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Efficacy of therapeutic neck and shoulder exercise for pain relief among handloom workers

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Abstract
Background: Handloom industry is an ancient hand craft industry in India, and it represents the Indian weaver's artistic and aesthetic ability to make the products by handlooms. It is the second largest source of rural employment after agriculture. Work related musculoskeletal disorders (WMSDs) are the major health problem among handloom workers in both industrialized and industrially developing countries. Handloom industry need long time static manual labour, the employees in this industry have to be involved in long time static working postures which lead to work related musculoskeletal disorders. In addition to static working posture, the fixed awaked positions and repetitive working also leads to the musculoskeletal and neurological disorders.
Objectives: The purpose of this study is to find out the efficacy of therapeutic exercise in reducing non-specific neck and shoulder pain among handloom workers.
Design: Pre test post test experimental design.
Methods: The study population included 30 patients fulfilling both inclusion & exclusion criteria. They were divided into 2 groups in which Group A [experimental] and Group B [control]. Informed consent was obtained from each subject prior to participation. A brief description about the procedure was given to the subjects before commencing the study. A total of 30 subject were divided equally into two groups by random sampling method, Group A [n=15] &Group B [n=15]. Group A continued with their normal exercise and they had undergone stretching and strengthening. Group B had not undergone any treatment they stay physically active.
Results: A 20-week Therapeutic Neck and shoulder exercise program will not reduce the neck and shoulder pain among handloom workers.

Keywords: therapeutic neck, shoulder exercise, handloom workers

Introduction
Handloom industry is an ancient hand craft industry in India, and it represents the Indian weaver's artistic and aesthetic ability to make the products by handlooms. It is the second largest source of rural employment after agriculture [1]. Throughout the world there are about 4.60 million handlooms are there out of which about 3.9 million are situated in India [2]. Usually weaving communities have crowded, poorly ventilated and poorly lighted rooms. Weavers needs to work under unhygienic conditions which will leads to health problems. In present situation, the handloom weavers are the poorest community, least respected, socially and economically deprived living in rural area and almost living like an island in the Indian society [3]. Work related musculoskeletal disorders (WMSDs) are the major health problem among handloom workers in both industrialized and industrially developing countries [4].
WMSDs are defined as acute or chronic diseases that cause pain or dysfunction due to the accumulation of micro traumas due to work that leads to the excessive loading of muscles, ligaments, tendons, intervertebral discs, cartilages, bones and the related nerves and blood vessels [5]. Handloom industry need long time static manual labour, the employees in this industry have to be involved in long time static working postures which lead to work related musculoskeletal disorders. In addition to static working posture, the fixed awaked positions and repetitive working also leads to the musculoskeletal and neurological disorders. During work the weavers attain postures without giving considerations to their individual capacity which contributes to stress and trauma.

The main activities of handloom weavers are weaving, cutting, adjustment of handloom, arrangement of threads, and spindle insertion. Musculoskeletal disorders in the upper limbs (also known as repetitive strain injuries or cumulative trauma disorders) continue to have an important place in reported illness suffered in the work place [6]. Among handloom workers neck and shoulder pain are the most frequent health complaints [7]. There are lot of studies emerged for physical exercise for treating neck and shoulder pain, while moderate to strong evidence for the effectiveness of strength training for relieving neck pain among office workers exists [8] recommendations for handloom workers are not readily available.

Many strategies have been recommended for managing such presentations most common among these are resistance training and stretching of work specific muscle groups. Resistance training is an effective tool for improving muscle strength. Progressive overload principle is universally accepted to create the greatest gains in strength [9]. Progressive resistance training should preferably be done using resistance equipment such as dumbbells or weight cuffs a variety of exercise can be designed for all the muscle groups. Resisted exercise by using dumbbells allow self-selected movement based on anatomy unlike machines which confine the movement [10].

In addition to strengthening exercise stretching and flexibility exercises also plays an important role in reduction of risk of work related musculoskeletal disorders. Studies suggest that there are beneficial effects of stretching including increased flexibility, improving circulation, improving range of motion with in the joints, improving posture, and also in stress relief [11].

The aim of this study is to find out the efficacy of therapeutic exercise in reducing non- specific neck and shoulder pain among handloom workers.

