. Due to the location of

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the hamstring muscles, originating from the ischial tuberosities, poor hamstring flexibility may restrict anterior pelvic rotation. This in turn could limit Forward bending range unless compensated for by an increase in lumbar flexion. Large amounts of lumbar flexion on a repeated basis could be a factor in the development of Low Back Pain (LBP). A relationship between hamstring flexibility and limited hip motion has been demonstrated in LBP patients [5]. It was therefore proposed to investigate if such a relationship is also seen in asymptomatic individuals. This may provide reasoning for theories regarding the direction of the causal relationship between hamstring flexibility and hip motion as it excludes pathological factors, such as sciatic nerve tension [6]. Esola et al [5]. in 1996 found the latter part of the forward bending motion occurs mainly at the hips, with a 2:1 ratio of lumbar spine to hip motion between 0°-30°, building to a 1:2 ratio between 60°-90°. Therefore the present study may be more representative of the full pelvic rotation seen during forward bending. This means it is likely that hamstring is most influential when approaching the end of pelvic rotation range. This concurs with the flexion-relaxation phenomenon, whereby at the end of forward bending range hamstring muscle activity is seen to suddenly decrease and the final degrees of motion are passive[7]. The results presented suggest hamstring flexibility influences forward bending in healthy individuals.

Li et al. [8] 1999 found a three week program of daily hamstring stretching lead to an increase in hamstring flexibility. Improved hip motion during forward bending was also seen following the program, which further supports the influential nature of the hamstrings on this movement. A stretching program focusing on the hamstrings may decrease the forces through the hips and lumbar spine.

Hence the above literature indicate towards the role of hamstrings length and the need of its stretching in general population. Effect of prolong stretching has been well documented whereas short term & immediate effect of hamstring stretching has lesser studies in their support. Few studies have been performed investigating the effect of Static stretches less than 30 seconds i.e a short static stretching bout on maximal power output of hamstring muscle. According to Kay and Blazevich's 2011 systematic review, stretching bouts under 30 seconds result in no significant disadvantageous effects on power [9]. In research studies the term "static stretching" has been linked to durations of a single stretch cycle ranging from as few as 5 seconds to 5 minutes per repetition when either a manual stretch or self stretching procedure is employed. If a mechanical stretch provides the static stretch, the time frame can range from almost an hour to several days or weeks [10].

Also commonest static stretching method applied clinically was found to be 90-90 knee extension in supine position (passive) or forward bending in long sitting position (active). Both the positions are difficult to approach in office settings due to their type & place of work however the chair stretching method for hamstring flexibility may be easier to apply. There are two basic ways static stretching can be performed: active or passive.

Active stretching occurs when the individual uses his/her own muscles to hold the stretching position. Active stretching is more beneficial in the development of active flexibility. In passive stretching, an external force holds the static stretching position for the individual. This external force can be an object or a person. Passive stretching eliminates the need for the opposing muscle to contract while stretching. In active static stretching reciprocal inhibition is applied so the opposing muscle groups are contracted whereas in passive static stretching both the antagonist and agonist muscles may be relaxed through the stretch [11].

For example, the quadriceps can be actively stretched by the contraction of the hamstrings to flex the knee. Flexion refers to the movement allowed by some joints of the skeleton that decreases the angle between 2 adjoining bones while extension indicates the motion that increases the angle [11]. The quadriceps are passively stretched by flexing the knee using a chair or object or pulling one's ankle toward their buttocks. This allows both agonist and antagonist muscle to relax while stretching. Passive stretching is preferred when the elasticity of the muscles and connective tissues restrict flexibility and is commonly performed in rehabilitation settings. Since the muscles are in a relaxed state, there is an increased risk of muscle soreness if stretching is performed too aggressively. Active stretching may be more beneficial in improving ROM.

Therefore in view of above findings and recommendations it was hypothesized that active stretch in the form of 'Chair stretch' could be effective in enhancing hamstring flexibility in office workers having long duration sitting work.

Methodology

40 subjects fulfilling inclusion and exclusion

criteria were included in the study from delhi region. A written informed consent was obtained from the patient prior to the study for both the groups, ROM at hip joint by SLR test was measured just prior & immediately after the interventions using full circle goniometer. Selection criteria included normal 18-25 years male and female individuals working with minimum 6 hours of sitting job (full or part time) with hip flexion and ankle dorsiflexion measured within normal range using goniometer. Subjects were evenly assigned to one of the two groups by using a random numbers table. Group A; experimental group had 20 subject which were given static Chair stretch [12] only. The subject was in sitting position at the edge of a treatment table, with the leg to be stretched on the table and the opposite foot on the floor. Then the subject was asked to lean the trunk forward toward the thigh, keeping the back extended so there is motion only at the hip joint. The static stretch was maintained for 30 seconds. This sequence was repeated 3 times with 10-second rest intervals between each stretch (Figure 4).

A Universal goniometer (Figure 1) was used to measure range of motion at hip joint in SLR before & after the hamstring stretching in group A [13]. Subject was placed in the supine position, with both knees extended and hips in 0 degrees of flexion, extension, abduction, adduction and rotation. The knee of the lower extremity being tested was held in full extension. The other lower extremity was kept flat on the examining table to stabilize the pelvis and prevent excessive amounts of posterior pelvic tilt and lumbar flexion (Figure 2). The hip was flexed by lifting the lower extremity off the table. The knee was kept in full extension by applying firm pressure to the anterior thigh. The end of the testing motion occurs when resistance is felt from tension in the posterior thigh and further flexion of the hip causes knee flexion, posterior pelvic tilt, or lumbar flexion. The fulcrum of the goniometer was placed over the lateral aspect of the hip joint, using the greater trochanter of the femur for reference. The proximal arm was aligned with the lateral midline of the pelvis and the distal arm was aligned with the lateral midline of the femur, using the lateral epicondyle for reference (Figure 3).

Group B; control group had 20 subjects and they were made to do warm up exercises including brisk walking 10 minutes and general movements of lower limb such as knee extension (with no hold in end range) for 5min in sitting position on chair. A Universal goniometer was used to measure range of motion at hip joint in SLR before & after the warm-up protocol given in group A. All readings before & after in chair stretch group or control group were recorded three times and average was calculated for record purpose for all subjects.

Results

Comparison of age of subjects between Group A (mean=21.05 SD=2.04) and Group B (mean=20.95 SD=2.06) showed no significant difference. On statistical analysis using One way ANOVA at 95% confidence interval F-value was found to be 25.53 with p-value 0.05 & standard error 5.34. Hence the value varied significantly among the two groups.

Comparison between Pre and Post Values of ROM at Hip Joint in the Group A & B

Group	Total no of patients	Pre intervention mean ± standard deviation	Post intervention mean ± standard deviation	df= 19	t-Test value	p=level of significance
A	20	54.20 ± 5.92	66.70 ± 11.68	19	4.28	0.05*
B	20	54.45 ± 5.92	55.43 ± 5.23	19	0.57	0.25^{NS}

*significant at p<0.05, NS – Not Significant, df – degree of freedom

Group B showed no significant difference (t=0.57 p=0.25) before & after the warm up was given however after stretching was given in group A significant difference (t=4.28, p<0.05) was found in hip ROM. Therefore result of the study signified that chair stretch was found to be effective in increasing hip ROM in office workers.

Comparison of ROM at Hip Joint between the Group A & B Post Intervention

Groups	Total no of patients	Post intervention mean ± standard deviation
A	20	66.70 ± 11.68
B	20	55.43 ± 5.23
t-Test value (p=level of significance)	df=38	t= 5.56 p<0.05*

*significant at p<0.05, df – degree of freedom

Group A & Group B showed no significant difference (t=0.884, p=0.5) at the starting of experiment however after stretching was given in group A and control group was given warm up significant difference (t=5.56, p<0.05) was found between the two groups in hip ROM. Chair stretch group showed significantly higher increase in hip ROM. Therefore results of the study signified that chair stretch was found to be effective in increasing hamstring flexibility in office workers.

Fig. 1: Goniometer

Fig. 2: Measurement of Hip ROM (initial position)

Fig. 3: Measurement of Hip ROM (final position)

Fig. 4: Static Stretch

Discussion

Many people suffer with tight hamstrings. Hamstring injuries are one of the most common musculotendinous injuries in the lower extremity. They occur primarily during high-speed or high intensity exercises and have a high rate of recurrence. Worrel et al [14] stated that a ''lack of hamstring flexibility was the single most important characteristic of hamstring injuries in athletes.'' Static stretching is one of the safest and most commonly performed stretching methods used to increase muscle length [15]. This type of stretch is applied slowly and gradually at a relatively constant force to avoid eliciting a stretch reflex [16]. The resultant increase in muscle length is related to visco-elastic behavior that has been demonstrated with in vitro and in vivo experiments [17]. In the present study, chair stretch group showed significant improvement in hamstring flexibility when compared to control group.

The results of this study agree with other studies that a static stretch is effective in increasing hamstring length [18]. This study also showed that with warm up exercises, no significant change was obtained in hamstring length.

Conclusion

Static stretching is effective in immediately improving hamstring flexibility with a single session of 3 repetition of 30 second in office workers.

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Role of Vestibular Adaptation Exercises on Motion Sickness

Anshika Singh*, Sanjai Kumar, Raj Kumar Meena*****

Abstract

Objective: The study was done to find the effects of the vestibular adaption exercises on the motion sickness. *Methods:* The study was done on 25 subjects with the signs and symptoms of motion sickness while travelling in a bus, car or train, selected according to the inclusion and exclusion criteria and carried out in the O.P.D. of physiotherapy at CSS Hospital, Meerut. The score were measured before the application of the vestibular adaptation exercises and just after completion of vestibular adaption exercises for Total Duration of 40 min per session, Twice a day (40 + 40 min= 80 min every day) per week, for 12 weeks. The mean standard deviation (S.D) and standard error (S.E) are being calculated to perform the entire statistical data. The "t" test was used for analysis and the significant difference was calculated from the statistical data. *Results:* The 't' test result shows that the difference between 0-4 week is less significant as the 't' value is 2.20, and the difference between 4-8 week is significant as the 't' value is 2.46, while the difference between week 4-8 & week 8-12 is significant as the 't' value is 2.47. After comparing the pre-experimental and post- experimental data I saw that the vestibular adaption exercises have the very significant value on motion sickness. Therefore, vestibular adaption exercises can be safely used to decrease the motion sickness.

Keywords: Vestibular Adaption Exercise; Motion Sickness; Vestibular Rehabilitation Therapy.

Introduction

Motion sickness is also known as travel sickness, is a condition in which a disagreement exists between visually perceived movement and the vestibular system's sense of movement. Depending on the cause it can also be referred to as car sickness, bus sickness or train sickness [1]. Dizziness, fatigue, and nausea are the most common symptoms of motion sickness [2]. If the motion causing nausea is not resolved, the sufferer will frequently vomit. Unlike ordinary sickness, vomiting in motion sickness tends not to relieve the nausea. About 33% of people are susceptible to motion sickness even in mild circumstances such as being on a boat in calm water, although nearly 66% of people are susceptible in more conditions [3]. Individuals and animals without a functional vestibular system are immune to motion sickness [4].

