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Research Paper Review

# Range of Motion Differences in Patients with Neck Pain vs. Whiplash & Pain-Free

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## ABSTRACT

*INTRODUCTION: Whiplash has been suggested to cause chronic symptoms and long term disability. This study was designed to assess long term function after whiplash injury.*

*METHODS: A random sample of patients in the outpatient clinic was interviewed, questionnaire completed and clinical examination performed. Assessment was made of passive cervical range of movement and Visual Analogue Scale pain scores. One hundred and sixty-four patients were divided into four different groups including patients with no whiplash injury but long-standing neck pain (Group A), previous symptomatic whiplash injury and long-standing neck pain (Group B), previous symptomatic whiplash injury and no neck symptoms (Group C), and a control group of patients with no history of whiplash injury or neck symptoms (Group D).*

*RESULTS: Data was analyzed by performing an Independent samples t-test and ANOVA, with level of significance taken as $p<0.05$. Comparing the four groups using a one-way ANOVA showed a significant difference between the groups ($p<0.001$). There were significant differences when comparing mean ranges of movement between Group A and Group D, and between Group B and Group D. There was no significant difference between Group C and Group D. similar differences were also seen in the pain scores.*

*CONCLUSION: We conclude that osteoarthritis in the cervical spine, and whiplash injury with chronic problems cause a significantly decreased cervical range of movement with a higher pain score. Patients with shorter duration of whiplash symptoms appear to do better in the long-term.*

## ANALYSIS

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### Background Information

Clinicians in many disciplines commonly measure active cervical range of motion (aCROM) to describe impairments in cervical mobility, determine prognosis or evaluate the effects of treatment (2). Evidence has shown that aCROM steadily diminishes with age (4) and is reduced in patients with moderate to severe pain (5). As well, evidence suggests that reductions in cervical mobility can be associated with activity limitations and disability in individuals with neck pain and chronic whiplash associated disorders (WADs) (6). Reduced aCROM has even been thought to increase the risk of developing neck pain and is considered to be an unfavorable prognostic factor in recovery of patients with neck pain (1).

It remains unclear how useful aCROM measurements are in a clinical setting, as studies on differences in aCROM between patients with neck pain and asymptomatic patients have shown conflicting results. It is important to note that these studies often include heterogeneous groups of patients, consider different planes of movement, and utilize different measurement procedures, all of which make it difficult to form definite conclusions (3).

This review aimed to systematically assess the literature to determine whether, and to what extent, patients with neck pain differ from patients without neck pain on 2-dimensional aCROM, to assess differences in aCROM between patients with acute neck pain and those with chronic neck pain, and to assess differences in aCROM between individuals with nonspecific neck pain and those with WADs.

## PERTINENT RESULTS:

27 studies were included in this systematic review. These studies utilized a variety of tests to measure aCROM, including the cervical range of motion instrument, a Myron goniometer, single inclinometers, a compass device, electronic devices such as the 3Space Fastrak or ultrasound-based Zebris system, as well as video systems. All but one study described aCROM in degrees. One study used radians which the authors converted into degrees to allow for pooling of the data.

**Differences in aCROM between patients with neck pain and persons without neck pain:**

Four studies with a total of 507 participants assessed total aCROM (a combination of total flexion, extension, left and right rotation, and left and right lateral bending) and found that patients with neck pain had a significantly decreased total aCROM. Five studies with a total of 483 participants assessed total flexion-extension, six studies including a total of 653 participants assessed total rotation, and four studies with a total of 398 participants assessed total lateral bending. Patients with neck pain showed significantly reduced total flexion-extension, total rotation, and total lateral bending compared with controls. Nineteen studies with 1649 total participants evaluated half-cycle flexion and extension and showed significant reductions in both flexion and extension in the neck pain groups. Sixteen studies including 1458 participants looking at right and left rotation and 11 studies including 1070 patients looking at right and left lateral bending showed similar reductions in the neck pain groups.

**Whiplash Associated Disorders (WADs) versus non-traumatic neck pain or persons without neck pain:**

Three studies compared individuals with WADs to individuals with non-traumatic neck pain with two of these, including 237 participants, finding significantly less aCROM in the WADs group than the non-traumatic neck pain group. However, the third study showed less aCROM in the non-traumatic neck pain group, although their results did not reach statistical significance. 14 studies compared patients with WADs to individuals without neck pain and found a greater reduction in aCROM in all directions in those with WADs. Thirteen studies compared individuals with non-traumatic neck pain to individuals with no neck pain and found greater reduction in aCROM in the neck pain group for all movements.

