The Immediate Extent of the Hypoalgesic Effect Following Central Mobilisations to L3, L4 and L5.

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Study Protocol

Study Design

The design of the study was a randomised, single-blind, repeated measures, cross-over design, performed in a single-centre environment. Ethical approval was gained from the School of Sport and Exercise Science ethics committee at the University of Worcester (ISES2018RF1). Informed consent was gained from each participant before testing.

Sample and Inclusion Criteria

The study included twenty asymptomatic participants (11 females and 9 males); the mean age of the participants was 21.9 years (±2.67, range 20- 30). A health questionnaire (based on the PARQ) was completed by each participant to establish any contraindications they may have to the experimental procedures, namely the application of vertebral mobilisations. No participants were required to be excluded as none of them had consulted their doctor in the last six months, were taking any medication, had an infection in the past two weeks, had no heart, asthma, diabetes, bronchitis, epilepsy or blood pressure issues, had any current muscle or joint injury, were able to train/exercise normally or knew of any other reason that would preclude them from participating.

Data Collection

Each participant was randomly assigned using a random number generator to the order in which their lumbar vertebral levels were mobilised and to the order of each dermatome level tested for the baseline and all three mobilisation interventions.

Before initiating the experimental procedure, the participant's age, height, and weight were recorded. The participant was instructed to lay on their back, on the plinth and had the five locations for dermatome testing marked with a water-soluble pen. The researchers utilised the method of using participant's finger breadth to establish dermatome testing sites (Gross et al 2015) the dermatome testing sites were based on Keegan and Garrett's dermatome map (Keegan & Garrett, 1948) see Figure 1. From this point forth, the spinal levels will be referred to as L2 or L3, respectively and the corresponding dermatome of the vertebral level will be referred to as DL2 or DL3.

Figure not included due to copyright reasons.

Figure 1. The dermatome map was established originally by Keegan & Garrett (1948). DL2 landmark- 4 participant's finger breadth inferior from ASIS, mid anterior thigh. DL3 landmark- 8 participant's finger breadth inferior from DL2 landmark, mid anterior thigh. DL4 landmark- 2 participant's finger breadth superior from the proximal border of the patella, mid-way. DL5 landmark- 4 participant's finger breadth inferior from tibial tuberosity, then 1 participant's finger breadth lateral (so that the landmark is on the tibialis anterior, not tibia). S1 landmark- 1 participant's finger breadth inferior to the lateral malleolus. Adapted and used with permission from Anatomical Record. 1948;102(4):409.

Once these locations were marked on the participant's left leg, a demonstration of the Neuropen® (Owen Mumford, Oxfordshire, UK) was performed on the participant's hand (opposite to the side being tested). Once all this had been completed, baseline measures were taken. Using the Neuropen®, a standardised force of 40g was applied to one of the locations. The participant then received a small piece of card with a vertical 10cm visual analogue scale (VAS) line on it and a pen and was asked to "draw a horizontal line on the scale to indicate how much sensation you feel, 0 being can-not feel anything and 10 being an extremely strong sensation". Following this explanation, the participant was asked if they understood and whether they needed further instruction to complete the VAS card. Once the participant marked the card, the card and pen were collected and stored, this process was repeated with the remaining four locations (these five cards provided the baseline data). A new tip was used for each participant, and a decrease in PPS represents a reduction in pain.

Once baseline measurements were collected by the lead researcher, the participant was asked to turn onto their front; the first (pre-determined) lumbar vertebra was found using the iliac crest as an anatomical landmark for the differentiation test. When the correct vertebra was located, the experimenter pressed record on the laptop connected to the PGD plinth (see Cooper et al (2018) for full details) to record the force applied and calculate the frequency.

The lumbar vertebra was mobilised using Maitland's vertebral mobilisation method for posterior-anterior central vertebral pressures (PACVPs) for four sets of 30 seconds (Pentelka et al 2012) with up to 30s between each, at a grade III amplitude (Maitland et al 2005) and a target rate of 3Hz (Piekarz & Perry 2015) to ensure the total time for testing was less than fifteen minutes in duration,

before the opioid system is activated (Beatti et al 2010). Once the fourth 30-second mobilisation had been completed, the researcher pressed stop on the laptop and asked the participant to roll onto their back. Then the next five sets of data were collected following the same procedure implemented for the baseline measures (collected in a different, pre-determined order each time). This process was repeated for the remaining two vertebrae.

Statistical Analysis Plan

A Multivariate Analysis of Variance (MANOVA) for individual levels against baseline and a One-way Analysis of Variance (ANOVA) for the collated (data set reduced to identify effects at either the same vertebral level as treated versus baseline, one, two or three above or below respectively) mobilisation effect including Tukey post hoc tests for both were conducted using IBM SPSS statistics 25, p values less than 0.05 were defined as acceptable. Effect sizes identifying Cohens d (Large 0.8, Medium 0.5, and Small 0.2) and Magnitude Based Inferences (MBI) were also calculated for each a more comprehensive analysis of the data.