"EFFICACY OF NECK EXERCISES IN ADDITION TO WORK STATION MODIFICATIONS IN TENSION NECK SYNDROME IN SEWING MACHINE OPERATORS"

- AN EXPERIMENTAL STUDY

A DISSERTATION SUBMITTED TO THE TAMILNADU Dr. M.G.R MEDICALUNIVERSITY, CHENNAI, AS PARTIAL FULFILLMENT OF THE MASTER OF PHYSIOTHERAPY DEGREE

APRIL 2012.

CERTIFICATE

Certified that this is the bonafide work of **Miss. R.PADMAPRIYA** of K.G. College of Physiotherapy, Coimbatore submitted in partial fulfillment of the requirements for the Master of Physiotherapy Degree course from the Tamil Nadu Dr.M.G.R. Medical University under the **Registration No: 27102203** for the April 2012 Examination.

Place : Coimbatore Principal

Date :

"EFFICACY OF NECK EXERCISES IN ADDITION TO WORK STATION MODIFICATIONS IN TENSION NECK SYNDROME IN SEWING MACHINE OPERATORS"

Under the guidance of,

Principal: …….

Prof. MR.S.Ramesh , M.P.T.,

Principal,

K.G. College of Physiotherapy,

K.G. Hospital, Coimbatore- 641035.

Guide: ……..

Prof. MR.B.Arun MPT . CMPT ,

Vice – principal

K.G. College of Physiotherapy ,

K.G Hospital ,Coimbatore -641035

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_____ _____

Internal Examiner **External Examiner**

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I INTRODUCTION

Neck pain is a significant contributor to worldwide disability (Cote P et al., 1998, 2000, 2004,). Upto 70% of the population will experience of neck pain at some point in the lives and 15 % of the population will experience chronic neck pain. (Bovim G et al., 1994).

Neck pain is a common disorder in both men and women. The prevalence of neck pain was found to be high among such occupational groups as secretaries and other office workers,(Maeda K.1977, Kamwendo K,et al., 1991), factory workers and construction site workers. (Kilborm A, 1986).

Sewing machine operators experience more chronic neck pain than other working populations (Punnett L et al., 1985, Birsson C, et al., 1989, Schibye B et al., 1995), In a cross sectional study on 224 subjects sewing machine operators, 67 % reported with Neck pain and 24 % reported with Tension Neck syndrome. (Blade S et al., 1991).

In India, the readymade garment industry had its beginning during the first half of the 20th century and has witnessed impressive growth during the last four decades. India is the second contributor in readymade garments next to Gems and Jwellery. (Uchikawa S 1998). In India there are around 70,000 garments manufacturing units and more than 3 million workers play a role in it. (Awasthi M, et al., 2003.)

A high occurrence of musculoskeletal complaints and neck and shoulder disorders have been found in studies of women sewing machine operators, and likewise among several other groups of women performing repetitive industrial work.(Vihma T 1982, Punnett L et al., 1985, Brisson C et al., 1989).

Neck pain may be a produced due to mixture of reasons ; One of the frequent causes are spasm or trigger point in the trapezius muscles. Pain with discomfort in the muscles surrounding the neck is grouped as cervico brachial syndromes . Commonest among them is tension neck syndrome (TNS) , it is one type of occupational cervicobrachial syndrome, a term used to refer to those disorders of the neck and shoulder which are (or can be) related to occupational factors.(Winkel and Westgaard, 1992).

TNS patients usually complain of constant muscle fatigue or stiffness in the neck and shoulder areas along with subjective neck pain or headache.(Hagberg and Wegman 1987). Palpation along the shoulder and neck muscles may identified at least two tender spots or trigger points. Waris 1980, defined tension myalgia as a complex of pain, tenderness, hardened bands or nodules, and stiffness of muscle which is physically palpable.

Sewing machine operators performs precision tasks at a relatively fast pace with work cycles of 30 — 60 seconds , this repetitive stereotyped work is typically performed on non adjustable workstations and chairs. The task demands and the --

lack of adjustability of the work stations may lead to sustained awkward postures, such as cervical and thoracic spine flexion and shoulder elevation and abduction which may result in elevated rates of neck symptoms. (Anderson JH et al., 1993, Jensen BR et al., 1993, Vihma T et al., 1982).

The job involves monotonous, highly repetitive tasks performed in a sitting working posture with upper back curved and head bent over the sewing machine. The work is visually demanding and requires a high degree of concentration and accuracy. (Hagberg M, et al., 1987, Ekberg K et al., 1994).

Working Atmosphere in these units are usually Unsafe and Unhealthy. The poorly designed workstations, unsuitable furniture's, lack of ventilation, inappropriate lighting, excessive noise, insufficient protection from dangerous chemicals, insufficient safety measures in fire emergencies and lack of personal protective equipment. People working in such poor or substandard environment are prone to occupational diseases. Evidences suggest that garment workers suffer with work related musculoskeletal disorders such as carpal tunnel syndrome, neck pain, low back pain, knee pain. (Parimalam et al., 2003).

Posture has been demonstrated as possible contributor of neck pain . Neck pain associated with posture is generally due to static loading positions. (Nyman T et al., 2007, Tittiranonda P et al., 1999). Poor posture may also increase compressive loading of cervical spine, which is a result of weight transfer from

upper extremities through cervicoscapular muscle attachments.(Mc Donnell MK et al., 2005). Postural abnormalities have significant increase of cervical and interscapular pain. (Griegel-Morris P et al., 1992).

There exists a mismatch between the machine and the man and this has been identified as major factor contributing to some musculoskeletal problems. Various researches directed on ruling out the mismatch between the man and the machine, redesigning the work environment and to provide optimum comfort to the workers.

Ergonomics in the workplace refers to interactions between the workers and other elements in the working environment. It is essentially about fitting the job to the worker.

1.1 NEED FOR THE STUDY:

Prevention programs structured around ergonomically based recommendations have been introduced to help in reducing the negative consequences of computer use and have been reported to be successful by some authors.

However, recommendations for ergonomic prevention which have appeared in the literature have not been consistent in the way they are described and may be hard for novice users to understand causing confusion. Such confusion may occur because the reported recommendations are often specific to a single work task and a particular individual. (Wall et al., 1992).

Sewing machine operators are more focused on job task completion than job positioning. Employers work in a cluster environment and safety issues are relatively small, employees in such working environments may not be protected by duty of care and occupational health and safety laws. Therefore, it is necessary to assist employers to use ergonomic principles, which do not require expensive alternatives and can ensure an increase in profitability and a decrease in symptoms of work-related disorders among their workers. Instructions for such intervention must be clear and readily understandable to ensure successful application.

Many researchers support the ergonomic role in prevention of neck pain as well as its role in rehabilitation, but very few conducted studies with conjunction of exercises. So this study focused to find out the role of exercises and the ergonomics on Tension Neck syndrome.

1.2 PURPOSE OF THE STUDY:

The purpose of the study was to compare the efficacy of neck exercises in addition to workstation modification on tension neck syndrome in sewing machine operators.

1.3 OBJECTIVES OF THE STUDY:

- To find out the efficacy of neck exercises in reducing disability in subjects with tension neck syndrome.

- To find out the efficacy of work station modifications with neck exercises in reducing disability in subjects with tension neck syndrome.
- To compare the efficacy of neck exercises in addition to Workstation modifications in reducing the disability in subjects with tension neck syndrome.

1.4 HYPOTHESIS

Alternate hypothesis

There will be a significant effect of neck Stabilization Exercises in addition to workstation modifications in sewing machine operators with Tension neck syndrome .

Null Hypothesis

There will be no significant effect of neck Stabilization Exercises in addition to workstation modifications in sewing machine operators with Tension neck syndrome .

II REVIEW OF LITERATURE

Hagberg . M (1984)

He conducted a study to evaluate the occupational musculoskeletal stress and disorders of the neck and shoulder. The study is aimed at reviewing the path physiological mechanism of occupational stress on the neck and shoulder. Garment industrial workers were selected for the study . The author studied the subject's working posture involving the elevated arms . The study findings concluded that work tasks with repetitive arm movements may evoke shoulder tendinitis or teno – vaginitis due to friction.

Brisson .C , Vinet A et al., M (1989)

These authors conducted a study to identify the chronic health problems associated with garment workers .This study aimed at comparing the health status of female garment workers with women employed in clerical work and manufacturing industries .The study consisted of 800 subjects selected from the Quebec garment industry .The disability status was obtained in a personal interview . The disability prevalence was compared with the national disability prevalence of women working in clerical , services and other manufacturing industries .The study findings concluded that the currently employed garment

workers had an increased prevalence of moderate and slight disability when compared with workers employed in other occupations .

K. Liston , S. Nandharanji et al., (1989)

The authors conducted a study to evaluate the effect of ergonomic intervention in patients with Tension neck syndrome. The study is aimed at investigating the long – term effects of ergonomic intervention on neck and shoulder discomfort among patients with TNS. 80 patients with TNS were included in the study. Two pre-test were conducted to study the level of discomfort. 40 subjects received workstation modification according to their anthropometric measures for 3 months. 40 received the same interventions 3 months later. The mean level of discomfort ratings before and after intervention showed significant difference. The study findings concluded that ergonomic intervention helps to reduce the discomfort in patients with Tension neck syndrome.

Blader S .Barck – Hoist U et al ., (1991)

This study was aimed at finding out the occurrence of neck and shoulder problems in a population of sewing machine operators. 204 sewing machine operators were selected from 4 textile factories in Sweden. Comprehensive questionnaire about demographic, vocational, medical and psychosocial data were

collected. Nordic questionnaire was used towards neck – shoulder complaints. Tension neck syndrome was most frequent followed by cervical – syndrome , a positive correlation between TNS and working hours per week suggested a daily prolonged static load on the neck and shoulder problems among sewing machine operators.

Gerr . F.Letz .Landrigan PJ et al., (1991)

They conducted a study to evaluate occupational origin of upper extremity musculoskeletal disorders. This study is aimed at studying the soft – tissue disorders of upper extremity related to occupational factors . The authors studied the subjects of different occupational groups. Force , repetition and vibration of the occupation were studied .The study findings concludes that several well – defined soft tissue disorders of the upper - extremities are etiologically related to occupational factors these include TNS , CTS , hand – arm vibration syndrome , tendinitis of the wrist and hand .

Vernon H, Mior .S et al ., (1991)

These authors conducted a study to evaluate the reliability and validity of NDI. The study is aimed at evaluating the test – retest reliability and validity of NDI. A group of 52 subjects with cervical pain were included in the study . Assessment was made using a modified Oswestry Low Back Pain index named as

Neck Disability Index. Test – retest scores were analyzed using Pearlson correlation. NDI scores were compared to Mc Gill pain questionnaire .The correlation was high (0.69 – 0.70).The results concluded that NDI achieved a high degree of reliability and internal consistency than McGill pain questionnaire.

Anderson J.H , Gaarboe .O et al ., (1993)

They conducted a study to evaluate the musculoskeletal disorders of the neck and upper limb among sewing machine operators. They observed the exposure response relationship between clinical outcomes and years of sewing machine operators exposed to musculoskeletal strain. They found that there is a strong relationship between sewing machine operators and musculoskeletal disorders.

