Reliability and validity study of the iPhone as a device used to measure Cervical Range of Motion

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Purpose/relevance: Cervical disorders are a major health problem in rehabilitation. A thorough assessment of range of motion (ROM) is essential in the physical therapist's evaluation. This can be done by using various types of tools, including inclinometers. However, no study has been done regarding the digital inclinometer integrated with the iPhone. The objective of the current study is to estimate the reliability and the criterion validity of the iPhone to evaluate cervical ROM in healthy subjects.

Methods: The sample consisted of 28 participants without cervical disorder or neck pain. Two testers independently measured all cervical spine (CS) movements (maximal flexion, extension, lateral flexions and rotations) of each participant. All measures were taken twice, separated by a 10 minutes period. Afterward, another set of measures were taken with the Cervical Range of Motion Device (CROM). Intra and interrater reliability was established using the intra-class correlation (ICC) and the validity using the Pearson r, with the CROM as the gold standard.

Results: We found moderate to good intra-rater reliability for each CS movement (ICC's=0.65-0.85) and lower inter-rater reliability (ICC's < 0.60). However, we found that the criterion validity was good for flexion (r= 0.76), lateral flexions (r= 0.85 [right]; r=0.70 [left]) and left rotation (r= 0.78). We found moderate validity for the movements of extension (r= 0.58) and right rotation (r= 0.55).

Conclusion: Although the results show that the iPhone had moderate intra-rater reliability and lower inter-rater reliability, it has moderate to good criterion validity compared to the CROM for each cervical movement, except for extension and right rotation.

Implications: The positive results obtained in this study with healthy subjects reveal the potential clinical use of the iPhone to measure CS ROM. However, we need future validation study in a population with neck pain and/or ROM restrictions.