Characterization of Ankle Proprioception in Healthy Older Adults

School of Kinesiology
University of Minnesota
Driven to Discover®

Nicole Fall, Jacquelyn Sertic, Jürgen Konczak
Human Sensorimotor Control Laboratory, School of Kinesiology, University of Minnesota, Minneapolis, MN

INTRODUCTION

Study Aim: Establish a typical dataset of ankle proprioception in a healthy aging population.

- Proprioception is the awareness of the body in space. Ankle proprioception is important for balance and gait. When proprioception is compromised from neurological disorders (i.e. Parkinson's disease), these motor functions are impaired.
- The Ankle Proprioceptive Acuity System (APAS, **Figure 1**) quantifies ankle proprioception with a sensitivity of 0.1°.

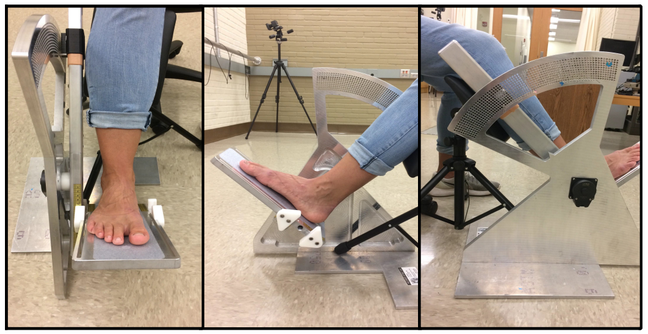

Figure 1: Ankle Proprioception Acuity System (APAS)

- There is no established dataset of ankle proprioception in a healthy aging population. Characterizing ankle proprioception will allow clinicians to monitor disease progression and researchers to monitor treatment efficacy in people with proprioceptive impairment.

METHODOLOGY

- Participants: N = 46, M = 18, F = 28, Aged 50-79 years
- The participant's foot was positioned on the APAS platform (**Figure 1**).
- A single test consisted of 25 trials. One trial was comprised of moving the foot to two different positions (**Figure 2**). The participant then answered, *"In which position, the first or the second, were your toes closer to the floor?"*
- Tests were repeated twice on each foot.

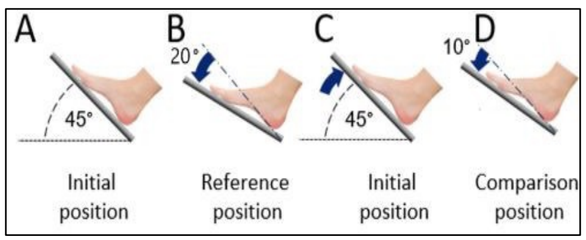

Figure 2: Single trial diagram. Foot is moved from initial position (A) to reference position (B), returns to initial position (A), followed by comparison position (D).

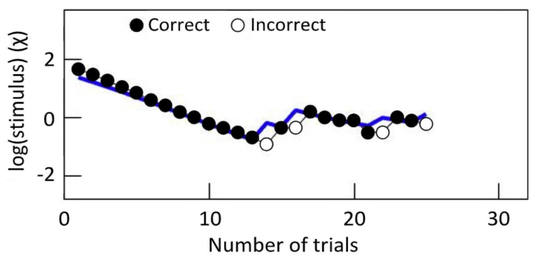

Figure 3. Psi-marginal adaptive method estimates proprioceptive acuity threshold (blue) based on participant's response correctness (black) after every trial.

RESULTS

Ankle proprioception was similar between age groups for all measures of acuity **(Figures 4, 5)**. Mean values of proprioceptive acuity were nearly identical (**Table 1**).

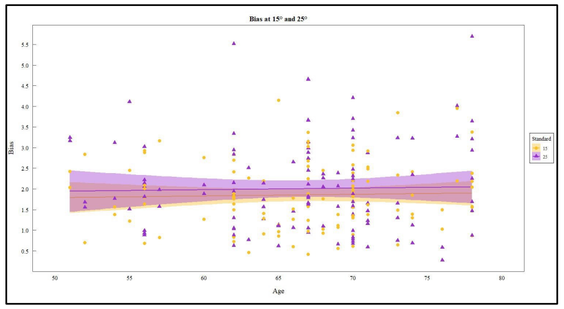

Figure 4: *Raw data of Bias at 15° and 25°.*

	Mean	SD	F(2,91)	P-value
Bias (15°)	1.9°	0.8°	0.652	0.524
Precision (15°)	1.1	0.3	1.114	0.333
Bias (25°)	2.0°	1.1°	0.63	0.535
Precision (25°)	1.1	0.2	0.302	0.740

Table 1: *Descriptive statistics of Bias and Precision by age groups (younger [50s], middle [60's] and older [70's]).*

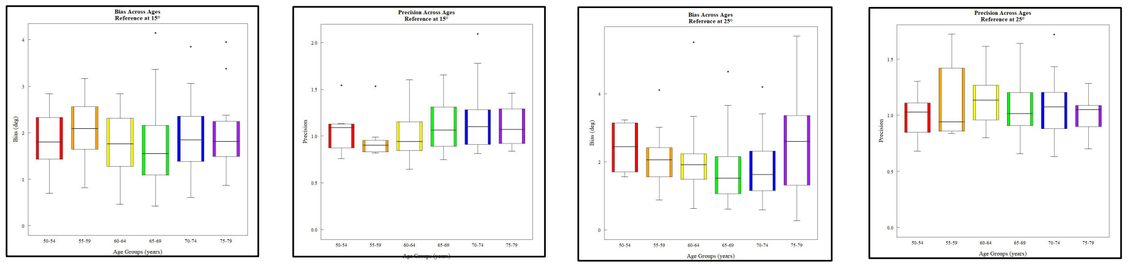

Figure 5: *Bias and precision values at both standards (15° and 25°) grouped by age.*

CONCLUSIONS

- The number of participants in each age group were non-comparable. Recruiting more participants of the 50-y/o age range may provide more representative results.
- Data collection allowed the establishment of a control group. In future work, this control dataset will be compared to individuals with Parkinson's disease. Identifying trends in ankle proprioception are important in diagnosis, treatment monitoring, and determining the efficacy of interventions aimed at improving proprioception.

Conclusion: Age does not contribute to a decline in ankle proprioception up until the age of 79 years.

REFERENCES

ACKNOWLEDGMENTS

Thank you to the following entities for ongoing support and assistance in facilitating research efforts:
- University of Minnesota Undergraduate Research Opportunity Program
- University of Minnesota Human Sensorimotor Control Laboratory