A Study to Assess the Effect of Isometric Exercise in College Going Students and Workers of The Galgotias University with Neck Pain Due to Prolong Sitting Posture

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***Abstract*—Background: Neck pain is a common occurrence, affecting approximately two-thirds of the population. Isometric exercises have been shown to improve muscular performance by providing the strength needed for dynamic movements. Objective: This study aimed to determine the effect of isometric exercises on college students and workers with neck pain. Methodology: Thirty subjects, both male and female, aged 20-35 years with neck pain, were randomly selected and received isometric exercises for three weeks. The outcome measures were the Neck Disability Index (NDI) and Visual Analog Scale (VAS). Results: The results showed a significant reduction in both NDI and VAS scores. The NDI scores decreased from 22.06 to 17.73, and the VAS scores decreased from 7.7 to 5.86. The paired sample t-tests revealed statistically significant decreases in NDI and VAS scores from pre-test to post-test assessments. A strong positive correlation was observed between NDI and VAS scores. Conclusion: The results of this study demonstrate that isometric exercises can significantly reduce neck disability and pain in college students and workers with neck pain. The statistical analyses provide strong evidence to support the effectiveness of this intervention**

***Index Terms*—Isometric exercise, NAS, VAS, students, Workers**

I. INTRODUCTION

Neck pain is the most common complaint among working men and women. Student professionals sit at a classroom for prolonged periods of time for their study, or job, one of the most common complaints for them is neck pain.([1])Neck is a commonest location of non-traumatic pain .The issue of neck discomfort is experienced by two thirds general populations at some times during their lives.([3]). Work place and work duration have not been properly modified to the personal physical conditions of these students and workers. Ergonomic interventions result in enhancement of working posture and a decline in incidence of musculoskeletal symptoms. The human body is designed to move health depends on it. ([4]) Pain Working groups with high levels of static contraction, prolonged static loads, or extreme working postures involving the neck musculoskeletal disorders. Numerous studies have demonstrated that neck pain is associated with altered behavior of the cervical muscle. Studies have been observed that muscles dysfunction with neck pain Reduced activation of the deep cervical flexors during a task of craniometrical flexion, as well as lower activation of the deep semispinalis cervicis muscle during multidirectional isometric contraction and cervical extension performed in a neutral craniometrical position, are all associated with mild neckaccompained be headache and arm pain.Painful conditions appear in most cases as a result of excessive mental or physical stress.Grieger-Morris et al reported that people with frequently occurring neck pain maintain a head forward -leaning posture in which the shoulders are held abnormally forward . The bad forward posture is also linked to weak neck flexor muscles, according to clinical data. ([6]) Isometric and isotonic exercises of the neck muscles were the most commonly used in clinical trials among the various types of exercise. ([5]). This study was undertaken with the goal of exploring the influence of isometric exercises on pain, due to a dearth of studies in this subject. Controls discomfort and improves muscle strength. ([2])They also discovered that a bad forward posture is linked to weak neck flexor muscle. ([6]) Isometric and isotonic exercises of the neck muscles were the most commonly used in clinical trials among the various types of exercise. ([5]). Due to a scarcity of research in

this subject, this investigation was undertaken. Pain control and increases muscle strength. ([2]) Muscle isometric workouts are widely utilised to improve performance. Many postural muscles act in an isometric fashion, which strengthens the foundation for dynamic exercise. ([3]) Isometric exercise helps to relieve neck stiffness and makes the neck more flexible, with little or no joint movement. Stretching resistance exercises for the neck, according to DM Kietrys, are simple to undertake and when completed Neck soreness is more common in middle age, and women are more susceptible. Forward head position is one of the most common postural deformities in patients with neck difficulties, and it falls under the category of improper posture. ([3]) Neck pain is thought to be a complex condition, with various risk factors implicated in its development.Physical demands, poor ergonomic job design, and some psychosocial issues are all causes of neck discomfort. Neck discomfort has become a widespread epidermiological concern, according to Lisinski P et al.([4]) cervical spine diseases are the second leading cause of musculoskeletal illnesses. Neck discomfort can occur on its own or in conjunction with symptoms in the upper extremities. ([2])Neck pain is one of the most common musculoskeletal disorders in adults, with prevalence ranging from 16 percent to 75 percent worldwide. This condition has a complex aetiology, which includes a number of factors such as ergonomics (heavy physical activity, use of force and vibration, poor posture, repetitive movement) and individual (age, body massage index, genome, musculoskeletal). Cervical spinal pain is defined by the International Association for the Study of Discomfort (IASP) as pain felt anywhere in the posterior portion of the cervical spine, from the superior nuchal line to the first thoracic spinous process. It claims that neck pain is frequently felt from the back. Neck discomfort, according to Bogduk and McGuirk, can be separated into upper cervical spinal pain Upper cervical spinal pain can be referred to the head, whereas lower cervical spinal pain can be referred to the scapular area, anterior chest wall, shoulder, or upper limb, depending on whether the pain is above or below an imaginary transverse line across C4. They also describe subocipital pain as discomfort that occurs between the superior nuchal line and C2, a region that appears between the eyes. ([3])

