



RESEARCH REPORT

# The repeatability of pressure algometry in asymptomatic individuals over consecutive days

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## KEYWORDS

Pressure pain threshold;  
Algometry;  
Algometer;  
Data correlation;  
Reliability

**Abstract** *Background:* To determine if electronic pressure algometry is a statistically stable measure of spinal pressure pain threshold (PPT) in asymptomatic individuals, in particular, to determine if repeated measurements at the same site changes the PPT, and to determine if repeatability differs in each of the spinal regions tested.

*Design:* Repeated measures design.

*Setting:* University teaching clinic.

*Participants:* Thirty-three asymptomatic participants.

*Interventions:* The PPT of three spinal segments (C6, T6 and L4) was measured three times in consecutive measures (10 s apart), then repeated one day and two days post-initial measurement. Measurements were taken using an electronic pressure algometer.

*Main outcome measures:* PPT, intra-class correlation coefficient and test of significant equality.

*Results:* Results demonstrated that the PPT measurement is statistically stable both between days ( $p < 0.001$ ) and within day ( $p < 0.001$ ). The intra-class correlation coefficient (ICC) values between the mean scores of daily trials demonstrated excellent concordance for each spinal segment (ICC = 0.860–0.953), with the exception of the correlation between day 1 and day 3 at T6, demonstrating good concordance (ICC = 0.676). All trial-to-trial correlations demonstrated excellent concordance both within trials of the same day (ICC = 0.833–0.988) and subsequent days (ICC = 0.823–0.940).

*Conclusion:* Electronic pressure algometry is a repeatable and statistically stable measure of the spinal PPT, both between days and within-day. The results provide

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evidence that the use of this device may be of value as an outcome measure for primary spinal complaints such as low back or thoracic spine pain.  
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### Implications for clinical practice

- Pressure algometry is an appropriate method for quantifying a patient's pain levels.
- Pressure algometry is a stable and reliable measure of the pressure pain threshold.
- Pressure algometry can be used as an outcome measure for assessing change in pain levels.

## Introduction

Palpation provides relevant information about underlying tissue and the nociceptive system,<sup>1</sup> however, quantification of tenderness by palpation is subjective, and makes comparison over time periods and between patients difficult, in both clinical and research settings. The application of pressure by a device to a tissue has the advantage of triggering the same type of nociceptors as that of palpation.<sup>2</sup> A controlled application of pressure, as applied with an algometer, may therefore be a more appropriate technique for quantifying pain thresholds and pain tolerance levels of various musculoskeletal tissues. Algometry is also appropriate given the rate of application of pressure and the direction of the pressure being applied can be controlled.<sup>3</sup>

Pressure algometry has been described as a semi-objective method, or subjective measure,<sup>4</sup> for establishing the pressure pain threshold (PPT) of various tissues. The PPT is defined as the minimum amount of pressure which induces pain or tenderness.<sup>5,6</sup> The use of pressure algometry has been demonstrated in many studies to be a reliable and repeatable tool for quantifying local pain and tenderness in various tissues.<sup>5,7,8</sup> PPT values have been used in studying a variety of musculoskeletal conditions including fibromyalgia, headaches (such as cervicogenic and tension-type headaches), arthritis, spinal conditions, and Delayed Onset Muscle Soreness.<sup>9,10</sup>

Much of the previous literature investigating the effect of repeated PPT measurements on musculoskeletal tissues has focused on soft tissues, with most studies demonstrating reliability over repeated measures.<sup>5,6,8,11–13</sup> Two studies<sup>1,9</sup> have investigated the effect of repeated algometry in the spine however none have investigated the stability of PPT measurements over consecutive

days. Keating et al.<sup>1</sup> tested the repeatability of electronic algometry over a short period of time (30 min) on four spinal segments (C6, T4, T6, L4), using the mean of three trials on each segment. Sterling et al.<sup>9</sup> investigated repeatability over a longer period of time (one week between testing) on two segments of the cervical spine, using only one trial on each segment. Both of these studies demonstrated that the PPT was stable over both short and long durations.

Concurrent validity testing of the electronic pressure algometer used in this study was conducted by Vaughan et al.<sup>14</sup> Results obtained were similar for all rates of pressure application according to the standard correlation-based measure (ICC > 0.9). However, when tested for equality the two data sets were not significantly the same. These authors suggested that future studies investigate the validity and repeatability of the device, particularly with human tissues, as it was implied that repeated application of force may lead to an erroneous result.

The aim of the present study was to determine if electronic pressure algometry was a repeatable measure of spinal pressure-pain thresholds in asymptomatic individuals. In particular, the study investigated if repeated measurements on the same spinal site affected the stability of the PPT measures over consecutive days, and to determine if reliability differed in each of the three regions of the spine.

## Methods

### Participants

Thirty-three ( $N = 33$ ) asymptomatic participants were recruited from the student population at Victoria University. Twenty female and thirteen

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