

Correlation Between Executive Function Task and Reactive Balance Ability

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Introduction

- Cognitive decline is related to an increased risk of falls. This indicates that higher cognitive processes are involved in balance, however, beyond this correlation, we have little mechanistic understanding of how the brain contributes to balance.
- One key element of cognitive control that may serve our ability to avoid a fall, is **response inhibition**. This is especially relevant in the cluttered settings we face everyday.
- In general, response inhibition is the ability to stop a highly automated, but contextually unwanted response.
- Here, we tested if performance on a standard cognitive assessment of Response Inhibition –the **Stop Signal Task (SST)** - related to performance on a reactive balance test.
- This could offer insight into a cognitive mechanism that serves our ability to avoid falls in complex environments.

Hypothesis: A positive correlation exists between an individual's SST performance and response errors in a reactive balance task.

Methods

- 16 Participants were tested using a SST program to assess response inhibition (Fig. 3). An average SSRT was calculated for all participants (Fig. 1).
- The lean-and-release test (Fig. 2), simulates a fall in an unpredictable environment, by manipulating vision, & response environment.
- Muscle activity was recorded to assess responses in the stepping leg during trials where participants were required to: (a) step to recover balance, OR (b) suppress a step, and grasp a safety handle instead.
- Our outcome measure was the relative muscle activity in the stepping leg between step vs. reach trials. Reactive balance data was compared to SSRT values for each participant.

