



## How does pain influence cervical endurance test performance in migraine patients?

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### Introduction

Migraine sufferers frequently complain of cervical pain during and in-between migraine attacks and studies suggest that chronic neck pain is a risk factor for high-frequency migraine, including chronic migraine. Increased headache frequency and chronic neck pain are, in turn, independently associated with cephalic cutaneous allodynia, a known risk factor for increased headache frequency.

### Objective

To verify the influence that pain in migraine patients has on muscle performance during the cervical endurance test and whether the change in performance is due to pain during the test, neck muscle dysfunction or both.

### Methods

We evaluate 100 women stratified by diagnosis (migraine, cervical pain, both and none) and self-reported pain during the cervical muscle endurance test in flexion and extension (with or without headache and/or cervical pain during the endurance test). Pain during the test by numerical rate scale (NPRS, 0-10) and pain pressure threshold were collected for all groups. Migraine patients answered 12-item Allodynia Symptom. We used one-way analysis of variance with the Tukey's HSD post hoc test analysis to contrast pressure pain threshold and endurance across groups. Differences in flexion and extension times were compared using the Welch T-test and the McNemar Test was used to compare differences in headache and neck pain incidence per study group during flexion and extension endurance tests.

### Results

There are significant differences in mean endurance during flexion between migraine and neck pain [34.4s (25)] relative to neck pain alone [45.2 (18)], migraine [40.2s (29)] and controls [57.5.4s (40)] ( $p = 0.04$ ). On average, those who experienced headache during the flexion test sustained for significantly less time than those without headache during the test (27.80 versus 46.18 seconds,  $p < 0.01$ ); similar results were seen when comparing those with both headache and neck pain during the flexion test relative to those who experienced neither (24.86 versus 46.85 seconds,  $p < 0.01$ ). For extension values were, controls: 269.7 (150), migraine: 215 (132), neck pain: 165.64 (98), and migraine with neck pain 142.5 (75),  $p < 0.001$ . There was statistically significant difference in average time sustained between those who experienced headache versus no headaches during extension test (98.68 versus 205.59 seconds,  $p < 0.01$ ) and for those who experienced both headache and neck pain versus neither during test (101.60 versus 215.74 seconds,  $p < 0.01$ ). Migraine and migraine with neck pain groups had the lowest pressure pain threshold in all muscle groups, suggesting that cephalic allodynia, as measured by pressure pain threshold, was mainly driven by migraine. Statistical significance ( $p = 0.04$ ) was seen between the ASC-12 scores of migraine group without neck pain or headache during endurance flexion test (average score=7.59) and migraine and neck pain group with neither neck pain nor headache during endurance flexion test (average score=10.33). Differences between groups for those who experienced headache, neck pain, or both during the test were not statistically significant for the endurance flexion test. For ASC-12 scores during the endurance extension test, statistical significance ( $p < 0.01$ ) was seen between the scores of migraineurs with neck pain during test (average score=5.14) and migraineurs with neck pain who experienced neck pain during the test (average score=10). No statistical difference was seen for ASC-12 scores of the remaining groups during the extension test.

### Conclusion

We found that patients with migraine, chronic neck pain and the association of both may have altered cervical muscle function. Moreover, the presence of pain triggered by the tests, not the diagnosis, is associated with impact in endurance. Migraine patients are profoundly allodynic relative to those with neck pain or controls were expected. Trigeminal cervical sensitization explains the findings.

**Keywords:** Endurance, Migraine, Headache, Neck pain, Pain, Allodynia.