WRNP work related neck disorders are common problems in students and workers especially those who are sitting long time in a job. It is generally agreed that the etiology pf work related neck Disorders is multidimensional which is associated with, and influenced by, a complex array of individual, physical and psychosocial factors. ([12])

Every day, neck pain is a leading source of morbidity and impairment. In many nations, life and work can be hectic. Furthermore, as the population of medium and low-income countries ages, the prevalence of neck pain will increase significantly in the coming decades, necessitating knowledge of risk factors as well as preventive and curative interventions (for example, global warming). postural re-education, segmental stretching). ([2])Neck pain is common in the working population, but little is known about occupational factors influencing the occurrence, aggravation, and alleviation of pain. Knowing more about occupational factors influencing the occurrence, aggravation, and alleviation of pain would support a better prevention of pain and aid in promoting recovery among the workers afflicted with pain would support a better prevention of pain and aid in promoting recovery among the workers afflicted with pain. Standing for long periods of time might be hazardous to one's Further inactivity may affect the cardiovascular and pain regulation systems in the central nervous system. ([8])Total sitting time is related with a higher risk of cardio metabolic disease and mortality, but breaks in prolonged sitting ameliorate these effects. ([9])

When distracted by a job, those with neck pain had a harder time maintaining the neutral position. During this employment and studies, the exercise enhanced my capacity to keep an upright stance. ([10]) The number of health problems, such as leg pain, cardiovascular difficulties, weariness, neck pain, and pregnancy-related health outcomes, has been affected by static posture at work. ([11])

II. METHODOLOGY

A. Study Design and Participants

This study was a 12-week program conducted at Galgotias University in Greater Noida. The total number of subjects was 30, with both male and female participants randomly selected.

The inclusion criteria were:

- Age: 20 to 35 years
- Both males and females with neck pain
- Visual analogue scale (VAS) scoring
- Neck Disability Index (NDI) Score
- Commitment not to receive any other specific intervention for their neck pain during the study period
- Commitment not to participate in any exercise during three months prior to the study
- The exclusion criteria were:
- Serious injury
- Tumour or other non-mechanical cause of neck pain
- Herniated disc with positive cause of neck pain
- Spinal fractures
- Recent cervical surgery
- Shoulder diseases (tendonitis, bursitis, capsulitis)
- Inflammatory rheumatic disease
- Severe psychiatric illness
- Pregnancy

B. Exercise Training Program

The exercise training program consisted of 12 weeks of isometric exercises and active range of motion exercises. The exercises were performed daily for three months, with a time duration of 15 to 20 minutes. The exercises were performed in a sitting position, with the therapist standing. The procedure for isometric exercises was given to the students and workers, and they were instructed to perform two times daily.

C. Data Collection

The study began with 45 subjects who were given the Neck Disability Index (NDI) and explained to fill the questionnaire with a scoring out of 50. Among these subjects, 30 met the inclusion and exclusion criteria and were given the Visual Analogue Scale (VAS) to note their scores. The pre-test values of NDI and VAS were taken. The subjects were then instructed to perform the exercises two times a day for 12 weeks during alternate class hours. If increased pain or discomfort occurred, the subjects were advised to stop the exercise and consult their healthcare provider.

D. Neck Disability Index (NDI)

The NDI is a 10-item questionnaire that measures a patient's self-reported neck pain related disability. It was the first of its kind when published in 1991 in JMPT and was based on the Oswestry Low Back Pain Disability Questionnaire. The NDI was reviewed in 2008 by the same author. It has been shown to have high test-retest reliability and validity when compared to other pain and disability measures. (41,42)

E. Data Analysis

This section examines the effectiveness of isometric exercises in reducing neck pain and disability among college students and workers. The analysis focuses on the pre-test and post-test scores of the Neck Disability Index (NDI) and Visual Analogue Scale (VAS). The data analysis for this study consisted of descriptive statistics, paired sample t-tests, and correlation analysis.

F. Descriptive Statistics

Descriptive statistics were used to summarize and describe the main features of the data. The mean and standard deviation of the Neck Disability Index (NDI) and Visual Analog Scale (VAS) scores were calculated for both the pre-test and post-test assessments.

G. Paired Sample t-Test

Paired sample t-tests were conducted to compare the means of the NDI and VAS scores between the pre-test and post-test assessments. The paired sample t-test is a statistical test used to compare the means of two related samples, such as pre-test and post-test scores from the same group of participants.

H. Correlation Analysis

Correlation analysis was performed to examine the relationship between the NDI and VAS scores. The correlation coefficient was calculated to determine the strength and direction of the relationship between the two variables.