**Patients with acute and chronic complaints versus persons without neck pain:**

No studies were found with both an acute and a chronic neck pain group. Four studies, including 257 participants, compared individuals with only acute neck pain (< 6 weeks) to individuals without neck pain and 18 studies, including 1653 participants, compared individuals with only chronic neck pain to individuals without neck pain. When the data was pooled, conflicting results were found leading to no clear conclusion.

*Clinical Application & Conclusions:*

Patients with neck pain showed reductions in aCROM when compared with controls, with the largest differences found in full-cycle flexion-extension, total rotation, and in half-cycle motion in extension. Patients with WADs showed even greater reductions in aCROM than patients with non-traumatic neck pain. No consistent differences could be found in patients with acute versus chronic neck pain, which may indicate that duration of symptoms is not an important factor for aCROM.

There was high heterogeneity across the studies included, which may reduce the precision of the findings. However, when only studies with low risk of bias were included, the amount of heterogeneity was significantly reduced and the differences in outcomes were very small, allowing us to assume that the amount of heterogeneity may not have had a great deal of influence on the results. Further research is needed, however, focusing on increases in aCROM after therapeutic interventions, the correlation with reduction in neck pain as well as measuring aCROM in patients with neck pain while distinguishing between clinically relevant subgroups.

Overall, this review supports the conclusion that individuals with neck pain (whether traumatic or non-traumatic) show clinically relevant decreases in aCROM when compared with individuals without neck pain. This supports the notion that aCROM is a potentially useful clinical measurement.

*EDITOR'S NOTE: Depending on the goal of the patient and the nature of the clinical issue, I am generally more interested in the quality of ROM versus the overt quantity. What I mean by that is – how does the patient feel throughout the range? Is there a painful point in the arc of motion? What does that pain feel like? Can the patient move beyond it, or does it stop them? Why does it stop them – mechanical, or perceived block? There is lots of useful clinical information to be gleaned from ROM testing, and prior literature has shown that many people don't need what is considered "full" ROM to effectively and comfortably perform activities of daily living and even many recreational activities. So, next time you ask a patient to turn their head the left or right, perhaps there are some addition questions to be asked?*

## STUDY METHODS:

A research librarian performed a search of electronic databases. Retrieved article titles and abstracts were independently reviewed by two researchers who then further assessed the full text of all acceptable articles. References from retrieved and related articles were also screened for possible additional references. Disagreements were solved through discussion or arbitration with a third author.

## INCLUSION CRITERIA:

- Assessment of 2-dimensional aCROM in both a group of patients with either neck pain or WADs and a control group without neck pain
- Difference in average age between groups of no more than 10 years
- Patients > 18 years of age with acute or chronic neck pain rated grade I, II, or III according to the Neck Pain Task Force (7) or with WADs grade I, II, or III according to the Quebec Task Force (8)
- Numerical comparison of maximal aCROM in degrees or radians

Studies utilizing radiography, computed tomography, or magnetic resonance imaging, or analyzing segmental mobility were excluded. No restrictions were placed on language or publication date.

An electronic pre-piloted data extraction form was used to gather data on general study information, characteristics of the study population, outcome assessors, measurement procedure, statistical analysis, and results. Methodological quality assessment was performed by two independent reviewers using a criteria list developed by the authors based on the recommendation of the Cochrane Handbook for Systematic Reviews of Interventions (9) and criteria items derived from the Newcastle-Ottawa Scale and the Quality Assessment of Diagnostic Accuracy Studies-2 Scale (10).

## STUDY STRENGTHS / WEAKNESSES:

**Strengths:**

- The authors should be commended for attempting to systematically address and evaluate the literature on a clinical issue that hasn't received a lot of research attention.

**Weaknesses:**

- It is always possible that relevant studies were missed or that unpublished studies were not found or could have contributed valuable data. It is more likely that studies showing no difference between patients and controls will remain unpublished, which may affect the overall conclusion (11).
- The authors used a self-developed criteria list to assess risk of bias. This specific list has not been validated, but they did use items from tools that have been validated (ex. Cochrane, QUADAS, etc.).
- Only 6 of 27 studies reported adequate blinding of assessors. This may have enlarged the difference in aCROM in the other studies.

**Additional References:**


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