

Association Between Trapezius Muscle Tenderness and Tension-Type Headache in Female Office Workers: A Cross-sectional Study



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ABSTRACT

Objective: The purpose of the study was to determine the association between trapezius muscle tenderness and tension-type headache among female office workers.

Methods: Through a questionnaire survey, 256 female office workers with tension-type headaches reported the level of palpable tenderness (“no,” “some,” or “severe tenderness”) in the trapezius muscle. The number of days with headache (“0-7,” “8-14,” or “>14”), intensity (“low,” “moderate,” or “high”), duration of headache (“<8 hours per day,” “>8 hours per day,” and “all day”), and use of analgesic medications were reported. Odds ratio (OR) for tenderness in the trapezius muscle (“no/some” vs “severe tenderness”) as a function of days with headache, intensity of headache, duration of headache, and use of analgesic medications were calculated using a binary logistic regression controlling for age and body mass index.

Results: After adjustments for confounders, a strong association was found between the level of trapezius muscle tenderness and intensity of headache (moderate intensity, OR 2.45; 95% confidence interval [CI] 1.08-5.54; high intensity, OR 7.51 [95% CI 2.65-21.29]) and days with headache (>14 days, OR 4.75 [95% CI 1.41-15.89]). No association was observed for duration of headache or use of analgesic medications.

Conclusions: For the participants studied, there was a strong association between trapezius muscle tenderness and the level of intensity and the number of days with a headache among female office workers. No association was seen for duration of headaches or use of analgesic medications. (J Manipulative Physiol Ther 2018;41:483-487)

Key Indexing Terms: Headache; Neck Pain; Shoulder Pain; Musculoskeletal Pain

INTRODUCTION

Tenderness and pain in the neck and shoulder muscles are common problems among people who have a sedentary

work life with extensive computer work,¹⁻⁴ and a link between computer work and development of muscular pain in these muscles has been suggested.^{5,6} Prior research has shown that pain in the neck and shoulder muscles is strongly correlated with clinically verified muscle tenderness.⁷ Particularly, tenderness in the trapezius muscle regularly occurs in conjunction with neck and shoulder pain,⁸ with 1 of the consequences being headaches.⁹

A tension-type headache (TTH) is the predominant type of headache and affects up to almost 80% of the general population and has a major socioeconomic impact.¹⁰⁻¹² In addition, many white collar workers have TTH.¹³ Although multiple factors are linked to TTH, myofascial tissues are considered to be 1 of the most important places of origin.¹⁴ Thus, a possible association between muscular tenderness and TTH may exist.^{15,16} Previous studies have shown that it is possible to induce TTH by inflicting pain on the trapezius muscle.^{17,18} Our laboratory has previously shown an association between pain in the neck and shoulder muscles and muscular tenderness among female office workers, where high levels of muscular pain were associated with high

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tenderness.¹⁹ Thus, it can be hypothesized that there would also be a strong association between trapezius muscle tenderness and TTH.

However, the relative importance for muscle tenderness on frequency, intensity, and duration of TTH remains debated because previous studies have shown conflicting results. Studies have demonstrated an increased muscular tenderness in the pericranial region in people with TTH²⁰ and that the level of tenderness is associated with both the frequency and intensity of TTH.²¹ However, a range of studies has found no association between muscular tenderness in the pericranial region and frequency, intensity, or duration of TTH.²²⁻²⁴

Therefore, the aim of this study is to determine if associations between TTH and tenderness in trapezius muscles in female office workers exists. The main hypothesis of the study was that a higher number of days with headache, prolonged daily duration of headache, and higher intensity of headache would be associated with trapezius muscle tenderness.

METHODS

Design and Participants

This study was registered with the Danish Data Protection Agency (journal number 2009-54-0737), according to Danish law (Act on Research Ethics Review of Health Research Projects, Section 14 [2]). The provision of information about the survey and its purpose, as well as the voluntary completion and return of the survey by participants constituted implied consent. All data were deidentified and analyzed anonymously. The study conformed to the Declaration of Helsinki. The survey was conducted in June 2009 among the female employees at 2 large office workplaces in Copenhagen, Denmark. A total of 1094 individuals were invited to answer the survey questionnaire, which concerned health and working conditions, and 653 replied, which corresponds to a response rate of 59.7%. Individuals with no headache, unknown headache, or migraine headache were excluded. From this sample, only females with TTH were included in the analysis, resulting in a total study population of 256.