The restrictive definition (e.g., onset of vomiting, nausea) and lack of clear diagnostic testing may result in false negative identification and an underestimation of the incidence of motion sickness [5]. If current theories of motion sickness are correct then the principles of habituation that have been applied with varying success to reduce or prevent motion sickness in pilots and astronauts [6] might be applicable to the development of evaluation and treatment methods for individuals with motion sickness that interferes with daily function.

Motion is sensed by the brain through three different pathways of the nervous system that send signals coming from the inner ear (sensing motion, acceleration, and gravity), the eyes (vision), and the deeper tissues of the body surface (proprioceptors). When the body is moved intentionally, for example, when we walk, the input from all three pathways is coordinated by our brain. When there is unintentional movement of the body, as occurs during motion when driving in a car, the brain is not coordinating the input, and there is thought to be in-coordination or conflict among the inputs from the

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three pathways. It is hypothesized that the conflict among the inputs is responsible for motion sickness. Many of the drugs that are used to treat motion sickness act by influencing or affecting the levels of these compounds within the brain. Without the motion-sensing organs of the inner ear, motion sickness does not occur, suggesting that the inner ear is critical for the development of motion sickness. Visual input seems to be of lesser importance, since blind people can develop motion sickness. Motion sickness is more likely to occur with complex types of movement, especially movement that is slow or involves two different directions (for example, vertical and horizontal) at the same time.

Sudden jerky movements tend to be worse for provoking motion sickness than slower smooth ones, because they disrupt the fluid balance more. Motion sickness is greatest for vertical sinusoidal motion in the frequency range of 0.05- 0.08 Hz and is maximal at 0.167 Hz [7]. The most common hypothesis for the cause of motion sickness is that it functions as a defense mechanism against neurotoxins [8].

Vestibular Rehablitaton Therapy

Vestibular Rehabilitation Therapy (VRT) is a form of physical therapy that uses specialized exercises that result in gaze and gait stabilization. Most VRT exercises involve head movement, and head movements are essential in stimulating and retraining the vestibular system. Vestibular rehabilitation therapy has been a highly effective modality for most adults and children with disorder of the vestibular or central balance system. The basis for the success of VRT is the use of existing neural mechanisms in the human brain for adaptation, plasticity and compensation. The extent of vestibular compensation and adaptation is closely related to the direction, duration, frequency, magnitude and nature of the retraining stimulus. Our inner ear controls our sense of balance. The delicate bones and organs of the inner ear are known as the vestibular system. If something goes wrong with this system due to illness or injury, we may find our self dizzy, nauseous and unable to balance properly. Vestibular adaptation exercises strive to train our body to compensate and regain our sense of balance. A trained therapist will work to learn exercises to compensate for particular condition [9].

Vestibular System

The vestibular system is the system of balance. It is also involved in the function of maintaining visual fixation during head movement and in maintaining posture and lower muscular control. An understanding of the anatomy and physiology of the normal vestibular system is the first step in being able to understand the symptoms, physical exam findings, and testing results during disease states.

The vestibular system is made of five sensory organs on each side of the head embedded in the petrous portion of the temporal bone. There are the superior, posterior, and lateral semicircular canals as wells as the utricle and saccule [10].

Statement of Study

Does the vestibular adaptation exercises effects on motion sickness?

Aims and Objectives

To investigate the effect of vestibular adaptation exercises on motion sickness.

Materials and Methods

- Questionnaire
- Stationary
- Inches tape
- Stop watch
- Target
- Chair/Stool
- Statistical tests

Vestibular Adaptation Exercises

There are numerous exercises but the most popular exercises are:

1. Head fixed, object fixed & eye balls moving.
2. Head fixed, object & eye balls moving.
3. Head moving, object fixed && eye balls moving.
4. Head, object & eye balls moving.

Hypothesis

Experimental Hypothesis

The Vestibular adaptation exercises decreases the motion sickness.

Null Hypothesis

The Vestibular adaptation exercises does not effect on motion sickness.

Significance

1. This research should be able to give concrete baseline information regarding the effects of vestibular adaptation exercises on motion sickness and its modification for therapeutic intervention.
2. The result of this study would be widely applied in clinics as well as in hospitals.
3. This research would upgrade the professional skills and show the path for future research.

Limitation of Study

1. Small sample size.
2. Short duration.

Sample

Convenient sample of 25 subjects with the signs and symptoms of motion sickness while travelling in a bus, car or train, according to the inclusion and exclusion criteria, were include in the study. The study was conducted in the O.P.D. of Physiotherapy at CSS Hospital and Jai Physiotherapy and Dental Clinic, SF-06, Ansal Galleria, Ansal Town, Meerut.

Variables

Dependent variable: Motion sickness.

Independent variable: Vestibular adaptation exercises.

Inclusion Criteria

- Age between 17 – 25 years.
- Presence of signs and symptoms of motion sickness.
- Normal subjects without any pathology.

Exclusion Criteria

- Individuals on medications for motion sickness.
- Individuals with any kind of central or peripheral vestibular pathologies.
- Subjects who are suffering from any kind of injury, fracture or any other pathology.

Protocol

After getting their informed consent, the protocol of the vestibular adaption exercises was told to them.

Vestibular Adaptation Exercises

1. Rising while focused

   INTENSITY: 5 repetitions / 30 seconds.

   Total= 20 repetitions.

   2 minutes break after every 5 repetitions.

   DURATION: 10 min
2. Moving head while focused

   INTENSITY: 5 repetitions / 30 seconds.

   Total= 20 repetitions.

   2 minutes break after every 5 repetitions.

   DURATION: 10 min.
3. Focus on moving target

   INTENSITY: 5 repetitions / 30 seconds.

   Total= 20 repetitions.

   2 minutes break after every 5 repetitions.

   DURATION: 10 min.
4. Move with moving target

   INTENSITY: 5 repetitions / 30 seconds.

   Total= 20 repetitions.

   2 minutes break after every 5 repetitions.

   DURATION: 10 min.

Total Duration

40 min per session, twice a day (40 + 40 min), = 80 min every day, per week for 12 weeks.

Time of Scoring

All the scoring of data was recorded prior to the commencement of the treatment and after every week till 12 weeks by using a motion sickness severity questionnaire.

Procedure

Rising While Focused

Sitting in a chair, focus on a stable object across the room, 5 to 10 feet away. Keeping your focus on this object, stand up. Repeat this exercise as prescribed and remain balanced. Then practice sitting and standing with your eyes closed.

Moving Head While Focused

Focus your gaze on a bright object about 5-feet away. This could be a picture on the wall or a target

printed on a piece of paper and tacked to the wall. Keep your eyes focused on this object while you turn your head from side to side, slowly at first, then more rapidly.

Focus on Moving Target

This time, you remain still but follow the movement of a target with your eyes. The direction of the target's movement will vary, from side to side to up and down and diagonal.

Move with Moving Target

While focused on a target, you'll be asked to move your head in the opposite direction of the target, while keeping your eyes locked to the target. You may also be asked to move in the same direction as the target [11].

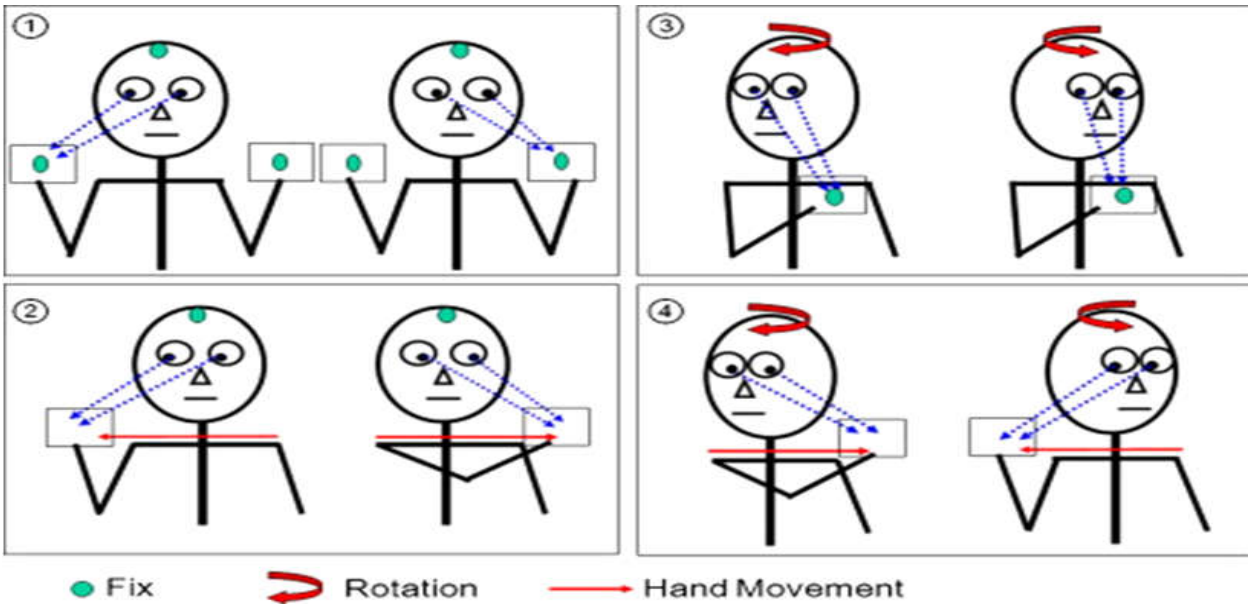


Fig. 1: Diagram of vestibular adaptation exercises

Data Analysis

The effect of vestibular adaptation exercises was recorded on motion sickness susceptibility questionnaire on 1st ,2nd , 3rd ,4th , 5th , 6th ,7th , 8th, 9th , 10th , 11th and 12th week and were compared with the readings which was taken prior to the treatment.

The mean standard deviation (S.D) and standard error (S.E) are being calculated to perform the entire statistical data. The "t" test was used for analysis and the significant difference was calculated from the statistical data.

Formula

1. Mean – It is denoted by and is given by $\bar{X}$

$\bar{X}$= Sum of all the observations / Total no. of observations

$$\sum_{i=1}^{n} xi = \bar{x}$$

2. Standard Deviation(S.D) – It is denoted by (sigma) and is given by

$$\delta = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(xi \quad \bar{x})}$$

3. Standard Error of Mean (S.E.M)

$$S.E.M = \delta/\sqrt{n}$$

4. Paired't' test: It is used to test the significant difference between pre and post observational study for the same sample.

$$t = \bar{d}/S.D/\sqrt{n}$$

$H_{0=}$ (Null Hypothesis)

No significant difference is observed between pre and post observation.

$$t = \bar{d}/S.D/\sqrt{n} \quad \sim t_{(n-1)} d.f., \propto$$

Where $\bar{d}$= mean difference between pre and post observations.

