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Original Article

The effects of a neck musculoskeletal intervention on neck pain levels and depression in post-traumatic stress disorder patients

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Abstract. [Purpose] To identify the effects of a neck intervention on neck pain and depression in patients with post-traumatic stress disorder (PTSD). [Subjects] Thirty-one patients with neck pain and a diagnosis of PTSD were enrolled. [Methods] Neck exercise training was performed with the experimental group and neck self-exercise (using a modification of the McKenzie exercise) was used with the control group. Both groups performed their exercises for 30 minutes at a time, three times per week. To compare the effects of the interventions, the threshold of neck tenderness and depression levels were measured at each period. [Results] The pain threshold of both sides of the trapezius showed a significant difference between the two groups at the three measurement periods. In the experimental group, the threshold increased by 19.7% on the left and 18.3% on the right after the intervention compared to before. Depression levels significantly differed in the experimental group between the three measurements. [Conclusion] This study has important implications for therapeutic strategies, as it provides strong evidence for a method of improving symptoms of neck pain; furthermore, it is effective for subjects with psychological problems such as PTSD.

Key words: Post-traumatic stress disorder, Neck pain, Depression

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INTRODUCTION

In their lifetimes, without accounting for special cases of major incidents, most people will experience a traumatic event that threatens their life or to cause physical harm. Among the general population of the US, 50–90% will experience some form of traumatic event at least once in their lifetimes[1)].

Post-traumatic stress disorder (PTSD) is a general anxiety disorder that occurs after exposure to a traumatic event. It was first introduced in the Diagnostic and Statistical Manual of Mental Disorders (DSM) of the American Psychiatric Association[2)]. Studies on PTSD using computed tomography have reported that most PTSD patients' frontal and temporal lobes, which control emotions, fear, and problem solving skills, are severely damaged.

The positive effects of exercise as a form of physical therapy on symptoms of PTSD are currently being studied. Diaz and Motta[3)] showed that in 91% of child subjects, the symptoms of PTSD decreased significantly after a walking exercise. Manger et al.[4)] found that aerobic exercise reduced PTSD symptoms in a group of adults, while Newman et al.[5)] showed that after 8 weeks of aerobic exercise, children with PTSD showed a significant decrease in PTSD symptoms, depression, and anxiety after exercise, despite little decrease in symptoms in the early days of the intervention. Kim et al.[6)] reported that after 8 weeks of meditation and respiration exercise, PTSD Checklist scores decreased significantly while cortisol levels increased.

The treatment of PTSD has so far been limited to drug therapy and psychotherapy (e.g., cognitive behavioral therapy). The physical symptoms are treated by respiration, meditation, and relaxation exercises. However, among studies on the psychological and social problems associated with PTSD, such as depression and anxiety, studies on problems of the neck—which is the most common musculoskeletal problem in people with PTSD—is lacking. Direct contact with a person who has experienced traumatic events has its limits and can cause subjects to feel external pressure or resistance. To compensate for these disadvantages, in this study, we present a treatment that relies on the sling system.

This study aimed to investigate the impact of six weeks of a neck exercise intervention on neck pain levels, upper trapezius pressure threshold, and depression in patients with PTSD and neck pain.

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SUBJECTS AND METHODS

This study targeted 31 patients living in G city who had neck pain and a diagnosis of PTSD. Patients who understood our description of the study and could answer the questionnaire were selected. To participate, subjects had to give their written consent to participate in the study with their own hand. This study was approved by the center, and all the participants provided their written informed consent. The specific criteria for selecting subjects are as follows. First, according to the diagnostic criteria of the DSM-IV, subjects had to have more than a certain number of the three major symptoms of PTSD—re-experiencing, avoidance, and arousal—lasting for at least a month. Second, subjects had to have neck pain for more than 3 months and a neck dysfunction index of lower than 15. The study was performed using a pre-posttest control group design. In the T center located in G city, 31 subjects who met the selection and exclusion criteria for neck pain among patients diagnosed with PTSD (n = 58) were selected. Using a coin toss, subjects were divided randomly into the neck exercise group (experimental group) and neck self-exercise group (control group). Neck exercise training using a sling system was used for the experimental group whereas a neck movement self-exercise (specifically, a modification of the McKenzie exercise) was used for the control group. We checked in with both groups weekly to determine whether they had performed the exercises. Both groups performed their exercise for 35 minutes at a time, 3 times per week. The total intervention period was 6 weeks. To compare the effects of the exercises, the threshold of neck tenderness and depression were measured before and after the intervention and at a follow-up.