Questionnaire

The participants were told to rate the tenderness of the neck and shoulder muscles in their dominant arm using manual palpation. The participants were provided with a picture showing the targeted muscle area and were instructed to lightly squeeze the muscle using the opposite hand. The tenderness was rated on a scale of “no tenderness,” “some tenderness,” and “severe tenderness.” The question about self-palpation of trapezius muscle tenderness had previously been validated in relation to pain intensity.¹⁹ The participants reported the number of days with a headache within the last month, using 3 response

Table 1. Demographics and Trapezius Muscle Tenderness in the Study Population of Female Workers With Tension-Type Headache (*n* = 256)

	Mean	SD	Percentage
Age	41.8	11.7	
BMI	23.9	4.5	
Trapezius muscle tenderness			
No			7.8
Some			61.7
Severe			30.5

BMI, body mass index; SD, standard deviation.

categories: “0 to 7 days,” “8 to 14 days,” and “more than 14 days.” Further, the participants reported the typical duration of headache per day within the last month using 3 response categories: “less than 8 hours,” “more than 8 hours,” and “all day.” Intensity of headache was determined using a scale from 0 (no pain at all) to 10 (worst pain imaginable). A score between 0 to 3, 4 to 6, and 7 to 10 were respectively categorized as low intensity, moderate intensity, and high intensity. Participants were asked to identify if they used analgesic medications targeted headaches. The headache questions have been developed and used in a training intervention study in collaboration with an expert (Professor Rigmor Jensen) in the field of headache diagnosis and rehabilitation.²⁵

Statistics

All statistical analyses were performed in SAS version 9.2 (SAS Institute Inc, Cary, North Carolina). A binary logistic regression reporting the odds ratio for tenderness in the trapezius muscle (dichotomized to no or some tenderness vs severe tenderness) as a function of days with headache, intensity of headache, duration of headache, and use of analgesic medications targeted to headaches was performed and controlled for age and body mass index. All of these variables were included in the same statistical model, for example, intensity of headache was controlled for days with headache and vice versa. Odds ratio, as well as 95% confidence intervals, were calculated with tenderness being the dependent variable. According to the definition of Chen et al, an odds ratio of 1.68, 3.47, and 6.71 would be defined as a weak, moderate, and strong association, respectively.²⁶

RESULTS

Table 1 shows that the study population of female workers with TTH were, on average, 42 years old and had a normal body mass index. More than 92% experienced

Table 2. Association Between Days With Headache, Duration of Headache, Intensity of Headache, and Use of Analgesic Medications With Tenderness in Trapezius Muscle (*n* = 256)

	n	%	Adjusted OR	95% CI
Days with headache				
0-7	216	84.4	1.00	
8-14	22	8.6	2.86	0.96-8.53
>14	18	7.0	4.75 ^a	1.41-15.89
Duration of headache				
Less than 8 hours	207	80.9	1.00	
More than 8 hours	21	8.2	0.80	0.24-2.65
All day	28	10.9	0.86	0.03-2.36
Intensity of headache				
Low intensity	87	34.0	1.00	
Moderate intensity	119	46.5	2.45 ^a	1.08-5.54
High intensity	50	19.5	7.51 ^a	2.65-21.29
Use of analgesic medications				
Yes	161	62.9	1.00	
No	95	37.1	0.66	0.32-1.37

CI, confidence interval; OR, odds ratio.

^a *P* < .05.

trapezius muscle tenderness, and 31% experienced severe trapezius muscle tenderness.

Table 2 shows the associations of days with headache, duration of headache, intensity of headache, and use of analgesic medications, with trapezius muscle tenderness. A significant graded relationship was observed between intensity of headache and tenderness in the trapezius muscle. Further, a tendency towards a significant graded relationship between days with headache and tenderness in trapezius muscle tenderness was seen. No significant interaction effects were observed between duration of headache and use of analgesic medications in relation to tenderness in the trapezius muscle.

DISCUSSION

This study showed that both intensity of and days with TTH among female office workers were strongly associated with trapezius muscle tenderness. Further, a graded relationship seems to exist for both intensity of headache and number of days with headache, showing that greater trapezius muscle tenderness leads to more days with headache and greater intensity of headache.