Materials and Method

1. Stop watch
2. Chair
3. Inch tape
4. Dumbbells

Procedure

The study population included 30 patients fulfilling both inclusion & exclusion criteria. They were divided into 2 groups in which Group A [experimental] and Group B [control]. Informed consent was obtained from each subject prior to participation. A brief description about the procedure was given to the subjects before commencing the study. A total of 30 subject were divided equally into two groups by random sampling method, Group A [n=15] &Group B [n=15]. Group A continued with their normal exercise and they had undergone stretching and strengthening. Group B had not undergone any treatment they stay physically active.

Group A Experimental Group

Fifteen subjects randomly selected to participate in the therapeutic exercise program form the experimental group. The subjects were allowed to continue with their ongoing physical activities as usual. After taking the base line values on the outcome tools they were initiated into the strength training program. The final score had taken after 20 weeks of participation in therapeutic exercise routine. The exercise routine were include 4 dumbbell exercises. Front raise, lateral raise, reverse flies, shrugs and wrist extension and stretching of muscles of trapezius, Rotator cuff, Pectoralis major, Triceps muscles.

During the intervention period the training load was progressively increased according to the principles of progressive overload and both linear (week 1-12) and undulating periodization (week 13-20) strategies were used throughout the training programme. It was taken 20 minutes, three sessions per week. In linear periodization training load was gradually increased over time while training volume (total number of repetitions) was decreased systematically.

In undulating periodization, the manipulation of training volume and training load was on a weekly basis. Relative loadings was progressively increased from 15 repetitions maximum (RM; ~ 75% of maximal intensity) at the beginning of the training period to 8-12 RM (~75-85% of maximal intensity) during the later phase.

Stretching exercises was aimed at gaining full length stretch of the chosen muscles. The stretch held for 10 sec and this cycle was repeated 5 times.

Fig 1: Front Raise

Fig 2: Lateral Raise

Fig 3: Reverse Flies

Fig 4: Shoulder Shrugs

Fig 5: Wrist Extension

Fig 6: Rotator Cuff Stretching

Fig 7: Triceps Stretch

Fig 8: Trapezius Stretching

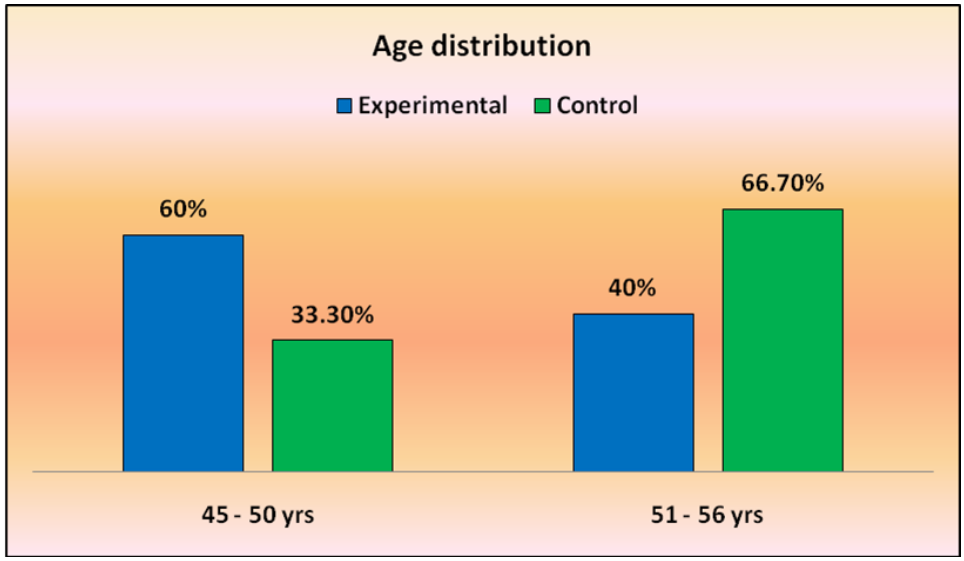
Fig 9: Pectoralis Major Muscle Stretching