Ogon M (1996)

He did a study by enquiring pain intensity for 78 chronic low back pain patients, and on the lifestyle changes caused by their pain, on a horizontally-oriented visual analogue scale (VAS). Vertical scale was also used to assess the current pain intensities. Statistical analysis showed normal distribution of data in the measurement of usual pain on the horizontal VAS, but no homogeneous distribution on the vertical VAS. Therefore, in the measurement of chronic low back pain VAS should be used horizontally rather than vertically, because of

higher sensitivity. The intensity of usual pain was significantly correlated with the degree of lifestyle change. No correlation was found between current and usual pain. There was no significant difference in the failure rate between the vertical and horizontal VAS. Also, there was no reduction of the failure rate by giving additional oral explanations in the use of the scale to the patient. Owing to a negative influence in distribution of rates and an increase in the failure rate, complex questions should be avoided. A short written introduction to the scale is sufficient, and oral explanations are not essential.

Victor .CW. Hoe et al ., (1997)

The authors conducted a study to evaluate the effects of ergonomic intervention and training in prevention of work related musculoskeletal disorders of the neck and upper limb in adults . The study aims at assessing the effects of workplace ergonomic design and training interventions in reducing the prevalence of musculoskeletal disorders of neck and upper limb. The study interventions included the workstation design modifications and ergonomic advices and the combination of any of these two . The study results concluded that there was a decrease in prevalence of work related musculoskeletal disorders of neck and upper limb after the intervention programme .

Guangyan Lil, Christine.M et al., (2000)

The authors conducted this study to determine the factors affecting posture for sewing machine tasks . The study aims at assessing the musculoskeletal problems of sewing machine operators due to their posture adapted during various tasks, The effects of two parameters 1. table inclination and 2. view of needle were evaluated. The study findings concludes that head posture was most influenced by the view of the task/needle and could be improved by improving the visual condition for the task .

Fredrickson . K . Alfredsson . L et al., (2000)

They conducted a study on risk factors for neck and shoulder disorder. The study is aimed at evaluating the risk factors associated with neck – shoulder disorders. 783 subjects were selected. Neck – shoulder disorders were evaluated using post sick leave (or) medical attention and recent symptoms . Information's regarding working condition, outside work conditions , neck and shoulder disorders were collected retrospectively for a period of 2 years .The study findings concludes that psychosocial factors among women and physical factors among men were associated with neck and shoulder disorders. The study findings concluded that the common risk factor for both gender was found to be repetitive hand work.

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Colombini D . Occhipinti E et al ., (2001)

The authors conducted a study to assess the relationship between musculoskeletal disorders and upper limb repetitive movements. The study is aimed at evaluating work conditions that can represent a physical overload to upper limbs. The authors studied subjects of different occupational group involving repetitive movements. A rapidly developed body of literature on job analysis was used. The study results suggests that design of jobs should be integrated into an

ongoing ergonomics program that includes training, surveillance and medical case management.

Zanoli Gustavo (2001)

It is a prospective observational study of visual analog scale (VAS) scores for pain. The objective is to describe the use of recording VAS for pain intensity in patients operated on for lumbar spine problems. The result of this study shows that preoperative VAS mean values for local and radiating pain were significantly, different in the five diagnostic groups. Significant but moderate correlation between different types of pain outcomes and with patient satisfaction was present in all cases. Thus the study concludes that measuring pain intensity with VAS is a useful tool in describing spine patients, in the search for a standard in the evaluation of pain as an outcome, the differences between the various methods should be taken into account.

Bijur PE (2001)

This study is done in adults with acute pain the reliable and valid measures of pain are needed to advance research initiatives on appropriate and effective use of analgesia in the emergency department (ED). The objective of the study was to assess the reliability of the VAS for measurement of acute pain. The study was a prospective convenience sample of adults with acute pain presenting to two EDs.

Intraclass correlation coefficients (ICCs) with 95% confidence intervals (95% CIs) and a Bland-Altman analysis were used to assess reliability of paired VAS. The study concludes that Reliability of the VAS for acute pain measurement as assessed by the ICC appears to be high. Ninety percent of the pain ratings were reproducible within 9 mm. These data suggest that the VAS is sufficiently reliable to be used to assess acute pain.

Jane Chao Pun et al., (2004)

These authors conducted a study to analyze the effects of education of garment workers in prevention of work related musculoskeletal disorders. The study aimed at evaluating the effects of health education in prevention of musculoskeletal disorders among sewing machine operators .A total of 21 women participated in healthy work classes and there was also a train the trainer programme with the training of garment work leaders. The study findings concluded that there was a significant decrease in the incidence of musculoskeletal disorders in women who participated in the healthy worker classes .

Kay TM et al., (2005)

These authors conducted a study to investigate the effects of exercise therapy in neck disorders. The study is aimed at assessing the effectiveness of exercise therapy to relieve pain (or) improve function, disability in adults with

mechanical neck disorders. Databases including central, medline , cinahl , icl were searched . Two reviewers independently conducted citation identification, study selection , data abstraction and methodological quality assessment. Random effect model was used to assess the relative risk and standardization mean differences were calculated 31 trials were selected 19 % (van tudler criteria) to 35 % (jaded scale) had high quality . The study findings concluded that the specific neck exercises will be effective in reducing pain , improved function and global perceived effect in short and long term than other treatments in neck pain.

Parimalam N Kamalamina et al., (2006)

These authors conducted a study to evaluate the ergonomic interventions to improve work environment in garment manufacturing units. The study aimed at analyzing the work environment including ventilation, excessive noise , workstations . The authors conducted the study in eighteen garment manufacturing units . 216 workers were selected for the study . Analysis of work environment , questionnaires , hazard identification , assessment of neck and quantifying techniques was used to collect data's regarding the health status of the workers , nature of their work and the work environment. The study findings revealed that there were several drawbacks in the tools , the working environment and the equipments all these factors were found to affect the health status of the workers and the safety of workers in the working environment . Ergonomic interventions to

the cutting and sewing section workers lead to a good improvement in the pain and discomfort of the workers

M.G Boocook , P.J Nair et al., (2007)

They conducted a study to evaluate the effects of various interventions on the prevention and management of neck and upper extremity musculoskeletal disorders. The study aimed at evaluating the findings of primary, secondary and tertiary intervention studies for neck and upper extremity conditions. 31 intervention studies were included for the study. 10 were classified as mechanical exposure intervention and 19 were classified as modifier intervention. The study findings concluded that the 19 studies of modifier intervention had positive effects upon the neck / shoulder disability among the sewing machine operators

Bente R. Jensen et al., (2007)

These authors conducted a study to evaluate shoulder muscle load and muscle fatigue among industrial sewing-machine operators . The study aimed at evaluating the physiological responses to physical work in female sewing machine operators .29 female sewing machine operators were included in the study , the static load on left and right trapezius muscle during sewing machine activity was recorded using a electromyogram . The study findings showed that there was an increase in muscle fatigue in the trapezius muscle during the 8 hours working day .

Findings of the study concluded that industrial sewing-machine work involves a pattern of shoulder muscle activity which induces fatiguing processes in the shoulder and neck regions.

David Rampel , Pinchick wang et al., (2007)

They conducted a randomized controlled trial to evaluate the effects of chair design on neck – shoulder pain among sewing machine operators . They determined to find out whether a chair with a curved seat pan leads to improved changes in monthly neck and shoulder pain scores compared with a control intervention . A total of 277 sewing machine operators participated in this 4 month duration study , completed a monthly questionnaire .Based on the pain score participants who received flat seat chair experienced a decline in pain 0.14 points per month compared with the control group ,while those who received the curved seat experienced a decline of 0.24 points per month .The study findings concludes that chairs with curved seat pan can reduce neck and shoulder pain in sewing machine operators .

Mc Carthy, M.P.Grawth, (2007)

They compared the reliability and validity of NDI and with short form 36 health survey questionnaire (SF36). The study is aimed at determining the reliability and validity of NDI in patients with chronic neck pain .164 patients with

neck pain were selected for the study. The study was conducted for 2 weeks. The NDI and SF36 scores were compared using Cranbach's alpha. The test – retest reliability are assessed using Bland and Altman method . Correlation between NDI and SF36 ranged -0.45 to -0.74 . The results concluded that NDI has good reliability and validity than SF36.

Boonstra AM (2008)

The study uses a test-retest design and for validity cross-sectional design. It focused to determine the reliability and concurrent validity of a visual analogue scale (VAS) for disability as a single-item instrument measuring disability in chronic pain patients was the objective of the study. The study uses the Spearman's correlation coefficients (rho values) of the test and retest data of the VAS for disability, and the validity of the study: rho values of the VAS disability scores with the scores on four domains of the Short-Form Health Survey (SF-36) and VAS pain scores, and with Roland-Morris Disability Questionnaire scores in chronic low back pain patients. The conclusion of the study was that the reliability of the VAS for disability is moderate to good. Because of a weak correlation with other disability instruments and a strong correlation with the VAS for pain, however, its validity is questionable.

Young A .Cleland JA et al., (2010)

These authors determined the reliability and construct validity and responsiveness of neck disability index in patients with cervical radiculopathy. The study aimed at evaluating the psychometric properties of NDI , patients who presented to physical therapy with cervical radiculopathy completed the NDI , PSFS, NPRS at the baseline examination and follow – up examination .All patients completed Global tatting of change – which was used to dichotomize patients as improved (or) stable . Baseline and follow up scores were compared and the results concluded that both NDI and NPRS exhibited test – retest reliability and validity than the PSFS in patients with cervical radiculopathy.

III METHODOLOGY

3.1 STUDY DESIGN

Pre test vs. Post test Experimental study design.

3.2 STUDY SETTING

Outpatient Department – K.G College of Physiotherapy. K.G Hospital, Coimbatore.

3.3 STUDY POPULATION

Patients with chronic neck pain were selected for the study after due consideration of the inclusion and exclusion criteria's. A questionnaire was used up to find out the appropriate patients for the study. The selection method was detailed in the procedure of the study.

3.4 STUDY DURATION

The study was conducted for a duration of six months.

3.5 SELECTION OF SAMPLES

Total of 40 patients were included for the study using simple random sampling method.

3.6 CRITERIA FOR SELECTION

INCLUSION CRITERIA ;

- Both sex was included
- Age group of 28—35 yrs
- NDI: with moderate disability
- Willing subjects
- Working for more than 6 hours a day
- Working for at least one year

EXCLUSION CRITERIA :

- Cardio Vascular impairments
- Neurovascular impairments
- Fractures around cervical spine
- Spinal deformity
- Severe disability
- Unwilling subjects

3.7 VARIABLES

- Independent Variables
    - Work station modification
    - Neck stabilization exercises
- Dependent Variables
    - Pain
    - Functional performance

3.8 OPERATIONAL TOOLS

- Visual analog scale
- Neck disability index

3.9 PARAMETERS FOR MEASUREMENT

- Pain
- Functional performance

3.10 PROCEDURE OF THE STUDY

Study focused on sewing machine operators , subjects who are working in tailoring shops around Saravanampatti area and Sarkarsamakulam area were included in the study. Cornell musculoskeletal Questionnaire was given to all the sewing machine operators and their data's were collected. Cornell musculoskeletal questionnaire was specifically designed for male subjects as well as female subjects. The questionnaire consists of two pages, which includes a detailed demographic data and symptoms specific scale. The questionnaires were distributed to every individual who were willing to participate and a clear explanation was given to them.

Around 180 questionnaires were given to the sewing machine operators. They were advised to fill up the questions. All the subjects were instructed about the purpose of the study. Subjects query's were cleared up on the site of assessment. The collection of data was done at different levels , questionnaires were given to individual subject and at their convenient timings.