III. RESULT AND DISCUSSION

A. Descriptive Statistics

Descriptive statistics for the Neck Disability Index (NDI) and Visual Analog Scale (VAS) scores were calculated. The mean, standard deviation, and sample size for each measure at pre-test and post-test are presented in Table 1.

Measure	Pre - Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD
NDI	22.06	4.33	17.73	4.33
VAS	7.7	1.23	5.86	1.23

Table 1: Descriptive Statistics for NDI and VAS Scores

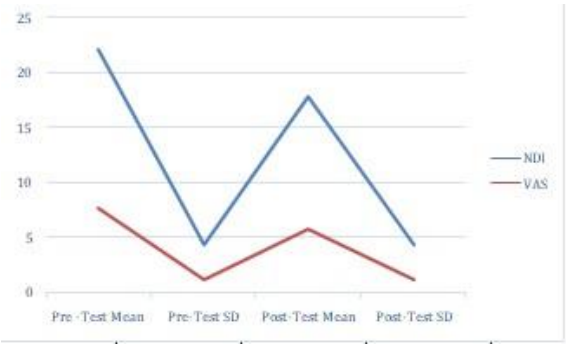

Figure 1: Pre and post score of NDI and VAS scale

B. Paired Sample t-Test

Paired sample t-tests were conducted to assess the differences between pre-test and post-test scores for NDI and VAS. The results are summarised in Table 2

Measure	t-value	p-value
NDI	4.67	0.000154
VAS	3.84	0.000154

Table 2: Paired Sample t-Test Results

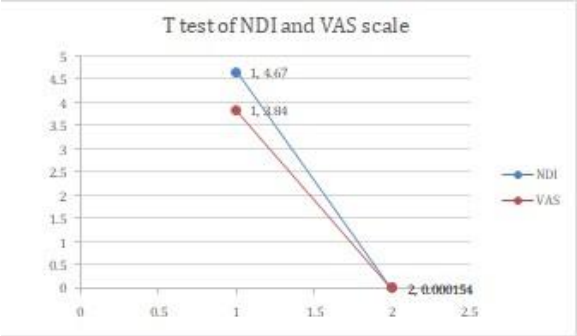

Fig2: t test score of NDI and VAS Scale

C. Correlation Analysis

A correlation analysis was performed to examine the relationship between NDI and VAS scores. The results are presented in Table 3

Measure	r	p- value
NDI and VAS	0.91	0.000154

Table 3: Correlation between NDI and VAS Scores

The results of the study support the alternative hypothesis (H1) that there is a significant reduction in NDI and VAS scores of college students and workers with neck pain after performing isometric exercises for three weeks. Both NDI and VAS scores showed a statistically significant decrease from pre-test to post-test assessments, indicating improvements in neck disability and pain intensity following the intervention. Additionally, a strong positive correlation was observed between NDI and VAS scores, suggesting a close relationship between neck disability and pain intensity. These findings highlight the effectiveness of the isometric exercise program in reducing neck-related disability and pain among participants, providing valuable insights for the management of neck pain in college students and workers. This study investigated the effectiveness of isometric exercises in reducing neck pain and disability among college students and workers. The results supported the hypothesis, showing significant reductions in both neck disability (NDI) and pain intensity (VAS) scores after a three-week isometric exercise program. These findings align with previous research highlighting the benefits of isometric exercises for neck pain management. [43,44] However, a gap in knowledge remains regarding the optimal program duration. While prior studies have demonstrated positive effects, they often employed longer intervention periods compared to the three weeks used here. [45,46]

This study's strength lies in its focus on a specific population – college students and workers – who are frequently affected by neck pain due to prolonged sitting postures. [46] However, limitations include the short program duration and the lack of a control group. The absence of a control group makes it difficult to definitively isolate the impact of isometric exercises. Other factors, such as natural fluctuations in pain perception or changes in lifestyle habits during the study, could have also contributed to the observed improvements. [47]

Future research should address these limitations by incorporating a control group that does not perform the isometric exercises and extending the follow-up period. This would provide a clearer picture of the program's long-term efficacy and isolate the specific effects of the exercises. Additionally, research could explore the optimal frequency and duration of isometric exercise programs tailored for different populations. Comparing isometric exercises with other therapeutic interventions, such as manual therapy or stretching programs, or a combined approach could offer further insights into the most effective strategies for managing neck pain. [47,48]

In conclusion, this study adds to the evidence supporting the use of isometric exercises for neck pain management in young adults. Further research with a control group and a longer follow-up period is warranted to confirm these findings and refine treatment protocols. By optimizing the program's design and exploring its effectiveness in different

populations, isometric exercises have the potential to become a cornerstone of non-invasive neck pain management strategies.

IV. CONCLUSIONS

In conclusion, the results of this study demonstrate that isometric exercises can significantly reduce neck disability and pain in college students and workers with neck pain. The statistical analyses provide strong evidence to support the effectiveness of this intervention.

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