S.D = Standard Deviation of difference

n = Sample size

If – $t_{calculated} > t_{(n-1, \alpha)}$ then the null hypothesis (H_0) is rejected at α% level of significance.

[α=0.05 or 0.01]

Results

Table 1: Effect of Vestibular Adaptation Exercises on Motion sickness on week 0-4

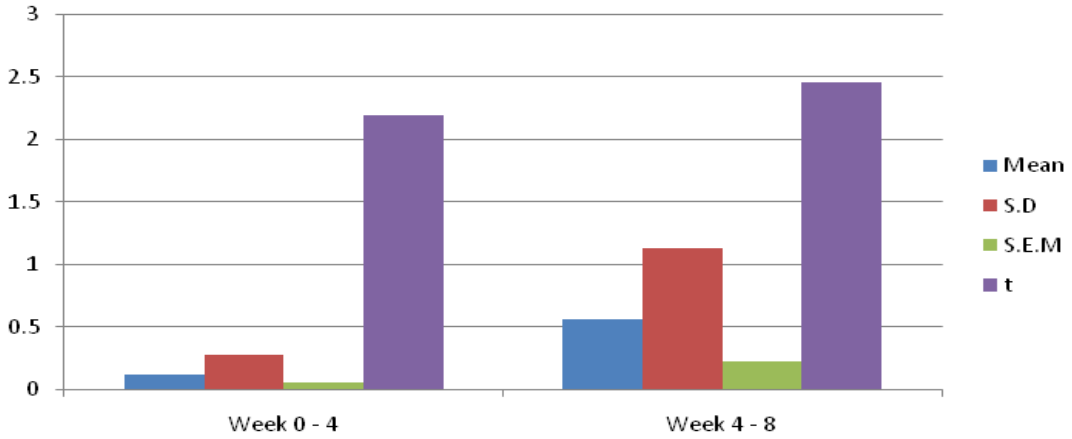
Effect of Vestibular Adaptation Exercises				
Improvement	**Mean**	**S.D**	**S.E.M**	**T**
Week 0 – 4	0.12	0.27	0.05	2.20

The't' test result shows that the difference between weeks 0-4 is less significant as the't' value is 2.20

Table 2: Comparison of Effect of Vestibular Adaptation Exercises on Motion sickness on week 0-4 and week 4-8

Effect of Vestibular Adaptation Exercises				
Relative Improvement	**Mean**	**S.D**	**S.E.M**	**T**
Week 0 – 4	0.12	0.27	0.05	2.20
Week 4 – 8	0.56	1.13	0.22	2.46

The't' test result shows that the difference between week 4-8 is significant as the 't' value is 2.46

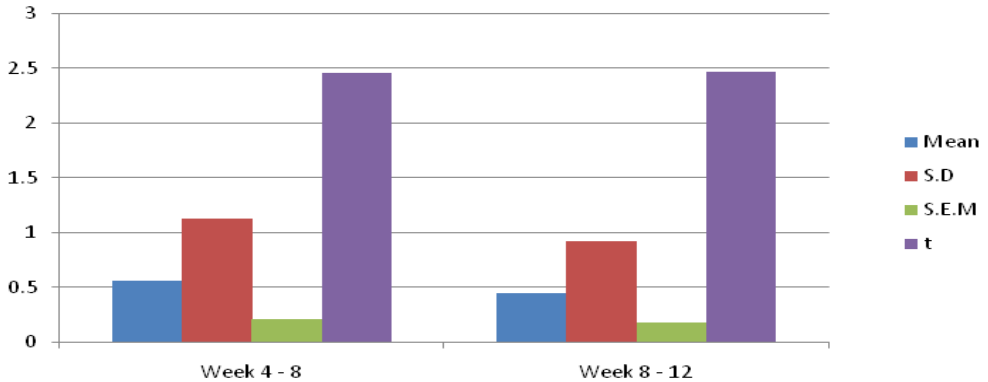


Graph 2: Comparison of MSSQ Scores from 0 – 4 weeks and 4 – 8 weeks

Table 3: Comparison of Effect of Vestibular Adaptation Exercises on Motion sickness on week 4-8 & week 8-12

Effect of Vestibular Adaptation Exercises				
Relative Improvement	**Mean**	**S.D**	**S.E.M**	**T**
Week 4 – 8	0.56	1.13	0.22	2.46
Week 8 – 12	0.45	0.92	0.18	2.47

The't' test result shows that the difference between week 4-8 & week 8-12 is significant as the 't' value is 2.47.

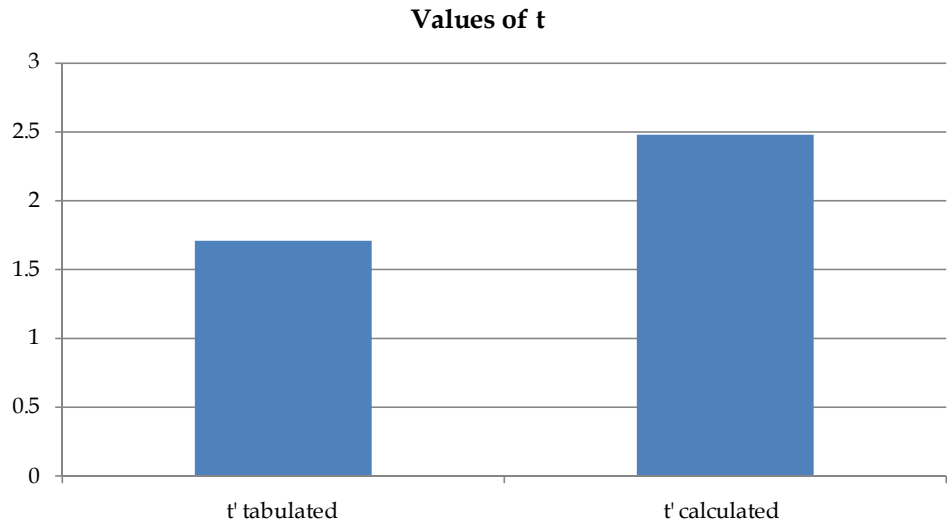


Graph 3: Comparison of MSSQ Scores from 4 – 8 weeks and 8 – 12 weeks

Table 4: Effect of Vestibular Adaptation Exercises on Motion sickness on week 0-12

Effect of Vestibular Adaptation Exercises				
Improvement	**Mean**	**S.D**	**S.E.M**	**T**
Week 0 - 12	1.14	2.29	0.45	2.48

The 't'test result shows that the difference between week 0-12 is significant as the 't' value is 2.48.
The above result shows that a significant difference is present between the readings of week 0 and week 12.



Graph 4: Comparison of 't'calculated and't' tabulated values

The value of $t_{calculated}$=2.48 is greater than value of $t_{24,0.05}$ = 1.711. So the null hypothesis (H_o) is rejected and the experimental hypothesis (H_1) is accepted.

In this study 25 subjects were included between 17-25 years of age, who were suffering from the sign and symptoms of the motion sickness. The score were measured before the application of the vestibular adaptation exercises and just after completion of vestibular adaption exercises for Total Duration of 40 min per session, Twice a day (40 + 40 min= 80 min per day) per week, for 12 weeks. The mean standard deviation (S.D) and standard error (S.E) are being calculated to perform the entire statistical data. The "t" test was used for analysis and the significant difference was calculated from the statistical data. The above all tables and graphs result shows that the 't' test difference between 0-4 week is less significant as the 't' value is 2.20, and the difference between 4-8 week is significant as the 't' value is 2.46, while the difference between week 4-8 & week 8-12 is significant as the 't' value is 2.47.After comparing the pre-experimental and post-experimental data we saw that the vestibular adaption exercises have the very significant value on motion sickness. Therefore, vestibular adaption exercises can be safely used to decrease the motion sickness.

Discussion

This study has shown that the effect of vestibular adaptation exercises on motion sickness. The vestibular adaptation exercises are most commonly used in the clinical and hospital settings and we intended to check their effects on motion sickness. This study has revealed that the methods which used in the study decrease the susceptibility to motion sickness which has led to improvement in the subjects.

A few researchers have done work where they have attempted to reduce signs and symptoms of motion sickness by giving vestibular adaptation exercises. An article by Rose Mary Rine, Michael Schubert and Thomas J Balkany describes physical therapy for motion sickness in a 34 year old woman. The purpose of the study was to describe the evaluation and treatment of a patient with motion sickness. The patient initially had moderate to severe visually induced motion sickness, which affected her function abilities. Following 10 weeks of a primary home based program of vestibular rehabilitation and balance training, her symptoms were decreased and she could resume all work-related activities[7].

The values of the motion sickness susceptibility questionnaire clearly shows that the vestibular adaptation exercises effectively reduce signs and symptoms of motion sickness. Therefore, vestibular adaption exercises can be safely used to reduce signs and symptoms of motion sickness in clinical and hospital settings and also for the home based programs.

Future Research

It is recommended that the future studies would be challenging if:-

1. The study is done for longer duration.
2. The advance regime of the vestibular adaptation exercises can also be included effectively which

can be useful in maintaining the interest of the subject in the activity.

3. The study can be done in the other age group.
4. The study can be done with the different group of gender.
5. The study can be done with other symptomatic subjects.
6. The number of subjects will be more, then the better conclusion can be made regarding the effectiveness of the treatment protocol.

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Comparison of Lower Limb and Trunk Muscle Strength Training on Balance in Elderly Population

Savita Tamaria*, Davinder K. Gaur*, Nidhi Kalra*, Sumit Kalra*

Abstract

Aging refers to the time sequential detoriation that occurs in most animals including weakness, increased susceptibility to disease and adverse environment conditions, loss of mobility and agility and age related physiological changes.Balance and muscle force deteriorate with aging, and it has been suggested that a decrease in the ability to generate force in the lower extremity muscles contributes to balance impairment. balance impairments are also associated with poorer mobility measures in elderly population. *Sample A* group of 24 elderly subjects of age between 60-80 years were included in the study. Subjects are divided into two groups 12 in each group (Group A no. = 12), (Group B no. = 12). Group A (Lower limb muscle strength training) *Group B* (Trunk muscle strength training was given. *Conclusion:* Based on the result of present study, it can be concluded that there is no significant change in lower limb and trunk muscle strength training on balance in elderly population. Thus, the null hypothesis, that there is no difference in lower limb and trunk muscle strength training on balance in elderly population holds true.

Keywords: Lower Limb Muscle Strengthening; Trunk Muscle strengthening; Elderly Population.

Introduction

Aging refers to the time sequential detoriation that occurs in most animals including weakness, increased susceptibility to disease and adverse environment conditions, loss of mobility and agility and age related physiological changes [1].

For the frail elderly, falls and fractures constitute a major health problem.The cost for healthcare involved is substantial, and there is also great social and personal suffering involved. The injuries and their complications may even be a threat to life in old age. previous studies have shown that falls occur mainly during walking, and if the fall occurs while turning,there is a particularly high risk of hip fracture. During walking, there is a considerable multisensory load upon the individual. it is obvious that there are complex mechanism involved in walking and balance control [2].