Upon collection of the Questionnaires, all these were analyzed. Upon analysis of the questionnaires, there were about 35 questionnaires that not suitable for the study. Out of 145 questions their musculoskeletal problems were listed and analyzed.

The questionnaires were analyzed and it was found out which region has got more involvement in repetitive work and work related musculoskeletal injury. Analyses stated that the neck pain ranks 1st when compared to other musculoskeletal ailments.

Around 60 percent of population experience neck pain, followed with back pain and leg pain. Since neck pain ranked first, it was selected and patients were advised to participate in the study, they all were given a counseling session by a physiotherapist, and advised on management of neck pain. Out of 40 subjects chosen, they were randomized and divided into 2 groups.

GROUP A

Subjects underwent neck Stabilization Exercises for a duration of 30 minutes followed with Range of motion exercises.

GROUP B

Subjects underwent neck Stabilization Exercises for duration of 30 minutes followed with Range of motion exercises. The work site was assessed and ergonomic advices were given to every participant.

Ergonomic advices were explained at the work site which is mentioned in the appendix, educational session on ergonomics was conducted for all the participants in group B. 2 hours class on ergonomics included various musculoskeletal impairments, risk of poor posture, self help measures for pain and ergonomic importance were advised to all the participants.

INCORRECT SITTING POSITION WITHOUT BACK SUPPORT

CORRECT SITTING POSITION WITH PROPER BACK SUPPORT AND FOOT REST

NECK STABILIZATION EXERCISES

NECK STABILIZATION EXERCISES

3.11 STATISTICAL TOOL

Paired 't' test

The following statistical tool is used to compare the effect of exercises in addition to ergonomic modifications in the improvement of pain and functional ability in subjects with tension neck syndrome

Formula: Paired t-test

$$S = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n-1}}$$

$$t = \frac{\overline{d}\sqrt{n}}{s}$$

Where,

d = difference between the pre test versus post test

$\overline{d}$ = mean difference

n = total number of subjects

S = standard deviation

U

npaired ‘t’ test:

The unpaired‘t’ test was used to compare the post test values between the two groups of two interventions of neck stabilization exercises and ergonomic modifications in improvement pain and functional performance in subjects with tension neck syndrome .

Formula: Unpaired t-test

$$S = \sqrt{\frac{\sum \left(X_1 - \overline{X_2}\right)^2 + \sum \left(X_2 - \overline{X_2}\right)^2}{n_1 + n_2 - 2}}$$

$$t = \frac{\overline{X_1} - \overline{X_2}}{S} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

Where, $\overline{x_1}$ = Mean of Group A

$\overline{x_2}$ = Mean of Group B

$\sum$= sum of the value

n_1 = number of subjects in Group A

n_1 = number of subjects in Group B

S = standard deviation

Level of significance: 5%

IV DATA ANALYSIS AND INTERPRETATION

TABLE I

PERCENTILE EVALUATION OF MUSCULOSKELETAL INJURIES

S.No	Location of injury	No of subjects	Percentage of Involvement
1	Back	22	32%
2	Neck	75	52%
3	Knee & thigh	15	10%
4	Wrist & Hand	10	3%
5	Shoulder	4	3%
6	Ankle, foot & Hands	3	2%
7	Others (Elbow)	1	1%

GRAPH I

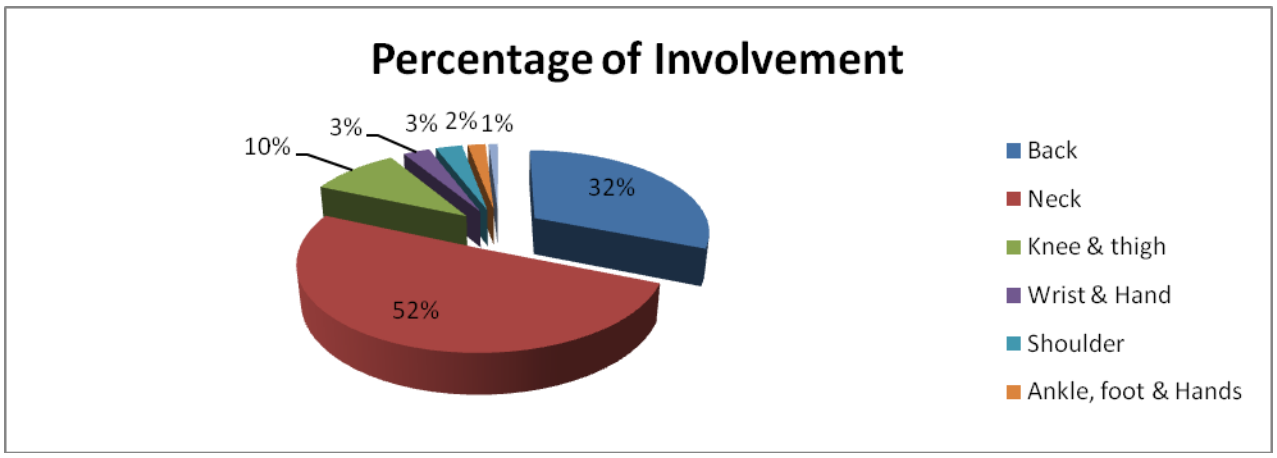


TABLE II

DEMOGRAPHIC DATA FOR NECK PAIN

S.NO	Age group classification	Neck pain
1	28—29	10
2	30—31	13
3	32—33	9
4	34—35	8
Total		40

GRAPH II

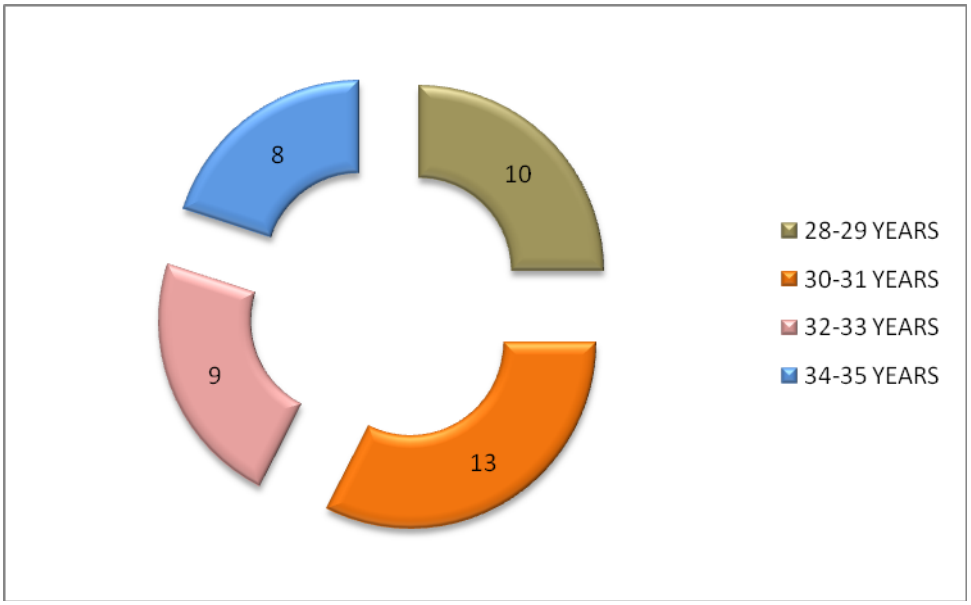


TABLE-III

PAIRED ‘t’ TEST

PRE TEST AND POST TEST VALUES OF GROUP A

GROUP A – NECK STABILIZATION EXERCISES

NECK DISABILITY INDEX

The comparative mean values, mean differences, standard deviation and Paired ‘t’ test values of Group A who were treated with Conventional Neck Exercises.

S.NO	GROUP A	MEAN	MEAN DEVIATION	STANDARD DEVIATION	‘t’ VALUE
1.	Pre test	31.15	10.95	1.41	34.6
2.	Post test	20.2			

The table shows analysis of NDI on paired ‘t’ test. The test values for Group A was 34.6 at 0.05 % level of significance, which was greater than the tabulated ‘t’ value 2.093. The results shows that there was marked reduction of pain between pre test and post test values.

GRAPH-III

GRAPHICAL REPRESENTATION OF PRE TEST AND POST TEST VALUES OF GROUP A (NECK STABILIZATION EXERCISES)

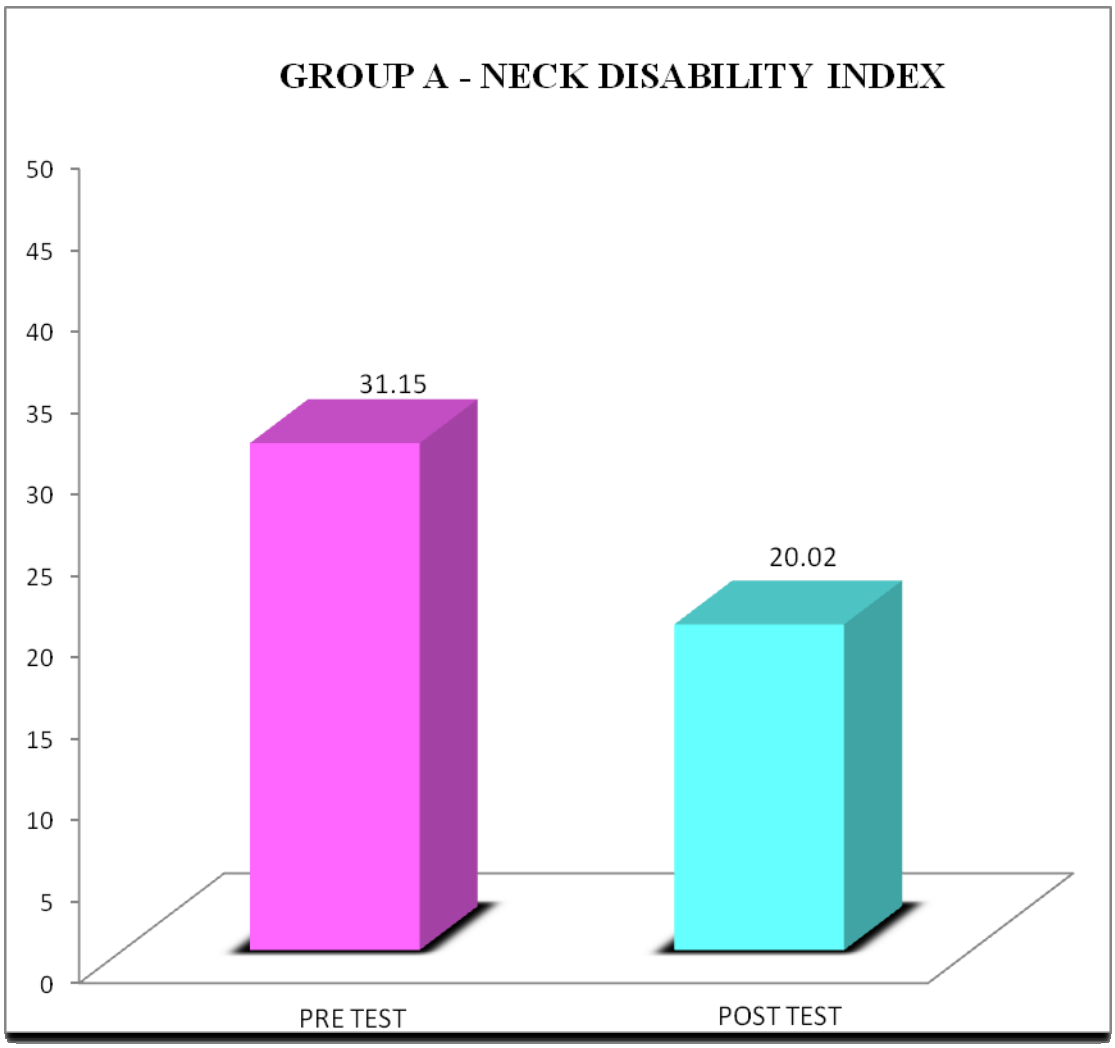


TABLE-IV

PAIRED ‘t’ TEST

PRE TEST AND POST TEST VALUES OF GROUP B

NECK STABILIZATION EXERCISES AND ERGONOMIC MODIFICATIONS

NECK DISABILITY INDEX

The comparative mean values, mean differences, standard deviation and Paired ‘t’ test values of Group B who were treated with neck stabilization exercises.

