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Original Article

A COMPARATIVE STUDY ON DYNAMIC NECK EXERCISE VERSUS ISOMETRIC NECK EXERCISES WITH THERABAND IN CHRONIC NECK PAIN

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ABSTRACT

Objective: To compare the efficacy of dynamic neck exercises versus isometric neck exercises with theraband in chronic neck pain

Methods: 60 patients with chronic neck pain selected as per the inclusion criteria; all the conditions in exclusion criteria was excluded. By dividing them into group A (n =30) (treated with dynamic neck exercise), group B (n=30) (treated with isometric neck exercise with theraband).

Results: After screening of the 60 patients for study eligibility, a total of 30 patients were included for analysis, of whom 30 were in the control group A (Dynamic neck exercise with theraband) and 30 were in group B (Isometric neck exercise with theraband) Analysis pre-test and post-test score within and between the values of groups are tabulated with intervention of the result of the study. Group B showed significant change in ROM and Neck pain.

Conclusion: Isometric Exercise is very well known for its pain reliving and long-lasting properties, but variability of techniques make it difficult to document but Theraband is known to provide consistency in training whilst preventing fatigue. Hence, patients in group B (treated with Theraband) showed decrease in VAS (Visual Analog Score) and NDI (Neck Disability Index) scores, which prove that isometric with theraband is better in treating Chronic Neck Pain.

Keywords: Neck pain, Neck disability, Theraband, Isometric training, Lifestyle, Occupational, Isometric exercises, Dynamic training, Chronic pain

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INTRODUCTION

Warikoo 2013 observed that many professions, especially banking, initially, paperwork was used to be done. However, with the advancement of technology, usage of computer replaced papers work in banking profession, which created health related problems in workers and other offices due to continuous usage of computer and posture unawareness. The unhealthy lifestyle, awkward posture and prolonged working hours on computers can lead to health problems such as fatigue, eye strain which causes relaxation and strain of the neck muscles and ligaments, musculoskeletal disorder, cervical spine stability disorder, cervical nerve compression as well as impaired the circulation [1]. Anxiety, distress, mood swings, cognitive functioning, nature of pain and stress are major risk factors for neck pain (Linton, 2000). Prolong working in a static posture or repetitive movements and work overload during work are the major risk factors for cervical pain (Straker, *et al.*, 2009).

Chronic neck pain is burden to health globally and is one of the major factors behind the years of disability. This is because of the higher prevalence, persistence and recurrence. It is the major health concern for the society these days with highest recurrence rate combined with its chronicity [2]. In United States of America, the annual prevalence was 41.5% in which individuals with chronic neck pain were middle-aged (mean age 48.9 y) and the majority of subjects were women. In United Kingdom, the annual incidence was 34%. In Australia, the prevalence of neck pain was 27.1%. In Canada one population-based cohort study showed that the annual incidence of neck pain was 14.6% and each year, 0.6% of the population developed disabling neck pain. Women are more likely than men to develop neck pain more likely to suffer from persistent neck problems and less likely to experience resolution. In the terms of the region of Asia, the prevalence of neck pain demonstrated in the peak position in West and the Midwest of the Asia whereas in the South part of Asia showed relatively lower. In India, the prevalence of chronic neck pain among computer operators was found 47%. Majority of the participants were in between the age of 30-50 y [3]. Isometric exercises are contractions of a particular muscle or group of muscles. During isometric exercises, the muscle doesn't noticeably change length and the affected joint doesn't move. Isometric exercises help to maintain strength. They can also build strength. Isometric exercises refers to increasing muscle tension to fight against fixed resistance exercise and is simple, safe, non-invasive, time-saving and effective [4]. Neck pain is a complaint that is often felt by workers, especially workers with a certain neck position in a long enough period of time, resulting in excessive contraction of the neck muscles. Various types of work can lead to complaints of neck pain especially for workers with wrong body position that affects the position of the neck, resulting in non-specific neck pain [5]. The costs incurred by workers for treatment of neck pain are sufficiently high. Research showed that the prevalence of musculoskeletal pain in the neck in the community for one year was 40% and more prevalent in women, while the prevalence of neck pain in workers ranges from 6-76 % and mostly in women. Neck pain may originate from the structures of the neck. It includes muscles, nerves as well as the spine and the cushioning discs in between. The surrounding regions of neck, like head, jaw, shoulder, upper arm can also contributes to neck pain [6]. If neck pain is due to nerves for example, when due to muscle spasm, nerve gets entrapped significantly or a slipped disc compressing a erve), one may feel numbness, tingling, or weakness in your arm, hand, or elsewhere [7]. A common cause of neck pain is muscle strain or tension. Florence Peterson Kendall, Elizabeth Kendall Mc Corney, Patricia Giece Provance in their publication, say that the muscle problems associated with pain in the posterior neck are essentially of two types, one associated with muscle tightness and the other with muscle strain. Symptoms and treatment indications differ according to the underlying fault. Both types are quite prevalent; the one associated with muscle tightness usually has a gradual onset of symptoms, while the one associated with muscle strain usually has an acute onset [8]. Usually, everyday activities are to blame. Such activities include bending over a desk

