

Does frequency of exercise therapy sessions affect pain response in patients with chronic mechanical neck pain?

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ABSTRACT

Background: Chronic neck pain is a common condition affecting many large proportion of population all over the world and in our society. Many physical therapy approaches were used to treat neck pain, and there is high evidence that exercises are effective, but there still is a great debate about which type is more effective. Also there is little evidence about the best parameters of exercises such as frequency, and intensity. **Purpose:** to investigate the effect of exercising therapy frequency on patient's ache response in instances of persistent mechanical neck pain. **Methods:** Thirty sufferers recognized as persistent mechanical neck ache have been assigned randomly into equal groups. They have been assessed by pain severity through the usage of visible analogue scale, earlier and after remedy. The primary experimental group (a) received exercise sessions three times a week; while the second experimental organization (b) acquired the equal remedy instances twice a week. **Results:** In both groups, there was a significant decrease in pain intensity. In addition, there was no significant statistical difference in pain intensity between both groups. **Conclusions:** It was concluded that exercise therapy twice a week is equally effective as three times per week in patients with chronic mechanical neck pain.

Keywords: Mechanical neck pain, endurance exercise, exercise therapy frequency

Introduction

Neck pain (NP) is a widespread condition that is associated with great socioeconomic burden [1-12]. Chronic neck pain is more common in the working age population in modern industrialized countries [2-4,13-17].

Mechanical neck disorders (MND) are disorders that are not related to a systematic problems or serious disease, these disorders may be due to abnormality in muscle, ligament, joint, disc, or degenerative involvement [5,18-24]. An altered pattern of muscle activation, such as deep cervical extensor and flexor muscles is evident in neck pain patients [6,25-31].

NP causes are not specified [7, 8,32]. A recent study demonstrated that in young adults, almost 1/3 wake up with NP or difficulty once a week [9,33-39].

Neck muscles' faintness was proposed as a contributor to persistent NP [7,40-43]. Elements influencing posture along with

postural recognition and muscle characteristics may be poor in patients with NP. Scapular alignment is frequently related to concomitant weak spot of some or all portions of the trapezius as well as rhomboids and levator scapulae. These impairments increase compressive loading of the cervical spine [10,44-49].

There's a stated discount in the electricity and staying power capacity of the neck flexor muscle masses in sufferers with distinctive NP syndromes [11-14,50].

Changes in muscle strength in neck pain populations are well documented. However, muscle endurance impairments are not as well defined [15,51-55]. A decrease in endurance of neck extensor muscles in patients with nonspecific neck pain has been described by [7,56-60].

More myoelectric manifestations of muscle fatigue of the sternocleidomastoid and anterior scalene muscular tissues had been established in chronic neck ache sufferers with a symptomatic manipulation [16,61].

The intention of the cutting-edge study turned into investigating the impact of selected staying power training application frequency on patients' pain response in cases of persistent mechanical neck ache.

Materials and Methods

Thirty female patients diagnosed with chronic mechanical neck pain, assigned randomly into two equal study groups. Group (A) consisted of 15 patients with mean age (30.93±7.03) years, and BMI values of (27.47±4.53) Kg/m, and Group (B)

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consisted of 15 patients with mean age (28.8 ± 5.34) years, and BMI values of (29.38 ± 5.01) Kg/m², were enrolled into this clinical trial. Patients were interviewed and the study goal was explained. Patients that agreed to participate in this study were asked to fill a consent form. This study was approved by the Ethics Committee for scientific research of the Faculty of Physical Therapy, Cairo University.

Patients participated in the study if they had the following criteria: Patients with chronic mechanical neck pain more than three months who had palpable cervical joint tenderness up to manual pressure of the cervical spine^[17].

Patients were randomly assigned into two groups (A and B); each group consisted of fifteen patients. Group (A) received endurance exercises for neck flexors and extensors and active correction to scapular muscles three times per week, while group (B) received the same exercise program two times per week.

