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Effect of yogasanas on neck pain, function, strength and psychosocial factors among sedentary workers with chronic mechanical neck pain a randomized control trial

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Abstract
Background: Neck pain is a major prevalent musculoskeletal disorder in adult sedentary workers. There is limited information of Yoga specific to mechanical neck pain.This study evaluates effectiveness of Yoga specific to neck by means of interventional study design.
Objectives: Evaluate the effect of 12-week Yoga intervention pre and post on neck pain intensity, neck muscle strength, components of self-rated neck disability and fear avoidance belief questionnaire amongst participants with sedentary job profile with chronic mechanical neck pain.
Materials and Methods: Forty individuals participated in the study with chronic mechanical neck pain with a sedentary job profile. Neck pain intensity was assessed using numerical pain rating scale, neck muscle strength was assessed using pressure biofeedback, components of self-rated neck disability index and fear avoidance belief questionnaire were assessed pre and post 12 weeks of intervention. Yogasanas permitting cervical spine rotation (Arthmatsendrasan,uttanvakrasan), flexion and extension (marajarasan), neutral cervical spine(dandasana), pranayama and meditation.
Results: Yoga intervention for 12 weeks demonstrated significant effects on effect on neck pain by reducing neck pain intensity with 37.9%($p<0.05$), improving muscle strength with 38%($p<0.05$), improving components of pain intensity, concentration and work capacity components of neck disability index by 24%($p<0.05$) and improving statements of components of normal work affected due to neck pain in fear avoidance belief questionnaire related to neck pain by 25%($p<0.05$)
Conclusion: Yoga intervention including meditation and pranayama were effective in reducing neck pain intensity, improving neck muscle strength, improving components of neck disability index and fear avoidance belief questionnaire in workers with sedentary job profile.

Keywords: Neck pain, Yoga, cervical spine, neck disability index, neck strength, pressure- biofeedback, sedentary workers

Introduction

Sedentary work is work that involves very limited amounts of physical activity. As defined by the U.S. Department of Labor's Dictionary of Occupational Titles, sedentary jobs are those in which an employee lifts no more than 10 pounds. In a sedentary job, it is likely that an employee will only carry small items. Additionally, the primary tasks of a sedentary job can be performed while sitting. In particular, a job that requires sitting for 6 of the 8 hours in a workday is usually considered sedentary. Jobs that require light even levels of physical activity such as walking or standing are not considered sedentary work.

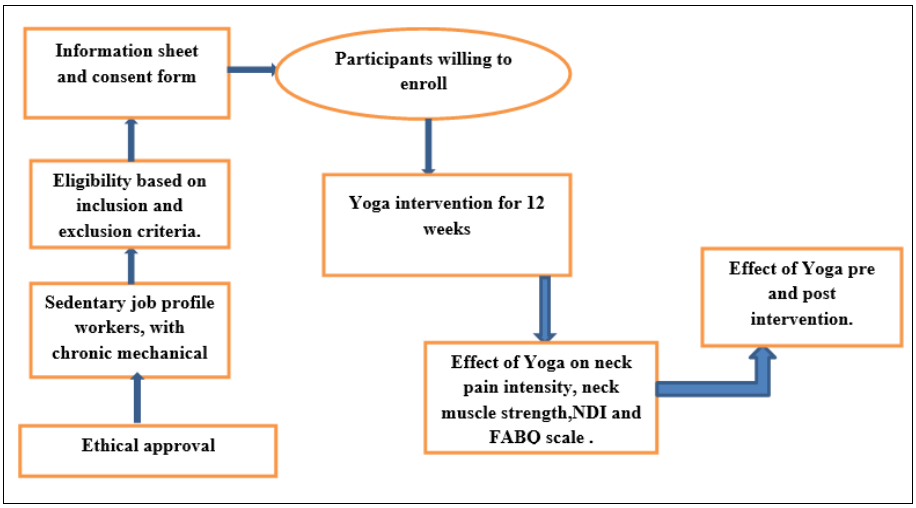
The neck and shoulder pain (NSP) symptoms are very common among intensive computer users. Complaints of arms, neck and shoulders (CANS) is defined as the presence of musculoskeletal complaints of the said region not caused by acute trauma or by any systemic disease [1]. CANS is common among computer office workers worldwide and is a well-recognized cause of occupational illness leading to frequent absenteeism from work, reduction in overall productivity, poor quality of life and escalating medical expenses [2, 3]. In the United States, CANS is a leading cause of occupational illness with annual costs related to absenteeism from work and treatment being $45-54 billion [4]. The recent increase in computer-related work as a consequence of rapid industrialization has considerably increased the prevalence of CANS among computer office workers not only in western developed countries.