for hours, having poor posture while watching TV or reading, placing your computer monitor too high or too low, sleeping in an uncomfortable position, or twisting and turning the neck in a jarring manner while exercising. Traumatic accidents or falls can cause severe neck injuries like vertebral fractures, whiplash injury, blood vessel injury, and even paralysis. Various studies and guidelines have confirmed the efficacy of exercise therapy for improving neck pain [9]. Other causes include herniated disc, fibromyalgia (pain syndrome throughout the body), and arthritis. Meningitis, although much less common, can cause significant neck stiffness [10]. Gary Kannen in his publication, tells that in contrast to isometric exercise, dynamic resistance exercise involves movement. These muscle contractions involve changes in muscle length and joint angles. One of the best-known legends involving dynamic resistance exercise and the overload principle was written about 500BC [17]. Carrie M. Hall, Lori Thein Brody in their text published that dynamic muscle strengthening occurs when muscles contract as they shorten (i. e., concentric contractions) or lengthen (i. e., eccentric contractions); resulting in movement of the joint they cross. The advantages of dynamic exercise include increased movement of the joint, resulting in maintenance of capsular, ligament, and muscular flexibility and increased in cartilage nutrition. Muscle strengthening occurs in the entire joint ranges achieved during the exercise and results in a functionally more efficient muscle-joint complex [11].

MATERIALS AND METHODS

60 subjects with chronic neck pain were randomly selected based on inclusion and exclusion criteria. Then divided into 2 groups-Group A and Group B (30 subjects each group).

- Group A (n=30 subjects): Treated with dynamic neck exercise
- Group B (n=30 subjects): Treated with isometric neck exercise with theraband.
- All the subjects were informed that they are under the experiment and prior consent of subject was taken before assessment. All the subjects regimen including exercise level.

Study timeline: Our study period was 3 times per day 3 session/week, total of 12 w.

Pre-and post-intervention assessments

All pre-and post-intervention scores of outcome measures (NDI, VAS) will be recorded and securely stored for analysis.

Intervention protocol

Treatment protocol for group a, dynamic neck exercise

1. Cervical chin tuck

- Patient sit upright with shoulder blades squeezed together. Patient is asked to pull the chin in gently, with the neck stable. Hold this position for 10 sec and return back to normal slowly.

2. Cervical flexion with chin tuck

- Patient sit upright with shoulder blades squeezed together. Patient is asked to chin tuck and slowly bend the neck forward till patient feel the stretch. Go within the pain free range, hold for 10 sec and return back to the starting position.

3. Cervical extension with chin tuck

- Patient sit upright with shoulder blades squeezed together. Patient is asked to chin tuck and slowly look up towards the ceiling stretching the head backwards, hold for 10 sec and return back to the starting position.

4. Cervical lateral flexion

- Patient sit upright with shoulder blades squeezed together. Patient is asked to chin tuck and bend the neck to the side bringing the left ear towards the left shoulder, hold for 10 sec and return back to the starting position.

5. Cervical rotation

- Patient sit upright with shoulder blades squeezed together. Patient is asked to chin tuck and rotate the neck towards the shoulder, hold for 10 seconds and return back to the starting position.

Treatment protocol for group B, isometric neck exercise with theraband

1. Cervical neck flexion

- Place the centre of the band around the front of the head. Therapist holds the ends of the band at the back near eye level. Patient Keep the neck in neutral position with chin tucked slightly. The ends of the bands are pulled backwards, hold for 10 sec and return back slowly. Patient is asked to keep the neck stable.

2. Cervical neck extension

- Place the centre of the band at the back of the head. Therapist grasps the ends of the band in the front of the head. Keep the neck in neutral position with chin tucked slightly. The ends of the band pulled forward, hold for 10 sec and return back slowly. Patient is asked to keep the neck stable.

3. Cervical side flexion

- Place the centre of the band at the side of the head above the ears. Therapist grasps the ends of the band in opposite direction. Keep the neck in neutral position with chin tucked slightly. Therapist pulls the band in opposite direction, hold for 10 sec and return back slowly. Patient is asked to keep the neck stable.