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Poor balance in older persons increases the risk of injurious falls during daily activities [3]. It is probable that balance declines in the elderly due to age-related degeneration, potentially aggravated by infections and injuries which can affect the sensory, motor and adaptive components of balance function. Mild changes in any one system may not lead to significant disturbances of control, but if there is a combination of these factors then there may be severe balance deficits [4]. Studies in young people show that muscle fatigue in the lower limbs increases postural sway, that fatiguing postural back muscles impairs head and trunk control while walking, and that quadriceps muscle fatigue alters gait parameters related to slip propensity [5].

Balance and muscle force deteriorate with aging,and it has been suggested that a decrease in the ability to generate force in the lower extremity muscles contributes to balance impairment. balance impairments are also associated with poorer mobility measures in elderly population [1].

Good trunk stability is essential for balance and extremity use during daily functional activities and higher level tasks. Dynamic stability of the trunk requires adequate flexibility, muscle strength, neural control, and proprioception [8].

The functional reach test was designed to measure

the limits of stability in an anterior direction. The maximal distance that subjects can reach forward horizontally while maintaining a fixed base of support is measured [10].

Aim of this Study is to Analyze the Effectiveness of

1. Lower limb strengthening on balance in elderly people.
2. Trunk muscle strengthening on balance in elderly people.
3. Compare the effect of lower limb strengthening with trunk muscle strengthening on balance in elderly.

Methodology

Sample

A group of 24 elderly subjects of age between 60-80 years were included in the study. Subjects are divided into two groups 12 in each group (Group A no. = 12), (Group B no. = 12).

The subjects for this study were taken from O.P.D of Banarsidas Chandiwala Institute of physiotherapy.

Inclusion Criteria

1. Age group of 60-80 years.
2. Both male and female geriatric subjects.
3. Elderly with score less than 10 inches on functional reach measure.
4. No known neurological symptoms which affects balance.

Exclusion Criteria

1. Subjects with cardio – respiratory symptoms which will hinder strength training.
2. Subjects with Musculoskeletal / Neurological problem of lower limb or spine (Apart from age related changes).
3. Uncooperative patients.

Instrumentation

1. Strain gauge
2. Plinth
3. Yard stick
4. Chair
5. Velcro

Protocol

Group A – Lower Limb Muscle Strength Training

Before strength training program proper warm up was given for a period of 5 minutes in the form of free exercise.

The following exercise were given for 30 minutes each day, 6 days in a week for duration of 20 days.

Hip Flexion

POP – Supine with knee extended. Pelvis is stabilize and the opposite hip and knee are flexed. Patient lift the leg to above 45 degree of hip flexion. Hold the leg in that position for a count of 10 second and then lower it and repeats.

Isometrics to Quadriceps

POP – Supine with knee extended. Towel roll is placed under the knee. Patient is then pushes the knee down against the towel roll into the ground . patient holds that position for 10 second and repeats.

Isometrics to Hamstring

POP – Supine with knee extended. Towel roll is placed under the heel, patient then pushes the heel down against the towel roll. Holds the position for 10 second and repeat it.

Step Up Exercise

Patient begins with the step of 2 to 3 inches in height. Patient step up sideways, forward and backward. Patient places the foot on step and the body is lifted with smooth motion.

Standing on Uneven Surface, Patient stand with bilateral support on wobble board with single plane weight shifting forward, backward and side to side.

Knee Extension Exercise

POP – High sitting, with the knee at edge of the treatment table and flexed as far as possible. Patient relax and actively flex the knee to the end of the range and hold in the same position for 10 seconds and repeats the same.

Ankle Dorsiflexion

POP – Sitting with knee extended. Patient strongly dorsiflex the feet, keeping the toes relaxed. Holds the position for 10 seconds and repeats.

Hip Extension Exercise

POP – Prone lying with knee extended. Patient lifts the extremity away from the table. Hold the extremity in the same position for the 10 seconds and repeats.

Hip Abduction Exercises

POP– Side lying. Patient flexes the other extremity and lifts the another extremity away from the table and holds for 10 seconds and repeats.

Group B – Trunk Muscle Strength Training

Before strength training program proper warm up was given for a period of 5 minutes in the form of free exercise and stretching. The following exercise were given for 30 min each day,6 days in a week for duration of 20 days.

Pelvic Bridging

POP – Hook – Lying Position.

Patient press the upper back and feet into the mat elevate the pelvis and extend the hips. Patient hold the position for 10 seconds and relaxes and repeats.

Abdominal Curls

POP – Crook Lying

Patient lifts the head, progress by lifting the shoulders until the scapula and thorax clear the mat, keeping the arm horizontal.

Seated Back Extension

POP – Sitting Upright on the Ball with the Feet on the Floor.

Wall Sqauts with Ball

Patient lower the trunk by flexing the hips and knees with back rolling a gym ball down the wall.

Procedure

The Purpose of the study was explained to the subject. The subjects were encouraged to participate in the study. Subjects were taken into the study only if they met inclusion criteria. A baseline assessment of the subjects in both the groups was done prior to the study and demographic data was collected which includes name, age group 60-80 for both the sexes. Following the completion of all baseline assessment. All the subjects were evaluated before commencement of training and at the end of the 20th day by FRT and strain gauge for the evaluation of muscle strength. The exercises were given for 30 min each day, 6 days in a week for duration of 20 days. Subjects are divided into two groups, 12 in each group. Group A for lower limb strength training and Group B for trunk muscle strength training.

Table 1: Comparison of Pre and Post test outcome variables of Group A

S. No	Variables	Muscle Strength			
		PRE		POST	
		Mean	S.D	Mean	S.D
1	Hip flexor	6.67	0.7	7.35	0.61
2	Hip extensor	6.55	0.32	7.4	0.36
3	Knee flexor	5.96	0.85	6.70	0.88
4	Knee extensor	6.47	0.58	7.32	0.52
5	Ankle dorsiflexor	2.33	0.23	2.97	0.18

FRT			
PRE		POST	
Mean	S.D	Mean	S.D
8.04	0.81	8.3	0.8

Table 1.2: Comparison of Pre and Post test outcome variables of Group B

S. No	Variables	Pre		Post	
		Mean	S.D	Mean	S.D
1	Trunk flexor	6.23	0.35	6.78	0.39
2	Trunk extensor	6.65	0.43	7.15	0.42

FRT			
PRE		POST	
Mean	S.D	Mean	S.D
7.90	0.93	8.35	0.89

Table 1.3: Comparison of FRT outcomes between Group A and Group B

	FRT			
	PRE		POST	
	Mean	S.D	Mean	S.D
GroupA	8.04	0.81	8.3	0.8
GroupB	7.90	0.93	8.35	0.89

Discussion

Present study which compares the Functional Reach Test after lower limb muscle strengthening with that of trunk muscle strengthening in elderly people. The hypothesis that one group would gain more improvement in functional reach as compared to other group cannot be accepted on the basis of finding in this study, our primary finding was Lower Limb and Trunk Muscles Strengthening results in improvement in Functional Reach in elderly population. It appears from the result of study that strengthening of muscle group in trunk and lower limb had very similar improvements in the Functional Reach Test.

It has been well established that aging is associated with a loss in muscle strength. Muscle strength is lost not only in radial muscle i.e lower limb muscle but also to the trunk muscles or core muscles of body, making balance difficult. There are also deficits in neurological, vestibular and visual system. It is a combination of the two and the resulting lack of reflex coordination that leads to the loss of balance and poor gait in older individuals. This loss in reflex ability as well as muscle strength in lower limb and trunk muscle reduces functional ability of people over 60 years of age.

The resistance training is recognized as beneficial for the health, the most appropriate technique is still controversial. It is well established that progressive resisted exercises in elderly people produces the strength that results from the increased motor unit activation of trained muscles and hyper-trophy of muscle fibers. This is supported by previous study done by Laidlaw DH [18] strength training improves the steadiness of slow lengthening contractions performed by older adults.

According to them Maximum voluntary contraction increase in heavy load muscles. These improvements were associated with reduced level of muscle activation especially during the lengthening contractions. Frontera WR et al [19], conducted that strengths gain in older adults were associated with muscles hyper-trophy and an increase in myofibrillar protein turn over.

Daubney et al [20], found that the distal muscle force measure may be able to contribute to the prediction of functional balance scores. According to them, Ankle dorsiflexors and hip extensor forces were lower in subjects reporting falls and force of ankle dorsiflexor predicts fall status.

Deepak Kumar [21], concluded that age is negatively related to balance performance and with muscle force production. The torque production of hip extensors and knee extensors can serve to predict balance performance on certain scales and have significant contribution in maintenance of older adults.

Nelson SE [22], support the result of lower limb that the progressive strengthening of the lower limb muscles and upper limb muscles will lead to improved Functional Reach Test measure and timed get up and go test in the elderly population who are at risk of falls. The results in trunk muscle group shows that their is significant improvement in muscle strength in both the muscle groups and significant improvement in functional reach measure and dynamic balance in elderly people who got trunk muscle strengthening.

According to Goldberg A [23], controlling the flexing trunk is critical in recovery from a loss of balance and avoiding falls. The trunk repositioning error is more in balance impaired group in older individuals as compared to normal people.

A study done by Jerrold S, Petrofsky [24] supports the results obtained from the present study that the strengthening of core muscles i.e. rectus abdominis, transverus abdominis and back extensors muscles will lead to the improvement in the functional reach in all the three directions i.e. forward reach , right and left reach in elderly populations of age group more than 65 years.

Although no significant difference were noted in the clinical outcome between the trunk muscle and lower limb muscle strengthening groups in this study.

Conclusion

Based on the result of present study, it can be concluded that there is no significant change in lower limb and trunk muscle strength training on

balance in elderly population.

Conflict of Interest: Nil

Source of Funding: self

Ethical Clearance: it was approved by ethical committee

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A Comparative Study on the Effect of Mulligan's Technique (SNAG's) Versus Deep Transverse Friction Massage on Patient with Mechanical Neck Pain

Sumit Raghav*, Shefali Pushp, Raj Kumar Meena***, Anshika Singh***

Abstract

Objective: The study was done to find out the difference between the effect of two manual therapies i.e., SNAG's and DTFM, on patients with mechanical neck pain. *Method:* The study was of an experimental design, with 30 subjects, 12 were female, 18 were male, and all subjects were assigned into two groups, 15 subjects in each, according to criteria (inclusion & exclusion) and carried out at physiotherapy OPD of CSS Hospital. In both groups, disability & pain were assessed by using the NDI & NBQ score respectively. The collected data were of men and standard deviation of NDI & NBQ score and has been analyzed using SPSS software. Paired T-test was used to find the difference between two groups. *Results:* The results showed that there was significant difference in pain and disability with their NDI and NBQ score (p=0.000).

