The Validity and Reliability of a Self-Administered, Smartphone-Enabled, 4-Meter Gait Speed Test in Older Adults

Pei-An Lee[1,2,3], Levi Ask[1], Wanting Yu[1], Junhong Zhou[1,2,3], Brad Manor[1,2,3] and On-Yee Lo[1,2,3]

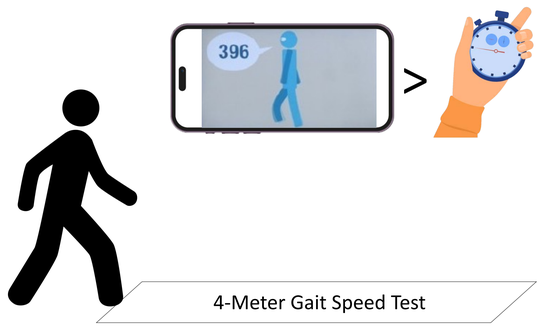
[1]Hinda and Arthur Marcus Institute for Aging Research, Hebrew SeniorLife, Boston, MA, USA;
[2]Harvard Medical School, Boston, MA, USA; [3]Beth Israel Deaconess Medical Center, Boston, MA, USA

Marcus Institute for Aging Research
Hebrew SeniorLife

HARVARD MEDICAL SCHOOL AFFILIATE

INTRODUCTION

- 4-meter gait speed, while meaningful, requires staff assistance and is subject to human error and bias.
- Our team developed an iPhone-based Application (App) to complete the 4-meter gait test.
- The aims of this study were to (1) determine the validity of the App-based assessment, and (2) establish the test-retest reliability of the App-based assessment when used unsupervised by older adults within their home.



METHODS

- 16 older adults (15 females, 77.6 ± 6.2 years) completed five study sessions in their home.
- The smartphone provided verbal instruction while placed in the participant's front pants pocket.

Sessions 1 and 2: **Supervised sessions**
The study team traveled to the participant's home, used a stopwatch to record the time and a video camera to confirm start and finish timing of each trial.

Sessions 3-5: **Unsupervised sessions**
The participants used the App to administer the 4-meter test alone at home.

- After training, older adults were able to use the smartphone App to administer the 4-meter gait speed independently at home.
- The gait speed derived from our smartphone App is valid, reliable, and appears to be more accurate than using a stopwatch for the 4-meter gait speed test in older adults.

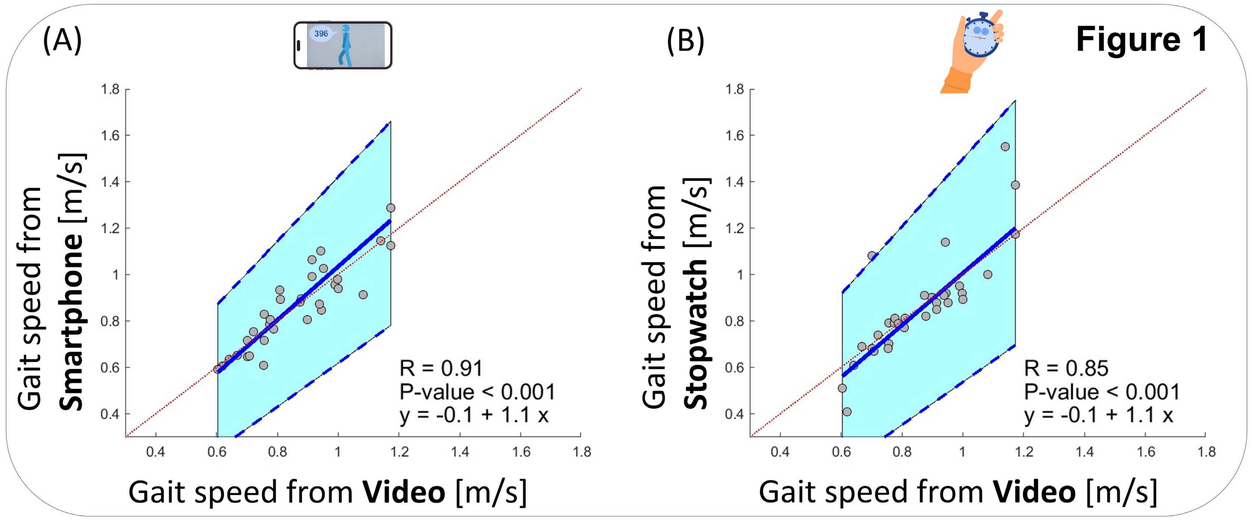


Figure 1

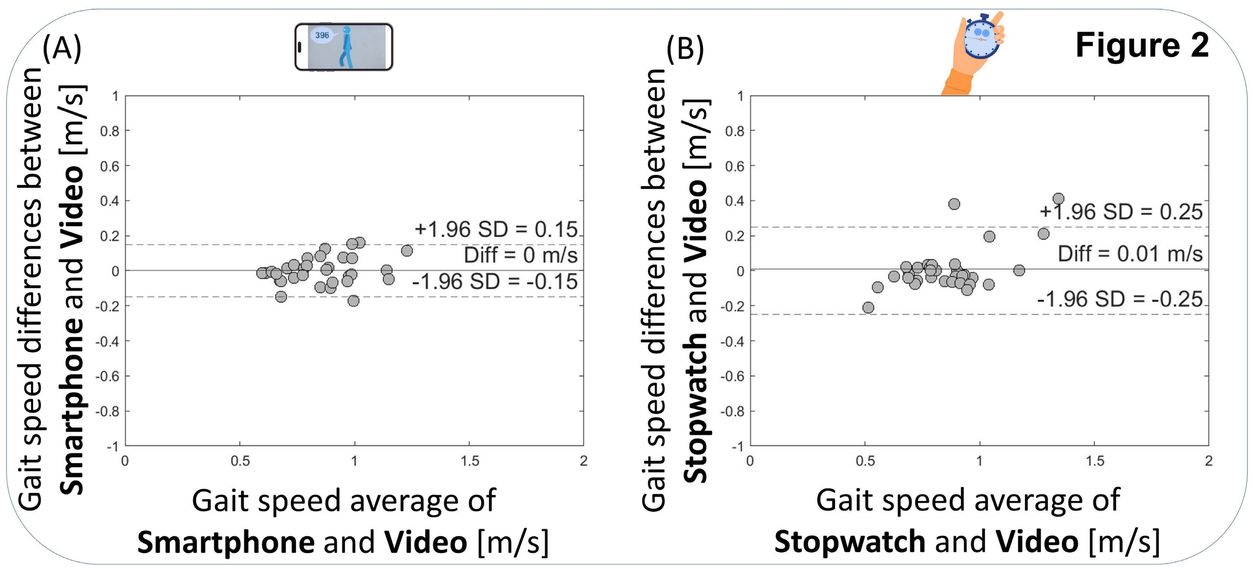


Figure 2

RESULTS & DISCUSSION

- Gait speed derived from App was highly correlated with video, and was stronger than between the stopwatch and video (Figure 1 and 2).

Figure 1. Scatter plots for gait speeds derived from video and App (A), and from video and stopwatch (B).

Figure 2. Within the Bland-Altman plots, the solid lines depict the average differences and the dashed lines reflect the limit of agreement (± 1.96 SD).

- Good to excellent test-retest reliability between two supervised sessions: App (0.82), video (0.88), stopwatch (0.73).
- Excellent test-retest reliability among three unsupervised sessions: smartphone (0.78).