4. Cervical rotation isometric

- Place the centre of the band around the back of the head. Then, cross the ends of the band in front of the forehead. Grasp the ends of the band at eye level near the head. Keep the neck in neutral position with chin tucked slightly. Therapist stretches the band of one side at a time, hold for 10 sec and return back slowly. Repeat the same procedure on the other side.

Data analysis

Pre and post-intervention evaluation of outcome measure had collected through Neck Disabilty Index and Visual Analogue Scale and analyzed with statistical package SPSS 16. Student t-test, paired t-test and mean improvement has been analyzed. The demographic variables and pre-intervention outcome measures between the groups were evaluated by Student's t-test. The parametric test results within the group and between the groups were obtained and statistically analyzed using Student's paired and unpaired t-tests, respectively.

Results and tables

After screening of the 60 patients for study eligibility, a total of 30 patients were included for analysis, of whom 30 were in the control group A (Dynamic neck exercise with theraband) and 30 were in the group B (Isometric neck exercise with theraband) Analysis pre-test and post-test score within and between the values of groups are tabulated with intervention of the result of the study.

Interpretation

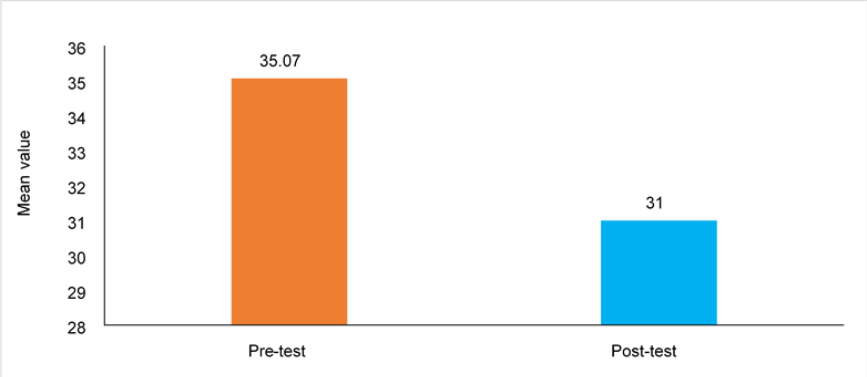
The above table and graph shows the comparison of score for the Neck disability index within group A.

Interpretation

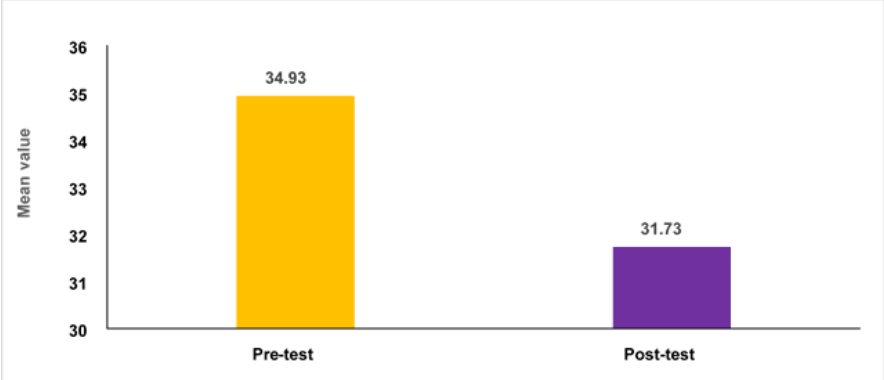
The above table and graph shows the comparison of score for the Neck disability index within group B.

Interpretation

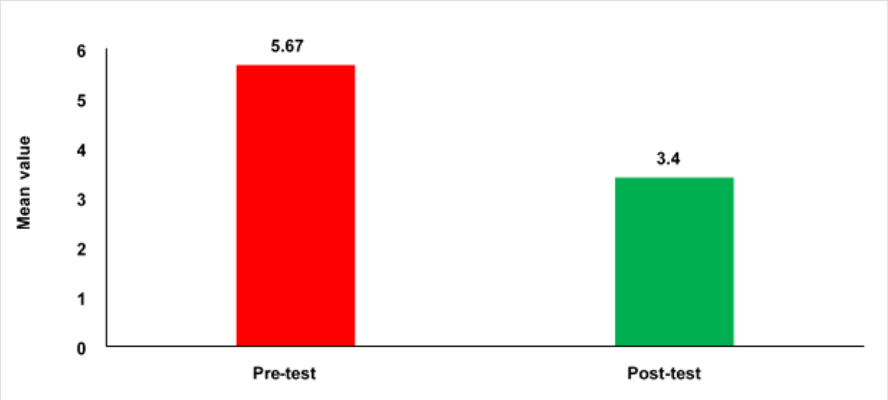
The above graph shows the comparison of score for the VAS within group A.