The aetiology of CANS among computer office workers is complex and poorly defined. Recently several studies have defined and identified potential risk factors for CANS, such as physical exposure resulting from static body postures, repetitive tasks and workplace design [7, 8]. In addition, psychosocial factors such as high quantitative job demands, minimal autonomy and limited peer support have also been implicated. Thus, it is important that an aetiological model for CANS, consider both physical and psychosocial factors. s. In a review, Punnett & Bergqvist (1) concluded that strong evidence exists for elevated risks of upper extremity disorders among persons with data entry and similar intensive keying tasks, and, for hand and wrist disorders, the risk is related to hours of keying per day. The review found some evidence for the claim that computer work per se increases the risk for neck and shoulder disorders, most risk ratios varying between 1.7 and 3. Furthermore, evidence was found of an exposure response relationship with hours of work with a computer per day. In addition, evidence of a positive association between years of employment and neck or shoulder disorders was highlighted. Results from a recent cross-sectional study among more than 25,000 computer workers suggested that self-reported physical symptoms increase with increasing duration of daily computer use with no threshold effect.

Evidence of efficacy is limited for a number of treatment options including medicine and invasive technique. Non-invasive technique offers many options for management of

neck pain, [9]. Therefore, many patients with chronic neck pain prefer physical therapy, acupuncture, massage, tai chi, pilates and Yoga [10]. As derived from ancient Indian spiritual practice, Yoga comprises of physical activity, relaxation, and lifestyle modification [11]. Yoga is most often associated with posture of the body, breathing patterns and concentration [11]. Physically yoga focuses on improving posture, flexibility and strength. [11] One of the goals of asanas or yoga posture is to re-establish a neutral cervical spine. This is achieved by conscious awareness of alignment cultivated through Yoga practice. In addition to physical focus through breathing and meditation Yogasana targets stress, anxiety and depression. It has been hypothesized that Yogasana helps to relieve neck pain by increasing body awareness in daily life [11]. Studies have been done exploring effects of Yoga asanas in general targeting the entire body which demonstrated encouraging results in participants with chronic neck pain. However, there is paucity of literature assessing effects of Yogaasana specifically targeting the cervical spine (wherein the Yogasana are analogous to movements of the cervical spine). This study evaluates Yogasana specific to cervical spine which consisted of rotation component (arthmatsendrasan,uttanvakrasan), flexion and extension (marajarasan), neutral cervical spine(dandasana), pranayama and meditation.

Methodology



The study commenced after ethical approval of research proposal by Institutional Ethics Review Committee, MGM Institute of Health Sciences, Kamothe, Navi-Mumbai. Current experimental study was conducted at MGM School of Physiotherapy, Kamothe, Navi-Mumbai. Forty participants with sedentary job profile were included in the study. In this study, sedentary job is defined as one which involves sitting, walking and standing are required occasionally.[7]

Participants were recruited from physiotherapy outpatient department (5), MGM university department (2) MGM hospital administration department kamothe (11), MGM college of dentistry (14), MGM college of engineering (8) Navi-Mumbai via purposive sampling technique. Sedentary workers with chronic mechanical neck pain persisting for more than 3 months within age group 25-45years with a minimum of 5 years of work experience and neck pain intensity at rest 0/10 and on activity is 5/10 on numerical pain rating scale and working on video display unit for a minimum of 3-5 hours a day were included.

Participants with a history of major medical or surgical conditions, cervical spine instability, acute upper limb/ lower limb musculoskeletal injuries/ fractures or receiving any other treatment for neck pain were excluded from the study.