The neck exercise of the experimental group involved the sling system presented by Kirkesola[7]. The warm-up before the exercise for the experimental group was 10 minutes of treadmill running and stretching (stretching was also performed after the exercise as a cool-down). First, in the main exercise, subjects, while supine, actively move to the left and right while an inelastic band holds their heads in a neutral position. Second, subjects performed a curvature-extension of the neck: while supine, they hold their head in a neutral position and slowly extend it using the elastic band until they are bent into a lying down position. Third, subjects performed an extensional movement: while supine, they hook the sling to the back of the skull using the inelastic band and pull the jaw, holding this for 30 seconds. Fourth was a neck stabilization exercise: with the elastic band, subjects hook the sling to the pelvis and shoulders from the knee-high, and with the inelastic band, they hook the sling to their occipital bones and pull the jaw forwards, after which they hold this position. The first movement was performed for 5 to 10 minutes and the second movement was performed repeatedly 15 times in 3 sets (each set involved holding the position for 30 seconds and resting for 10 seconds). The third and fourth movements were performed in 3 sets (each set involved holding the position for 30 seconds and resting for 10 seconds). All of the interventions were performed 3 times per week for a total of 6 weeks. The control group was educated on neck self-exercise using McKenzie exercise therapy[8]. During the education, verbal explanations and demonstrations by the therapist were provided along with handouts.

In this study, to evaluate the threshold of upper trapezius pressure and joint working range, we used an algometer. To evaluate the degree of depression, we used a self-report questionnaire, the Hopkins Symptom Checklist[9]. Each measurement and evaluation was performed a total of three times: before the intervention, just after the intervention (6 weeks from the start), and 12 weeks of the intervention.

RESULTS

To compare the changes in neck pain between two groups over the measurement period, we compared the pain threshold of each group.

The pain threshold of the left trapezius showed a significant difference between two groups at the three measurement points. It increased by 19.7% in the experimental group after the intervention compared to before the intervention. At follow-up, it had increased by 20.0% in the experimental group ($p < 0.05$) compared to before the intervention. In the control group, it increased by 6.59% after the intervention compared to before it, while at follow-up, it had increased by 6.5% compared to before. Accordingly, the interaction between group and measurement time was significant ($F = 4.1$, $p < 0.01$). The pain threshold of the right trapezius showed significant differences across the three measurements between the groups. In the experimental group, the pain threshold increased by 18.35% after the intervention compared to before it, and at follow-up, it had increased by 15.9% ($p < 0.05$) compared to before the intervention. In the control group, pain threshold increased by 2.6% after the intervention compared to before it, while at follow-up, it had only increased by 1.74%. Accordingly, the interaction between group and measurement time was significant ($F = 7.1$, $p < 0.01$).

To compare the changes in depression level over the measurement period between two groups, we compared the Hopkins Symptom Checklist scores between the groups across the measurement period.

Depression level showed significant differences in the experimental group across the three measurements. It decreased by 18.0% after the intervention compared to before it, and decreased by 15.2% at follow-up compared to before the intervention. In the control group, depression level decreased by 2.3% after the intervention compared to before it, and at follow-up, it increased by 3.0% compared to before the intervention. Accordingly, the interaction between group and measurement time in depression level was significant ($F = 23.5$, $p < 0.01$) (Table 1).

DISCUSSION

This study was performed to investigate the impact of a neck musculoskeletal intervention on the neck pain and depression levels of patients with PTSD and to identify the utility of this intervention for clinical practice.

The results indicated significant differences in pain threshold on both sides of the upper trapezius muscle and in depression level across the measurement period for subjects

Table 1. Changes in the pressure threshold of the trapezius muscle and depression between the experimental and control groups before and after intervention and at follow-up