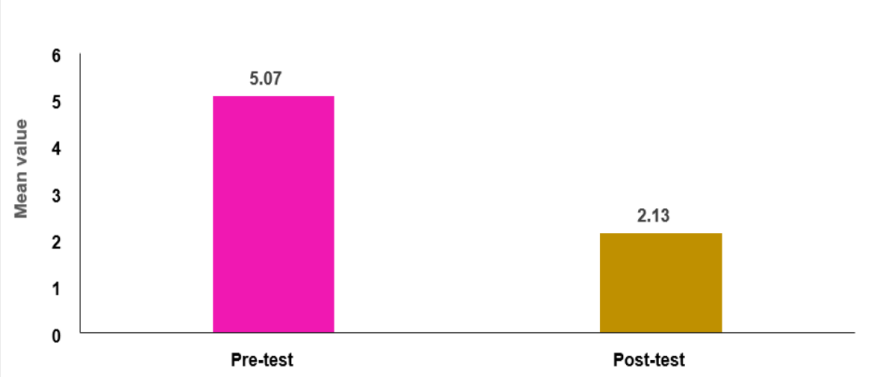
Graph 1: Neck disability index group a



Graph 2: Neck disability index group B



Graph 3: Vas group A



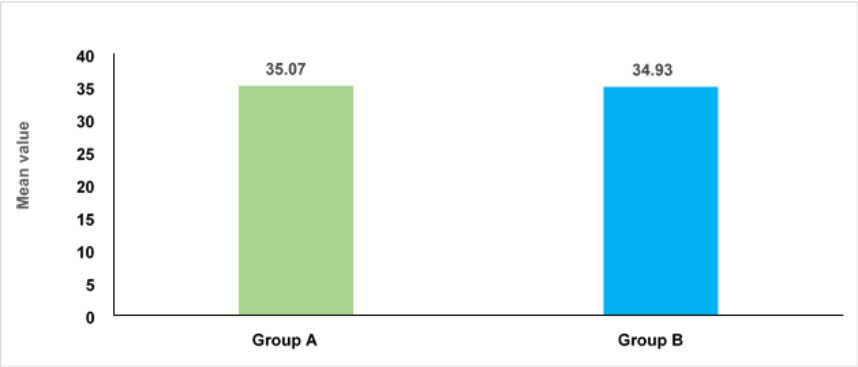
Graph 4: Vas group B

Interpretation

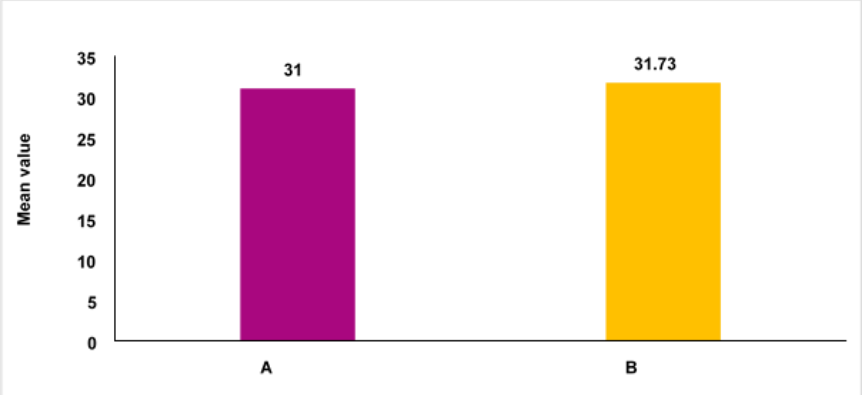
The above graph shows the comparison of VAS score within Group B.

Interpretation

The above table and graph shows the comparison NDI pre-test values between group A and group B.



Graph 5: NDI pre-test between group A and B



Graph 6: Post NDI score group A and B

Interpretation

The above table and graph shows the comparison of score of post test values between group A and group B.