S.NO	GROUP B	MEAN	MEAN DEVIATION	STANDARD DEVIATION	‘t’ VALUE
1.	Pre test	31.3	23.05	1.6511	61.996
2.	Post test	8.25			

The table shows analysis of NDI on paired ‘t’ test. The test value for Group B was 61.996 at 0.05 % level of significance, which was greater than the tabulated ‘t’ value 2.093. The result shows that there was marked reduction of pain between pre test and post test values.

GRAPH-IV

GRAPHICAL REPRESENTATION OF PRE TEST AND POST TEST VALUES OF GROUP B

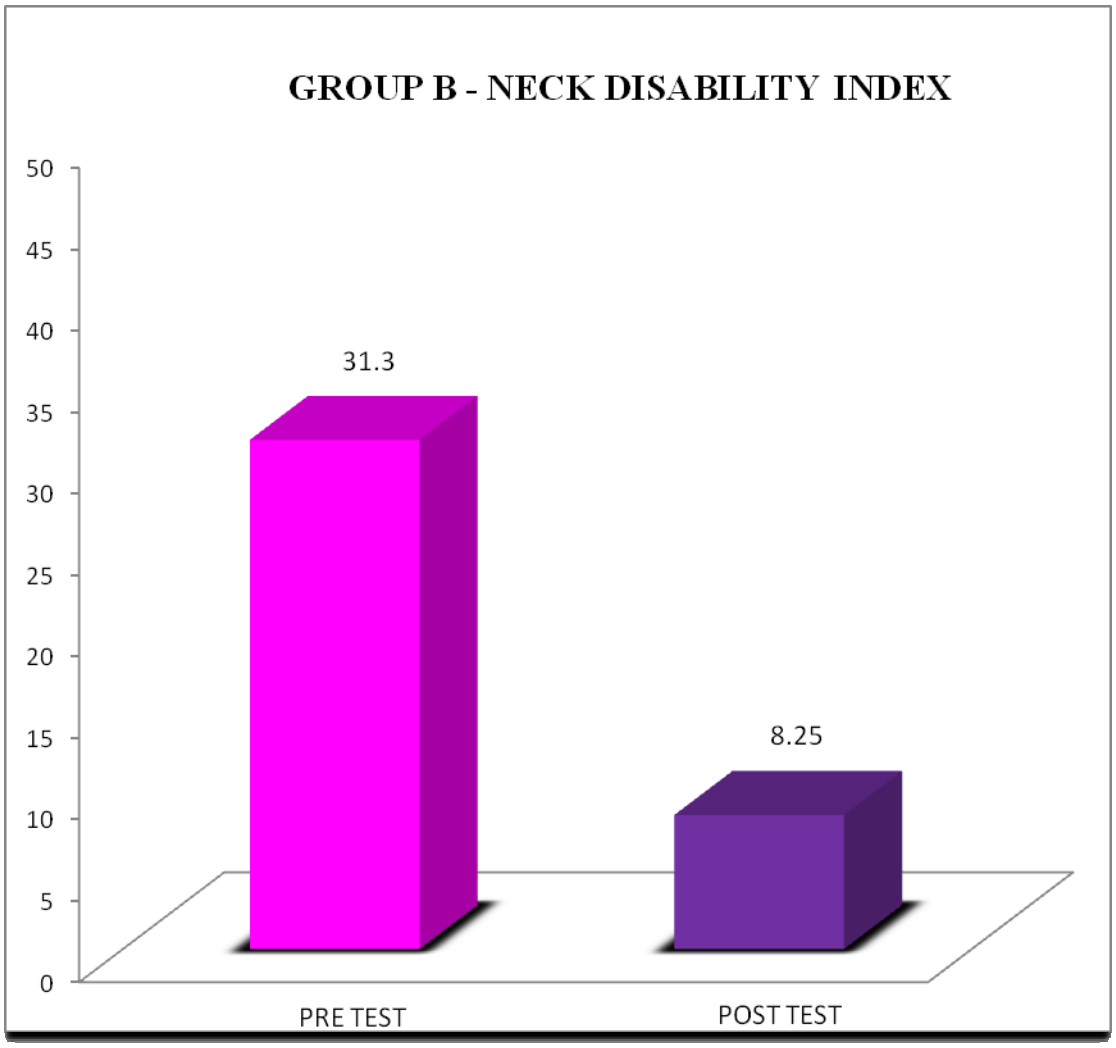


TABLE-V

PAIRED ‘t’ TEST

PRE TEST AND POST TEST VALUES OF GROUP A

GROUP A – NECK STABILIZATION EXERCISES

VISUAL ANALOG SCALE

The comparative mean values, mean differences, standard deviation and Paired ‘t’ test values of Group A who were treated with Neck stabilization exercises

S.NO	GROUP A	MEAN	MEAN DEVIATION	STANDARD DEVIATION	‘t’ VALUE
1.	Pre test	6.25	2.6	0.8825	13.17
2.	Post test	3.65			

The table shows analysis of VAS on paired ‘t’ test. The test value for Group A was 13.17 at 0.05 % level of significance, which was greater than the tabulated ‘t’ value 2.093. The result shows that there was marked reduction of pain between pre and post test values.

GRAPH-V

GRAPHICAL REPRESENTATION OF PRE TEST AND POST TEST VALUES OF GROUP A (NECK STABILIZATION EXERCISES)

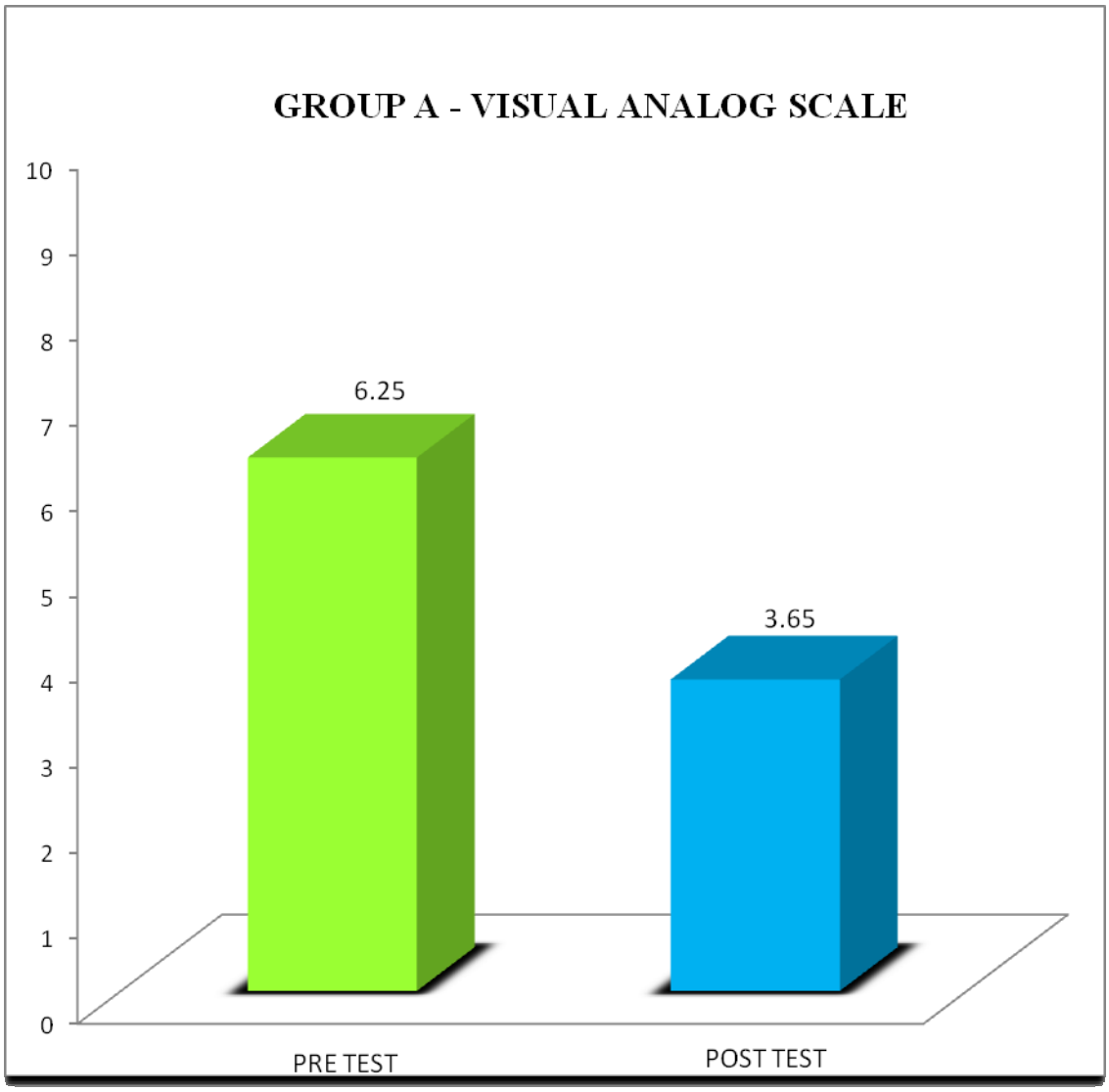


TABLE-VI

PAIRED 't' TEST

PRE TEST AND POST TEST VALUES OF GROUP B

NECK STABILIZATION EXERCISES AND ERGONOMIC MODIFICATIONS

VISUAL ANALOG SCALE

The comparative mean values, mean differences, standard deviation and Paired 't' test values of Group B who were treated with Neck stabilization exercises.

