Course objective: explain how sensory cells translate stimulus into action potentials

By: Logan Hertzler

Explanations

Action Potentials (AP): How sensory and motor cells generate electrical signals

Neural Transmission Speed: How quickly AP’s travel along neurons

Motor unit requirement: How muscles respond when AP’s reach the muscle

Age effects: Slower conduction, less synchronized motor units, weaker fast-twitch fibers

Reaction Time (RT): A measurable behavior output of neural and muscle motivation

Test 1 — Simple Visual Reaction Time (SVRT)

- Stimulus: light or screen change
- AP generation: photoreceptors → optic nerve → motor cortex → motor neurons
- Motor response: finger tap or key press
- What it shows: How fast action potentials travel through the sensory → motor pathway.

Test 2 — Drop-Ruler Reaction Test

- Stimulus: visual + sensory cue when ruler drops
- AP generation: eyes → brain → motor neurons
- Motor response: hand closing around ruler
- What it shows: How fast the nervous system creates and sends APs that activate muscles.

Subjects- Ruler test



S1

Age: 6 years old
Attempts-
1st: 6 inches
2nd: 8 inches
3rd: 5 inches



S2

Age: 15
Attempts-
1st: 7.75 inches
2nd: 6 inches
3rd: 4 inches



S3

Age: 27
Attempts-
1st: 1 inch
2nd: 3.5 inches
3rd: 3.5 inches



S4

Age: 39
Attempts-
1st: 6.5 inches
2nd: 2.5 inches
3rd: 8 inches

Subject 5



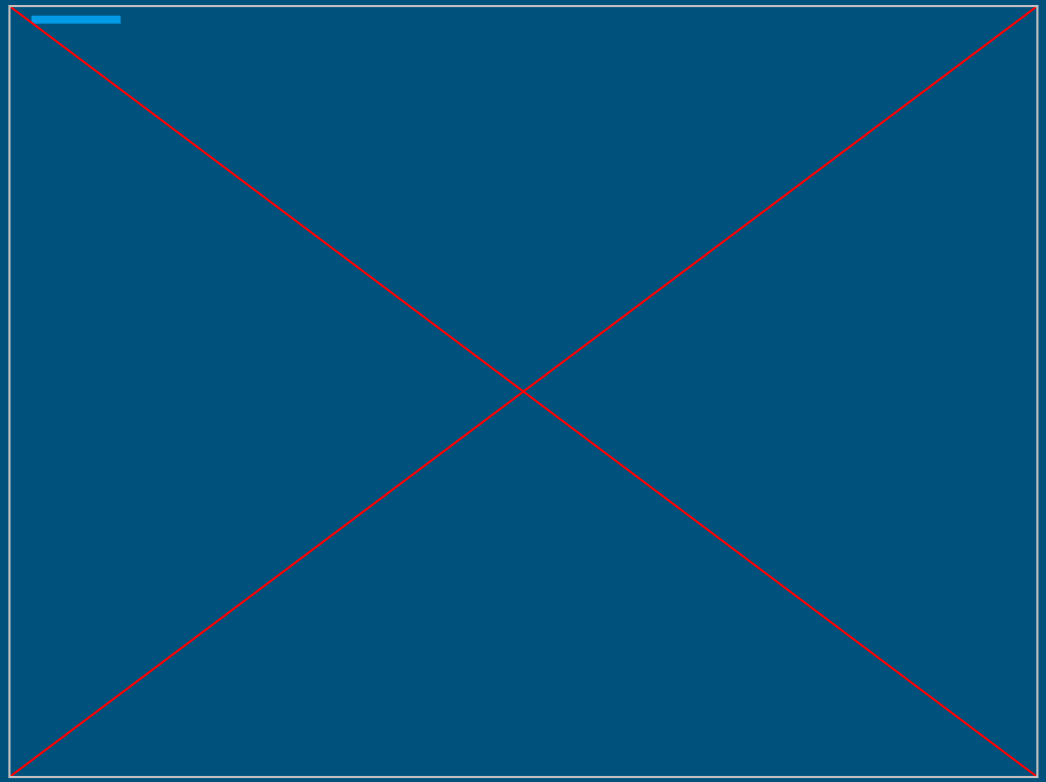
Age: 52
Attempts-
1st: 5.5 inches
2nd: 7.75 inches
3rd: 6.75 inches