Keywords: Mechanical Neck Pain; SNAG's (Sustained Natural Apophyseal Glides); DTFM (Deep Transverse Friction Massage); NDI (Neck Disability Index) & NBQ (Neck Bournemouth Questionnaire).

Introduction

Neck pain in particular is considered to be a major health problem in modern societies. Neck pain is a very common problem with two-thirds of population having neck pain at some point in their lives. It is also increasing in intensity, frequency and severity of episodes. As people are increasingly sedentary in nature, live fast-paced and sedentary lives, they place more stress and strain on the upper back and neck regions of their spines [1].

Neck pain is a common complaint in the general population with the lifetime prevalence of approximately 50% [2]. Most patients who present with neck pain symptoms fit into the category of mechanical neck pain, having postural or mechanical basis.[3]Aetiological factors include poor posture, neck strain or occupational or sporting activities, anxiety, depression, but are often multifactorial and poorly understood. Its exact pathology remains obscure, but the source of symptoms has been asserted to involve mechanical dysfunction of the cervical spine, particularly the zygapophysial joints [4].

Neck pain is a common source of disability in the general population. Around 67% of adults will have neck pain sometimes during their life time [5]. Causes of neck pain are varied most causes are believed to be due to sprain or strain in the muscles and soft tissues of the neck. Mechanical neck pain is probably due to minor strains and sprains and is often associated with poor postures [6]. Mechanical neck pain refers to pain that has been present for less than 3 months. It does not refer to the severity or quality of pain [7]. Some studies have shown that altered muscle activation and reduced neck muscle strength is a well-known feature of neck pain, which presents with increased levels of disability [8].

SNAGs are the acronym for "Sustained natural apophyseal glides" and are the useful as a treatment of cervical, thoracic and lumbar spine. It is a specific type of spinal mobilization technique applied over the joints. It was developed by Brian R Mulligan and is currently used in clinical practice. It is a specific technique for loss of joint movement, pain associated with movement and pain associated with specific activity. As this technique is sustained at the end of available pain-free range and still follow the plane of the apophyseal joints under treatment [9].

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It is a specific type of connective tissue massage applied precisely to the soft tissue structure such as tendons. It was developed by empirical way by James Cyriax and is currently used in rehabilitative practices**.** The transverse, or Cyriax, method of deep friction massage is increasingly being used in sports medicine [10].

Aims and Objective

To compare the effectiveness of Mulligan's Technique (SNAGs) versus Deep Transverse Friction Massage for reducing pain and disability on patient with mechanical neck pain.

Materials and Method

Bournemouth Questionnaire

A lot of questionnaires which concentrate on pain and disability in patients with low back pain and neck pain already existed. However, since other dimensions are also involved with musculoskeletal pain, the BQ was developed. The development was based on the dimensions of the ICF, which means that, next to the pain and disability, it also takes the affective and cognitive aspects of neck pain and low back pain in account. Both versions of the questionnaire consist of seven core items, which are: pain intensity, function in activities of daily living, function in social activities, anxiety, depression levels, fear avoidance behavior and locus of control behavior. The only difference between the questionnaire for low back pain and the Neck BQ is the subscript in the item 'activities of daily living'. The items "walking", "climbing stairs" and "getting in/out of bed", described in the Back BQ, where modified to "lifting", "reading" and "driving" in the Neck BQ. Both the questionnaires are used in the same way. The questionnaires exist of 7 questions which contain the different dimensions of the ICF. Each item is rated on a numeric rating scale (NRS) from 0 to 10. A total score on 70 can be calculated, in which a higher score reflects more complains [11].

Neck Disability Index

The NDI has become a standard instrument for measuring self-rated disability due to neck pain and is used by clinicians and researchers alike.

Each of the 10 items is scored from 0-5. The maximum score is therefore 50. The obtained score can be multiplied by 2 to produce a percentage score. Occasionally, a respondent will not complete one question or another. The average of all other items is then added to the completed items.

The original report provided scoring intervals for interpretation, as follows:

0 - 4 = no disability

5 - 14 = mild

15 - 24 = moderate

25 - 34 = severe

Above 34 = complete.

It is recommended that the NDI be used at baseline and for every 2 weeks thereafter within the treatment program to measure progress. As noted above, at least a 5-point change is required to be clinically meaningful. Patients often do not score the items as zero, once they are in treatment. In other words, it is common to find that patients will continue to score between 5 - 15 despite having made excellent recovery (i.e., they may be back to work). The practitioner should avoid the trap of "treating till zero", as this is not supportable based on current evidence [12].

Hypothesis

Experimental Hypothesis

There is significant difference between Mulligan's Technique (SNAG's) and Deep Transverse Friction Massage to reduce pain and disability in mechanical neck pain.

Null Hypothesis

There is no significant difference between Mulligan's Technique (SNAG's) and deep transverse friction massage to reduce pain and disability in mechanical neck pain.

Limitation of Study

Small Sample Size

The duration of study is so small.

Research is done only among a particular age group. It could have taken on large groups.

Only pain and disability recovery was considered.

Variables

Dependent Variable: BQ score and NDI score

This study is an experimental design in nature, a comparative study.

Sample Selection: Convenient sample of 30 subjects, according to the inclusion and exclusion criteria, randomly assigned into two groups include in the study. This study was conducted in physiotherapy OPD of CSS Hospital Subharti University Meerut.

Inclusion Criteria

1. Age 25-35 year
2. Gender both male and female
3. History of pain less than 2 months
4. Muscles spasm
5. Neck disability index more than 10%
6. Bournemouth questionnaire score for neck pain more than 3.

Exclusion Criteria

1. Age not above 35 year
2. History of any trauma to cervical spine
3. Rheumatoid arthritis
4. Degenerative disorder
5. Sign of spinal cord compression
6. Vertigo/Dizziness
7. Ankylosing spondylitis
8. Tumors
9. Vertibrobasilar insufficiency symptoms
10. Any pathology around shoulder region such as Periarthritis, Bursitis, Tendinitis.
11. Cervicogenic Headache
12. Congenital and Acquired deformity i.e Torticolis, Scoliosis, Kyphosis
13. Whiplash Injury

Tools Used in Study

1. Couch
2. Talcum
3. Cotton
4. Towel
5. Gel

Protocol

After getting their informed consent the subjects were randomly assigned into two groups. Both of two groups i.e. group A and group B have 15 patients in each. SNAGs with moist heat pack and ultrasound therapy was given to group A subjects. It was given to the patient with duration of 3 sets of 6 repetition/ session. Deep Transverse Friction Massage was given to the patients with moist heat pack and ultrasound therapy. It was given to the patient with duration of 15 minutes/session for 2-3 days in a week.

- Moist heat pack was given to the both group of patient for 10 minutes(before SNAGS and Deep Transverse Friction Massage)to reduce pain and muscle spasm and to help improve tissue extensibility.
- Ultrasound therapy was also given to the both group of patient for 8 minutes with a frequency of 1MHz by direct method in a pulse mode 1:1 with an intensity of 0.7-0.9w/cm2.
- Patients attended physiotherapy session for 6 days a week for 3 weeks.

Data Analysis

All analysis was obtained using SPSS version 13.0 (For window 7). Demo graphic data of the patients including age and gender were summarized. The dependent variables for the statistical analysis were BQ and NDI. A base line data was taken at the beginning of the study **(**pre test values) and after the completion of the treatment (post test values) to analyze the difference between the two treatment groups; independent t-test was used. A level of 0.05 was used to determine the statistical significance.

Table 1: Mean, standard deviation & s.e.m. for b.q. scores in group a& group b

S. No.	Time Periods	Group 1 (Mean±S.D.)	S.E.M.	Group 2 (Mean±S.D.)	S.E.M.
1	At 1 St Day	4.1373±.6925	.1785	4.1447±.5940	.1526
2	At 21 St Day	1.8007±.9578	.2469	1.8447±.8637	.2226

Table 2: Mean, standard deviation & s.e.m. for n.d.i. score in group a& group b

S. No.	Time Periods	Group 1 (Mean±S.D.)	S.E.M.	Group 2 (Mean±S.D.)	S.E.M.
1	At 1 St Day	.256±.0718	.0185	.26±.0875	.0226
2	At 21 St Day	.076±.0241	.0062	.0827±.0446	.0115

Table 3: Mean, standard deviation for the difference (1st – 21stday)

S. No.	Time- Difference	Group 1 (Mean±S.D.) (Difference)	Group 2 (Mean±S.D.) (Difference)
1	(1-21) Day B.Q. Score	2.3367 ±.7050	2.3±.6141
2	(1-21) Day N.D.I. Score	.18±.0641	.1773±.0645

Table 4: Comparasion B/W (1st – 21stdays) In B.Q.Scores & N.D.I. Scores (By Paired "T" Test) In Group A & Group B

S. No.	Type of Scores	Group **1 (P-**Value)	Group **2 (**P-Value**)**
1	B.Q. SCORE	.0000 (p<.05), significant	.0000 (p<.05) ,significant
2	NDI SCORE	.0000 (p<.05), significant	.0000 (p<.05), significant

*p<.05 shows a significant difference at á=.05 level of significance

Table 5: % improvemennt b/w (1st – 21stdays) in b.q. scores & n.d.i. scores in group 1 & group 2

S. No.	Type of Scores	Group 1	Group 2	Difference In % B/W The Groups
1	B.Q. Score	56.48%	70.31%	13.83%
2	N.D.I. Score	55.49%	68.19%	12.7%

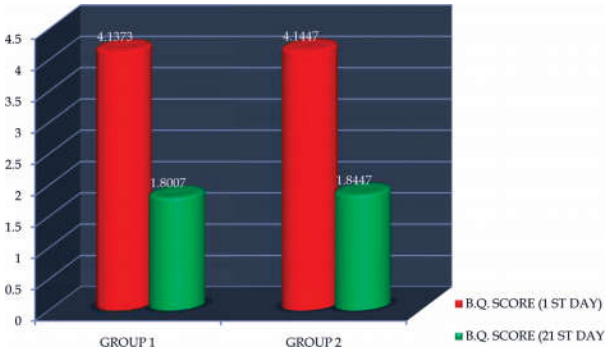

Fig. 1: The Bar chart of average values of B.Q. scores at 1st & 21 st day in two groups

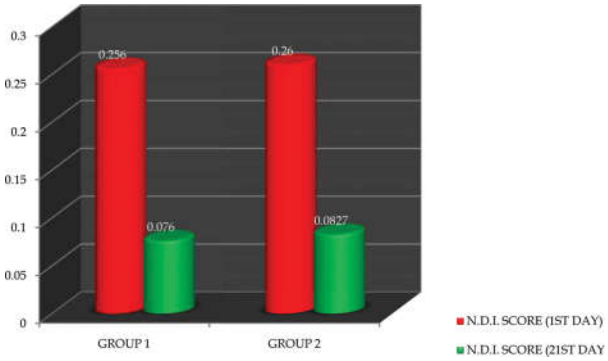

Fig. 2: The Bar chart of average values of N.D.I. scores at 1st & 21 st day in two groups

