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Validation Of A Smartphone Application For Measuring Shoulder Internal Rotation And External Rotation Range Of Motion With Intra-Rater Reliability

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Objective: Assessing range of motion of the shoulder girdle is a critical skill needed by athletic trainers and physical therapists due to the complexity of the motions allowed at the joint. The process can be very subjective with the majority of accepted techniques utilizing the clinician's ability to determine bony landmarks of the patient. In recent years, tools have been created to make the process of determining range of motion of the body valid and consistent. One of the most common tools used in the clinic setting to measure shoulder range of motion is the inclinometer. With the current technical age, there have been many smartphone applications created to mimic and serve as an inclinometer. Within the clinical setting, it is common practice for one clinician to measure a patient's range of motion multiple times throughout a course of treatment. Therefore, the purpose of this study is to determine the validity of the smartphone application, "Clinometer" for measuring shoulder internal and external rotation range of motion using intra-rater reliability

Design and Setting: An experienced Certified Athletic Trainer measured bilateral shoulder internal rotation and external rotation with a hand held goniometer and with the "Clinometer" smartphone application simultaneously. The Smartphone with the "Clinometer" application open, was fixed to the patient with an activity arm band.

Participants: 33 males, 65 arms of division III baseball players. Ages 18-23.

Intervention: "Clinometer" smartphone application

Main Outcome Measurement: Validation of the smartphone application with intra-rater reliability.

Results: Smartphone validation was statistically significant for shoulder internal and external range of motion with values of 0.959 and 0.940 respectively. Intra-rater reliability was statistically significant for external rotation with the goniometer, internal rotation with the application and external rotation with the application (0.804, 0.800, and 0.838).

Conclusions: The results of this study indicate that there is no significant difference in the hand held goniometer and the "Clinometer" smartphone application for measuring shoulder internal and external range of motion.

Key words: Inclinometer, range of motion, validity