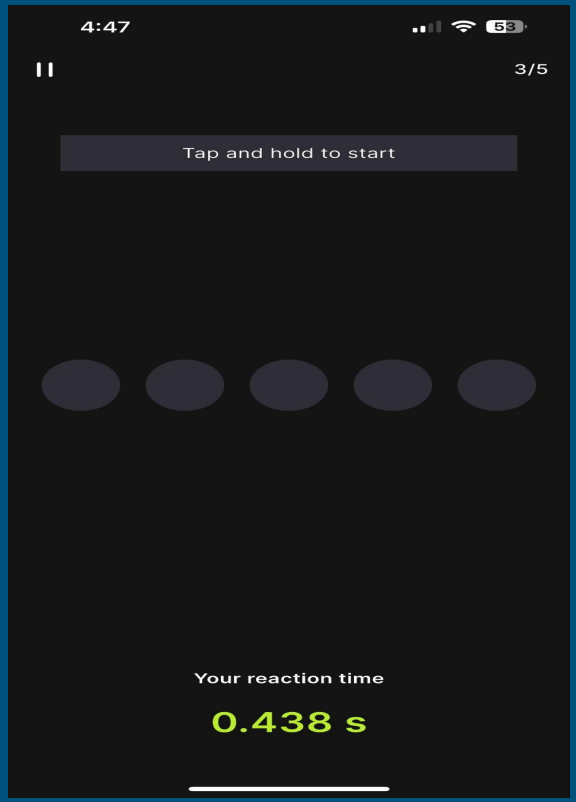
Subject 6



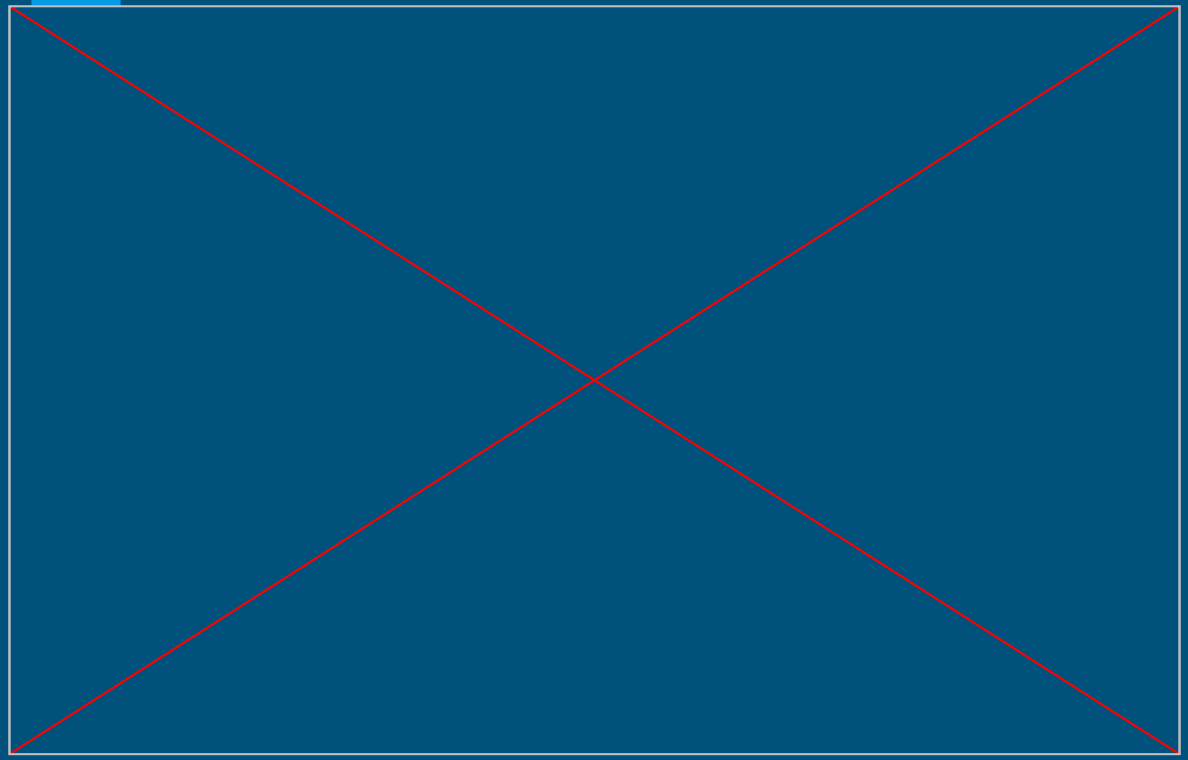
Age: 69
Attempts-
1st: 7.5 inches
2nd: 11.5 inches
3rd: 6 inches