	Experimental group[a]			Control group[b]		
	Pressure threshold (kg/cm^2)		Depression (Score)	Pressure threshold (kg/cm^2)		Depression (Score)
	Left	Right		Left	Right	
Before	3.0 ± 0.4 [c]	3.2 ± 0.2[c]	52.1 ± 4.8	3.1 ± 0.4	3.3 ± 0.2	53.3 ± 8.1
After	3.6 ± 0.4	3.7 ± 0.5	42.8 ± 7.5	3.2 ± 0.6	3.4 ± 0.3	52.0 ± 8.5††
Follow-up	3.6 ± 0.3**	3.7 ± 0.7	44.3 ± 6.8**	3.2 ± 0.6	3.4 ± 0.3	51.6 ± 7.7
Rate of change 1	19.7 ± 12.6	18.3 ± 13.6	18.0 ± 9.9	6.5 ± 23.6	2.6 ± 8.0††	2.3 ± 5.5††
Rate of change 2	20.0 ± 12.2	15.9 ± 22.2	15.2 ± 8.2	6.3 ± 23.7	1.7 ± 4.5†	3.0 ± 5.5††

[a]Neck exercise training group, [b]Self-exercise training group, [c]Mean ± standard deviation.
There is a significant difference between the three times: *$p < 0.05$, **$p < 0.01$.
There is a significant difference between the two groups, †$p < 0.05$, ††$p < 0.01$.
Rate of change 1: The rate of change between before and after the intervention.
Rate of change 2: The rate of change between before the intervention and follow-up.

with PTSD who had undergone an exercise intervention with the sling system.

It has been reported that people who have neck pain have poor neck strength and endurance[10]. For these people, use of a neck exercise therapy has been reported to increase neck strength and decrease pain[11]. A major cause of neck pain is problems in the upper muscles[12]. Lee et al.[13] investigated the measurement of the threshold of the upper trapezius muscle between a trapezius asymmetric group and a symmetric group. The results indicated that the asymmetric group's right and left trapezius threshold values were 3.27 ± 0.8 kg/cm^2 and 2.90 ± 1.1 kg/cm^2, respectively. In contrast, the symmetric group's right and left thresholds were 4.68 ± 1.3 kg/cm^2 and 4.41 ± 1.2 kg/cm^2, respectively; these latter numbers are similar to what was found in the present study.

The subjects of this study differed from people with neck pain alone, as they had neck pain with psychological problems. PTSD is caused by traumatic events and can damage the same muscles treated in physical therapy for whiplash injury. Ursano et al.[14] compared the incidence of chronic and acute PTSD between a group severely injured by car accidents and a group injured by other traumatic events on the basis of disability for 3 months. The results indicated that PTSD incidence increases in subjects with a history of the disorder. Mishaels et al.[15] performed psychological evaluations on 35 people hospitalized due to a car accident both one month and 5 months after the accident. In less than a month, 34% of subjects had been diagnosed with acute PTSD; after 5 months, 38% had been diagnosed with chronic PTSD. It has been reported that subjects who have suffered a trauma experience symptoms related to depression such as fear, anxiety, depressed mood, lethargy, hopelessness, and feelings of self-deprecation[16]. Sabin et al.[17] reported that for at least 4–6 months after a trauma, 11% of the 30% of the sample who showed PTSD symptoms had high levels of depressive symptoms. Additionally, in Agaibi and Wilson's study[18], higher levels of PTSD after a trauma were associated with more severe symptoms of depression. However, in the study by Bryant et al.[19], there was no relationship between level of impairment and depression. PTSD and anxiety symptoms, however, were reported to be associated. Among those who had experienced trauma and who had been diagnosed with PTSD, 48–55% were found to have a major depressive disorder[20, 21]. Treatment for PTSD is mainly psychological, and musculoskeletal problems are often overlooked. Higher percentages of neck pain have been reported among people with psychological problems[22]. People who have neck pain can experience discomfort and restrictions in daily life and develop further psychological problems[8].

This study has important implications for therapeutic strategies, given that it describes an intervention that can improve symptoms of neck pain in subjects who have psychological problems such as PTSD. Furthermore, it provides preliminary results for a specific intervention for psychological problems and musculoskeletal pain, which has recently been studied.