Group B. Control Group

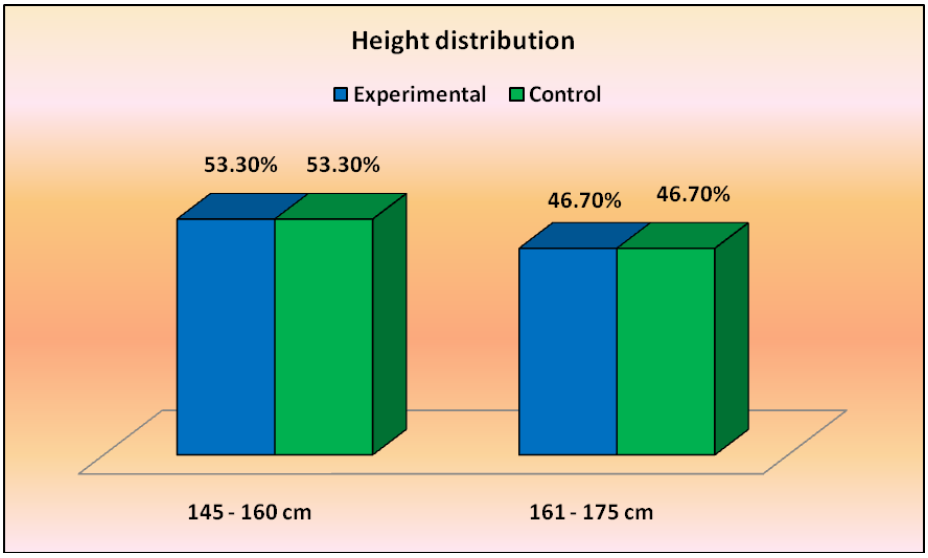
The control group includes 15 subjects, they were instructed to stay physically active and follow their ongoing activities. For both groups pre-test values were taken on the first day & the post-test values were taken after the total study duration of 20 weeks.

Statistical Analysis

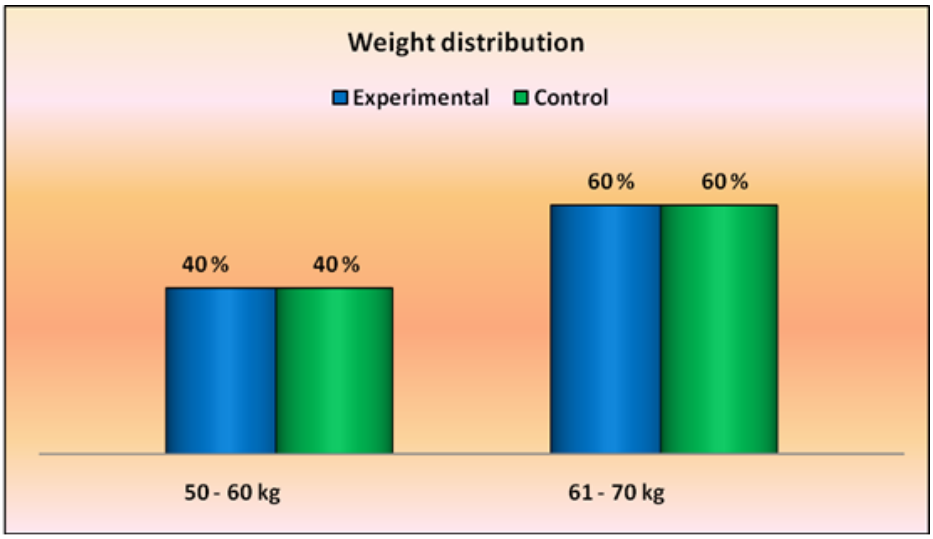
Demographic profile



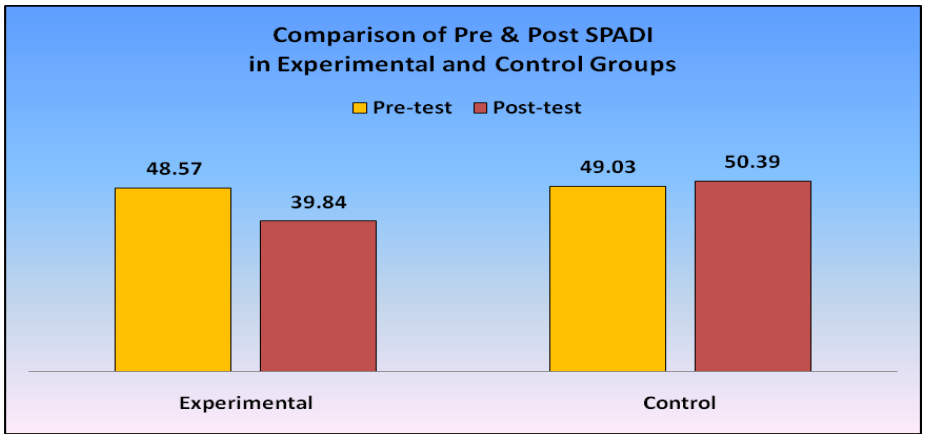
Age Distribution



Height Distribution



Weight Distribution



Statistical analysis of shoulder pain and disability index using t-tests

Mean, S.D. and t-value to compare the pre-test SPADI scores between Experimental and Control Groups using t-test