S.NO	GROUP B	MEAN	MEAN DEVIATION	STANDARD DEVIATION	't' VALUE
1.	Pre test	6.05	5.2	5.6612	4.3032
2.	Post test	0.85			

The table shows the analysis of VAS on paired t test . The test value for Group B was 4.3032 at 0.05 level of significance , which is greater than the tabulate value 2.093 . The results shows that there was marked difference between pre and post test values

GRAPH-VI

GRAPHICAL REPRESENTATION OF PRE TEST AND POST TEST VALUES OF GROUP B

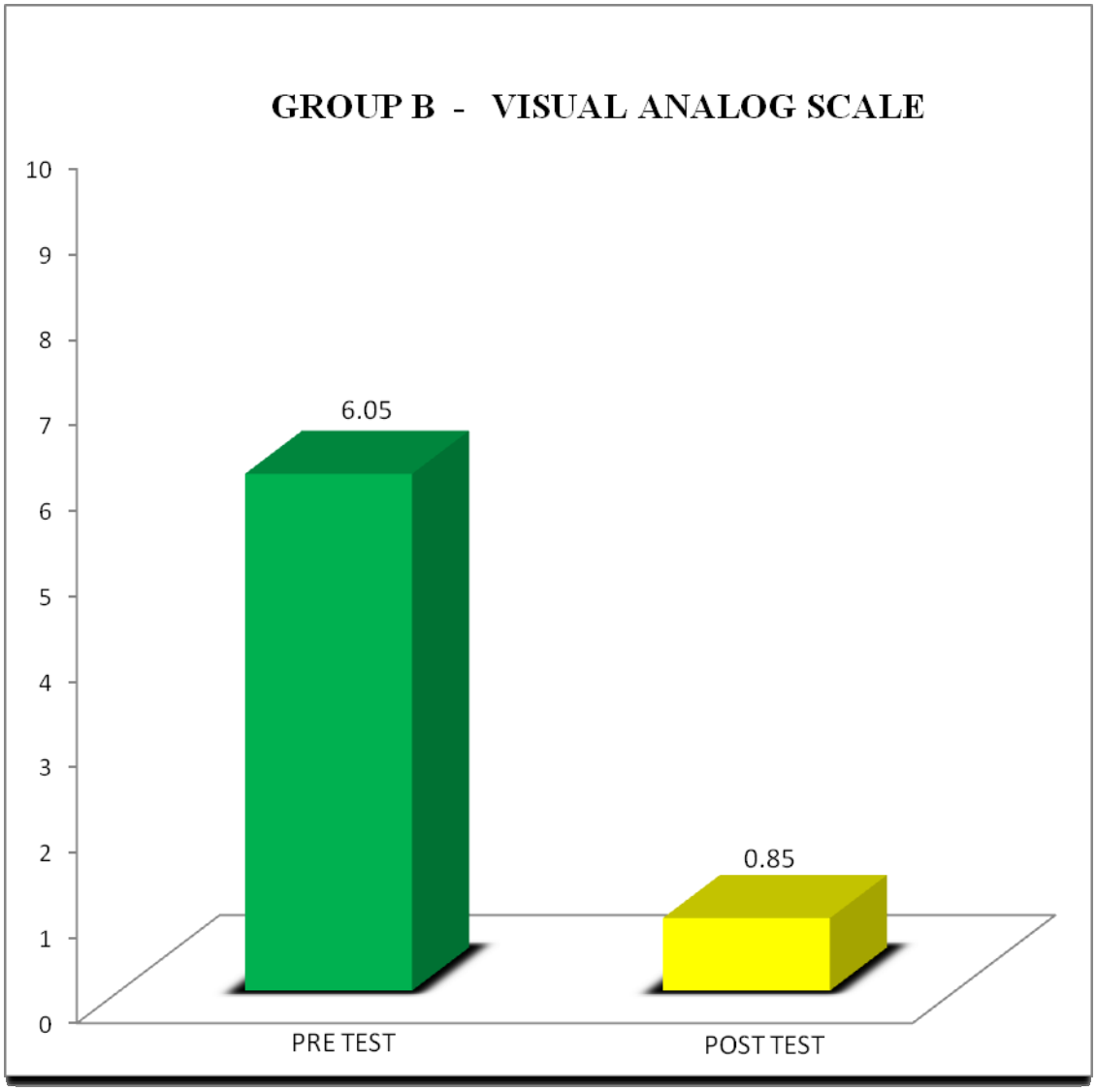


TABLE-VII

UNPAIRED‘t’ TEST

COMPARISON BETWEEN THE PRE TEST VALUES OF GROUP A AND GROUP B

NECK DISABILITY INDEX

The comparative mean values, mean differences, standard deviation and Unpaired‘t’ test values of Group A and Group B who were treated with Neck stabilization exercises and Ergonomic modifications .

S.NO	GROUPS	MEAN	MEAN DEVIATION	STANDARD DEVIATION	‘t’ VALUE
1.	Group A	31.15	0.15	1.1782	0.4025
2.	Group B	31.03			

The table shows analysis of NDI on unpaired t test . The pre test value for Group A and Group B was 0.4025 at 0.05 level of significance , which was less than the tabulate t value 1.960. The result shows that there was no marked difference between pretest test values of Group A and Group B

GRAPH-VII

GRAPHICL REPRESENTATION OF PRE TEST VALUES FOR GROUPA AND GROUP B

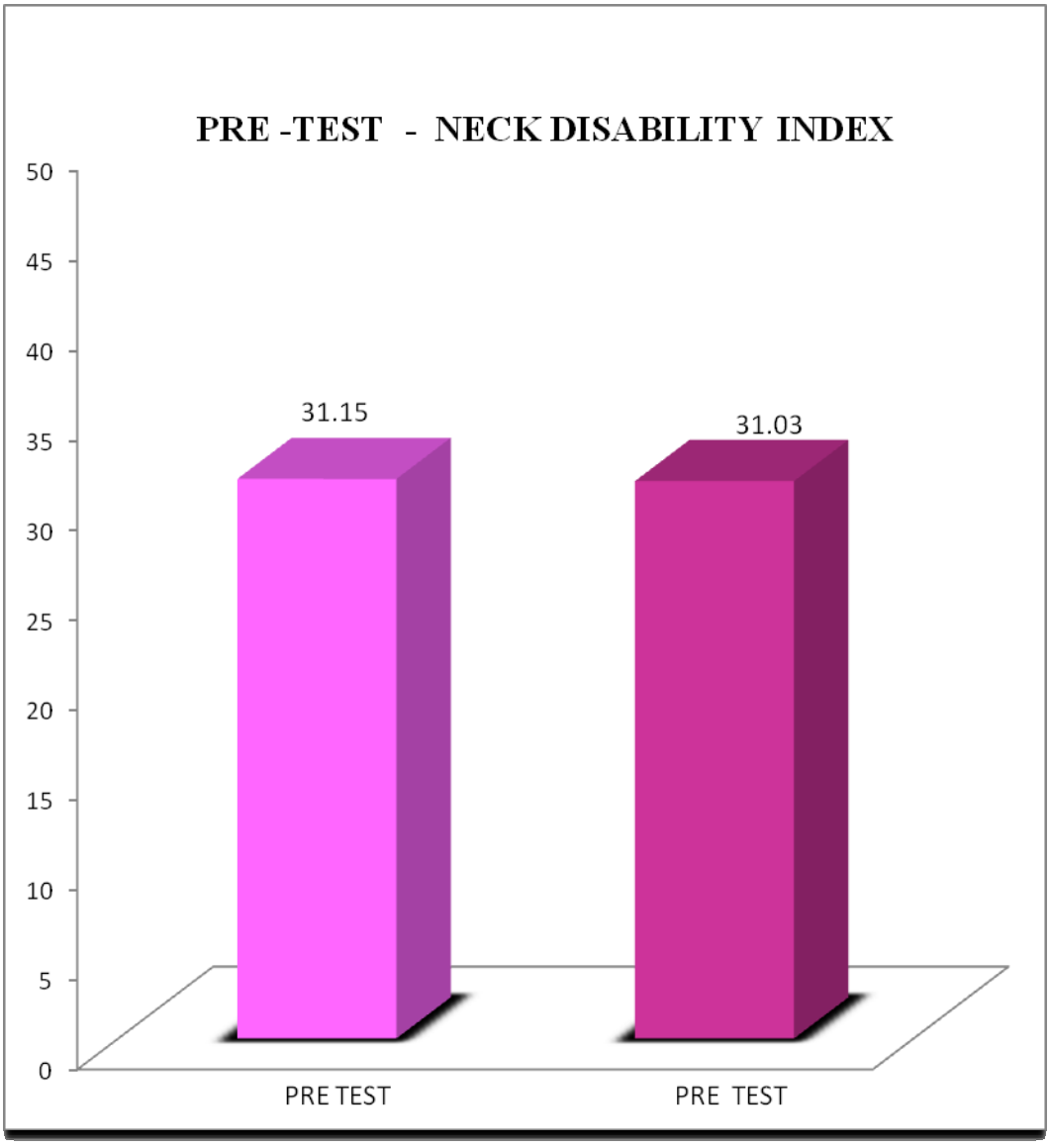


TABLE-VIII

UNPAIRED ‘t’ TEST

COMPARISON BETWEEN THE POST TEST VALUES OF GROUP A AND GROUP B

NECK DISABILITY INDEX

The comparative mean values, mean differences, standard deviation and Unpaired ‘t’ test values of Group A and Group B who were treated with Neck stabilization exercises and Ergonomic modifications .

S.NO	GROUPS	MEAN	MEAN DEVIATION	STANDARD DEVIATION	‘t’ VALUE
1.	Group A	20.2	11.95	0.8652	28.7
2.	Group B	8.25			

The table shows analysis of NDI on unpaired t test. The post test value for Group A and Group B was 28.7 at 0.05 level of significance , which was greater than the tabulated t value 1.960.The result shows that there was marked difference between post test values of Group A and Group B.