Pain severity was evaluated before and after the treatment. Pain intensity was evaluated by using a 10 cm visual analogue scale (VAS). The patients were asked to make a mark on the 10 cm line and the distance length was measured on the mark of the patient (18-25).

Treatment procedures:

The patients in both groups received the same exercise program which consisted of active scapular correcting exercises and endurance strengthening exercises for neck flexors and extensors. None of the exercise sessions were longer than 30 minutes for 6 weeks, all subjects were advised and requested to practice their exercise treatment program once per day for the duration of the trial. The exercises occupied a period of no longer than 10-20 minutes per day, and they were performed without any provocation of neck pain^[21,26,27]. The treatment exercise program will be as the following protocol.

Active scapular correcting exercise

This exercise is according to the work of ^[22, 28,28]. The active interventions involved an adaptation of the conventional (grad 3) muscle test for lower trapezius^[23].

The intervention was performed in prone position, with the arm rested on the plinth and the elbow in 45 degree of flexion. The examiner passively positioned the scapula in a natural position on the chest wall and will ask the patient to hold the position for 10 seconds. This procedure was repeated for 10 repetitions with a 10 seconds rest interval between each contraction.

Endurance strengthening exercise

Flexor muscles endurance strength training

This exercise was applied according to the work of^[17,30-35]. A progressive resistance exercise program for neck flexors performed in supine position was included in the endurance strength training regime, with the head supported in a comfortable resting position. In order to perform cervical flexion, the patient was instructed to lift his head while maintaining a neutral upper cervical spine. He slowly moved the head and neck through as full range of motion as possible without causing discomfort or reproducing his symptoms. This exercise regime had two stages. The first stage was 2 weeks and, the second stage was the next 4 weeks as recommended for initiating a weight program in previously untrained subjects^[24,36-39].

In stage one, all the subjects performed 12-15 repetitions with a weight that they can lift 12 times on the first training session (12

repetitions maximum) and progressed to 15 repetitions. They maintained at this level for the remaining two weeks.

In stage two, the subjects performed 3 sets of 15 repetitions of the initial 12 repetitions maximum load. One-minute rest intervals were provided between the sets. In case of easily achieving repetitions, weighted sand bags were applied to the patient's forehead in 0.5 kg increments as required. If the patient was unable to perform repetitions of the head lift maneuver, then the neck flexors were de-loaded by reducing the vertical component of the head weight vector. The upper body parts (trunk and neck) were inclined up from the horizontal in a way that the patient could perform the required repetitions of the movement.

Neck extensors endurance strengthening exercise

We applied the same protocol of neck flexors to neck extensor from prone position on the elbows' position^[25,40-43]. The patient was instructed to let the head and neck move into flexion, then return to the starting position without causing discomfort or reproducing his symptoms. The neck flexor exercise regime had two stages. The first stage was 2 weeks and, the second stage was the next 4 weeks as recommended for initiating a weight program in previously untrained subjects^[24,44].

In stage one, all the subjects performed 12-15 repetitions with a weight that they can lift 12 times on the first training session (12 repetitions maximum) and progressed to 15 repetitions. They maintained at this level for the remaining two weeks.

In stage two, the subjects performed 3 sets of 15 repetitions of the initial 12 repetitions maximum load. One-minute rest intervals were provided between sets. In case of achieving the repetitions easily, the weighted sand bags were applied to the patients' forehead in 0.5 kg increments as required. If the patient was unable to perform repetitions of the head lift maneuver, then the neck extensors were de-loaded.

Results

Data analysis

Statistical evaluation was performed by SPSS version 22 (SPSS, Inc., Chicago, IL). The current test elaborated two independent variables, the first one was the (treatment exercise); within subject factor which had two levels (group A receiving selected endurance training exercise and active scapular correcting exercise for 6 weeks, and group B receiving the same program), and the second one was the (frequency of the exercise sessions) among subjects' factor which had two levels (pre, post). In addition, this test involved one test-dependent variable (pain severity).