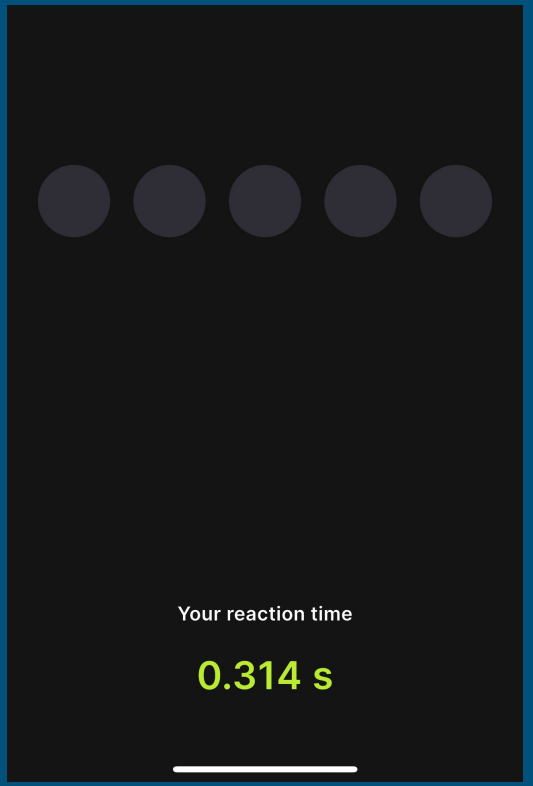
Subject 1- Age 7



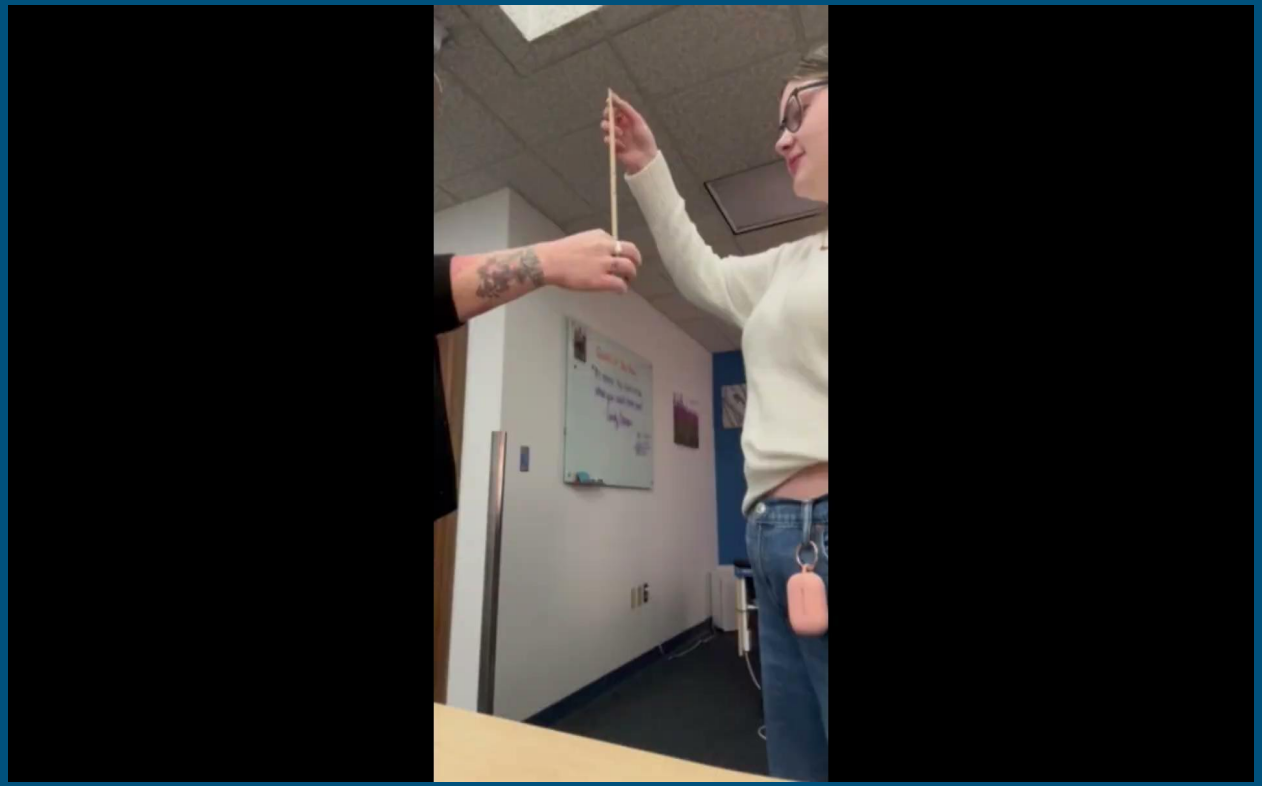


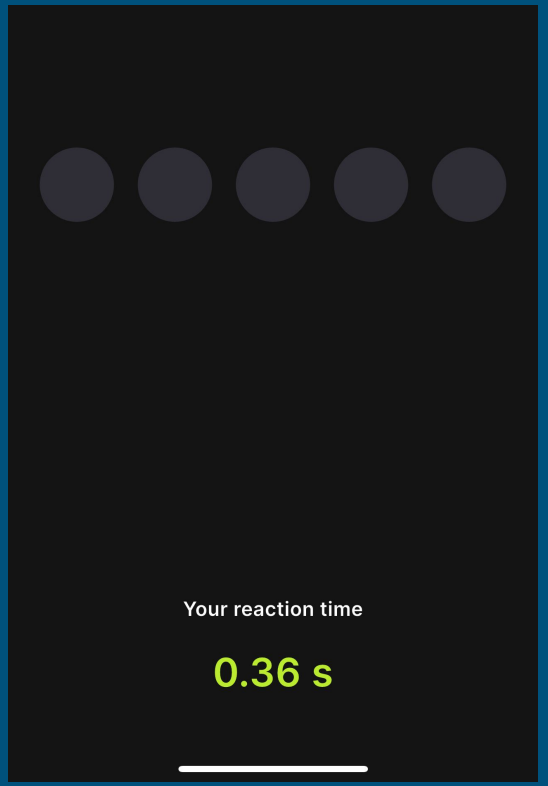
Subject 2-Age 17



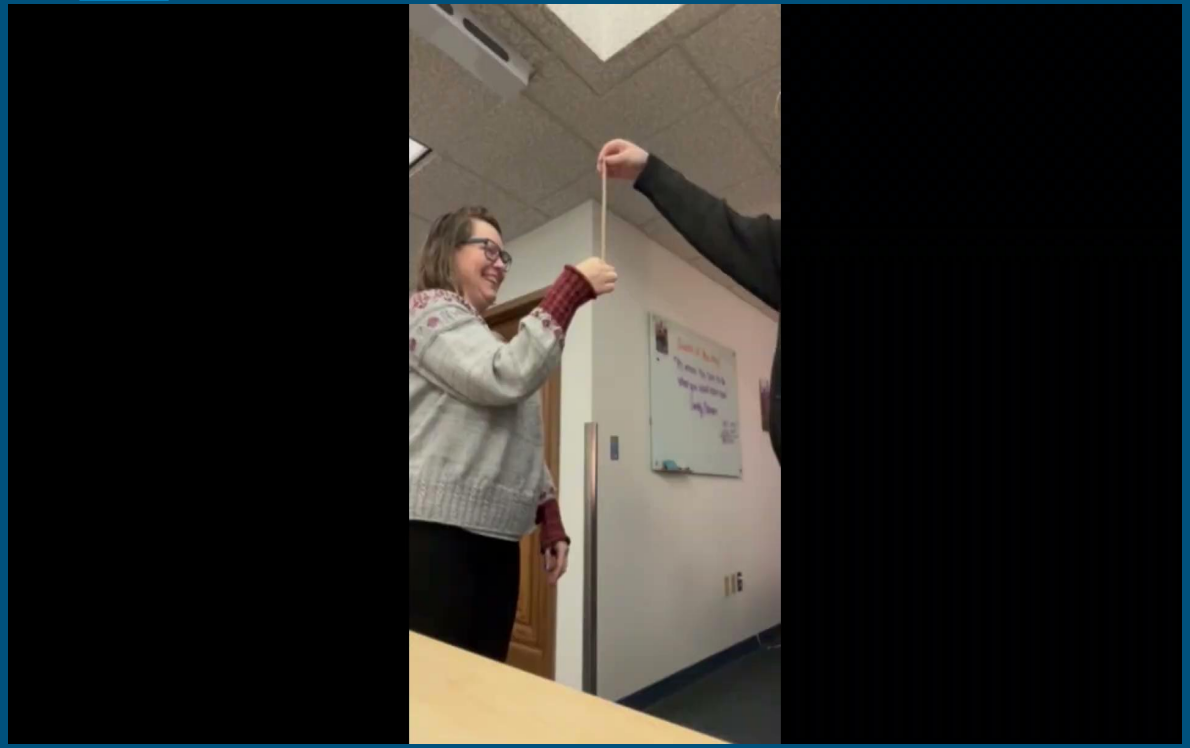


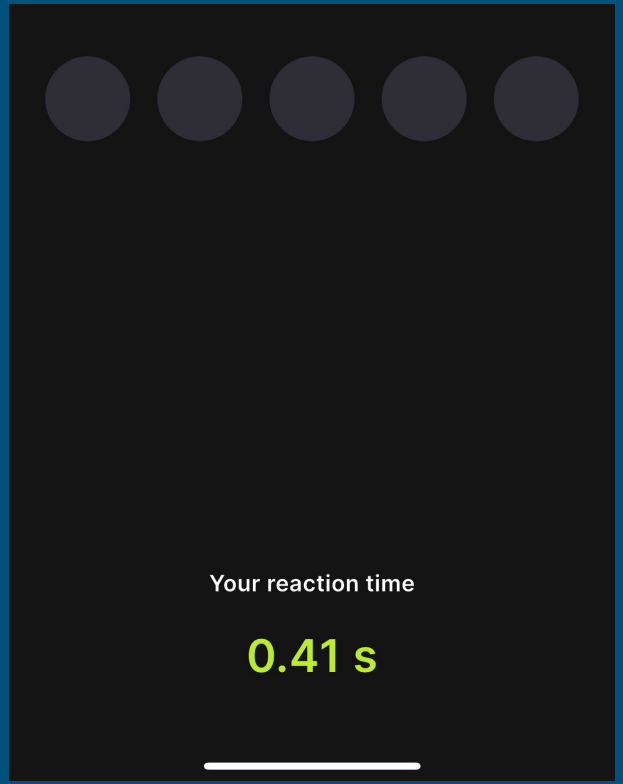
Subject 3-Age 27



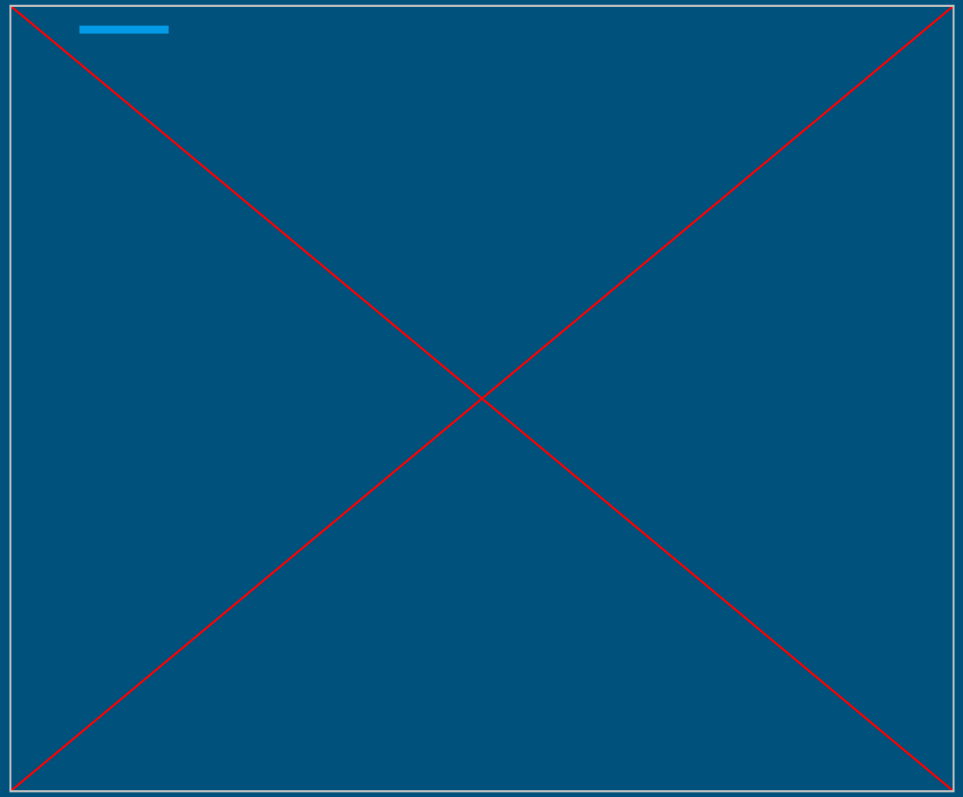


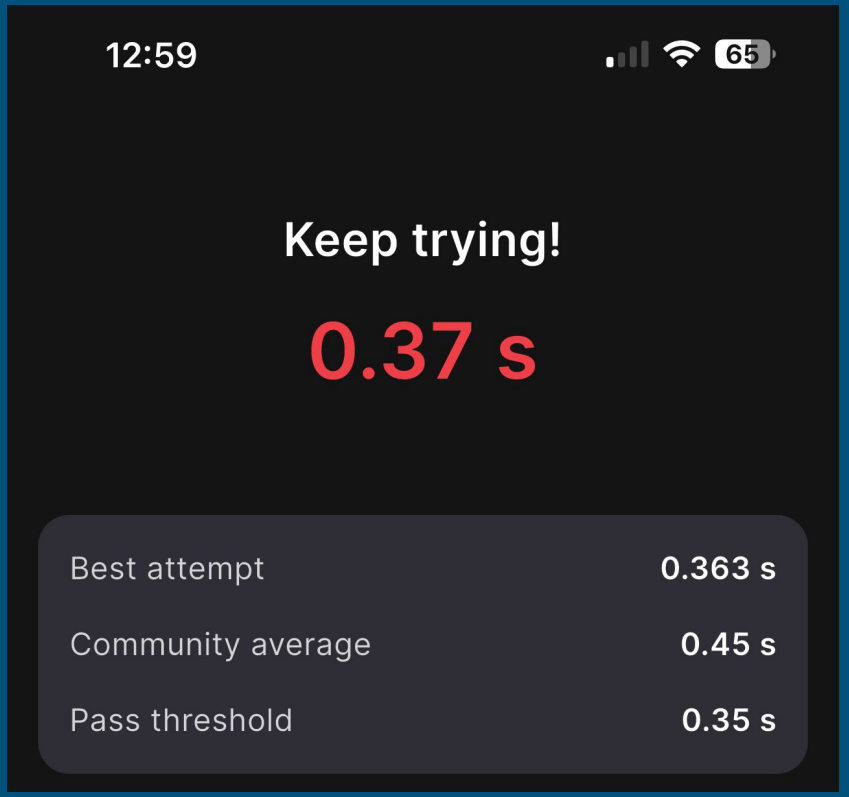