GRAPH-VIII

GRAPHICL REPRESENTATION OF POST TEST VALUES FOR GROUP A AND GROUP B

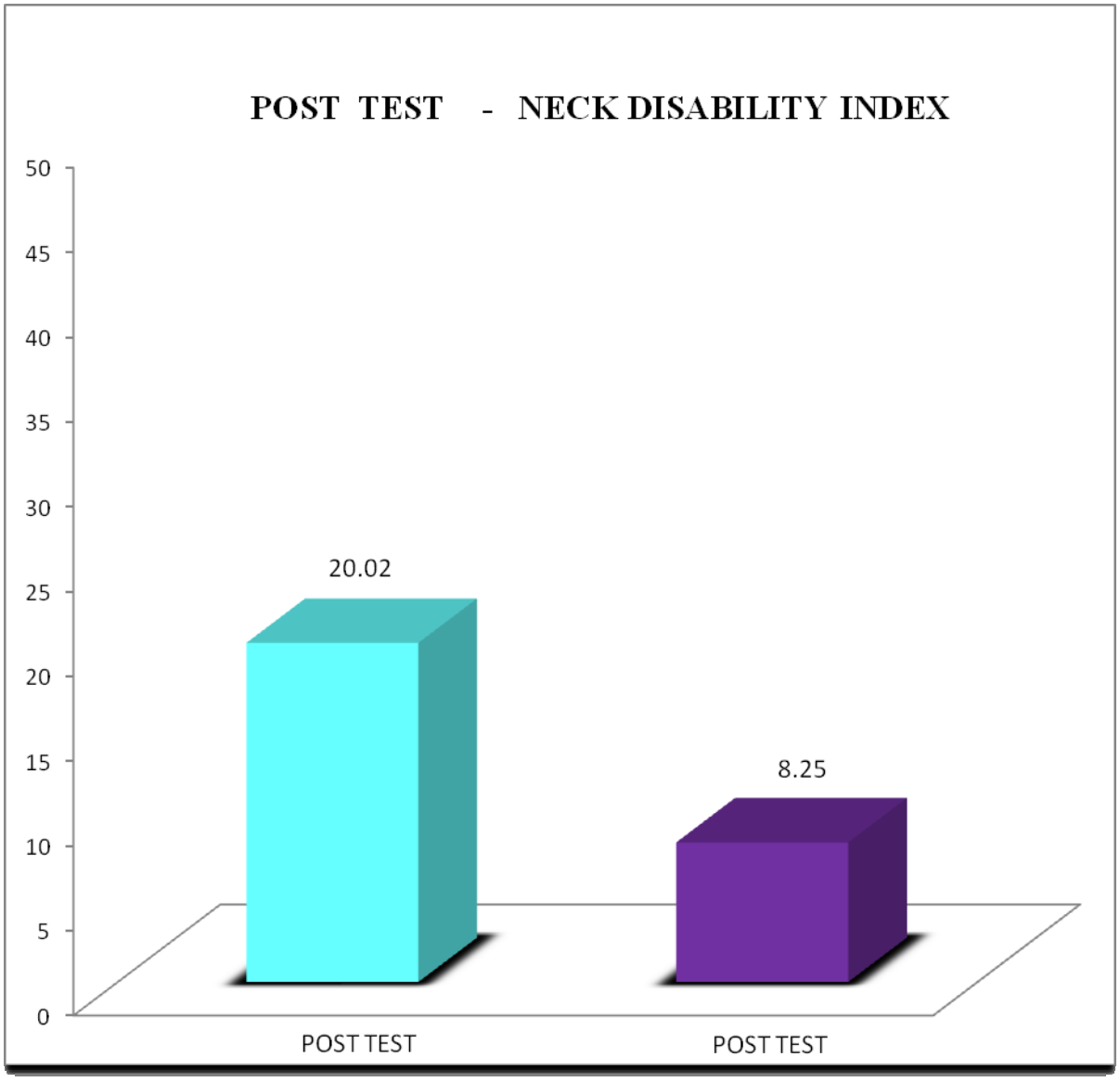


TABLE-IX

UNPAIRED 't' TEST

COMPARISON BETWEEN THE PRE TEST VALUES OF GROUP A AND GROUP B

VISUAL ANALOG SCALE

The comparative mean values, mean differences, standard deviation and Unpaired't' test values of Group A and Group B who were treated with Neck stabilization exercises and Ergonomic modifications.

S.NO	GROUPS	MEAN	MEAN DEVIATION	STANDARD DEVIATION	't' VALUE
1.	Group A	6.25	0.2	0.08840	0.175
2.	Group B	6.05			

The table shows analysis of VAS on unpaired t test . The pre test value for Group A and Group B was 0.175 at 0.05 level of significance , which was less than the tabulated t value 1.960 .The results shows that there was no marked difference between pretest values of Group A and Group B .

GRAPH-IX

GRAPHICL REPRESENTATION OF PRE TEST VALUES FOR GROUP A AND GROUP B

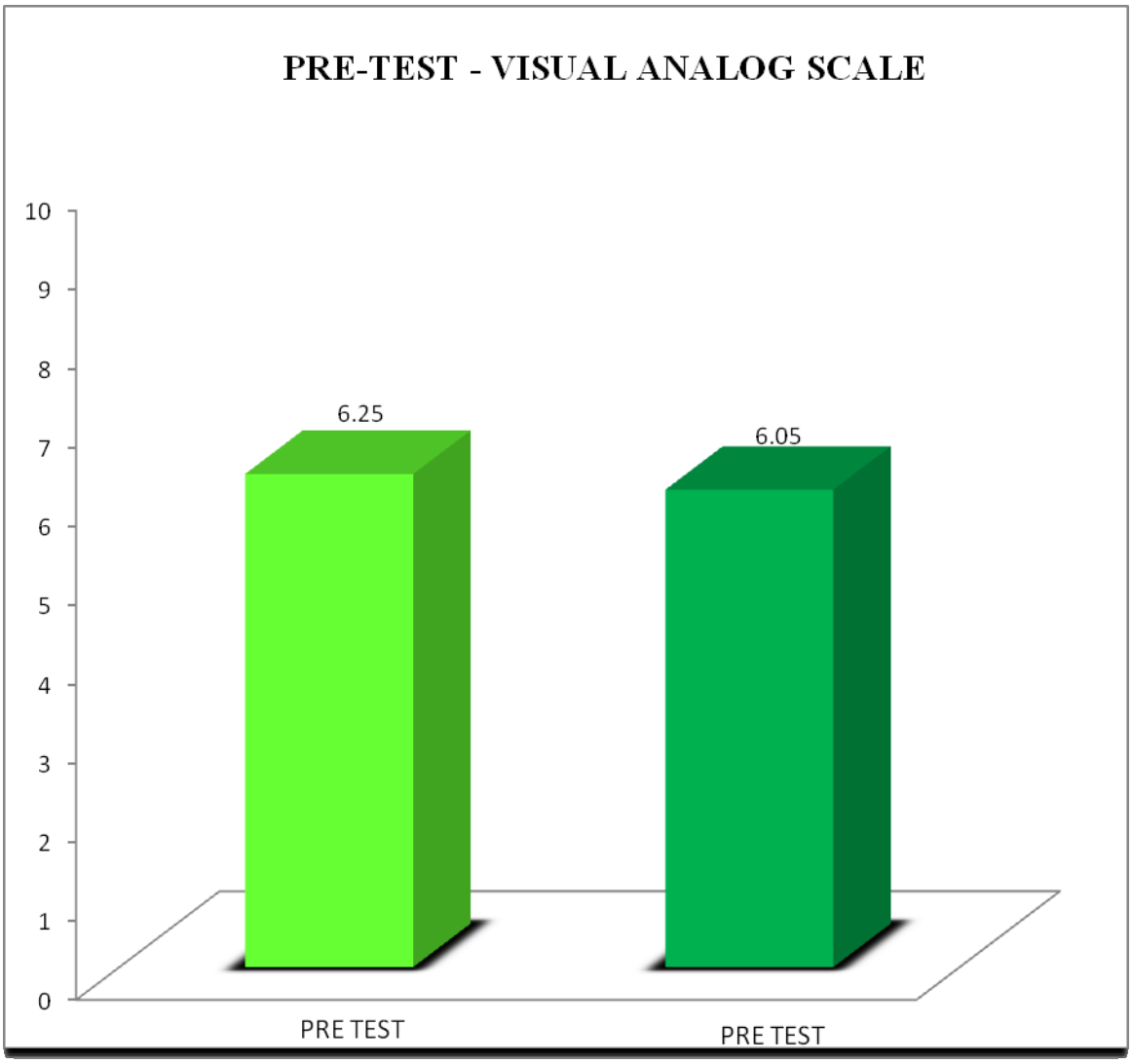


TABLE-X

UNPAIRED 't' TEST

COMPARISON BETWEEN THE POST TEST VALUES OF GROUP A AND GROUP B

VISUAL ANALOG SCALE

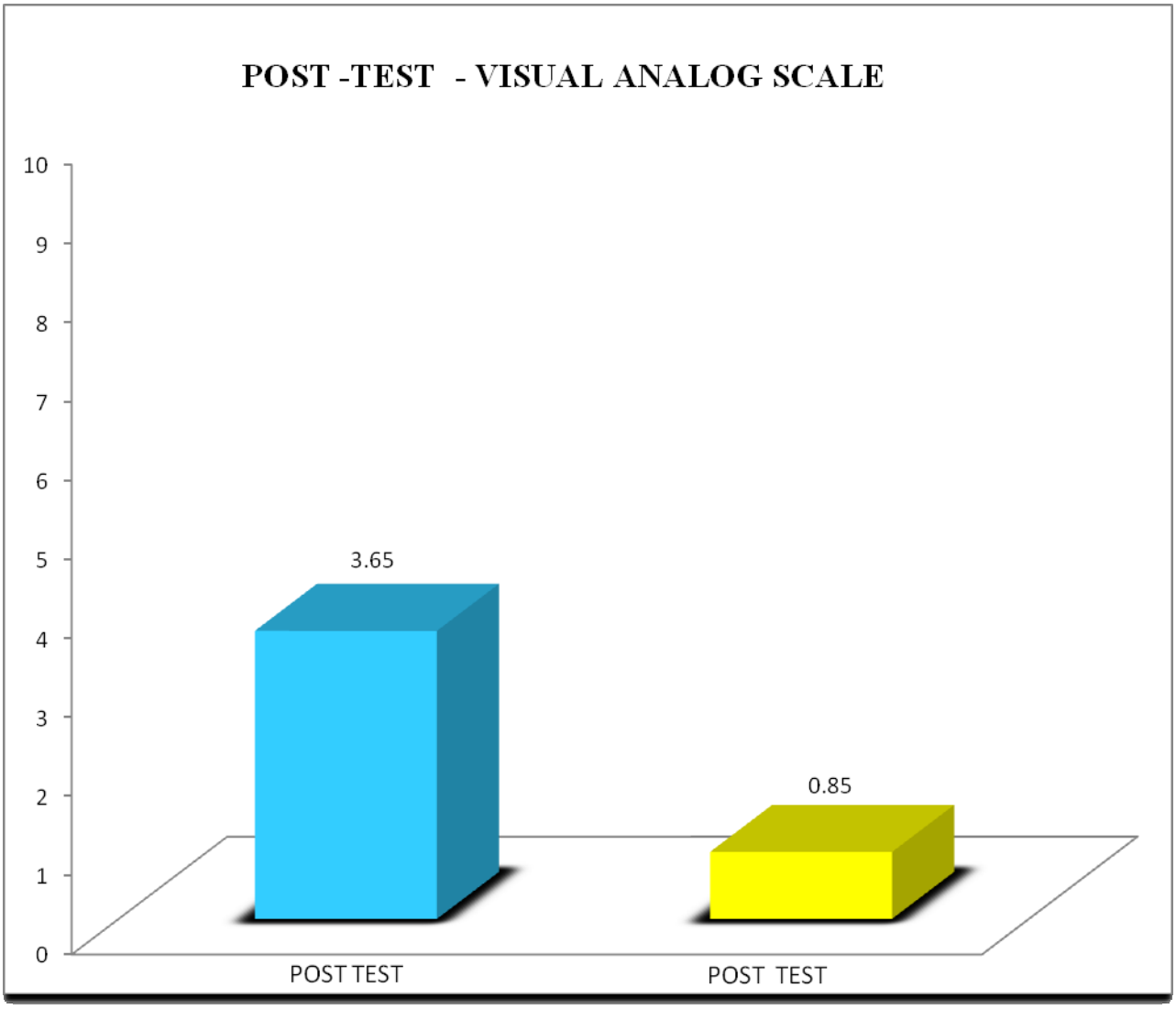
The comparative mean values, mean differences, standard deviation and Unpaired 't' test values of Group A and Group B who were treated with Neck stabilization exercises and Ergonomic modifications .

S.NO	GROUPS	MEAN	MEAN DEVIATION	STANDARD DEVIATION	't' VALUE
1.	Group A	3.65	2.8	0.844	10.48
2.	Group B	0.85			

The table shows analysis of VAS on unpaired t test . The post test value for Group A and Group B was 10.48 at 0.05 level of significance , which was greater than the tabulated value of t which was 1.960. The results shows that there was a significant difference between the post test values of Group A and Group B.

GRAPH-X

GRAPHICL REPRESENTATION OF POST TEST VALUES FOR GROUP A AND GROUP B



V RESULT

The percentage of musculoskeletal involvement for the 145 subjects data were assessed and noted in table I, The data shows that neck pain is the common musculoskeletal ailment in sewing machine operators. This followed by back pain, knee & thigh, shoulder and others.

