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Efficacy of Isometric Neck exercises and stretching with ergonomics over ergonomics alone in Computer Professionals

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Abstract- Neck pain has become a common epidemiological problem. One major reason for the neck pain is a sedentary way of life, along with using a personal computer in all daily activities.

Work place and work duration have not been properly modified to the personal physical conditions of these employees. Ergonomics is the application of scientific information concerning humans to the design of objects. Ergonomic intervention results in enhancement of working posture and a decline in incidence of musculoskeletal symptoms. The human body is designed to move and health depends on it. Stretching and resistance exercises to the neck are easy to do, when performed 1-2 times daily decrease discomfort and ease neck stiffness. This study is aimed at finding if ergonomics with exercises to the neck would provide better improvement from neck pain than ergonomics alone, in computer Professionals. Outcome measures used were VAS and Oswestry Neck Disability Index. Results showed that Neck exercises and stretching along with ergonomic intervention proved more beneficial than ergonomics alone for neck pain in computer professionals ($p<0.001$).

Index Terms- ergonomics, exercises for neck pain, neck pain, physiotherapy for neck pain

I. Introduction

Neck disorders remain a common problem in modern industrialized countries. Since early and mid – 19 eighties the use of computer has increased dramatically along with the increasing reports of pain from inflamed soft tissues in the neck Computer, a hallmark of technological advancement has ushered in a new genre of occupational health problem, i.e., of computer related health problems the fore runner on the Cyber World the occupational health personnel is slowly awakening to this group of modern occupational diseases which are slowly taking roots among computer professionals India being. These problems, if ignored can prove debilitating and can cause crippling injury forcing one to change one's profession. Neck pain is assumed to be a multifactorial disease and it has been suggested that there are several risk factors contributing to its development. The contributing factors of neck symptoms are - Physical workloads, poor ergonomic work design and certain psychosocial factors. Lisinski P et al, stated that neck pain has become a common epidemiological problem. One of the reasons for this is a sedentary way of life connected with using a personal computer during daily activity. Work place and work duration has not been properly adapted to the personal physical conditions of the employees. It is not possible that any individual has not suffered from neck pain. This pain can be trivial in nature and can lead to complications. Neck pain usually arises due to diseases of cervical spine and soft tissues of the neck. muscular pain can be due to spasm of muscles caused by injury, falling asleep in awkward position or prolonged working at computer desk with bent necksort of pain is usually self-limiting. If this spasm is for a long period, it becomes chronic pain. Neck pain should be identified and treated by posture correction and exercises to avoid complications

Slumped over documents and staring all day into a computer screen do no end of damage to musculoskeletal exacerbating tension and tightness around neck and shoulder. Forward head posture and flexion of the trunk form the main components of slumped sitting with the cervical alignment deemed to be poor when the head and trunk are held forward relative to the lumbopelvic region. A flexed spine results in higher activity in cervical erector spinae, trapezius and thoracic erector spinae muscles. There is evidence linking prolonged trunk flexed posture with increased muscle loading and a subsequently increased risk for symptoms in the upper body

Musculoskeletal disorders represent one of the leading causes of occupational injury and disability in developed and industrially developing countries loss due to such disorder affects not only the individual but also the organization and the society as a whole. At present time, musculoskeletal disorders are one of the most important problems ergonomists have encountered in the work place around the world. In many countries prevention of work-related musculoskeletal disorders has been considered as a national priority. WRMSD is a worldwide concern and distributed among both industrialized countries and industrially developing countries. In industrially developing countries the problems of workplace injuries are extremely serious. Studies showed that among computer professionals, 30 % of musculoskeletal problems is neck pain. These results indicated serious ergonomic deficiencies in office computer workstation, design, layout and usage . In a Canadian study 54 % of the general population had experienced neck pain for 6 months in which 5 % were highly disabled by neck pain.

A positive relation has been found between various neck disorders and work related risk factors, such as, static neck and arm postures, duration of sitting as well as workplace design. Among other job characteristics, high quantitative job demands,

having little influence on one's work situation and limited rest-break opportunities have been found as predictors of neck pain.

Computer use in sustained non-neutral postures, such as neck rotation and shoulder abduction, has been identified as risk factors for neck and shoulder symptoms. Low frequency neck exercises have been found preventive in some studies.

The human body is designed to move and health depends on it. Dynamic activity such as stretching should be incorporated in a work day and performed frequently. Isometric exercises ease neck stiffness and it becomes more flexible, there is little or no joint movement. DM Kietrys, stated that stretching and resistance exercises to the neck are easy to do and when performed 1-2 times daily reduce discomfort in the neck.