Group	Pre-test Mean	S.D.	Difference in mean	n	*t*	*df*	table value	p-value
Experimental	48.57	6.27	0.46	30	0.248	28	2.05	p = 0.806
Control	49.03	3.49						

The Mean column in the t test table displays the mean pre-test shoulder pain and disability index scores in experimental and control group respectively. The standard deviation column displays the standard deviation of the scores in two groups. The difference (0.46) shows the difference between mean in two groups (48.57&49.03). Since the *t-value*0.248, is less

than the *table value* 2.05, *p-value*> 0.05, there is no significant difference in pre-test SPADI scores between the experimental and the control groups. So we can consider the groups as homogenous in the base line level.

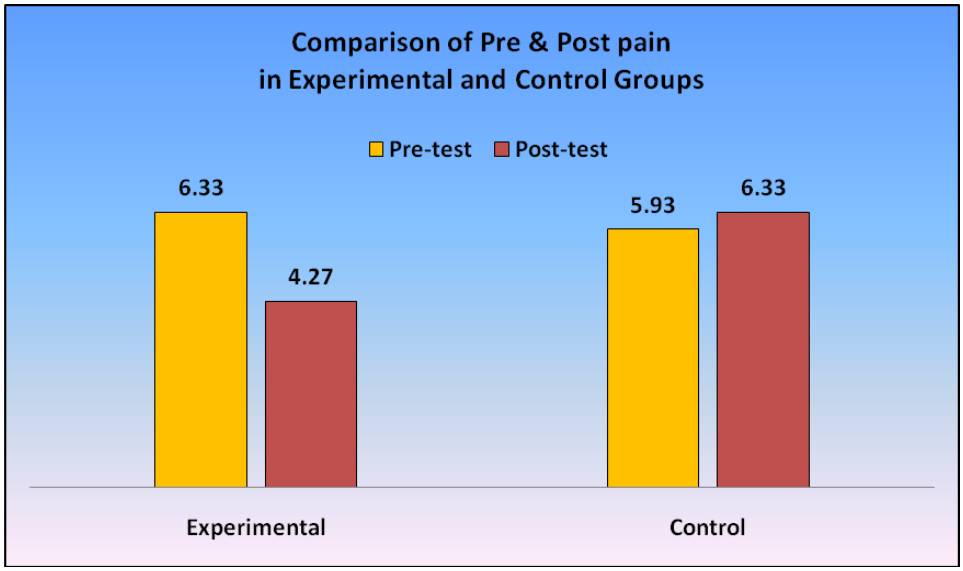
Mean, S.D. and t-value to compare the post-test SPADI scores between Experimental and Control Groups using t-test

Group	Mean	S.D.	Difference in mean	n	t	df	table value	p-value
Experimental	39.84	5.53	10.55	30	5.95	28	2.05	p <0.05
Control	50.39	4.07						

The Mean column in the t test table displays the mean post-test shoulder pain and disability index scores in experimental and control group respectively. The standard deviation column displays the standard deviation of the scores in two groups. The difference (10.55) shows the difference between post-test mean in two groups (39.84 & 50.39). Since the *t-value*5.95, is greater than the *table value* 2.05, *p-value*< 0.05, there is significant difference in post-test shoulder pain and disability index scores between the experimental and the control groups. The SPADI scores in the experimental group is significantly low.

Hence therapeutic exercise program has significant high effect as compared with those in the control group.