Outcome variables

Pain intensity: Numerical pain scale is a commonly used tool to assess pain level in individuals. It is contemplated as valid and reliable measure to consider as an effective tool for measuring pain intensity. (r=0.96) [13]

Neck muscle Strength: It was assessed using pressure biofeedback device and is commonly used device to assess isometric force produced together by neck core muscles in individuals. It is considered as a valid and reliable tool for assessing isometric strength of neckmuscles. (r:0.752-0.820) [14]

Neck Disability Index: It is commonly used outcome measure for people with neck pain. The questionnaire is self- rated and gives us information regarding how neck pain has affected their ability to manage everyday life addressing different aspects of function. Each component was scored between 0 to 5 (r-0.89) [15]

Fear Avoidance Belief Questionnaire: It is the most commonly used scale to assess the psychosocial measure, or as a screening tool to predict outcome based on the attitude and belief. The questionnaire consists of 16 items. Eachcomponent was scored from 0 to 5 (r-0.72-0.90) [16]

Procedure for intervention: Participants were trained for 12 weeks of Yoga intervention six times in a week, comprising of 1 session of Yoga under supervision.

Design of Yoga intervention: The Yoga intervention was designed by a certified trained Yoga practitioner. The participants were trained for all the Yoga asana, pranayama and meditation.Yogasana specific to cervical spine which consisted of rotation component (ardha matsyendrasana, uttanvakrasana), flexion and extension (marjaryasana), neutral cervical spine (dandasana), pranayama and meditation were included in the study as these asanas have proved effects on stress management and pain management.

Table 1: Structured Yoga intervention

Fig 1: A 29 year old male with chronic mechanical neck pain performing dandasana in long sitting position.

Fig 2: A 29 year old male with chronic mechanical neck pain performing ardha matsyendrasana in long sitting positon.

Fig 3: A 29 year old male with chronic mechanical neck pain performing uttan vakrasana in supine postion.

Fig 4: A 29 year old male with chronic mechanical neck pain performing pranayama in crossed leg sitting position.

Fig 5: A 29 year old male with chronic mechanical neck pain performing marjaryasana in quadruped position in step 1 pose and step 2 pose

Fig 6: A 29 year old male with chronic mechanical neck pain performing meditation in sitting position.

Results

Study selection

Out of 128 articles, 12 articles were most relevant as they involved yoga intervention, including both exercise and meditation. 116 articles were not included because they did not meet our inclusion criteria.

Characteristics of eligible studies

The basic characteristics of these 12 articles involved yoga intervention, including both exercise and meditation, and the program length was ranging from 10 days to 12 weeks which was similar to our study. Almost all articles measured neck pain intensity and associated disability.

Table 2: Baseline demographic characteristics

Demographic characteristics	Male participants (n=9)	Female participants (n=31)
Age	32.2	30
Body mass (kg)	69.7	61.7
Height (m)	1.68	1.07
BMI (kg/m^2)	25.46	24.53

Table 3: Intra group analysis of pain intensity, neck strength, functions and psychosocial factors

Variable	Baseline Mean(SD)	Post 12 weeks Mean(SD)	Wilcoxon test p value
Pain intensity (NPRS)	5.13 (0.56)	3.09 (0.60)	0.00*
Strength of cervical core muscles (using pressure biofeedback in seconds)	13.86 (3.13)	19.15 (2.89)	0.00 *
Variable	**Baseline Median (IQ)**	**Post 12 weeks Median (IQ)**	**Wilcoxon test p value**
Psychological factors (Fear avoidance belief questionnaire)	40 (36-42)	30.000 (26-32)	0.00*
Function (Neck disability index)	23 (19.25- 25.5)	18 (14-20)	0.00*

p<0.05*

Analysis was carried out using statistical tool IBM SPSS (2016) version 16. Statistical significance was set at $p \leq 0.05$. Each variable was tested for normality. Data did not fulfill the requirements for normal distribution. Hence appropriate non parametric tests were conducted. Intra group analysis was carried out for all the variables using Wilcoxon's test

Mean neck pain intensity on numeric rating scale at baseline was 5.13 this was reduced to 3.09 in week 12 ($p<0.05$). Strength of cervical core muscles as represented by the time (in seconds) to hold optimal pressure on the pressure biofeedback was 13.86 sec on day 1 progressed to 19.15 in week 12 ($p<0.05$). Components of neck disability scale was 23 in week 1, which improved to and 18 in week 12 ($p<0.05$). Components of fear avoidance belief questionnaire was 40 on day 1 which improved to 30 in week 12 ($p<0.05$).(Table number 3)