Most people with neck disorders experience a low level of disability of a large variety of therapeutic interventions available for treatment of mechanical neck pain, exercise therapy is a widely used treatment. The Verhagen 2004 update indicated the use of active interventions was more effective than passive ones.

The objective of the present study is to determine if ergonomic intervention with exercises are more efficient than, only ergonomic intervention for neck pain among computer professionals.

II. OBJECTIVES

1. To determine the effects of intermittent isometric exercises and stretching for
neck pain in computer professionals.

2. To find out the effectiveness of ergonomic intervention and exercises during
working hours in neck pain among computer professionals.

III. LITERATURE REVIEW

1. Arpita Desai and Shruti M Shah (2004) in a study on a 100 computer professionals by using ergonomic intervention and intermittent exercises for neck in the work day concluded that educating computer operators the importance of ergonomics and work modification techniques and intermittent exercises protocol can reduce risk of cumulative trauma disorders.

2. Kilroy, Niamh (2000) in a study on 47 female subjects treated with physical work place change and advice on risk factors showed that ergonomics intervention resulted in an improvement in working posture and a decrease in musculoskeletal symptoms and body discomfort.

3. Vernon H, Mior (1991) stated that modified Oswestry Neck index is a good practical tool to give information on how neck pain has affected ability to manage in everyday life. It has been proved valid and reliable.

4. Shikdar AA, Al-Kindi (2007) in a study in 40 workstations treated 138 workers with ergonomic interventions and found that of the musculoskeletal problems seen among computer employees 30 % was neck pain, due to ergonomic deficiencies in computer workstation.

5. Kary TN, Gross A (2005) (used 16 trials with multiple comparison, 6 studies compared stretching and strengthening exercises to control treatment showed that there is evidence that stretching and strengthening exercises have benefit on neck pain.

METHODOLOGY

A randomized controlled trial to find if ergonomic intervention with isometric exercises and stretching for neck proves more effective than ergonomics alone for neck pain in computer professionals.

POPULATION - Subjects with neck pain from IT Company in Bangalore.

SAMPLE - 100 female subjects satisfying the inclusion criteria were selected from
population and assigned in 2 groups: -

Group I – 50 subjects received ergonomic intervention.

Group II - 50 subjects received ergonomic intervention with stretching and isometric
exercises for neck.

SAMPLING DESIGN – Simple random sampling.

SAMPLING METHOD – Subjects were selected through simple random sampling using lottery method (Alphabets A & B).

INCLUSION CRITERIA
- Duration of pain 3 to 4 months.
- Age 25 – 35 years.
- Patients having primary complaint of neck pain with no radiculopathy.
- No treatment for neck pain taken before.

EXCLUSION CRITERIA
- History of trauma to neck.
- History of whiplash injury.
- Bilateral upper limb symptoms.
- Prior surgery to cervical and upper thoracic spine.
- Diminished or absent sensation to pinprick in upper limb dermatome.
- Positive 2 or more neurological signs.
- Physiotherapy interventions taken before for neck pain.

TOOLS: -
- A copy of Visual Analogue Scale for pain.
- A copy of Modified Oswestry Neck Disability Inde
- Ergonomic Guidelines.
- Neck Exercises.
- Knee Hammer.
- Cervical Tests- Neck Distraction Test
  Neck Compression Test

PROCEDURE

Female patients with neck pain since 3 to 4 months, between 25 to 35 years of age were selected. A complete standardized history taking and Physical examinations to rule out neurological signs were done by the physiotherapist.

Modified Oswestry Neck Disability Index was used: have shown that modified version has high levels of reliability, validity and responsiveness. It's a self report measure of function used in patients with neck pain. It contains 10 questions and each has to be scored between 0 -5 and the total score out of 50 was noted. It has high test – retest reliability with ICC – 0.93.

VAS**:** was used to indicate the intensity of pain. The scale has shown to have adequate reliability and responsiveness in patients with neck pain. It has high test-retest reliability with ICC - 0.91.

Following baseline examination patients were randomly assigned to two groups:

Group A- (Ergonomic intervention and Exercises group)

The patients were explained about the procedure and informed consent was taken.

Patients were given a copy of ergonomic guidelines, which included –

- Arms–Place frequently used items within close reach.
- Constraint head postures- Keep reference material upright at desk and do not move the head, instead raise and lower eyes to read.
- Incorrect screen height– Adjust monitor height so that top of screen is at or slightly lower than eye level.
- Poor posture habits– Do not slouch, sit upright.
- Adjust chair height correctly- Seat height should not compress the thigh.

- Front edge should be curved downwards.
- Chair seat height should be 25 to 35 cm below Work surface.
- Chair seat should be 2 inches behind the Popliteal level.
- Arm rest should allow elbow to rest at 90 degree.
- Alternate tasks – In between prolonged duration of typing and viewing the monitor, Some other tasks like- drinking water, speaking on phone, Speaking to a colleague, whole body stretch should be done.