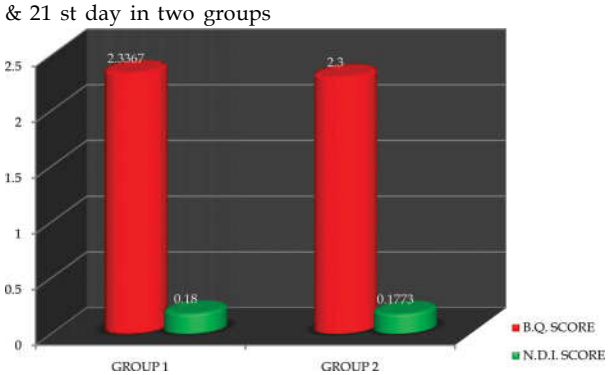

Fig. 3: The Bar chart of average difference b/w (1st- 21 st day) for B.Q. score & N.D.I. score in two groups

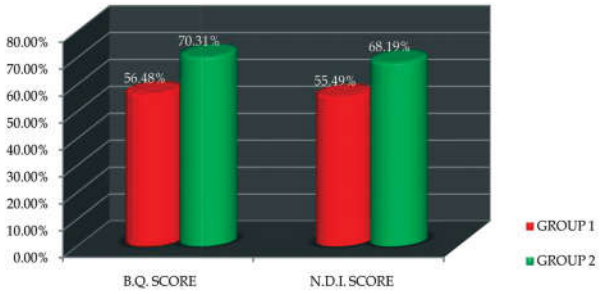

Fig. 5: The Percentage difference from (1st -21 st)day in two groups for B.Q. score & N.D.I.score

Result

A sample of size 30 (15 in SNAGs group & 15 in Deep Transverse Friction Massage group) was studied individually for BQ and NDI score at base line 1st and 21st day respectively. Table 1 presents the Mean & S.D. and standard error of Mean of SNAGs group and Deep Transverse Friction Massage group for Pre BQ and NDI score and Post BQ and NDI score respectively.

The Paired 't' test was applied to find the significant difference between Pre and Post –BQ and NDI score in SNAGs group and Deep Transverse Friction Massage group respectively, which shows a significant difference in both the groups separately at 5% level of significance (P<.05).(Table 4)

Further the BQ score increased in group B by (13.8%) in comparison to NDI score (12.7%). We can conclude that BQ score was better than NDI score. (Table 5)

Above set feature shows that Deep Transverse Friction Massage and SNAGs for the both type of score i.e. BQ and NDI. Further BQ score was better (1.13%) than NDI score for 15 patient study. The

average difference from 1st to 21st day in BQ and NDI score in shown.(Table 3) for both groups/ therapies which shows that group B, Deep Transverse Friction Massage therapy reduced pain and disability higher in comparison to SNAGs.

Discussion

The findings of this study indicated that subjects in both the groups had significant decrease in pain and disability. However, out of the two groups, the group receiving deep transverse friction massage had more improvement in both pain and disability. The reported success of deep transverse friction massage in the present study is supported by previously published trials. Lucie Brossea's et al compared the effectiveness of deep transverse friction massage, control or other treatment in managing neck pain symptoms. They concluded that deep transverse friction massage produced the more effective results in improving outcomes. A randomized controlled trial was conducted to evaluate whether is more effective than control or other treatment. The participants having age more than 18 year suffering from sub-acute and chronic neck pain divided into two groups. One group received transverse friction massage and other group received control or other treatment. The study was able to demonstrate that massage intervention is more effective for relieving for neck pain symptoms [13].

Conclusion

The study shows that the parameters utilized for the technique maneuvers were effective for improving pain and disability. Study supports experimental hypothesis H1.The significant difference was present between two types of therapies for BQ score as well as NDI score.

After seeing the data and graph, group B shows more significant improvement to reduce pain and disability. Therefore, Deep Transverse Friction Massage may be incorporated into the treatment regimen of the patient undergoing physiotherapy for the pain and disability in cervical region of spine.

Study conclude that the difference from 1st to 21st day in BQ and NDI which shown in (Table 3) for both groups/therapies which shows that group B i.e. Deep Transverse Friction Massage therapy reduced pain and disability higher in comparison to SNAGs.

Recommendation

1. NDI and BQ can be used as primary outcome to measure range of motion (ROM) of the neck movement for further study.
2. The comparison between Sustained Natural Apophyseal Glides and Deep Transverse Friction Massage techniques on other joints of spinal regions would be done for further study.
3. The comparison between Sustained Natural Apophyseal Glides and circular Friction Massage techniques would be done for further study.
4. MMT can be used as primary outcome to measure the strength of a neck muscles for further study.

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Musculoskeletal Pain among School and University Female Teachers

Singh Meenakshi*, Sharma Bindu**

Absract

Background and Introduction: Musculoskeletal pain is a known consequence of repetitive strain, overuse, and work-related musculoskeletal disorders. These injuries include a variety of disorders that cause pain in bones, joints, muscles, or surrounding structures. Despite increases in women's labour force participation, gender differences in work-related health conditions have received little research attention. The study was designed to give an estimation of the proportion of female teachers with chronic pain who appear to be seriously handicapped by their pain on one moment and the extent to which pain can lead to disability, to loss of working days, to premature incapacity, or to unnecessary medical treatment. *Methodology*: A sample size of 70 out of which 35 teachers from school and 35 from university In the age group of 25-45yrs were included in the study. Other criteria for inclusion were chronic musculoskeletal pain in knee, back, shoulders, neck; BMI - normal (18- 24.9); Pain due to exertion, ergonomics or overuse; job duration > 5yrs. Musculoskeletal pain assessed using Nordic pain questionnaire Whereas the disability was assessed using patient specific functional scale. *Results*: The results indicated that there is a negative correlation between the intensity of pain and disability among school as well as among the university female teachers. (r= -1.99) *Discussion*: The study concluded that there is a negative correlation between the intensity of pain and disability at work among school and university female teachers and there is a high prevalence of disability among the high school teachers due to the musculoskeletal pain as compared to the middle school and the university female teachers.

Keywords: Musculoskeletal Pain; Disability; Work Related Health Disorder.

Background & Introduction

Musculoskeletal pain is a known consequence of repetitive strain, overuse, and work-related musculoskeletal disorders. These injuries include a variety of disorders that cause pain in bones, joints, muscles, or surrounding structures. Low back pain is the most common example of chronic musculoskeletal pain. Employed women are at an increased risk for upper limb musculoskeletal disorders and this may tell us the way work and family life shape health. Musculoskeletal pain from overuse affects 33% of adults and accounts for 29% of lost workdays due to illness [1].

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Employed women are at an increased risk for upper limb musculoskeletal disorders and this may tell us the way work and family life shape health. The gender difference in symptom severity was explained by risk factors at work (repetitive work, poor ergonomic equipment), and at home (having less opportunity to relax and exercise outside of work). Changes in the nature of work mean that more and more employees, especially women, use computers for significant parts of their workday. The sex-segregation of women into sedentary, repetitive and routine work, and the persisting gender imbalance in domestic work are interlinking factors that explain gender differences in musculoskeletal disorders [1].

Musculoskeletal pain from overuse affects 33% of adults and accounts for 29% of lost workdays due to illness.Low back pain is most prevalent and most common work-related injury in Western society and it is the most costly work-related musculoskeletal disorder.While incidence rates for overexertion injury due to lifting are 1.3 times greater in males, rates are

higher in females for the following conditions: 3.0 times greater for carpal tunnel syndrome, 2.3 times greater for tendonitis, and 2.0 times greater for injuries caused by repetitive motion.The economic burden of musculoskeletal pain is second only to that of cardiovascular disease [1].

Pengying yue et al.(2012) observed that NSP and LBP are common among teachers. There were strong associations with different individual, ergonomic, and occupational factors [13].

De zwart BC et al.(1997) observed that Middle aged and younger employees develop musculoskeletal complaints as a result of exposure to heavy physical work. In the oldest age group health related selection seems to mask the occupational health risks under study. To prevent the expected increase in musculoskeletal disorders and related work disability in our aging workforce, preventive measures should be taken at all stages of a working life [14].

Patience N.eric et al.(2011) observed that Overall, this study suggests that school teachers are at a high risk of MSD. Further research, preferably longitudinal, is required to more thoroughly investigate the issue of MSD among teachers, with a greater emphasis on the possible wider use of ergonomic principles. This would represent a major step forward in the prevention of MSD among teachers, especially if easy to implement control measures could be recommended [15].

Ko matsudaira et al.(2013) observed that Workaholism is significantly associated with poor psychological health, disabling back pain, and sickness absence, particularly from mental health problems. Therefore, workaholism must be considered when addressing well-being of workers [16].

Despite increases in women's labour force participation, gender differences in work-related health conditions have received little research attention. This appears be the first study to examine why employed women are much more likely than men to experience upper body musculoskeletal disorders.

The aim of the study was to study musculoskeletal pain among school and university female teachers, to compare the pain among the two groups and to correlate the intensity of pain and disability

Methodology

Study Design

A cross sectional study to assess musculoskeletal pain disorders among school and university female teachers in Delhi and NCR region.

Questionnaires were translated in English. Some linguistic modifications of questions were made to avoid confusion about questions to make it easier for better understanding and interpretation of the participant. A written informed consent was obtained from the participants after explaining objectives of the study to them.

Study Population and Sample

Total sample of 70 out of which 35 teachers from school and 35 from university were included.

Place of Data Collection

schools and university in Delhi and NCR region.

Inclusion criteria-

1. Symptoms of chronic non specific musculoskeletal pain in knee, back, shoulders, neck for last 2-5 years.
2. Subjects aged b/w 25 to 45yrs.
3. BMI - normal (18- 24.9)
4. Job duration > 5yrs

Exclusion Criteria

1. Pain as a consequence of a defined disease such as cancer and RA
2. Any neurological pain.
3. Surgery in last 6 months.

Questionnaire used

Nordic musculoskeletal pain questionnaire and patient specific functional scale.

Procedure

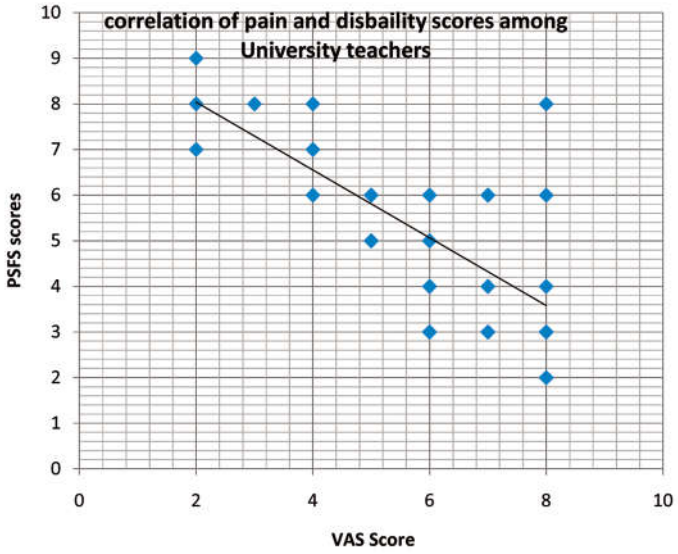
Teachers from school as well as university was selected as per the systematic randomized sampling. Total 70 teachers were selected as per the inclusion criteria. The objective and the significance of the study were explained .Musculoskeletal pain was assessed using Nordic pain questionnaire. Whereas the disability was assessed using patient specific functional scale. The data was recorded in the assessment sheet and data collection form and tabulated for analysis.