The present findings support previous research showing a strong association between muscle tenderness and intensity of headache and days with headache.²¹ However, these findings are contrary to results from a range of studies showing no association.²²⁻²⁴ A likely reason for the divergent result could be due to the size of the study population. Both of the studies from Lipchik et al²² and Fernández-de-las-Peñas et al²³ had a limited study population and could, as a result, potentially suffer from insufficient statistical power. However, despite showing no association between muscle tenderness and TTH, both studies reported a high level of total tenderness score. Another possible explanation for this difference could be due to the included participants. In the studies by Aaseth et al²⁴ and Fernández-de-las-Peñas et al,²³ all of the participants were diagnosed with chronic TTH and thus had TTH for more than 15 days per month, whereas the current study also included participants who had headaches for less than 15 days. The association between trapezius muscle tenderness and number of days with headache is only significant for participants with a headache for more than 14 days per month, suggesting that trapezius muscle tenderness could be a risk factor for developing chronic TTH.

This is the first study to show a graded relationship between trapezius muscle tenderness and intensity of TTH, as well as, to some extent, the number of days with headache. From a clinical perspective, this finding suggests that clinicians working with either TTH (eg, at headache centers) or muscle tenderness (eg, at physical therapy clinics) should consider collaboration and multimodal treatment strategies.

Findings from the current study showed no associated with respect to the duration of headaches, which is consistent with previous findings.²²⁻²⁴ Thus, the present finding underpins that muscle tenderness does not seem to affect the duration of headache. Further, we did not see any association between the use of analgesic medications and trapezius muscle tenderness.

Because of the cross-sectional nature of the study, we cannot conclude whether trapezius muscle tenderness leads to TTH or vice versa. However, findings from previous literature have shown that people with TTH have increased levels of muscular tenderness in the pericranial region in periods without TTH.¹⁴ In particular, trapezius muscle tenderness is shown to be greater in people with chronic headache, even on days without pain, compared to people without headache.²⁷ Thus, combined, these findings suggest that muscular tenderness is not a result of TTH.

The mechanisms associating tenderness in the pericranial muscles to TTH are, to a large extent, still unknown.^{9,24,28} One of the proposed mechanisms is central sensitization, which is the result of a period with prolonged nociceptive inputs from the myofascial tissues.²⁹ Another potential explanation of the association is based on the convergence of afferent nerves from the upper cervical nerves that innervates the trapezius muscle.¹⁵ Furthermore, the location of active

trigger points within the myofascial tissues of the pericranial muscles may play a role.^{30,31} In addition, a recent review suggested that an enhanced, local level of muscle tone could be responsible for the development of trauma in muscles and tendons, which could lead to the excitement of peripheral nociceptors.³²

Limitations

By using a very homogenous group, which only consists of female office workers, the risk of socioeconomic confounding was greatly reduced. However, this substantially limits the overall generalizability with respect to applying the findings to other occupational groups or to office workers who are men. In addition, the use of self-reported questionnaire data introduces a risk of recall bias; however, the risk of recall bias would be expected to be identical whether the person had TTH or not. The use of self-palpation in contrast to objective measures of muscular tenderness is a limitation; however, the use of this method has previously been validated.¹⁹ Furthermore, the use of self-diagnosed TTH is a limitation, as it introduces inconsistency with respect to when a case a case of TTH is being reported.

CONCLUSION

Trapezius muscle tenderness among female office workers was highly associated with the level of intensity as well as the number of days with a headache; however, no association exists for neither the duration of headaches or the use of analgesic medications. In addition, this study provides results that suggest the existence of a graded relationship between trapezius muscle tenderness and intensity of headache and number of days with headache.

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CONTRIBUTORSHIP INFORMATION

Concept development (provided idea for the research): L.L.A.
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Practical Applications

- Trapezius muscle tenderness may be associated with intensity and days with tension-type headache for female office workers; therefore, practitioners could evaluate for target trapezius muscle tenderness when treating tension-type headache.
- A dose-response relationship between trapezius muscle tenderness and intensity of tension-type headache was shown.
- These findings support that the intensity and days with tension-type headache may be associated with trapezius muscle tenderness and that duration of headache is not.

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