Measurement of wrist joint range of motion using the HALO digital goniometer versus the universal goniometer: A pilot study

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Background

- Goniometry is a widely accepted technique routinely used by hand therapists for objectively measuring joint range of motion (ROM).[1,2,3]
- Clinicians must ensure that they use devices that provide reliable and valid measures in order to make accurate assessments regarding limitations, progress over time and outcomes.[2,4,5]
- A variety of goniometric devices are available, with the universal goniometer (UG) being the most commonly used in the clinical setting[3] (see Figure 1). The reliability of the UG is well established, and its use is widely accepted.[3,6]
- Recently various digital devices have been developed which have challenged the use of manual devices for clinical measurements.[1] One such digital device is the HALO digital goniometer (HDG) which was developed in Australia and is now commercially available (see Figure 2).

Figure 1: Universal goniometer

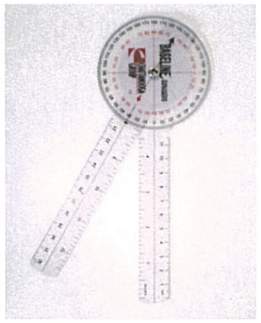


Figure 2: HALO digital goniometer

Figure 3: The HALO goniometer in use

Aim

- To investigate the degree of agreement between the UG and the HDG when measuring active range of motion of the wrist.
- To explore the feasibility of undertaking a more extensive research project.

Method

- Ten healthy adult subjects without wrist pain or pathology consented to participate in our pilot study.
- An experienced hand therapist measured and recorded each subject's wrist active ROM at both end of range extension and flexion.
- Measurements were taken using the ulnar alignment goniometric technique, with both the UG and the HDG.

Results

- The 10 subjects (5 males and 5 females, aged 46±14 years) had a mean active wrist flexion measurement of 76±7 degrees, and a mean active wrist extension measurement of 62±10 degrees (as measured using the UG).
- There were no significant differences between end of range measures obtained by the UG and HDG (flexion: p=0.061; extension: p=0.572).
- 95% limits of agreement were: flexion: -9 to 19 degrees; extension: -14 to -11 degrees.
- Bland-Altman plots showed that there was no consistent bias between UG and HDG measures across extension range of motion, and that the difference between measures reduced as flexion range of motion increased (presented in Tables 1 and 2).

Table 1: Bland-Altman Chart of Difference Between UG and HDG vs Mean of UG and HDG With 95% Limits of Agreement (Wrist Flexion)

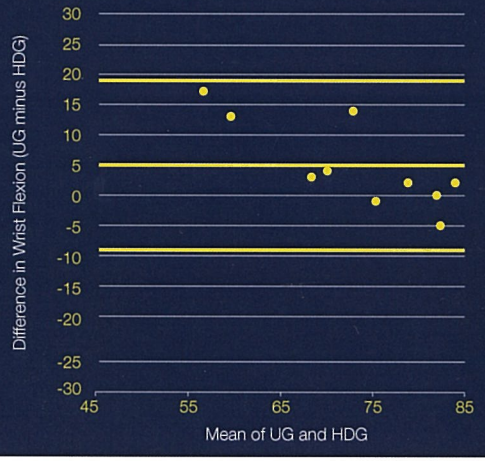
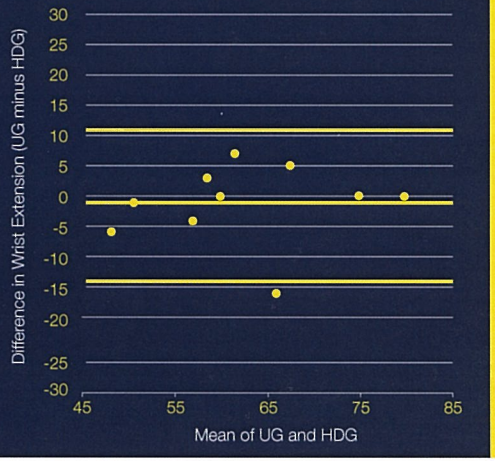


Table 2: Bland-Altman Chart of Difference Between UG and HDG vs Mean of UG and HDG With 95% Limits of Agreement (Wrist Extension)



Discussion

- Our data suggests that in the hands of an experienced clinician the HDG may produce measurements that agree with those produced using a UG in measures of wrist active ROM.
- What constitutes sufficient agreement to not compromise decisions regarding patient management is a question of judgment regarding clinical importance or significance[7].
- "Limits of agreement" must be sufficiently small for clinicians to consider using a new technique in place of an old technique.
- Our data provides good evidence to support the feasibility of undertaking a more extensive research project. As a result, we are currently conducting a research project on a larger number of subjects and in a variety of wrist positions throughout range of motion to reflect the range of wrist positions that hand therapists encounter clinically.

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