Results

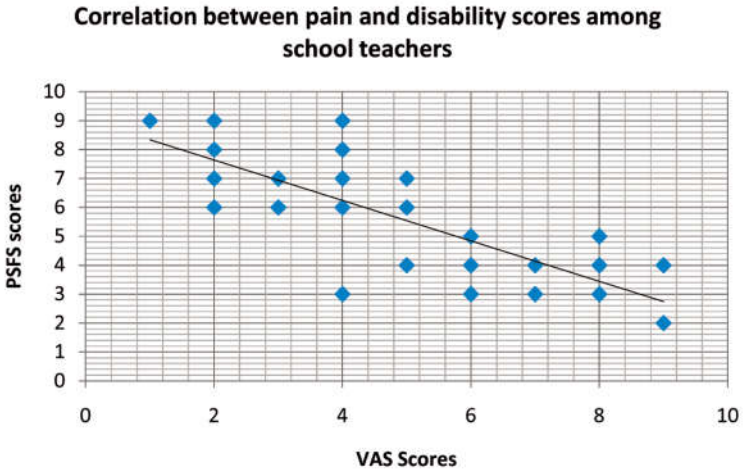
The results indicated that there is a negative

correlation between the intensity of pain and disability among school as well as among the university female teachers.

Pearson's correlation test was applied to find the correlation between pain and disability scores of university teachers and school teachers was r= -1.994 and r= -0.7756. Both the results were statistically insignificant (p> 0.05).



Graph 1: Correlation between pain and disability scores among university teachers



Graph 2: Correlation between pain and disability scores among university teachers

Discussion

Musculoskeletal pain is a known consequence of repetitive strain, overuse, and work-related musculoskeletal disorders. These injuries include a variety of disorders that cause pain in bones, joints, muscles, or surrounding structures. Low back pain is the most common example of chronic musculoskeletal pain [1]. Musculoskeletal pain from overuse affects 33% of adults and accounts for 29% of lost workdays due to illness. Low back pain is most prevalent and most common work-related injury and it is the most costly work-related musculoskeletal disorder [1].

The pathophysiology of musculoskeletal pain is not completely clear, but inflammation, fibrosis, tissue degradation, neurotransmitters, and neurosensory disturbances have been implicated [2]. Symptoms are exacerbated by work-related or personal stress, for example, poor control over one's work,difficult relationships, and time pressure [2].

The most prevalent pain was musculoskeletal pain (back pain and joint pain), although headache and abdominal pain were also frequently mentioned [2]. The MSD is one of the leading causes for ill health retirement among school teachers [3].

Epidemiological studies have demonstrated that factors such as gender, age, length of employment and awkward posture are associated with higher MSD prevalence rates among teachers [4]. Sunisa and Pornnapa pointed out that among workers including teachers prolonged posture, static works and repetition are the cause of repetitive strain injuries (RSIs), which is one type of MSDs that directly affect the area of upper limb, neck, shoulder and low back [5].

Activities of sustained sitting of frequent reading, marking of assignment and in front of computer, standing up teaching in class, repetitively overhead writing on board are also unsafe act and favorable to the development of NSP, LBP and upper limb pain which found in teachers [6,7,8].

Studies have also confirmed that sitting for more than 3 hours daily could be a risk factor for LBP [9,10]. But Lis and colleagues, in their systematic review, found that sitting itself does not increase the risk of LBP, but sitting for more than half a workday, combined with whole-body vibration and/or awkward postures, does increase the likelihood of having LBP, and it is the combination of those risk factors that leads to the greatest increase in LBP [11].

One of the reasons could be that senior middle school teachers have to deal with more examinations and are under higher pressure to graduate students. So they experience more psychological stress and a higher work load than others. In the present study, teachers who worked in senior middle schools also had the highest work load in comparison to those who worked in other levels of schools. Emotional exhaustion correlates with the high numbers of weekly lessons [12].

Work activities that involve heavy lifting, awkward postures, bending, twisting or stooping, prolonged sitting or standing and repetitive motions may contribute to the development of MSD.

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Review Article

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To Scrutinize the Literature on the Role of Vestibular Rehabilitation Therapy in Concussion: A Review of Empirical Evidence

Manisha Uttam*, Harshita Yadav*

Abstract

Concussion typically results from the blow to the skull that generates abrupt acceleration and de-acceleration of the brain within the skull. Dizziness and imbalance may persist even after rest in concussion which may be treated by vestibular rehabilitation therapy (VRT). The intention of this review is to highlight the role of VRT by searching the literature from databases such as Google Scholar, Pubmed & Pedro. Current evidence supports the latent role of VRT in managing the persisting symptoms of concussion. Therefore, future research is needed to explore more experimental trials to strengthen its evidence.

Keywords: Mild Traumatic Brain Injury; Dizziness; Vestibular Exercise Therapy; Head Injury; Imbalance.

Introduction

The term Concussion is defined as a brain injury involving a complex pathophysiological process induced by biomechanical forces that disrupts the function of the brain [1]. According to the 'centers for disease control and prevention', Concussion is a term used in synonymous with mild traumatic brain injury (mTBI) [2]. The incidence of concussion is more in athletes, it is found through the present literature that children and adolescents are at higher risk for developing severe symptoms as compared to adults [3,4].

Dizziness, imbalance, headache and neck pain are the most prevalent symptoms after concussion & mTBI [3,5]. These symptoms may last from several minutes to months or even longer in some cases [9]. 23-81% of persons report dizziness in the initial days post concussion [8]. Persistence of symptoms like dizziness and imbalance after concussion may benefit from vestibular rehabilitation therapy (VRT) [7]. VRT involves task specific targeted exercises which are designed to reduce dizziness and improve balance [10]. The aim of this review is to explore the literature from Google Scholar, Pubmed & Pedro to find the role of VRT in Concussion.

Vestibular Rehabilitation Therapy in Concussion

Alsalaheen et al [2] reported a retrospective study to examine the effect of VRT in reducing dizziness and improving gait & balance function after concussion. A retrospective chart review was performed of 114 patients for VRT after concussion. At the time of initial evaluation and discharge, recordings were made with self report outcome measures, dynamic gait index, gait speed and sensory organization test. The results revealed that out of 114 patients who were referred, 84 returned for at least 1 visit. In these patients, improvements were observed in all self-report, gait, and balance performance measures at the time of discharge ($P < .05$). Thus, VRT should be considered in the management of individuals post concussion who has dizziness and gait and balance dysfunction that do not resolve with rest.

Alsalaheen et al [6] again performed a retrospective chart review of 104 patients diagnosed with concussion and having complaint of persistent dizziness & imbalance. The purpose of this study was to describe the vestibular rehabilitation exercises, provided to individuals after concussion. Each of the exercises was classified by exercise type,

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duration and frequency. The results showed that Eye–head coordination exercises were the most commonly prescribed exercise type (in 95% of participants), followed by standing static balance exercises (in 88% of participants), and ambulation exercises (in 76% of participants). This study may aid the therapist in implementing their vestibular rehabilitation programmes for management of individuals with concussion.

Schneider et al [5] performed a randomized controlled trial to determine the effect of combined vestibular rehabilitation and cervical spine physiotherapy in decreasing the time until medical clearance in individuals with prolonged post concussion symptoms. Patients with persistent symptoms of dizziness, neck pain and/or headaches following a sports related concussion were randomized to the control and intervention group. Both groups received postural education, range of motion exercises, cognitive and physical rest until asymptomatic followed by a protocol of graded exertion for 8 weeks or till the time of medical clearance. The intervention group also received cervical spine and vestibular rehabilitation. In the treatment group, 73% (11/15) of the participants were medically cleared within 8 weeks of initiation of treatment, compared with 7% (1/14) in the control group. Thus, combined cervical and vestibular physiotherapy decrease time of medical clearance to return to sport in youth and young adults with persistent symptoms of dizziness, neck pain and/or headaches following a sport-related concussion.

Discussion

Trauma to the brain causes a series of neurometabolic changes that involves sudden increase in glucose metabolism as well as a decrease in cerebral blood flow which results in mismatch in homeostasis. The restoration of homeostasis may take up to 24 hours followed by a period of reduced glucose metabolism which can last up to 1 month.[11] Proper rest is advised during this period otherwise early exercise can worsen the mismatch of energy and possibly may lead to further damage to the brain. After adequate rest also, the persistence of symptoms like dizziness and imbalance may be due to abnormal vestibular system functioning, brain receives abnormal signals regarding the position and movement of the head in relation to space.

Due to inaccurate vestibular signals, the brain relies on the visual system and prioprioceptors for maintaining the balance. Thus, excessive strain on visual system leads to eye strain and tension headache. Simultaneously, prioprioceptors fail to effectively compensate for being aware of the surface on which one is sitting or standing ultimately leads to dizziness. Therefore, VRT is very effective to treat the persistence of symptoms and also decrease the time of medical clearance of individuals to return to sports activities.

Conclusion

After studying the literature, we found there is a scarcity of evidence related to the role of VRT in concussion as there is only one prospective RCT and two retrospective studies. Thus, the intention of this review is to put the limelight on the importance of VRT to strengthen its evidence in moderate to high quality experimental trials.

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Indian Journal of Anthropology	2	12000	1200
Indian Journal of Biology	2	4000	400
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Journal of Forensic Chemistry and Toxicology	2	9000	900
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Review Article

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Neurac Training in Muscle Rehabilitation

Sairaali*, Saurabh Sharma**

Abstract

Musculoskeletal disorders are bane not only for sportsmen but many ordinary people that are not engaged in sports. Studies have shown that pain, injury and inactivity can disturb our neuromuscular systems. It is well documented that pain and inactivity reduce muscle force and activation patterns. Neurac is an abbreviation for NEURomuscularACtivation, it's a treatment method that aims to regain normal functional movement patterns in patients with musculoskeletal disorders by using high levels of neuromuscular stimulation. The development of the new Neurac method has emerged from the S-E-T concept (Suspension Exercise Therapy). Kinetic chains, these are the chain of events that affects the movement of neighboring joints and segments. With the neurac method 'weak link testing' is performed in order to assess the body's performance. Open and closed kinetic chains exercises combined with neurac method has provided results of better muscular activation. Suspension training provides alternative instability to the core, upper and lower limbs. The instability is supposed to activate or increase muscle activation which helps in stabilisation. The existing literature is insufficient to draw confirm conclusion regarding its ability to do muscle activation.