- Cradling phone between neck and shoulders: use head set

Patients were taught isometric neck exercises:

Patients were in sitting position on the working chair.

Isometric flexion - They were taught to place their dominant hand flat on the forehead. Next, they were told to firmly push forehead against the right hand and hold for 5 seconds and were told to repeat 5 times.

Isometric extension – Patients were taught to place their dominant hand behind their head, over the occipit. Next, they were told to firmly push the head backwards against the hand, and hold for 5 seconds and repeat 5 times.

Isometric side flexion – Patients were taught to place the right hand flat on the right side of the head. Next, they were told to firmly push the head against right hand and hold for 5 seconds and repeat 5 times. Same exercise was repeated with the left hand against the left side of the head.

Isometric neck rotation – Patients were taught to place the right hand on the right cheek. Next, they were told to firmly turn the face against the right hand and hold for 5 seconds and repeat 5 times. Same exercise was repeated with the left hand on the left cheek.

Patients were taught neck stretching:

Neck Extensors stretch- They were taught to gently bend neck forward, as if to touch the chin to jugular notch, and hold the position for 10 seconds and repeat 5 times.

Neck Flexors stretch - Patients were taught to gently bend the neck backwards as much as possible and hold the position for 10 seconds and repeat 5 times.

Neck side flexors stretch- They were taught to gently bend their neck on the right side, trying to touch the ear lobe to the shoulder and hold the position for 10 seconds and repeat 5 times.

Stretch for right side - They were taught to gently bend their neck to the left side, trying to touch the ear lobe to the shoulder and were told to hold the position for 10 seconds and repeat 5 times.

Neck lateral rotation stretch- They were taught to gently turn the neck to the right side, looking over the shoulder and were told to hold the position for 10 seconds and repeat 5 times.

Stretch for Right side - They were taught to gently turn the neck to the left side, looking over the shoulder and were told to hold the position for 10 seconds and repeat 5 times.

- Patients were instructed to do the isometric exercises and neck stretching every 2 hours of their work.
- Patients were instructed to follow the ergonomic guidelines regularly.

Group B- (Ergonomic intervention group)

- Patients were explained about the procedure and informed consent was taken.
- Patients were given a copy of ergonomic guidelines, same as was given to

Group A.

Follow up –

Evaluation using VAS and Modified Oswestry Neck disability index was done before starting treatment, and subsequently every 15 days for 2 months.

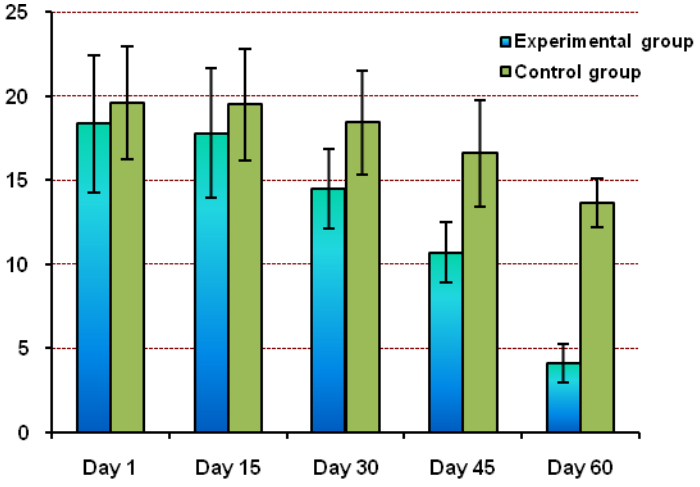
IV. RESULTS

Student t test (two tailed, independent) has been used to find the significance of study parameters (NDI) on continuous scale between two groups Inter group analysis) Mann Whitney U test has been used to find the significance of study parameters of VAS score between two groups.

Statistical analysis between the 2 groups based on NDI score

The day 1 observation of experimental group was 18.36 (SD – 4.07) and in control group it was 19.58 (SD – 3.36). Hence, the NDI was not statistically significant on day 1. At day 15 the mean in experimental group was 17.80 (SD – 3.87) with 3.1 % reduction and in control group it was 19.52 (SD – 3.31) with 0.4 % reduction, with a difference of 2.7 % (p value- 0.789) so it is statistically significant. On day 30 the mean in experimental group was 14.5 (SD – 2.36) with 20.9 % reduction and in control group it was 18.42 (SD – 3.09) with 5.9 % reduction, the difference being 15 % (p value – 0.056) it was statistically significant. At day 45 the mean in experimental group was 10.70 (SD – 1.79) with a decrease of 41.7 % and in control group it was 16.58 (SD – 3.15) with a decrease of 15.3 % the difference in improvement being 26.4 it was statistically significant. On day 60 the mean was 4.12 (SD – 1.15) and a reduction of 77.6 % and in control group it was 13.66 (SD – 1.45) and a reduction of 30.2 % difference in improvement was 47.4. Hence, the improvement in Experimental group was statistically significant.