DISCUSSION

This study shows that participation in a twelve-week neck exercise program led to a considerable reduction in the average neck pain, disability and improvement of neck muscle power in the group of patients who performed isometric neck exercises with theraband. Randlov A *et al.* performed a study on "Isometric exercise program with theraband for females with chronic neck pain" showed that isometric training program resulted in both subjective and objective improvements in patients suffering from chronic neck pain [12]. In support to this, Berg HE *et al.* examined in their study whether isometric neck resistance training could increase strength and reduces pain in workers with a high prevalence of neck disorders. As per the study isometric neck exercise training with theraband was given to the neck flexors, extensors and rotators on the basis of twelve minutes for a period of twelve weeks. Results showed that this exercise training increases the strength of rotators, extensors and flexors of neck. Also all individuals who had pain reported reduced perceived neck pain after training. Although studies have proved that isometric neck strength training increases the strength of the neck muscles and reduces neck pain. Some of the studies like the one conducted by Portero *et al.* proves that the beneficial effect of isometric resistance training increases neck muscle size and strength during lateral flexion and decreases the fatigability of superficial muscles of the neck [13].

Whereas another study performed by Viljanen M *et al.* in "Effectiveness of dynamic muscle training, relaxation training or ordinary activity for chronic neck pain showed that the dynamic muscle training and relaxation training do not lead to better improvements in neck pain compared with ordinary activity [14]. Concentric muscle contractions can offer very high forces and thus an appropriate overload stimulus. Eccentric contractions can produce more muscular force [15]. Carrie M Hall *et al.* says that isometric exercise is commonly used to increase muscle performance. Although no joint movement occurs, isometric exercise is considered functional because it provides a strength base for dynamic exercise [16]. Repeated and sustained working with elevated arms is known to lead to neck pain. Reductions in ROM have implications for the safety and efficiency of functional activities and lead to a loss of corrective or protective reactions. ROM losses can occur from inactivity and structural changes of the tissues in the cervical spine and result in an increase in connective-tissue density, shortening of collagen tissue, and muscle fibrosis [17]. The Thera-Band, which provides varied resistance through the range of movement, has been used for rehabilitation in combination with therapeutic exercise. It is light and portable, has low resistance, and can be adjusted to accommodate various situations. This method prevented ROM reduction and pain in the cervical regions and can be easily applied. Thera-Band and is also inexpensive. Ylinen J, Ruuska J proved that isometric exercises are useful and a practical method of showing a functional improvement in response to rehabilitation [18].

CONCLUSION

Neck pain is the most common problem which every seventh to eighth individual encounters in day-to-day life. Usually, neck pain arises from muscle strain, poor posture or any injury in the cervical region. Neck pain has a complex etiology including ergonomic [high intense physical activity, repetitive movements, poor posture],

individual [age, body mass index, history of pain], psychosocial [stress, anxiety, depression], behavioral [smoking, bad habits]. From desk job workers to housewives, from student industry to old age our body works more of in flexion pattern, which contribute to neck pain by putting extra strain on the joints and the muscles as well as leads to the compensation of surrounding muscles of the neck as whole body is connected by a kinetic chain. Neck pain can be acute or chronic, depending upon the injury. Some people with neck pain avoid doing physical activities in the fear of making the pain worse. But this can further create more stiffness in the neck. It is a good to stay active and carry on as usual despite the pain. Prevalence is generally higher in women. It is higher in high-income countries as compared with low-and middle-income countries. Higher in urban areas compared with rural areas. Many environmental and personal factors influence the onset and course of neck pain. Higher incidence of neck pain is seen in age group between 30-50 y of age. Neck pain causes have been pseudo propagated by so many of reasons, including from sleeping in an uncomfortable position to working for long hour over the computers which is not considerable because there is a clear image of affecting of soft tissues, which further influence the bony tissues and mal-aligned the structure staking along with the neck pain associated as a result of periphery dissociation of structures. As we know the weight of head is 1/8th of body weight and is highly dynamic. The structures of soft tissue allow us to go to its maximum range as it is elasticity in nature. But sometimes its recoiling capacity gets altered due to many reasons like occupational hazards, poor habits of prolong working in sitting posture, which does not allow muscles to come back to its own normal state where it initiated that is the ideal contraction and relaxation phase of normal wellbeing of soft tissues and alter its PH which causes biochemical changes and altering the sensation through chemical receptors and producing nociception around the tissues. There are so many theories proposing different treatment modules and exercises method which is sometimes so confusing and too fashionable to apply where the tissue and muscle already seeking for the ideal contraction and relaxation which is not happening. Hence, patients in Group B showed more improvements in ROM and neck pain relief after treatment. Isometric exercises with Thera band are an adjuvant treatment in the management in chronic neck pain. It results in more functional improvement.

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AUTHORS CONTRIBUTIONS

All authors have contributed equally

CONFLICT OF INTERESTS

Declared none

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