

# The Effect of Force Direction on Hypoalgesia Locally, Segmentally and Non-segmentally:

## an Investigation into AP & PA Mobilisation at C4/5

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### Introduction and Aims

Mechanisms of hypoalgesia following spinal mobilisation are not fully understood. Various treatment dose parameters are considered by Physiotherapists with little empirical evidence guiding decisions. Researchers<sup>1,2,3,4</sup> have investigated some treatment parameters yet none have investigated the effect of force direction on resultant hypoalgesia with regards size of effect and distribution (locally, segmentally and non-segmentally). The hypoalgesic effect of an intervention can be determined in healthy subjects through pre and post measures of pressure pain threshold (PPT) algometry.

The study aims were:

- To determine whether cervical mobilisations applied in different directions (AP and PA) significantly change the PPT in the upper limb.
- To establish stability of the baseline PPT measurements through intra and intersession reliability analysis.

### Methods

A double blind, within-subject, repeated measures design was employed. A convenience sample (n=25) of asymptomatic, manual therapy naïve subjects was recruited. Subjects attended three, randomly allocated experimental conditions: i) unilateral PA Gr III C4/5 (Figure 1) ii) unilateral AP Gr III C4/5 (Figure 2) iii) control. Ethical approval was granted by the Cardiff University School of Healthcare Sciences Ethics Committee (SREC). A blinded assessor measured mean PPT pre and post condition over three sites in the right upper quadrant (local right C4/5, ipsilateral segmental C5 dermatome, ipsilateral non-segmental C8 dermatome) with a manual algometer (Figure 3). Data were analysed for differences between the magnitude and the extent of hypoalgesia induced by the three conditions using Two-Way ANOVA with post-hoc analysis. Stability of baseline PPT measurements (intra and intersession reliability) was calculated using ANOVA and Intraclass Correlation Coefficients (ICC).

Figure 1: Unilateral right PA C4/5



Figure 2: Unilateral right AP C4/5



Figure 3: Manual algometer used to measure Pressure Pain Threshold (PPT) at 3 different sites

### Results

Baseline PPT readings were found to be highly reliable at each site (ICC local 0.936, segmental 0.955 and non-segmental 0.932) with no significant difference intersession ( $p=0.946, 0.745, 0.722$  for each site respectively). AP mobilisations demonstrated a statistically significant difference against control ( $p=0.007$ ) and clinically valuable changes (reduction of  $\geq 15\%$  in PPT of the right upper quadrant locally (15.7%) and segmentally (16.6%), but not non-segmentally (4.56%). AP mobilisations resulted in an overall moderate effect size ( $f=0.26$ ). PA mobilisations demonstrated no statistically significant difference against control ( $p=0.061$ ) and clinically valuable changes only within the segment (17.4%). PA mobilisations resulted in a small effect size ( $f=0.18$ ). No significant difference occurred at any site under the control condition. These results can be seen in Figure 4 as the mean change scores in PPT at each site under each condition. The results demonstrated a statistically significant local ( $p=0.023$ ) and segmental ( $p<0.001$ ) effect with either an AP or PA mobilisation, but failed to identify a non-segmental effect.

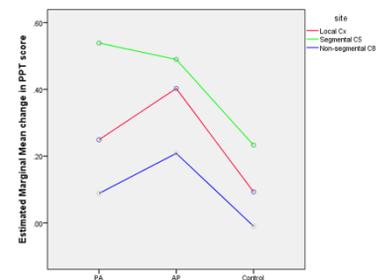


Figure 4: A profile plot of the estimated marginal mean change in PPT at each site under each condition

### Conclusions

The direction of force appears to be important in the overall hypoalgesic effect with clinically and statistically significant results only after the AP mobilisation. Within each site, no difference between the two mobilisations was demonstrated, with both producing a significant effect locally and segmentally, but not non-segmentally. Further research into the possible reasons for this difference such as extent of movement generated, proximity of mechanoreceptors/access to joint capsule and depth of overlying tissues would be beneficial. Investigations with a larger and/or symptomatic sample would add clinical value. Enhanced understanding of treatment parameters and mechanisms of hypoalgesia will allow more informed treatment selection, by current and future Physiotherapists, for improved patient outcome. This study creates a platform from which future investigations into the mechanisms of hypoalgesia and can be developed.

### References

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Acknowledgements: CSP Educational Bursary

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