Statistical analysis of pain using t-tests



Comparison of Pre & Post pain in experimental and control groups

Mean, S.D. and t-value to compare the pre-test pain scores between Experimental and Control Groups using t-test

Group	Pre-test Mean	S.D.	Difference in mean	n	t	df	table value	p-value
Experimental	6.33	1.11	0.4	30	1.05	28	2.05	p = 0.301
Control	5.93	0.96						

The Mean column in the t test table displays the mean pre-test pain scores in experimental and control group respectively. The standard deviation column displays the standard deviation of the scores in two groups. The difference (0.4) shows the difference between mean pre-test in two groups (6.33&5.93). Since the *t-value*1.05, is less than the *table value* 2.05, *p-value*> 0.05, there is no significant difference in pre-test pain scores between the experimental and the control groups. So we can consider the groups as homogenous in the baseline level.

Mean, S.D. and t-value to compare the post-test pain scores between Experimental and Control Groups using t-test

Group	Mean	S.D.	Difference in mean	n	t	df	table value	p-value
Experimental	4.27	0.29	2.06	30	5.63	28	2.05	*p* <0.05
Control	6.33	0.89						

The Mean column in the t test table displays the mean post-test pain scores in experimental and control group respectively. The standard deviation column displays the standard deviation of the scores in two groups. The difference (2.06) shows the difference between post-test mean in two groups (4.27&6.33). Since the *t-value* 5.63, is greater than the *table value* 2.05, *p-value*< 0.05, there is a significant difference in post-test pain scores between the experimental and the control groups. The pain in the experimental group is significantly low.

Hence therapeutic exercise programs significant high effect as compared with control group.

Discussion

The purpose of this study was to find out the efficacy of therapeutic neck and shoulder exercise for pain relief among handloom workers. The therapeutic exercise included warm up exercise, stretching of the neck muscles and shoulder muscles and strengthening exercise according to the protocol of progressive overload principle.

In this study two handloom weaving factories were taken into consideration. Subjects were selected after screening for

fulfilment of the Inclusion and Exclusion criteria. 30 employees were selected randomly and equally divided into 2 groups- Control group and Experimental group.

Control group continued with their usual activities without the therapeutic exercise program and experimental group underwent therapeutic exercise program for neck and shoulder pain. The treatment duration was 30 minutes thrice in a week.

On statistical analysis of Numeric Pain rating scale scores, the mean pre-treatment pain score of control and experimental group was 6.33 and 5.93 and mean post treatment pain scores of control and experimental group was 4.27 and 6.33 respectively. This result shows that there is an increase of -0.4 units of pain in control group and a decrease of 2.06 units of pain in experimental group; which indicates that there is a considerable decrease in pain in experimental group.

Bruno *et al.*, (2008) found that maintaining static posture for a prolonged time as seen in occupational setting compresses the veins and capillaries inside muscles thereby causing micro-lesions from the absence of oxygenation and nutrition. Handloom workers needs static working postures for prolonged durations which leads to compression of veins and capillaries, which in turn leads to decreased oxygen supply to the muscle and decreased waste removal, this causes muscle imbalance, fatigue, discomfort and pain as a result of disruption of tissues. Stretching lengthens the muscles which are shortened, deprived of oxygen, makes the muscle pliable, increases oxygen supply, remove waste products thus decreasing pain.

On statistical analysis, the mean pre-treatment SPADI scores of control and experimental group were 48.57 and 39.84and mean post treatment SPADI score of control and experimental group was49.03 and 50.39 respectively. Since there is a significant difference existing between the pre-test and post-test SPADI scores among individuals in the experimental group.

From the statistical analysis we understood that experimental group who were undergone stretching and strengthening have more effects than that of persons who didn't undergone therapeutic exercise

The mechanism for which can be similar to the one explained by Magnusson *et al.*, 1996. In their study they found that stretching reduces pain and following that there is consequent improvement in function by elongation of the muscle tendon unit, reduction in peak force, decrease in rate of force production and tensile stress on the muscle tendon unit, and alteration of the visco- elastic property of the muscle-tendon unit, thus resulting in less tight tissue.

On the basis of the finding is can be assumed that the Handloom workers must be engaging in regular and systematic exercise routines such that they can prevent the ill effects of prolonged static posture which is an integral part of their profession.

Conclusion

Statistically it is observed that, the stretching and strengthening exercise leads to a significant improvement in strength and decrease neck and shoulder pain of the subjects under study. Based on the performed study, it can be concluded that stretching and strengthening exercise therapy can be performed as a daily routine to improve strength and to decrease pain on neck and shoulder.

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