Physical characteristics

The current study was conducted on 30 patients (19 females and 11 males) suffering from chronic mechanical neck pain. They were appointed arbitrarily into two equivalent investigation groups. Group A consisted of 15 patients with mean age, body mass, height, and BMI values of 30.93 ± 7.03 years, 75.73 ± 11.76 kg, 166.3 ± 8.72 cm, and 27.47 ± 4.53 Kg/m², respectively. Group (B) consisted of 15 patients with mean age, body mass, height, and BMI values of 28.8 ± 5.34 years, 81.6 ± 13.82 kg, 166.8 ± 6.73 cm, and 29.38 ± 5.01 Kg/m², respectively. As indicated by the data obtained from (t test), there were no significant differences ($p > 0.05$) in the mean values of body mass, height, and age between the tested groups (table, 1).

*SD: standard deviation, P: probability, S: significance, NS: non-significant

Overall effect

Statistical analysis using 2x2mixed design (MANOVA) indicated that, there was no significant difference between groups of the exercise, the 1st variable (independent) the pain severity (VAS ($F=0.731$, $P=0.579$)). However, there were significant effects of the measuring periods (the 2nd independent variable) of pain severity ($F=1713.069$, $P=0.0001^*$). The interaction between the two independent variables was not significant, which indicates that the effect of the treatment exercise (first independent variable) on the dependent variables was not influenced by the exercise frequency (second independent variable) ($F=0.806$, $P=0.533$) (table 2).

Table 2. The 2x2mixed design Multivariate Analysis of Variance (MANOVA) for dependent variable at different measuring periods between both groups

Source of Variation	F-value	P-value
Treatment exercise	0.731	0.579
Exercise frequency	1713.069	0.0001*
Interaction	0.806	0.533

*Significant at alpha level <0.05 .

II- Multiple pairwise comparison tests (Post hoc tests)

Pain intensity

A-Within groups:

As presented in table (3) and illustrated in figure (1), within-group comparisons of the mean \pm SD values of VAS in the "pre" and "post" tests were 6.6 ± 0.91 and 2.98 ± 0.69 , respectively in group (A).

Table 1: Physical characteristics of patients in the tested groups (A&B)

Items	Group A	Group B	Comparison		S
	Mean \pm SD	Mean \pm SD	t-value	P-value	
Age (years)	30.93 ± 7.03	28.8 ± 5.34	0.935	0.358	NS
Body mass (Kg)	75.73 ± 11.76	81.6 ± 13.82	-1.252	0.221	NS
Height (cm)	166.3 ± 8.72	166.8 ± 6.73	-0.175	0.862	NS
BMI (kg/m ²)	27.47 ± 4.53	29.38 ± 5.01	-1.094	0.283	NS

Data obtained from the multiple pairwise test (Post hoc test) illustrated that, there was a significant reduction of VAS at post treatment compared with pretreatment ($P\text{-value} = 0.0001^*$). While, the mean \pm SD values of VAS in the "pre" and "post" tests were 6.18 ± 0.77 and 2.64 ± 0.59 , respectively in group (B). However, there was a significant reduction of VAS at post-treatment compared with the one at pre-treatment ($P\text{-value} = 0.0001^*$).

B- Between groups:

As the effect of the tested group (1st independent variable) on VAS, multiple pairwise comparison tests (Post hoc tests) revealed that, there was no significant difference of the mean values of the "pre" tests in both groups with ($P=0.181$). As well, multiple pairwise comparison tests (Post hoc tests) revealed that there was no significant difference of the mean values of the "post" test between both groups with ($p=0.164$). Although, there was no statistical significant difference between both groups, there was clinical difference and high percent of improvement in favor of group B.

Table 3: Mean \pm SD and p values of VAS pre and posttest at both groups.

