Title	Improving the reliability of thoracic spinal segmental mobility tests using a palpation training device with feedback; a randomized controlled pilot trial
Acronyme	MOVEbox
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Abstract	**Introduction** : For many manual therapists, choices for treatment relies on their ability to detect subtle tissue responses to motion palpation clinical tests. The MOVEbox is a mechanical device with a movable knob whose resistance is controlled by an electromagnet. It was developed to help students calibrate their palpation experience, provide them with accurate feedback. Little is however known on how this type of training transfers to clinical applications. We therefore planned an experimental study to evaluate the benefits for students of a short training program using the MOVEbox in improving the reliability of a spinal motion palpation test. **Methods** : Volunteer students without prior palpation training beginning their second semester in the Division of Osteopathy at the Faculty of Health were invited to participate. Two weeks prior to the measures for baseline values, students were shown, and practiced the thoracic motion palpation test (Rocking test) in groups of four. A pilot study with three experienced osteopaths revealed the motion palpation test to be sufficiently reliable on this population for improvements to be identifiable (ICC(3,1)=0.149). We then used block randomisation with random permuted group to allocate volenteers to three groups: the intervention group, the control group, and the tested subjects group. The training program on the MOVEbox ran over 5 weeks (March – April 2016) with two planned weekly sessions of 15 minutes. Students worked in pairs. One managed the computer, the other focused on palpation. The later consisted of comparing the resistance of the knob to mobilisation to the left and right. A first run would set their overall level from detecting differences ranging from 3000 mN to 50 mN on a seven step logarithmic scale. They would then test their threshold value on a finer tuned scale. Each time a correct answer was provided, the device would then diminish the difference thereby making the task more difficult until the user made a mistake. This was repeated ten times. Students were provided with feedback on the correct answer and on the level they had achieved for each answer. In the control group, all students followed the usual palpation courses that starts during the second semester including courses on spine mobilisation and testing. The primary outcome was the improvement of consensus in findings from the "Rocking test", a segmental spinal motion palpation test. This was measured as the Individual Consensus Score at baseline (Feb.2016) and at three months (Mai 2016). **Results** : Twenty-nine students volunteered to participate. Five students were unable to attend the three-month follow-up; leaving eight in the intervention group, eight in the control group, and eight in the tested subjects group. Students in the intervention group used the MOVEbox over 8–10 sessions. Six students reported not reaching a ceiling effect in their learning curve. Nevertheless, per protocol analysis showed that students who followed the MOVEbox training program had an improvement of their Individual Consensus Score (ICS) of 0.28 over the control group (CI95% 0.168 – 0.391; p<0.001). Their ICS increased from 0.194 at baseline to 0.434 at three months whereas no changes were observed in the control group (0.247 to 0.203) (Figure 3). At three months, the reliability of the motion palpation test remained poor but was improved compared to the

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	one measured in the control group (ICC(3,1) = 0.285 vs. 0.109). No adverse events in relation to the use of the MOVEbox were reported by students. **Conclusion** : This study has shown that a short training using the MOVEbox can increase the reliability in detecting subtle segmental differences of resistance to passive mobility. However having students focus on segmental resistance as a criterion for detecting abnormal motion palpation could lead to false beliefs that perceptions are directly related to palpable "segmental somatic dysfunctions". To prevent this, we recommend that education of palpation focuses on patients' perceptions of touch and movement rather than on clinicians'. We assume that enhanced palpation skills can help practitioners develop their insight on what patients might experience.
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