

Introduction

• The mechanism(s) behind the therapeutic effects of spinal manipulative therapy (SMT) in the treatment of neck pain are currently unknown. It has been proposed that SMT might reduce neck pain by changing the cervical lordosis, but this has yet to be substantiated by high-quality research. Equally, the repeatability of cervical lordosis measurement over time, in the absence of treatment, is unknown.

• The objectives of this study were:

1. To determine the intra-observer and intra-subject repeatability of the posterior tangent method of measuring cervical lordosis
2. To determine whether cervical lordosis changes after a course of spinal manipulation for non-specific neck pain



Figure 1: Stabilisation and motion-frame with aspects that were measured indicated (1-8)

Methods

• Participants

- 29 patients with non-specific neck pain
- 30 pain-free healthy volunteers age and gender-matched to the patients

• Inclusion criteria

- *Patients* - 2 weeks' mechanical neck pain, pain ≥ 3 on an 11-point numerical rating scale, no suspected pathology
- *Healthy volunteers* - no current neck pain, dizziness, vertigo, no activity-limiting neck pain lasting > 24hrs in last year

Methods

• **Imaging** - Cervical spine imaging was obtained with a Siemens Arcadis Avantic C-arm fluoroscope. Standardised positioning of participants was achieved using a stabilisation frame (Figure 1) as part of a standardised imaging protocol.

• **Image measurement** - Posterior tangents of C2 and C6 (Figure 2) were drawn on the neutral lateral cervical fluoroscopic images of 29 patients with subacute/chronic non-specific neck pain and 30 healthy volunteers at baseline and 4-week follow-up. The resultant angle was measured using 'Image J' digital geometric software.

• **Data Analysis** - Data were analysed using SPSS Version 21. ICC (3A, 1) single measures were calculated along with the standard error of measurement (SEM) and minimum detectable change (MDC):

$$SEM_{\text{agreement}} = \sqrt{MSW} = S_w$$

$$MDC = S_w \cdot \sqrt{2} \cdot 1.96$$

where S_w is the within-subject standard deviation and MSW is the within-subjects mean-square.

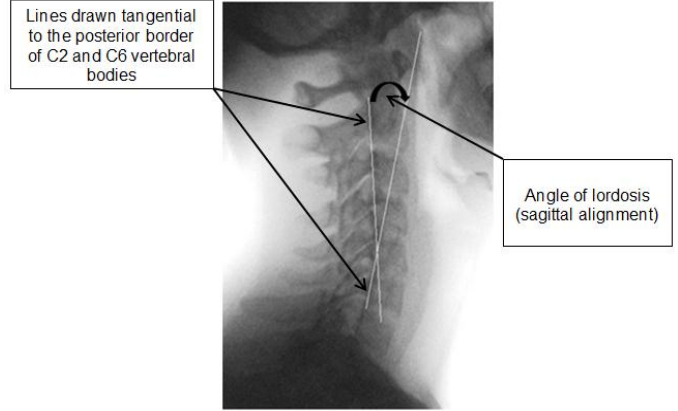


Figure 2: Posterior tangent method of measuring cervical sagittal alignment (lordosis)

Results

• **Baseline characteristics** - There were no significant baseline differences between patients and healthy volunteers in terms of age, gender or cervical lordosis, although lordosis was on average less in the healthy volunteers.

• **Repeatability** - As shown in table 1, intra-observer measurement error (SEM) for cervical lordosis was acceptable and reliability (ICC) was substantial. The intra-subject MDC however, was large.

Table 1: Intra-observer and intra-subject repeatability in healthy volunteers

	Intra-observer repeatability	Intra-subject repeatability
SEM _{agreement}	3.6°	4.9°
MDC	9.9°	13.5°
ICC (95% CI)	0.98 (0.962 – 0.991)	0.87 (0.743 – 0.936)

SEM standard error of measurement; MDC minimum detectable change; ICC (3A, 1) intra-class correlation coefficient two-way single measures mixed effects model (agreement)

• **Changes to cervical lordosis** - Patients' lordoses increased, on average, from +9.5° (SD 13.5°, 95% CI 4.6°–14.5°) to +11.6° (SD 11.8°, 95% CI 7.3°–15.9°); changes were not statistically significant ($p > 0.05$). The change in cervical lordosis was highly variable (range = 0.1–24.9°). In only 14 % (4/29) of patients was cervical lordosis increased by at least the MDC.

Conclusion

This study found no significant difference in cervical lordosis (sagittal alignment) between patients with mild non-specific neck pain and matched healthy volunteers. Furthermore, there was no significant change in cervical lordosis in patients after 4 weeks of cervical SMT.

Further Information

Shilton, M., Branney, J., Penning de Vries, B., and Breen, A.C., 2015. Does cervical lordosis change after spinal manipulation for non-specific neck pain? A prospective cohort study. *Chiropractic and Manual Therapies* 23: 33

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