INTER-RATER RELIABILITY AND CONCURRENT VALIDITY OF A NOVEL LASER-GUIDED GONIOMETER

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INTRODUCTION

Range of motion (ROM) assessments are important in a clinical setting to determine an individual's level of impairment and evaluate their progress towards their rehabilitative goals. The gold standard used to assess ROM is the universal goniometer. However, while movements commonly consist of coupled motions, goniometers can only measure movements in a single plane. [1] The HALO© (model HG1, HALO© Medical Devices, Australia) device is a novel, laser-guided, 3-axis goniometer which has been shown to have excellent inter-rater reliability (ICCs > 0.75) when assessing shoulder ROM. [2] However, such a study has not been conducted for lumbar and lower limb ROM. The purpose of this study was to determine the concurrent validity and inter-rater reliability of the HALO© when assessing the lumbar spine and lower limb ROM.

METHODS

Fifty asymptomatic participants were recruited and randomized into four groups for four separate assessments in the one session. Each assessment compromised of tester A or B asking the patient to complete their full active range of motion for a variety of movements, measured with either the goniometer or the HALO©. Testers A and B were both fully qualified physiotherapists with 10 years and 3 years of clinical experience, respectively.

Inter-rater reliability was assessed using intraclass correlation coefficients model (2,1). These results were categorized as excellent (ICCs ≥ 0.75), modest (0.40 ≤ ICC < 075) or poor (ICC < 0.40). [3]

Concurrent validity was determined by constructing Bland-Altman plots for each range of motion and for each tester. (Figure 2) The p-values of a paired samples t-test were also calculated to determine if the differences in measurements were statistically significant.

RESULTS AND DISCUSSION

For the lumbar spine movements, both the goniometer and the HALO© had modest inter-rater reliability for all movements. (Figure 1) For lower limb ROM, both the goniometer and HALO© showed modest inter-rater reliability for all the movements except when using the goniometer to measure hip abduction. (Figure 1)

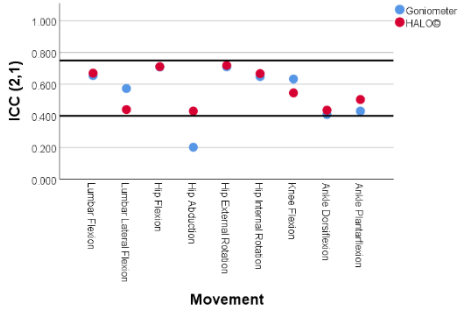

Figure 1: Intraclass correlation coefficients of the HALO© compared to the universal goniometer.

When assessing concurrent validity, there were significant differences ($p < 0.05$) between the measurements obtained by the goniometer and the HALO© only when Tester A measured knee flexion and ankle dorsiflexion, and when Tester B measured hip abduction and internal rotation, knee flexion as well as ankle dorsiflexion and plantarflexion.

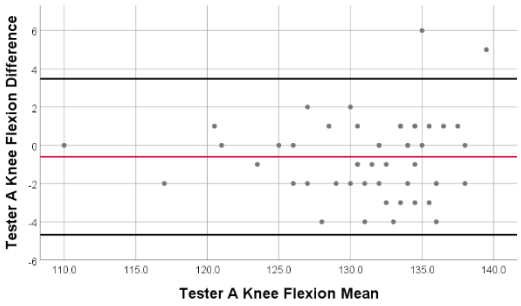

Figure 2: Concurrent validity of the HALO© compared to the universal goniometer when assessing knee flexion. (red = mean difference, black = 95% limits of agreement)

CONCLUSIONS

Based on these findings, there is potential for the HALO© to be used clinically to measure lumbar and lower limb ROM.

REFERENCES

1. Li G, et al., *J Biomechanical Engineering*, **129:** 937-943, 2007
2. Correl S, et al., APTA Combined Sections Meeting, New Orleans, Louisiana, USA 2018.
3. Fleiss J.L. *The design and analysis of clinical experiments*.

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