The demographic representations of the groups are given in table II. Treatment duration was not analyzed since all underwent same duration. Age group of the participants varies from 28 yrs to 35 yrs and about 33 % from 30—31 yrs, 25% from 28—29 yrs, 23% from 32—33 yrs and 20% from 34—35 yrs.

The Paired 't' test analyses for the pre test and post test variable for the Neck Disability Index measuring disability for neck pain is shown in table III and IV. Both the groups show a significant difference between the pre test and post test values. The 't' value for the Group A is 34.6, the 't' value for the Group B is 61.996.

The unpaired't' test analyses for the Post test variables for both groups for the Neck Disability Index measuring disability for neck pain is shown in the table VIII. There was a significant difference shown between the Groups. Group B subjects show superior to other group. The 't' value for the post test variables for both groups is 28.7.

The Paired ‘t’ test analyses for the pre test and post test variable for the Visual Analogue Scale measuring the pain in chronic neck pain is shown in table V and VI. Both the groups show a significant difference between the pre test and post test values. The ‘t’ value for the Group A is 13.17, the ‘t’ value for the Group B is 4.3032.

The unpaired‘t’ test analyses for the Post test variables for Both groups for the Visual Analogue Scale measuring the pain in chronic neck pain is shown in table VI. There was a significant difference shown between the Groups. Group B subjects show superior to other group. The ‘t’ value for the post test variables for both groups is 10.48.

VI DISCUSSION

The purpose of the study is to find out the effect of neck exercises in addition to work station modification on tension neck syndrome in sewing machine operators. A group of 40 subjects with tension neck syndrome were selected randomly and divided into two equal groups. 20 subjects in each group, Group A subjects underwent neck exercises where as Group B subjects underwent Neck exercises in addition with ergonomic programme. The study was conducted for a period of 6 months, and the individual subjects underwent 8 weeks of training. Outcome measures chosen were Pain and Disability. Pain was measured using Visual Analog scale (VAS) and Disability was measured using Neck disability index (NDI).

Neck pain is a common disorder in both men and women.(Lau EMC et al., 1996). Neck pain is a common problem prevailing especially high among women and around 67% of adults would have experienced neck pain at some point in their life. Tension neck syndrome has the highest rates of all the shoulder-neck diseases studied. Women tend to have higher rates of tension neck syndrome than men. Tension neck syndrome may cause a feeling of fatigue or stiffness of the neck, neck pain or headache radiating from the neck. signs consists of at least 2 tender spots or palpable hardenings.

Prevalence of neck pain was found to be high among such occupational groups as secretaries and other office workers, factory workers and construction site workers. (Kamwendo K et al., 1991, Meda K 1977, Holmstorm EB et al., 1977).

The existing mismatch between the machine and the man is a major risk factor identified to cause all the musculoskeletal problems. Empirical evidences suggest that the workers in the garment units suffer from work-related musculoskeletal disorders such as carpal tunnel syndrome, forearm tendinitis, epicondylitis, bicepital tendinitis, low back pain, neck pain, shoulder pain and osteoarthritis of the knees. (Courtney TK, et al. 1990, Nag A 1996, Parimalam PN,2004).

Poor task lighting was an important deficiency noted in the sewing machine operators. Usually the workers complained of Headache & occurrence of Accidents like needle piercing due to visual strain. The hazard identification and risk analysis indicated insufficient illumination as a risk for the sewing machine operators.

A high occurrence of musculoskeletal complaints and neck and shoulder disorders have been found in studies of women sewing machine operators (Vihma T. 1982, Punnett L,et al 1985., Brisson C 1989.) likewise among several other

groups of women performing repetitive industrial work. (Hagberg M, et al., 1987, Ekberg K, et al., 1985, Ohlsson K, et al., 1985).

The prevalence of persistent neck and shoulder disorders has been found to increase with years of employment as a sewing machine operator.(Andersen JH, et al., 1993, Wærsted M, et al., 1991). However, some women never experience more than slight or moderate symptoms and never develop clinical neck or shoulder disorders despite many years of work.

The job involves monotonous, highly repetitive tasks performed in a sitting working posture with upper back curved and head bent over the sewing machine. Sewing machine operators experience a high prevalence and severity of neck and shoulder pain in comparison to other working populations probably due to the sustained shoulder abduction and neck and upper back flexion required of the task. An adjustable height task chair that supports a forward sitting posture may reduce these posture-related risk factors and reduce neck/shoulder pain.

These findings demonstrate that an adjustable height task chair with a curved seat pan can reduce neck and shoulder pain severity among sewing machine operators. (David M et al., 2007)

Occurrence of neck-shoulder pain, risk factors for development of neck-shoulder pain, and its work-relatedness are addressed. Furthermore, the latest information on the biochemical milieu within healthy and painful neck-shoulder

muscles is reviewed. Finally diagnosis of and intervention for neck and shoulder pain are discussed. (Larsson B, et al., 2007).

Back and neck disorders represent one of the most common causes for both short- and long-term sick leave and disability person. (Jensen I et al., 2007) Evidenced risk factors for the onset and maintenance of non-specific neck and back pain include both individual and work-related psychosocial factors. Based on the existing evidence different forms of exercise can be strongly recommended for at-risk populations, as well as for the acute and chronic non-specific neck pain patient.

Work-organizational and personal factors were associated with increased prevalence of moderate or severe upper body musculoskeletal pain among garment workers. Owners of sewing companies may be able to reduce or prevent WMSDs among employees by adopting rotations between different types of workstations thus increasing task variety; by either shortening work periods or increasing rest periods to reduce the work–rest ratio; and by improving the work-organization to control psychosocial stressors.(Pin-Chieh Wang et al., 2007).

The main goals of a rehabilitation program are to maximize return to function, limit progression of degenerative changes, and prevent further injury. (Sweeney T 1992). Various multimodal approaches to treating neck pain are like

strengthening exercises for sub acute and chronic mechanical neck disorders (Gross AR et al., 2007)

Sewing machine workers experience a high prevalence and severity of neck pain and shoulder pain in comparison to other working population due to sustained shoulder abduction and neck and upper back flexion required for the task.

Garment workers experience a decline in neck / shoulder pain if they are provided with adjustable height task chairs, especially if the chair has a forward curved seat pan. The beneficial effects were slightly greater for garment workers with a systematic medical illness and for those who perceived a high physical isometric work load. (David M R et al., 2007).

Postural education and Ergonomic correction is an integral part of treating neck pain. (Childs JD 2004). Studies showed that decreased neck pain following exercises and postural support in sewing machine workers help in significant improvement in work performance. (Rempel et al.,2007),

Prolonged maintenance of abnormal postures results in dysfunction. (Kendal FP et al., 2005), Alterations in skeletal alignment during interactions with the environment may contribute to imbalances between muscular agonists and antagonists, facilitating abnormal musculoskeletal changes (Gurfinkel V et al., 2006, Hush JM et al., 2006), these muscle imbalances lead to chronic strain resulting in pain and dysfunction. (Smith L K et al., 1996)

Patient education is one form or another is a ubiquitous component of treatment used by many therapists. Research generally supports this type of intervention, particularly as it relates to neck pain. Many authors described that postural education decreases the severity of symptoms in patients with whiplash related disorders. (Brison et al.,2005) Many studies show that comprehensive ergonomic programme including education significantly helps in reducing discomfort scores in neck and shoulder. (Ketola R et al., 2002).

Rempel et al., 2006, demonstrated that providing ergonomic training and altering workstation reduce neck pain for individual with neck disorders. Postural instructions can also have a positive influence on neck pain. It has been demonstrated that skilled postural instruction and facilitations results in a greater activation of the of the deep cervical flexor group and lumbar multifidus. (Falla D et al., 2007). This suggests that training for proper posture is a dynamic process. Furthermore, outcomes are enhances when more than verbal instruction is provided. These findings are supported by a review that suggests that ergonomic changes can be made, which demonstrated a positive influence on posture and pain (Valachi B et al., 2003)

Readjusting the workspace also help influence neck pain. Rempel et al., 2006, demonstrated that improved postural support decreased neck and shoulder pain in sewing machine operators. Many randomized controlled trial showed that a

comprehensive ergonomics program including workstation changes was significantly associated with reduced discomfort scores in the neck and shoulder.

Using two arm support instead of one decreases upper trapezius activity and reduces discomfort. Lintula et al., 2001, altering the work environment like improvement in lighting and seat modification plays a major role in reduction of pain and discomfort.

Taking frequent breaks reduces continuous strain on the trapezius muscles and reduce pain and discomfort.(Voerman GE 2007). Van Den Heuvel et al., 2003 suggest that frequent breaks did improve symptoms. Regular breaks help the body to recover from the acute illness.

Aaras (1994a) introduced ergonomic intervention in a group of assembly workers and VDT users and found a reduction in the static load of trapezius muscle and decreases of pain intensity in various areas.

VII SUMMARY AND CONCLUSION

The purpose of the study is to find out the effect of neck exercises in addition to work station modification on tension neck syndrome in sewing machine operators. 40 subjects with chronic neck pain were selected for the study and divided into two equal groups. The subjects were selected using simple random sampling method. Group A subjects underwent neck exercises where as Group B subjects underwent Neck exercises in addition with ergonomic programme. The study was done for duration of 8 weeks. Treatment for an individual applied for thrice weekly, and a clear exercise schedule was given to every individual participants. The study uses outcome measures were Neck disability index for disability of neck following pain and Visual analog scale to measure the amount of pain.

Following 8 weeks of treatment the values were collected using the outcome measures. The values of the pre test and post test were calculated using student ‘t’ test. The difference between the treatments group were noted.

Based on the statistical analysis the subjects in Group B shown a marked improvement in pain reduction as well as reduction of disability when compared with Group A subjects.

CONCLUSION

1. There is a significant reduction of pain in both treatment groups
2. There is a significant reduction in neck disability on both treatment groups.
3. When compared with Neck stabilization exercises the neck exercises with Ergonomic corrections will help in reduction of pain in subjects with tension neck syndrome.
4. When compared with Neck stabilization exercises the neck exercises with Ergonomic corrections will help in reduction of disability in subjects with tension neck syndrome.
5. When compared with Neck stabilization exercises the neck exercises with Ergonomic corrections will have significant difference on treatment effectiveness.

So this study concludes that the Pain and disability following Tension neck syndrome were significantly reduced through application of Neck exercises with Ergonomic corrections.

VIII LIMITATIONS AND RECOMMENDATIONS

LIMITATIONS OF THE STUDY

- Only Sewing machine operators were focused in this study.
- Neck pain was the only focused symptom in the study.
- No standard protocol of treatment was used for this study.
- The study was done with small group, large group study need for more explorations
- Follow up of the subjects after treatment duration was not done
- Certain factors like climate conditions, nutrition, time of testing, psychological factors, regular activities of daily living could not be controlled during the testing period.

FUTURE RECOMMENDATIONS

- ✓ Other musculoskeletal conditions should be focused in future studies
- ✓ Comparison of modality with exercises will be recommended
- ✓ Hand's on approached like manipulations can be compared with therapeutic exercises.
- ✓ Work site evaluation and assessment has to be done in future studies.
- ✓ Other professionals are also included for this similar study.

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X APPENDIX

APPENDIX – I

TENSION NECK SYNDROME

Tension neck syndrome has the highest rates of all the shoulder neck diseases studied. This is one type of occupational cervicobrachial syndrome, a term used to refer to those disorders of the neck and shoulder which are related to occupational factors. Tension neck syndrome can be categorized as one of a group of work related neck and shoulder disorders.