Discussion

In the present study effect of Yoga on chronic mechanical neck pain was explored. All the outcome measures such as neck pain intensity, neck muscle strength, components of neck disability index,components of fear avoidance questionnaire,revealed significant improvement over 12 weeks. Neck pain intensity was measured on numerical pain rating scale. Meanneck pain intensity improved by 39.7% post 12 weeks of intervention. The differences noted between baseline and post intervention were statistically significant($p\leq0.05$). It is evident that improvement in chronic neck pain intensity is due to mindful breathing which does not let the pain to pass by blocking pain gait mechanism of the nociceptive fibers. Yoga asana focuses on isometric muscle training that can relieve muscles spasm and thus relieve pain. Previous Literature suggested similar reason for improvement in pain intensity by demonstrating reduction in nociceptive receptors in the pathway and thus causing more relaxation [12, 17, 19]

Strength of cervical core muscles (Longus capitis and longus colli) was measured using pressure biofeedback instrument. The ability to maintain optimal hold improved by 38.16% post 12 week intervention. It has been observed that in mechanical neck pain, postural deviation is a common complication. The muscles of the posterior aspect of the neck are shortened which leads to muscle imbalance. It has been proven that Yoga is effective in posture correction and strengthening cervical core muscles. Yogasana stimulates 1a afferent muscle fibers which causes increased rate of stimulation of motor units thus improving the strength of the cervical muscles. It works on strength aspect by maintaining attentiveness of joint position. [9]

The components of neck disability index (NDI) was assessed. Differences between baseline score and scores post 12 weeks of intervention were statistically significant ($p\leq0.05$). Yoga focuses on increasing perception of kinesthetic awareness, proprioception and changing habitual patterns of faulty posture and thus reducing muscle tension, inducing relaxation by aligning the neck in ideal position to function optimally. A previous study demonstrated similar results. [9, 18]

Components of fear avoidance belief questionnaire (FABQ)improved by 25% post 12week of intervention. There is a two-way relation between higher centers and musculoskeletal system, thus making yoga one of the ideal therapies for chronic mechanical neck pain. It has also been observed that increase in occurrence of frequency of encouraging emotions, which sets aback physiological process that has been altered due to continuous pain state and thus extending positive emotions and self–empowering. Improvements are attributed to careful body movement along with active mindfulness; thus promoting increased strength in the muscles and deeper relaxation. Previous study demonstrated similar results, focusing on the emotional aspect [9, 20, 21]

A study compared effects of Yoga on pain and function in patients with chronic neck pain demonstrated reduction inneck pain intensity by 34% which is similar to our study results and components of neck disability index scale improved by 24% which was again similar to the results of our study [9]. Pain perceivance is reduced along with distress and disability, thus improving functions of cervical spine [12]. In our study we found that at least 6 weeks of intervention was needed to improve neck pain outcomes which persisted for at least 12 weeks. To our knowledge, this was one of the pioneer studies where experts were consulted to formulate a neck specific Yoga intervention for patients with chronic neck pain. This intervention can pave a path for arriving at 'gold standard' intervention as recommended by a study (LI). We observed that at least 6 weeks of Yogasana is necessary to observe positive improvements in neck pain intensity,strength of cervical core muscles, components of neck disability index and fear avoidance belief questionnaire. Clinically, this is an important number (6 weeks) when educating, counseling patients regarding their prognosis. We found that the results obtained in the long term (12 weeks) were maintained [4, 9, 20]

The aim of our study was not to compare yoga with other forms of exercise but to attempt to design and explore an intervention specifically targeting chronic neck pain. Yogasanas specially designed for neck pain should be considered as an effective treatment for patients with chronic neck pain. This is more relevant in a country like India where Yogasanas are culturally well accepted and are popular. Patient adherence to Yogasanas can be considered to be better than other forms of exercises. Another benefit of Yogasanas was that no equipment was needed; thus making it cost efficient. Physiotherapists practicing in middle to low income countries like India can practice Yogasanas as a potent tool to empower patients to manage chronic mechanical neck pain.

Conclusion

Yoga intervention along with meditation and pranayama were effective in reducing neck pain intensity, improving neck muscle strength, improving components of neck disability index and fear avoidance belief questionnaire in workers with sedentary job profile.

Clinical implications: Present findings can be used to recommend effect of Yoga in sedentary workers with chronic mechanical neck pain. As neck pain is a common problem in sedentary workers, Yoga can be integrated in therapy for patients with chronic mechanical neck pain.

Limitation of our study include the absence of a conventional group for comparison of results.

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