**What is the effect of Manual Therapy on the Helical Axis of the cervical spine in patients with grade I and II Neck Pain?**

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## Summary

The study examines whether manual therapy (MT) affects the helical axis (FHA) of the cervical spine during flexion-extension, lateral bending, and axial rotation in patients with grade I and II non-specific neck pain. Data from 37 participants were analyzed using electromagnetic tracking and the Numeric Pain Rating Scale (NPRS). Post-treatment, a significant increase in the mean angle (MA) of axial rotation was found, while other movements showed no significant changes. The results suggest MT may enhance variability in cervical motion, but the mechanisms behind this change are unclear.

## Introduction

The finite helical axis (FHA) is a concept used to describe the motion of joints, capturing both rotational and translational movements in a single axis and several parameters have been determined to analyse its behaviour throughout the motion [1].

## Methods

37 participants were recruited from a private practice in The Netherlands. Patients were asked to perform three cervical planar movements: flexion-extension, lateral bending and axial rotation. Movements were registered using an electromagnetic tracking system. Changes in pain were measured with the Numeric Pain Rating Scale (NPRS) for the pre- and posttreatment sessions. Changes in cervical kinematics were analysed by calculating the minimal convex hull (MCH) and mean angle (MA) of the finite helical axis (FHA) between the pre-treatment, control and post-treatment measurements [2].

## Results and Discussion

The MA for axial rotation of the cervical spine was significantly increased post-treatment compared with the control measurement (Table 1). Statistical analyses using students-T or Wilcoxon test did not reveal significant changes for the other cervical planar movements on both the MCH and MA. The significant increase in the mean angle (MA) may be attributed to axial rotation being the movement with the least variability in helical axes (i.e., a more stable movement) compared to a healthy control group. This stability could make axial rotation more susceptible to the effects of the treatment session. There was a significant decrease on pain post treatment session. However, this is not clinically meaningful as it falls within the minimal detectable change (MDC) and minimal clinical important change (MCIC). Pain could potentially lead to more protective movement strategies to prevent pain during movement, redistribution of muscle activity within and between muscles, and therefore modified movement and stiffness

## Conclusions

Previous studies have already demonstrated that FHA differs between patients with neck-related problems and healthy controls in which the last ones show a higher variability in FHA behaviour [3]. One session of MT might have led to a more variable movement in comparison with the pre-test control measurement. Underlying mechanisms causing this change are unknown.

## References

[1] Woltring HJ. (1994) *J Biomech*, **27**(12):1399-414.
[2] Cescon C. et al. (2014) J. Electromyogr. Kinesiol., **24**: 628-635.
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*Table 1*. outcomes mean angle (MA)

| Movement | P25 | Median | P75 | N |
|---|---|---|---|---|
| FE_1 | 3.69 | 4.24 | 4.90 | 36 |
| FE_2 | 3.73 | 4.28 | 4.72 | 36 |
| LTB_1 | 7.91 | 8.93 | 11.73 | 37 |
| LTB_2 | 7.45 | 8.99 | 11.93 | 34 |
| *ROT_1* | 4.34 | 5.28 | 6.03 | 35 |
| *ROT_2** | 4.94 | 5.50 | 6.63 | 33 |

FE = flexion – extension LTB = lateral bending ROT = rotation 1 = pre-treatment measurement 2 = post-treatment measurement. P25= 25$^{th}$ percentile, P75= 75$^{th}$ percentile N = number of participants and their respective movement registrations that were included in the statistical analysis. * = statistical significant difference in comparison with ROT_2 ($p \leq 0.05$)