Women tend to have higher rates of tension neck syndrome than men. Tension neck syndrome causes a non-articular and non-neurological type of pain in the neck and shoulder. This causes a feeling of fatigue or stiffness in the neck. Neck pain radiation to the arm. Signs consist of at least 2 tender spots or palpable hardenings

APPENDIX –II

ERGONOMIC MODIFICATIONS

1.Check the chair seat tilt : The seat should be level or tilted forward

2.Adjust the chair seat height for the comfort of sewing operators shoulders , arms and neck , they be taught to, keep the shoulders relaxed, keep the elbows close to the body, advised to be in upright sitting during working so that the head , neck and back are not bent forward,

3.They should be taught to keep the hips to the back of the chair

4. Back rest should be adjusted to support the lower back

5. Providing adjustable chairs , A good chair for sewing should have a swivel and good padded seats with padded adjustable back rests should be easily adjustable in height and should have no wheels

6.Foot supports should be used for both feet

7.The equipment should be adjusted to suit according to the sewing operators body

8.Improve lighting , a goose neck lamp with a fluorescent light because it produces less heat

9.Making reach easier , Avoid twisting of the back , when using the swivel chair the entire back should be twisted .Reduce long reaches .Place the stack ,materials and finished pieces in nearby reach .Bins and carts in nearby reach .

10.Provide proper training , the workers should be taught to adjust their workstations , including chair , table heights and foot supports. Each worker should be taught of the early symptoms of injury

11.Short rest brakes - Short breaks should be taken for every one hour during the work day . The worker is taught to stretch , walk around or stand up for a while to relieve the work stress .

PROPER LIGHTING WITH TABLE LAMP

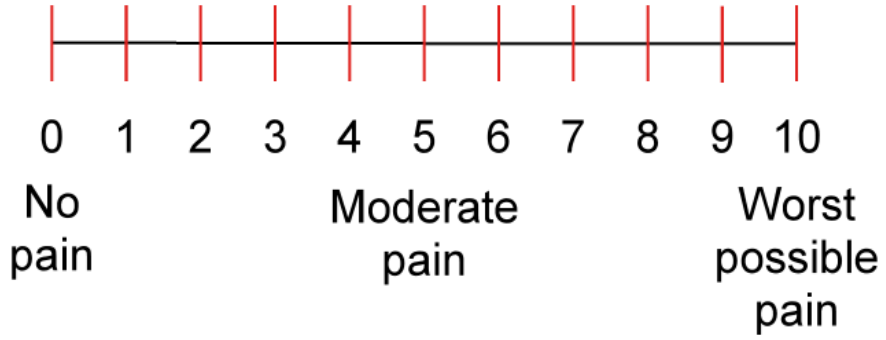
PROPER SITTIONG POSITION WITH A BACK SUPPORT CHAIR AND FOOT REST

APPENDIX – III

VISUAL ANALOG SCALE

Visual analog scale is a pain rating scale used to measure the neck pain . It is a 10 point scale starting from 0.The pain is graded according to the score as no pain , moderate pain and severe pain ,

The VAS has been used traditionally for measuring the neck pain and it is being used by many researchers for its reliability and validity



APPENDIX-IV

NECK DISABILITY INDEX

The Neck disability index is an instruct to assess the neck pain complaints. It was developed from oswestry index for back pain disability index. The authors are form the Canadian memorial chiropractic college in Toronto, Canada.

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.

Pain instructions:

The questionnaire has been desired to give the doctor information as to how your neck pain affected your ability to manage his everyday life. Please answer every section which applies to you. We realize you may consider that two of the statements in any one section relate to you which most closely describes your problem.

QUESTION 1: Pain Intensity

- A. I have no pain at the moment. (0 pts)
- B. The pain is mild at the moment. (1 pt)
- C. The pain comes & goes & is moderate. (2 pts)
- D. The pain is moderate not very much. (3 pts)
- E. The pain is severe but comes & goes. (4 pts)
- F. The pain is severe & not very much. (5 pts)

QUESTION 2: Personal Care (Washing, Dressing etc.)

- A. I can look after myself without causing extra pain. (0 pts)
- B. I can look after myself normally but it causes extra pain. (1 pts)
- C. It is painful to look after myself and I am slow & careful. (2 pts)
- D. I need some help but manage most of my personal care. (3 pts)
- E. I need help every day in most aspects of self-care. (4 pts)
- F. I do not get dressed; I wash with difficulty and stay in bed. (5 pts)

QUESTION 3: Lifting

- A. I can lift heavy weights without extra pain. (0 pts)
- B. I can lift heavy weights, but it causes extra pain. (1 pt)
- C. Pain prevents me from lifting heavy weights off the floor, but I can if they are conveniently positioned, for example on a table. (2 pts)

- D. Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned. (3 pts)
- E. I can only lift very light weights. (4 pts)
- F. I cannot lift or carry anything at all. (5 pts)

QUESTION 4: Reading

- A. I can read as much as I want with no pain in my neck. (0 pts)
- B. I can read as much as I want with slight pain in my neck. (1 pts)
- C. I can read as much as I want with moderate pain in my neck. (2 pts)
- D. I cannot read as much as I want because of moderate pain in my neck. (3 pts)
- E. I cannot read as much as I want because of severe pain in my neck. (4 pts)
- F. I cannot read at all because of neck pain. (5 pts)

QUESTION 5: Headache

- A. I have no headaches at all. (0 pts)
- B. I have slight headaches that come infrequently. (1 pt)
- C. I have moderate headaches that come in-frequently. (2 pts)
- D. I have moderate headaches that come frequently. (3 pts)
- E. I have severe headaches that come frequently. (4 pts)
- F. I have headaches almost all the time. (5 pts)

QUESTION 6: Concentration

- A. I can concentrate fully when I want to with no difficulty. (0 pts)
- B. I can concentrate fully when I want to with slight difficulty. (1 pts)
- C. I have a fair degree of difficulty in concentrating when I want to. (2 pts)
- D. I have a lot of difficulty in concentrating when I want to. (3 pts)
- E. I have a great deal of difficulty in concentrating when I want to. (4 pts)
- F. I cannot concentrate at all. (5 pts)

QUESTION 7: Work

- A. I can do as much work as I want to. (0 pts)
- B. I can only do my usual work but no more. (1 pt)
- C. I can do most of my usual work but no more. (2 pts)
- D. I cannot do my usual work. (3 pts)
- E. I can hardly do any work at all. (4 pts)
- F. I cannot do any work at all. (5 pts)

QUESTION 8: Driving

- A. I can drive my car without neck pain. (0 pts)
- B. I can drive my car as long as I want with slight pain in my neck. (1 pt)

- C. I can drive my car as long as I want with moderate pain in my neck. (2 pts)
- D. I cannot drive my car as long as I want because of moderate pain in my neck. (3 pts)
- E. I can hardly drive my car at all because of severe pain in my neck. (4pts)
- F. I cannot drive my car at all. (5 pts)

QUESTION 9: Sleeping

- A. I have no trouble sleeping. (0 pts)
- B. My sleep is slightly disturbed (less than 1 hour sleepless). (1 pt)
- C. My sleep is mildly disturbed (1-2 hours sleepless). (2 pts)
- D. My sleep is moderately disturbed (2-3 hours sleepless). (3 pts)
- E. My sleep is greatly disturbed (3-5 hours sleepless). (4 pts)
- F. My sleep is completely disturbed (5-7 hours sleepless). (5 pts)

QUESTION 10: Recreation

- I am able to engage in all recreational activities with no pain in my neck at all. (0 pts)
- B. I am able to engage in all recreational activities with some pain in my neck. (1 pt)

- C. I am able to engage in most, but not all, recreational activities because of pain in my neck. (2 pts)
- D. I am able to engage in only a few of my usual recreational activities because of pain in my neck. (3 pts)
- E. I can hardly do any recreational activities because of pain in my neck. (4 pts)
- F. I cannot do any recreational activities at all. (5 pts)

Simply add the score from your answers to the questions above and check the sum against the score.

Raw score	Level of disability
0-4	No disability
5-14	Mild disability
15-24	Moderate disability
25-34	Severe disability
35-50	Completely disability

APPENDIX-V

NECK STABILIZATION EXERCISES

Neck stabilization exercise consists of a progressive resisted exercise program for the neck muscles. Isometric neck exercises are given to improve the strength of the neck muscles.bn

NECK FLEXORS:

- Sit on the chair with comfortable positions.
- Hold both hands against the front of your head such as it covers frontal area.
- Use your hand to resist the flexion of the neck and hold it near neutral maintain isometric contraction for 10-15 seconds.
- Repeat for 10 times.

NECK EXTENSORS:

- Sit on the chair with comfortable positions.
- Hold both hands against the back of your head such as it covers occiput area.
- Use your hand to resist the extension of the neck and hold it near neutral maintain isometric contraction for 10-15 seconds.

- Repeat for 10 times.

NECK LATERAL FLEXORS:

- Sit on the chair with comfortable positions.
- Hold both hands against the side of your head such as it covers temporal area.
- Use your hand to resist the side flexion of the neck and hold it near neutral maintain isometric contraction for 10-15 seconds.
- Repeat for 10 times.

CHIN TUCK EXERCISES

- Sit in a chair in a relaxed position
- Lift your head up and away
- Tuck your chin in and straighten your spine, please concentrate
- Repeat it for 10 times

APPENDIX-VI

VISUAL ANALOG SCALE

GROUP A

S.NO	PRE TEST	POST TEST
1	7	4
2	6	3
3	7	5
4	6	3
5	8	5
6	7	4
7	6	3
8	5	3
9	7	2
10	7	4
11	6	4
12	6	3
13	5	4
14	5	4
15	7	5
16	6	4
17	5	2
18	6	3
19	7	5
20	6	3

VISUAL ANALOG SCALE

GROUP B

S.NO	PRE TEST	POST TEST
1	5	1
2	6	1
3	7	2
4	6	2
5	6	0
6	5	0
7	7	1
8	7	2
9	6	0
10	6	0
11	6	1
12	5	0
13	5	1
14	5	1
15	6	0
16	7	0
17	6	1
18	7	1
19	5	2
20	8	1

NECK DISABILITY INDEX

GROUP A

S.NO	PRE TEST	POST TEST
1	33	18
2	30	17
3	30	20
4	31	23
5	33	22
6	30	21
7	32	22
8	33	22
9	31	20
10	31	19
11	33	19
12	30	21
13	30	20
14	32	22
15	29	20
16	31	21
17	32	19
18	30	17
19	31	21
20	31	20

NECK DISABILITY INDEX

GROUP B

S.NO	PRE TEST	POST TEST
1	30	8
2	32	8
3	31	9
4	31	7
5	33	8
6	32	9
7	32	9
8	32	7
9	30	9
10	31	9
11	30	8
12	30	8
13	34	7
14	30	9
15	32	8
16	32	7
17	32	9
18	30	9
19	31	9
20	31	9

APPENDIX VII

CONSENT FORM

This is to certify that I _____ freely and voluntarily agree to participate in the study **" EFFICACY OF NECK EXERCISES IN ADDITION TO WORKSTATION MODIFICATION IN TENSION NECK SYNDROME IN SEWING MACHINE OPERATORS"**

I have been explained about the procedures and the risks that would occur during the study.

Participant:

Witness:

Date:

I have explained and defined the procedure to which the subject has consented to participate.

Researcher:

Date: