



## Research report

# Comparison of the Manual Assessment of Respiratory Motion (MARM) and the Hi Lo Breathing Assessment in determining a simulated breathing pattern<sup>☆</sup>

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## ABSTRACT

**Aim:** The aim of this study was to assess and compare the validity and potential utility of two manual breathing assessment procedures: the Manual Assessment of Respiratory Motion (MARM) and the Hi Lo Breathing Assessment. A secondary aim was to gauge the relationships between experience and the ability to perform these assessment techniques, by comparing the performance of students with practitioners.

**Method:** 56 osteopaths and osteopathic students were taught the MARM and the Hi Lo Breathing Assessment and trained to simulate breathing patterns. The participants, acting alternatively as breathers and examiners, then attempted to accurately determine whether the breathing patterns simulated by their partner were predominately abdominal, thoracic or, in the case of the Hi Lo, paradoxical. Participants were surveyed on their confidence in the use of each technique, their perceived ease in using each technique, and their intended future use of the techniques. Student and practitioner abilities to detect simulated breathing patterns were compared for the MARM and Hi Lo.

**Results:** Overall scores for correctly determining breathing patterns were not significantly different for the MARM or the Hi Lo, and there was no notable moderation of this effect according to experience, with both practitioners and students demonstrating a high level of performance on both techniques. There were some differences in accuracy of performance across different breathing styles, with Hi Lo assessment of paradoxical breathing being more difficult to identify correctly. Ease of learning was similar for MARM and Hi Lo but confidence in using the techniques, and intended future use was higher for the MARM. There were some significant relationships between these utility measures and performance, particularly on the MARM.

**Conclusions:** This study builds on our previous study to strengthen the evidence for the validity of the MARM and also supports the validity of the Hi Lo. Responses to the survey indicate that, overall, participants preferred the MARM to the Hi Lo. This study is a preliminary investigation of these techniques. Future studies to test the validity of these techniques should be performed in a clinical setting on individuals with actual rather than simulated breathing pattern disturbances.

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## 1. Introduction

Breathing pattern disturbance and abnormal function of the respiratory muscles have been proposed to contribute to symptoms such as dyspnea,<sup>1,2</sup> neck and shoulder girdle pain,<sup>3</sup> and

temporomandibular joint disorders.<sup>4</sup> It has also been argued that a person's habitual breathing patterns may influence posture and spinal stability, and it has been proposed that correct breathing is the foundation for the correction of dysfunctional movement and postural patterns.<sup>5,6</sup> It is difficult to evaluate the impact of breathing pattern on symptoms, movement and postural patterns on the basis of these previous studies because the characteristics of correct or dysfunctional breathing pattern were not clearly defined and the measurement techniques used to evaluate breathing pattern had not been standardized or validated.

Nevertheless in the clinical environment, breathing pattern is often assessed by observation and palpation and several palpatory

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techniques for assessment of breathing pattern have been described in manual therapy texts and other publications.<sup>3,5,7–10</sup> The techniques differ in the hand placement of the operator, and interpretation and recording of palpatory findings.

In a previous study one technique for evaluating and quantifying breathing pattern, the Manual Assessment of Respiratory Motion (MARM), was compared with measures performed with Respiratory Induction Plethysmography (RIP), an established standard for measuring breathing pattern.<sup>11</sup> This study tested inter-examiner agreement when two examiners used this technique to differentiate between diverse breathing and postural patterns. High levels of agreement between examiners were found with two MARM measures that reflected balance of thoracic to abdominal breathing,  $r_{ic} = .85, p < .001$ . Examiners' MARM measures also correlated with similar measures obtained from RIP,  $r = .59, p < .01$ . Both RIP and MARM methods were able to differentiate between abdominal and thoracic breathing patterns, but only MARM was able to differentiate between breathing changes occurring as an incidental result of postural change. It was concluded that the MARM was a reliable clinical tool for assessing breathing patterns and demonstrated better sensitivity to more dimensions of rib cage motion than RIP.<sup>12</sup>

The MARM procedure was first developed and applied in a follow-up study of breathing and relaxation therapy with cardiac patients in the 1980s. It appeared that two years after breathing therapy the MARM still showed differences between experimental and control patients.<sup>13</sup> The MARM is similar to other breathing assessment techniques that are based on the examiner's interpretation and estimation of the motion of their hands when placed at the posterior and lateral lower rib cage. However, the MARM is of particular interest as a clinical and research tool because it includes a system of notation that allows the examiner to derive numerical values for two variables related to relative distribution of breathing motion and another numerical variable for area of breathing involvement. The examiner can also gauge, rate and record their general impressions of breathing regularity, rib cage stiffness and symmetry of breathing.

In the previous validation study of the MARM high levels of inter-examiner agreement and agreement between MARM and RIP may have been due to the fact that the examiners were all experienced osteopaths.<sup>12</sup> It is unknown to what extent performance on various breathing assessments, such as the MARM and the Hi Lo, is moderated by the experience of the administrator; for example, do experienced practitioners and students differ in the accuracy of their assessments derived from these techniques?

The Hi Lo can be used to assess the motion of the upper rib cage and lower rib cage/abdomen and determine aspects of breathing such as rate, rhythm, relative motion and phase relation of upper and lower breathing compartments.<sup>7</sup> The Hi Lo assesses breathing from the motion observed at the front of the body while the MARM assessment is made with the examiner hands at the back on the mid thoracic and lateral lower rib cage and waist. The Hi Lo findings are reported as qualitative descriptions or as dichotomous variables in comparison with the MARM, which assigns numerical values. To our knowledge, no studies have compared these two assessment methods.

The main aim of this study was to examine the relationship between therapists' performance in the use of the MARM and Hi Lo by assessing the sensitivity and consistency of these techniques when used to assess simulated breathing patterns. Another aim was to gauge whether accurate performance in the use of these techniques was dependant on the examiners' general levels of experience in manual therapy. This was done by comparing results achieved by experienced osteopaths with those of osteopathic students. Finally, relationships between performance on the MARM and Hi Lo, and participants' views on their confidence in and

perceived ease of use of each technique and their intention to use each technique in the future, were also considered.

## 2. Method

Volunteer examiners who were either osteopathic students ( $n = 27$ ) or practicing osteopaths ( $n = 29$ ) attended a two-hour training class that utilised a structured training format. In the training session, participants were taught how to do the simulated breathing techniques and the MARM and Hi Lo breathing assessment techniques.

Participants were paired, with one acting alternatively as 'examiner' and one as 'breather'. Pre-screening of breathing ability was used to exclude people who were clearly unable to correctly modify their breathing pattern.

The breather was instructed to alter their breathing pattern 3 times according to randomly selected written instructions, firstly while the examiner performed the MARM and subsequently the Hi Lo. In the case of the Hi Lo, breathing instructions were various random combinations of thoracic, abdominal or paradoxical breathing. In the case of the MARM the breathing instructions were various random combinations of thoracic or abdominal breathing but not paradoxical breathing. The examiner, who was blinded to the breathing instruction, performed the MARM procedure 3 times, followed by the Hi Lo breathing assessment 3 times, with the aim of accurately determining which breathing pattern was being performed.

Precautions were taken to exclude people who were clearly unable to comply with breathing instructions. People who identified themselves as unable to control their breathing were asked to inform the researcher and were either not involved in the study or excluded from the data set.

Of the 56 volunteers, 29 were practitioners and 27 were students. There were 36 females and 20 males. All performed the MARM and the Hi Lo, but due to errors in the numbering of recording sheets we were only able to analyse data on 55 MARM score sheets and 53 Hi Lo score sheets.

## 3. Description of breathing assessment techniques

### 3.1. Manual Assessment of Respiratory Motion (MARM)

The examiners were taught how to perform the MARM and how to record their findings (see Fig. 1) by drawing lines on a pie chart to indicate their estimation of thoracic/vertical or abdominal/lateral dominance, and by ticking a box to indicate either thoracic or abdominal breathing. Usually there are 3 MARM measurement variables that can be calculated from these lines. These variables were not used in this study but are included with Fig. 1 for the reader's interest. Courtney et al. (2008) gives a complete description of the MARM procedure and the full system of notation with calculation of variables in a previous publication.<sup>12</sup>

The following is the description given to examiners for how to perform the MARM. *The examiner sits behind the subject and places their hands on the lower lateral rib cage. The hands rest firmly but do not direct or restrict breathing motion. The hands are comfortably open with fingers spread so that the little finger approaches a horizontal orientation and the thumbs are approximately vertical. The examiner's lower fingers are below the lower ribs to feel abdominal expansion. The examiner makes an assessment of the overall vertical motion relative to the overall lateral motion. Simultaneously they evaluate to what extent the motion is predominantly upper rib cage, lower rib cage/abdomen, or in balance. The examiner then draws two lines. An upper line (A) represents the degree of vertical and upper thoracic motion and the lower line (B) represents the degree of lower*

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