REFERENCES

1) Norris FH, Slone LB: The epidemiology of trauma and PTSD. Handbook of PTSD: Science and practice, 2007, pp 78–98.
2) Asmundson GJ, Frombach I, McQuaid J, et al.: Dimensionality of posttraumatic stress symptoms: a confirmatory factor analysis of DSM-IV symptom clusters and other symptom models. Behav Res Ther, 2000, 38: 203–214. [Medline] [CrossRef]
3) Diaz AB, Motta R: The effects of an aerobic exercise program on posttraumatic stress disorder symptom severity in adolescents. Int J Emerg Ment Health, 2008, 10: 49–59. [Medline]
4) Manger TA, Motta RW: The impact of an exercise program on posttraumatic stress disorder, anxiety, and depression. Int J Emerg Ment Health, 2005, 7: 49–57. [Medline]
5) Newman CL, Motta RW: The effects of aerobic exercise on childhood PTSD, anxiety, and depression. Int J Emerg Ment Health, 2007, 9: 133–158. [Medline]
6) Kim SH, Schneider SM, Bevans M, et al.: PTSD symptom reduction with mindfulness-based stretching and deep breathing exercise: randomized controlled clinical trial of efficacy. J Clin Endocrinol Metab, 2013, 98: 2984–2992. [Medline] [CrossRef]
7) Kirkesola G: Advanced musculoskeletal course. The s-e-t concept using the terapimaster system. In: Anonymous. Norway, 2001.
8) Häkkinen A, Salo P, Tarvainen U, et al.: Effect of manual therapy and stretching on neck muscle strength and mobility in chronic neck pain. J Rehabil Med, 2007, 39: 575–579. [Medline] [CrossRef]
9) Derogatis LR, Lipman RS, Rickels K, et al.: The Hopkins Symptom Checklist (HSCL): a self-report symptom inventory. Behav Sci, 1974, 19: 1–15. [Medline] [CrossRef]
10) Dall'Alba PT, Sterling MM, Treleaven JM, et al.: Cervical range of motion discriminates between asymptomatic persons and those with whiplash. Spine, 2001, 26: 2090–2094. [Medline] [CrossRef]
11) Ylinen J, Takala EP, Nykänen M, et al.: Active neck muscle training in the treatment of chronic neck pain in women: a randomized controlled trial.

JAMA, 2003, 289: 2509–2516. [Medline] [CrossRef]
12) Yoo WG: Comparison of the cervical extension angle and the upper trapezius muscle activity between overhead work and below-knee work. J Phys Ther Sci, 2013, 25: 1289–1290. [Medline] [CrossRef]
13) Lee KT, Chuang CC, Lai CH, et al.: Study of the trapezius muscle region pressure pain threshold and latency time in young people with and without depressed scapula. Man Ther, 2015, 20: 124–129. [Medline] [CrossRef]
14) Ursano RJ, Fullerton CS, Epstein RS, et al.: Acute and chronic posttraumatic stress disorder in motor vehicle accident victims. Am J Psychiatry, 1999, 156: 589–595. [Medline]
15) Michaels AJ, Michaels CE, Moon CH, et al.: Psychosocial factors limit outcomes after trauma. J Trauma, 1998, 44: 644–648. [Medline] [CrossRef]
16) Horowitz M, Wilner N, Alvarez W: Impact of Event Scale: a measure of subjective stress. Psychosom Med, 1979, 41: 209–218. [Medline] [CrossRef]
17) Sabin JA, Zatzick DF, Jurkovich G, et al.: Primary care utilization and detection of emotional distress after adolescent traumatic injury: identifying an unmet need. Pediatrics, 2006, 117: 130–138. [Medline] [CrossRef]
18) Agaibi CE, Wilson JP: Trauma, PTSD, and resilience: a review of the literature. Trauma Violence Abuse, 2005, 6: 195–216. [Medline] [CrossRef]
19) Bryant RA, Salmon K, Sinclair E, et al.: A prospective study of appraisals in childhood posttraumatic stress disorder. Behav Res Ther, 2007, 45: 2502–2507. [Medline] [CrossRef]
20) Elhai JD, Grubaugh AL, Kashdan TB, et al.: Empirical examination of a proposed refinement to DSM-IV posttraumatic stress disorder symptom criteria using the National Comorbidity Survey Replication data. J Clin Psychiatry, 2008, 69: 597–602. [Medline] [CrossRef]
21) Kessler RC, Crum RM, Warner LA, et al.: Lifetime co-occurrence of DSM-III-R alcohol abuse and dependence with other psychiatric disorders in the National Comorbidity Survey. Arch Gen Psychiatry, 1997, 54: 313–321. [Medline] [CrossRef]
22) Talvari A, Nemati N, Sini ZK, et al.: The association of neck pain with depression and anxiety symptoms in elderly. Procedia Soc Behav Sci, 2013, 82: 366–368. [CrossRef]