Forward flexion can reliably be measured with a front-facing camera used for at-home physical therapy

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INTRODUCTION:

Accurate assessment of shoulder range of motion (ROM) is important for both initial evaluation and evaluating rehabilitation progress. Recently, digital platforms have been developed which assess ROM with the use of a front-facing camera available on smart phone. Such tools allow ROM to be objectively assessed and monitored remotely, but require validation. The purpose of this study was therefore, to compare forward flexion (FF) measured with a digital health platform (PT Genie, Orlando, Fl) (*Figure 1*) to in-office measurements with a hand-held digital goniometer (Halo Medical Devices, Australia) (*Figure 2*)

METHODS:

A prospective evaluation was performed on consecutive patients evaluated in a single shoulder specialists practice. Thirty-two consecutive patients, including 16 males and 16 females, aged 58.5 ± 17.4 years (range 24-80) participated in the study. All participants completed 3 consecutive FF efforts measured first with a digital goniometer, followed by 3 consecutive FF efforts measured with the front-facing camera. All digital goniometer measurements were recorded by the same examiner. All measurements using the front-facing camera were obtained with an iPhone 11 running iOS 15.4.1, and the PT Genie platform. The mean from the 3 measurements was calculated and the mean differences between the two measurement options were then compared using the simple Student t-test. Analysis was completed using SPSS version 17 (SPSS Inc., Chicago).

RESULTS:

For both the digital goniometer and front-facing camera groups there were no significant differences within the 3 measurements ($p > 0.05$). Mean FF measured with the digital goniometer was 120.1° ± 24.7° (range 71.7° - 164.7°) compared to 123.5° ± 26.0° (range 74.7° – 173.0°) with the front-facing camera, for a difference of 3.4° between groups ($p<0.001$).

DISCUSSION AND CONCLUSION:

Our findings suggest that measurement of FF is comparable between a digital goniometer and front-facing camera. While small differences were seen between the methods, the differences are not likely clinically relevant, and more importantly the findings were internally consistent. These preliminary findings help in establishing the use of such an application for remote physical therapy. Further study is needed to assess other planes of range of motion and obtain data in a larger cohort.