VAS	Pre test Mean \pm SD	Post test Mean \pm SD	MD	% of change	p- value
Group A	6.6 ± 0.91	2.98 ± 0.69	3.62	55.69	0.0001*
Group B	6.18 ± 0.77	2.64 ± 0.59	3.53	57.11	0.0001*
MD	0.42	0.34			
p- value	0.181	0.164			

*Significant level is about at alpha level <0.05

SD: standard deviation,

MD: Mean difference,

p-value: probability value

Figure 1: Mean values of VAS pre and posttests in both groups.

Discussion

The object of the current study was to examine the effect of the selected endurance training frequency on ache severity in instances of chronic mechanical neck pain.

The results of this observation revealed that, there has been a giant decrease in pain severity. However, the results showed that, there have been no large differences among groups regarding the effect of frequency of exercise sessions on patients' outcomes.

In the current research, the study's first result for both groups showed a significant decrease in the pain severity, these finding are consistent with^[26] in which therapeutic healing exercises have validated efficacy in lowering ache and perceived disability in humans with neck disorders.

On other hand, this study rejected the findings of^[27, 24, 45,46] who found no effect of physical training on nonspecific neck pain in the neck area.

In the current study, the neck pain significantly was improved, this indicated that exercises made changes in VAS of patients with chronic mechanical neck pain, and this finding is consistent with the previous studies of^[29, 30,47-51] which showed the same trend of decrease in VAS after exercise interventions.

The current study's first result also supported the findings of^[31,52-58] who reported that both pain and neck disability had decreased in both groups who had strength training and endurance training in comparison with the control group.

Many conservative interventions are to be done for treating neck pain, which include physiotherapy modalities, and manual remedies^[32, 33,59,60]. A few facts are available from the randomized managed trials on the effectiveness of these remedies^[32, 34,61,62].

None of the published randomized trials evaluating the conservative treatment for neck pain thus far have blanketed an economic assessment. Two examinations comparing chiropractic and physiotherapy for sufferers with low ache and neck pain, included a price size but didn't include a complete economic consideration^[33, 35,63].

There is limited proof on the most fulfilling dosage requirements for workout therapies, and other modalities used to treat neck issues^[36, 37,64,65]. To deal with questions concerning the dose of therapies used to treat the neck, researchers^[38,66-68]

have recommended using factorial designs and analyzing the simplest unmarried interventions^[39, 40, 69].

Sooner or later, dosage comparisons of similar types of exercising or exercises that cope with the equal detail can be made; these comparisons may be used to assess the impact of dosage variation of the exercise details and the magnitude of remedy results. Precise dosage facts will be clinically relevant, and unique therapeutic pointers can be drawn from such trials^[41, 70-73].

In a systematic review of exercises for mechanical neck disorders^[41, 74-76], it was suggested that forty-eight percent of the rigors within the reviews didn't file on adverse activities, and none evaluated the price of the care. More consistent reporting over many trials is needed to understand the sort and severity of pain and bad results of exercising remedies. The current study's second result which demonstrated that there was no significant difference between both groups according to the second testing variable (exercise frequency), indicating no difference between group A who received exercise treatment 3 times per week and group B who received the same exercise treatment 2 times per week, is consistent with the report of^[41, 77, 78] who stated that, to better recognize the direct and oblique prices of the unique remedies and make decisions regarding the only and efficient kind of care, attempts to evaluate and file values related to the outcome, are needed.

Many studies compared the effects of different types of treatments using frequency of sessions in some studies once a week^[27, 42, 43, 79], twice a week^[44-47, 80] and three times a week^[28, 48, 81-85], but to our limited knowledge there is no study comparing the effects of frequency of sessions of the same exercise or the same modality of treatment on the patients' responses, and economic incomes.

Conclusions

Based on the current examination, we conclude that, both groups confirmed considerable development in pain severity, also the frequency of the exercise treatment done per week had no tremendous distinctions on affected person's pain response.

Limitation

We need more trials to assess the effect of exercise treatment frequency on patients' outcomes.

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