Keywords: Neurac Training; Weak Muscle Links; Muscle Activation.

Introduction

Musculoskeletal disorders are troubling not only for sportsmen but many ordinary people that are not engaged in sports. According to BLS, MSD's are the largest category of injuries and U.S. companies spent 50 billion dollaron direct costs of MSD's in 2011 (source: CDC). Studies have shown that pain, injury and inactivity can disturb our neuromuscular systems. It is well documented that pain and inactivity reduce muscle force and activation patterns. The loss of muscle control impairs the ability to stabilize a joint properly through its range of motion. Overtime this leads to muscle strains, abnormal movement strategies, much morepain and limitation.

Neurac is an abbreviation for NEU Romuscular ACtivation, it's a treatment method that aims to regain normal functional movement patterns in patients with musculoskeletal disorders by using high levels of neuromuscular stimulation. It includes the use of Redcord suspension system to regain neuromuscular control and function. Kim et al. demonstrated that Neurac sling exercise is a successful method for decreasingpain, correcting postural balance, and activate normal muscular pattern in patients with chronic low back pain.This is a dynamic treatment approach which has four fundamental components: 1. Body-weight-bearing activites using the Redcord sling system, 2. Controlled vibration to selected body parts, 3. Gradual increased resistance (workload), 4. No pain or no increase of existing pain. Also in addition, a newly developed vibration apparatus, RedcordStimula, can be utilized to enhance neural adaptations. The Neurac method also incorporates testing systems that assess and evaluate the neuromuscular function of kinetic chains, with an emphasis on the integration of "local" and "global" muscle function.

The development of the new Neurac method has emerged from the S-E-T concept (Suspension Exercise Therapy). The Suspension Exercise Therapy (SET) system from Norway has been utilise for musculoskeletal disorders and for athlete training.The functions of SET include assessment of muscular dysfunction, re-establishment of normal

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patterns of movement, injury prevention, performance enhancement, enhance proprioceptive and neuromuscular control, core muscle training, prevention of joint deterioration, and relieves muscular tension and pain.

The Redcord Trainer was initially intro-duced in 1991. The device was at first called TrimMaster, later renamed Te-rapiMaster and now named Redcord Trainer. After few years of develo-ping exercise and treatment regimens, the utilization of the apparatus was systematized and described in "Fysioterapeuten" in 2000 as S-E-T (Sling Exer-cise Therapy) (Kirkesola G. 2000).In 2002 manual perturbation was added to the ro-pes of the Red-cord Trainer, as this appear to enhance the tre-atment effect for some patients. Three years later the development of a mechanical vibration device was initiated, which could be attached to the ropes in the Red-cord Trainer. The theoretical argu-ment for this was that muscle spind-les respond better to frequencies higher than those possible to achieve by manual perturbation (Fujiwara K et al., 2006).

There are numerous speculations that haveimpacted the development of neurac method. Firstly Kinetic chains, these are the chain of events that affects the movement of neighboring joints and segments. Due to injuries, weakness, instability and poor biomechanics athletes can develop weak links. With the neurac method 'weak link testing' is performed in order to assess the body's performance. Open and closed kinetic chains exercises combined with neurac method has provided results of better muscular activation(Irish et al. 2010).Dannelly et al.composed closed kinetic exercises on the basis of sling exercise training and determined that sling-based closed kinetic exercise substantially influenced the muscle strength of the lower extremities.(Croy et al.2011).

Second theory is based on core stability training, Bergmark descri-bed a stabilization model for the lo-wer back where he used the terms "local" (deep) – and "global" (super-ficial) muscles (Bregmark A. 1989). This model has later been produced and renewed by Mottram and Comerford (Mottaram et al. 1998). Danneels et al. 2002 observed that uncoordinated patterns of the multifidus muscle (a deep muscle of the lumbar spine) and the trunk muscles occurred, and Silfieset al.2005 observed irregular mobilization patterns in which mobilization of global muscles increased and activity of deep muscles decreased. These changes placed a load on and moved the spine, triggering recurrent low back pain. Sling exercise therapy has been proposed to activate local spine stabilizers during the activity in pain free manner without substitution of global muscles.Stuge B et al. 2004 proposed that increased activation of local stabilizermuscles with the sling exercise therapy may have contributed toenhanced outcomes compared to traditional therapy.

Third, Gojanovica B et al. 2011 observed that vibratory stimulation can enhance muscle contraction by stimulating muscle hypertrophy, thereby affecting the muscle spindles. Mikhaeal M et al. 2010 observed that Type Ia afferent fibers are co-activated by $\alpha - \gamma$ motor neurons. They are activated during isometric contraction, and vibratory stimulation improves the strength of the muscular contraction by increasing the firing rate of Type Ia fibers, and the excitability of á motor neuron.Rittweger et al. 2010 observed that a group with lumbar pain that was treated with vibration and exercise together saw a decrease in pain and an enhanced ability to control nerve roots.

Behm et al (2010) reported that the benefit of an unstable training environment can increase core activation. Behm and Colado (2012) also observed that resistance training programs with instability achieved average 22% gains in functional performance measures.

Stray Pedersen J.I et al did a study in 2006 on sling exercise training improves balance, kicking velocity and torso stabilization strength in elite soccer players. This study is performed to quantify the impact of sling exercise training core stability program on postural balance, kicking velocity and functional core strength. It was controlled trial training session were given 2 days for 8 weeks. 12 subjects were recruited, all are soccer players(age range 19-29). Training sessions consisted of eight different exercises and with each exercises resistance and instability level increased. The outcome measures that are assessed were maximal kicking velocity, static balance and functional strength of pelvic and torso. Significant improvements were seen in outcome measures after sling exercise training. It was seen that balance deficits were eliminated but it is unclear what part of training had the most effect. It is likely that sling exercise training provides unstable base for enhancing neuromuscular control and joint stability.

Stephen Seiler et al., in 2006 performed a study to examine the effects of sling exercise training on maximal clubhead velocity in junior golfers. It was a controlled trial, 2 teams of junior male golfers consist of 10 players each were recruited Age range 17-18yr. The Sling Exercise Training (SET, n=10) group averaged 15+ 2 years old with a 13 handicap. The

control group (CON, n=10) averaged 15+ 3 yrs with a 6 handicap. While SET performed a specialized core stability training program 2 days/week, the control group engaged in traditional strength training exercises 2 days/wk. Both groups trained for 9 weeks. The exercises were progressed in difficulty by increasing resistance and degree of instability. Positive results were seen, significant enhancement in the performance of SET group was observed.The driving velocity increases in the SET group as compare to the control group. It was suggested that SET system allows the improvement in the performance by stabilizing and reactivating core musculature.Max P. Prokopy et al, in 2008 performed a study to evaluate the effects of closed–kinetic chain upper-body training improves throwing performance of NCAA division I softball players. This study compares the effect of training with CKCRT (using sling exercise training) and OKCRT in strength, power, and throwing velocity.14 female National Collegiate Athletic Association Division I softball player volunteers were blocked and randomly allocated into two groups:CKCRT and OKCRT. Training is done three times weekly for 12 weeks. Outcome measures were assessed pretraining and postraining program and includes isokinetic concentric phase peak torque for shoulder flexion, extension, internal rotation, and external rotation; dynamic single-leg balance; throwing velocity; 1RM bench press.The study observed statistically significant increasesin throwing velocity for the CKCRT group and also CKC training of the upper body is as effective as OKC training in promoting maximal strength gains. It has been suggested that the unique aspect of the rope-and-sling system of CKCRT allowed for progressive adjustments of exercise intensity and enhanced activation of the musculature involved in torso and shoulder stabilization, which led to improved segmental stability during throwing. The rope-and-sling equipment is inherently unstable, meaning that CKC subjects spent more time on the eccentric activity of a given exercise. It is possible that these additional eccentric stimuli played a role in throwing velocity improvements.

Soo-Yong Kim et al, in 2015 presents a new study concerning with effects of the Neurac technique in patients withacute-phase subacromial impingement syndrome(SIS). It is a first laboratory contol study to observe the effects neuarc therapy on shoulder pain, function and range of motion in patients with SIS. Neurac therapy has been used to restore muscle balance, improve muscular activation and joint stability. This study involved 13 participants diagnosed with shoulder impingement syndrome. Three sessions of training has been conducted for four weeks using neurac technique. It involves four main exercises and all exercises were performed using Redcord Stimuli at 50 hz vibration. Exercise load has gradually increased. Three measures evaluated for observing improvement were pain level using VAS, shoulder function using SPADI and shoulder ROM by goniometer. Positive results were seen pain decrese significantly after the application of neurac method. It has been suggested that improvement is caused by increase in the scapulohumeral stability and subacromial space and enhance muscular activation of serratusanterior , lower trapz and rotator cuff.Wen-Dien Chang et al did a study in 2015 to examine the muscle activation of vastusmedialis oblique and vastuslateralis in sling-based exercises in patients with patellofemoral pain syndrome. It was a cross-over study that evaluate the activity of the vastusmedialis oblique (VMO) and vastuslateralis (VL) during sling-based exercises in patients with patellofemoral pain syndrome (PFPS) and compare the muscular activations in patients with PFPS among the sling-based exercises.the most important factor of PFPS is imabalance between VMO and VL, the VMO cannot antaogonize VL that leads to patellar maltracking. Sixty participants diagnosed with PFPS with age range 20-25yr were recruited. Three sling based exercises, open and closed kinetic knee extension and hip adduction exercises were done by the participant in a random order, and electromyography was applied to record maximal voluntary contraction during the exercises. Positive significant difference were observed, VMO activations during the sling-based open and closed kinetic knee extension exercises were significantly improved than those during hip adduction exercises andalso VMO: VL ratio for the sling-based closed kinetic knee extension and hip adduction exercises

approximated to 1. It was concluded that the sling-based closed kinetic knee extension exercise produced the highest VMO activation and also sling-based hip adduction exercises had beneficial effects on PFPS. It was suggested that the reason is that open kinetic chain extension exercise is not a functional intervention, because closed kinetic knee extension utilizemuscle cocontraction and proprioceptive reaction ofmultiplejoint. Lam et al 2001 also reported that VMO training using open or closed kinetic chain exercise, effectively prevents and alleviates PFPS.

Conclusion

Neurac therapy is a newly developed method so there is a need for randomized controlled trials for different musculoskeletal disorders. It is clinicallyproved that this method of neuromuscular activation helps to regain normal function and normal muscular activating patterns. This method includes suspension that provides unstable surfaces to help in recruiting deep muscles. Suspension training provides alternative instability to the core, upper and lower limbs.

In spite of the wide use of suspension training system that are accessible and the expanding utilization of these techniques, there is an absence of evidence about the muscle action that might be affected by the different system.

It also involves vibration therapy, it has been reported that vibration has positive effects on enhancing motor function and improving energy metabolism and blood flow to the muscles. Still studies are needed to investigate the underlying mechanisms of sling exercise training, with and without different types of vibration.

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