Subject 4- Age 39





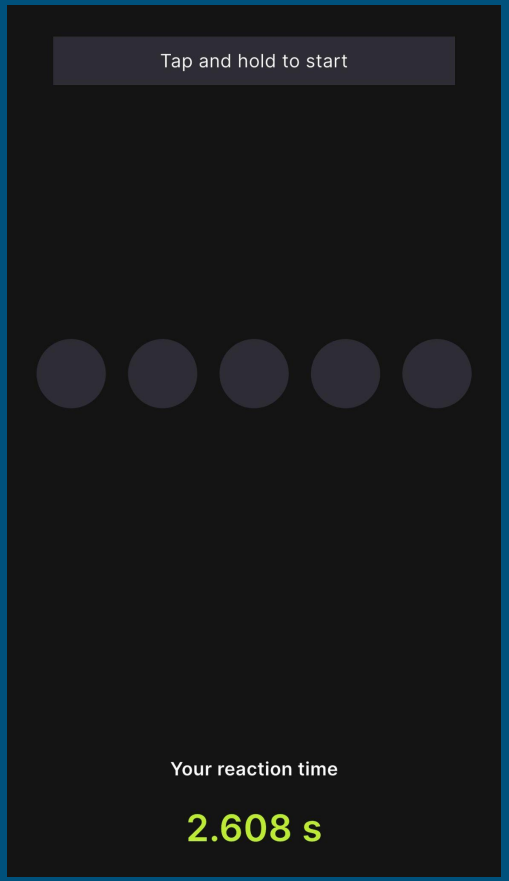
Subject 5- Age 52





Subject 6- Age 71





Citations

Arnold, P.,Vantieghem, S., Gorus, E., Lauwers, E., Fierens, Y., Pool-Goudzwaard, A., & Bautmans, I. (2015). Age-related differences in muscle recruitment and reaction-time performance. *Experimental Gerontology*. https://www.sciencedirect.com/science/article/pii/S0531556515300280?via%3Dihub

Siedlecki, P., Ivanova, T., & Garland, J. (2025) The effect of slow breathing on cardiovascular and electromyographic responses during standing perturbations in older adults. *European Journal of Ageing*. https://research.ebsco.com/c/qg64q2/viewer/pdf/2oqry3ogwj

John, N., Saranya, K., Dhanalakshmi, Y., & John, J. (2016) Aging-mediated neuromuscular instability and delayed choice reaction time. *Indira Gandhi Medical College & Research Institute*. https://www.researchgate.net/profile/Saranya-Kuppusamy-2/publication/303668739_Aging-mediated_neuromuscular_instability_and_delayed_choice_reaction_time/links/5f3115f992851cd302ebb987/Aging-mediated-neuromuscular-instability-and-delayed-choice-reaction-time.pdf

Betts, G., Young, K. A., Wise, J. A., Johnson, E., Poe, B., Kruse, D. H., Korol, O., Johnson, J. E., Womble, M., & DeSaix, P. (2022). *Anatomy and physiology 2e*. OpenStax. https://openstax.org/details/books/anatomy-and-physiology-2e.