Graph 1.1: Represents evaluation of NDI score between experimental and control group, from day 1 till end of 02 months

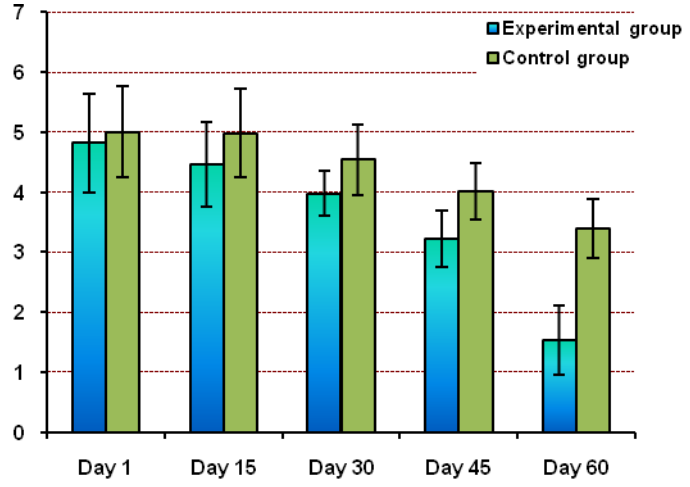


Evaluation of NDI

Statistical analysis between Experimental and Control group based on VAS score.

The day 1 observation of experimental group was 4.82 (SD – 0.83) and in control group it was 5.00 (SD – 0.76). Hence, it was not statistically significant. At day 15 in experimental group the mean was 4.46 (SD – 0.71) and a change of 7.5 % and in control group it was 4.98 (SD – 0.74) and percentage change of 9.2 %, with a difference of 1.7 in percentage (p value 0.195) it is statistically significant. At day 30 in experimental group the mean was 3.98 (SD – 0.38) and percentage change of 17.4 % and in control group it was 4.54 (SD – 0.58) and a percentage change of 9.2 %, there is a difference of 8.2 in percentage (p value – 0.361), hence, it is statistically significant. On day 45 in experimental group the mean was 3.22 (SD – 0.47) and a change of 33.2 % and in control group the mean was 4.02 (SD – 0.47) with a change of 19.6 %, the difference in percentage is 13.6 (p value – 0.188), so it is statistically significant. Finally on the 60th day the mean in experimental group was 1.54 (SD – 0.58) with 68.1 % improvement and in control group it was 3.40 (SD – 0.49) with 32 % improvement, the difference in percentage of improvement being 36.1 (p value- 0.001), the result is statistically significant.

Graph 1.2: Represents the analysis between the control and experimental group based on VAS score



Evaluation of VAS

V. DISCUSSION

The data collected in the study was analyzed using Mann Whitney U test and Paired t- test. The age group selected was from 35-45 years. The statistical analysis of the data supports the beneficial effects of exercises and ergonomics over ergonomics alone for neck pain in computer professionals.

Arpita Desai and Shruti M Shah in their study on 100 computer professionals by using ergonomic intervention and intermittent exercises for neck in the work day concluded that educating computer operators the importance of ergonomics and work modification techniques and intermittent exercises protocol can reduce risk of cumulative trauma disorders.

Kilroy, Niamh in a study on 47 female subjects treated with physical work place change and advice on risk factors showed that ergonomic intervention resulted in an improvement in working posture and a decrease in musculoskeletal symptoms and body discomfort. As in the present study this study was also done on female subjects and ergonomic intervention was given. But as in the present study exercises to the neck was not used as an intervention.

DM Kietry, JS Galper in their study on 72 subjects to find the efficacy of at-work exercises for computer operators concluded that resistance and stretching exercises are easy to do and when performed 1-2 times daily reduced discomfort in the neck. This study also included at-work exercises and proved to reduce discomfort in the neck.

Observing the efficacy of exercises and ergonomic intervention in reducing neck pain, the present study aimed at combining both these interventions to explore if exercises together with ergonomic intervention proved to be more beneficial than ergonomics alone for neck pain in computer professionals.

Following intervention the severity and incidence decreased for pain and disability. The subjects appreciated the ability to overcome the disabling effects of wrong posture and lack of physical exercise which were hindering their work performance. Subjects also improved from psychological stress due to neck pain to feelings of control and empowerment over their health which affected their quality of life. Changes in behavior were also seen with participants reporting efforts to continue ergonomic guidelines even after work in other daily activities.

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