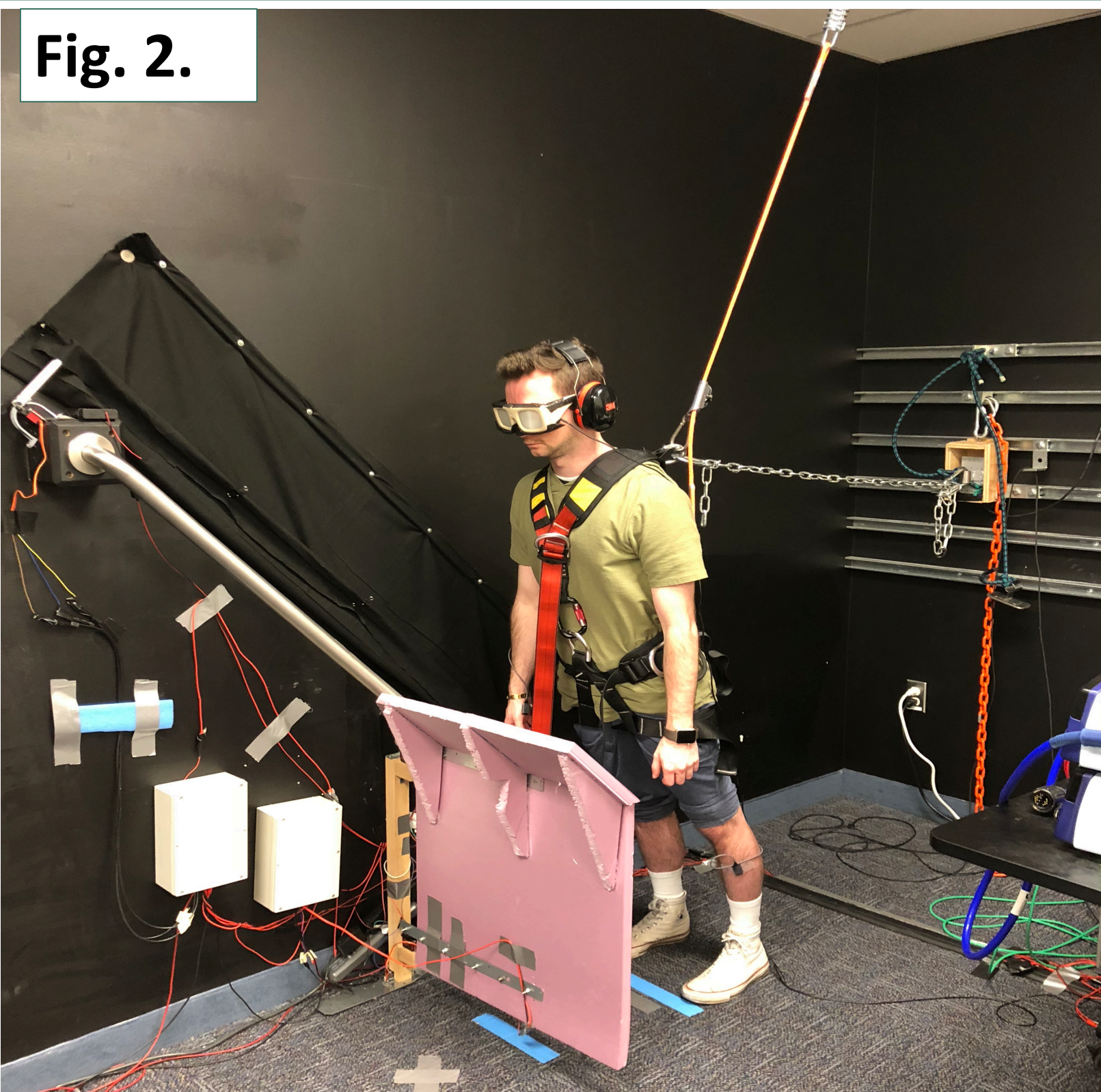


Fig. 2.

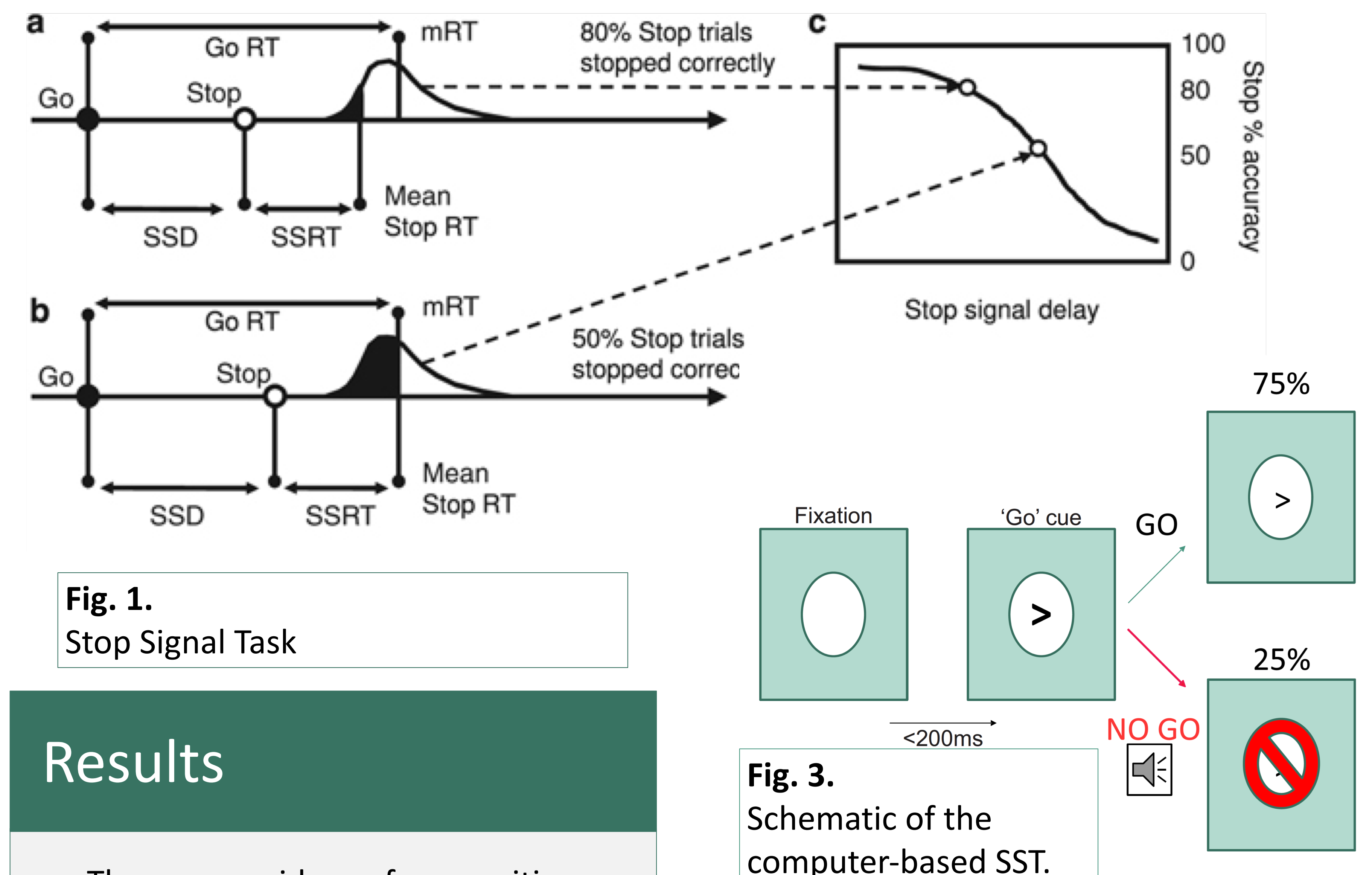
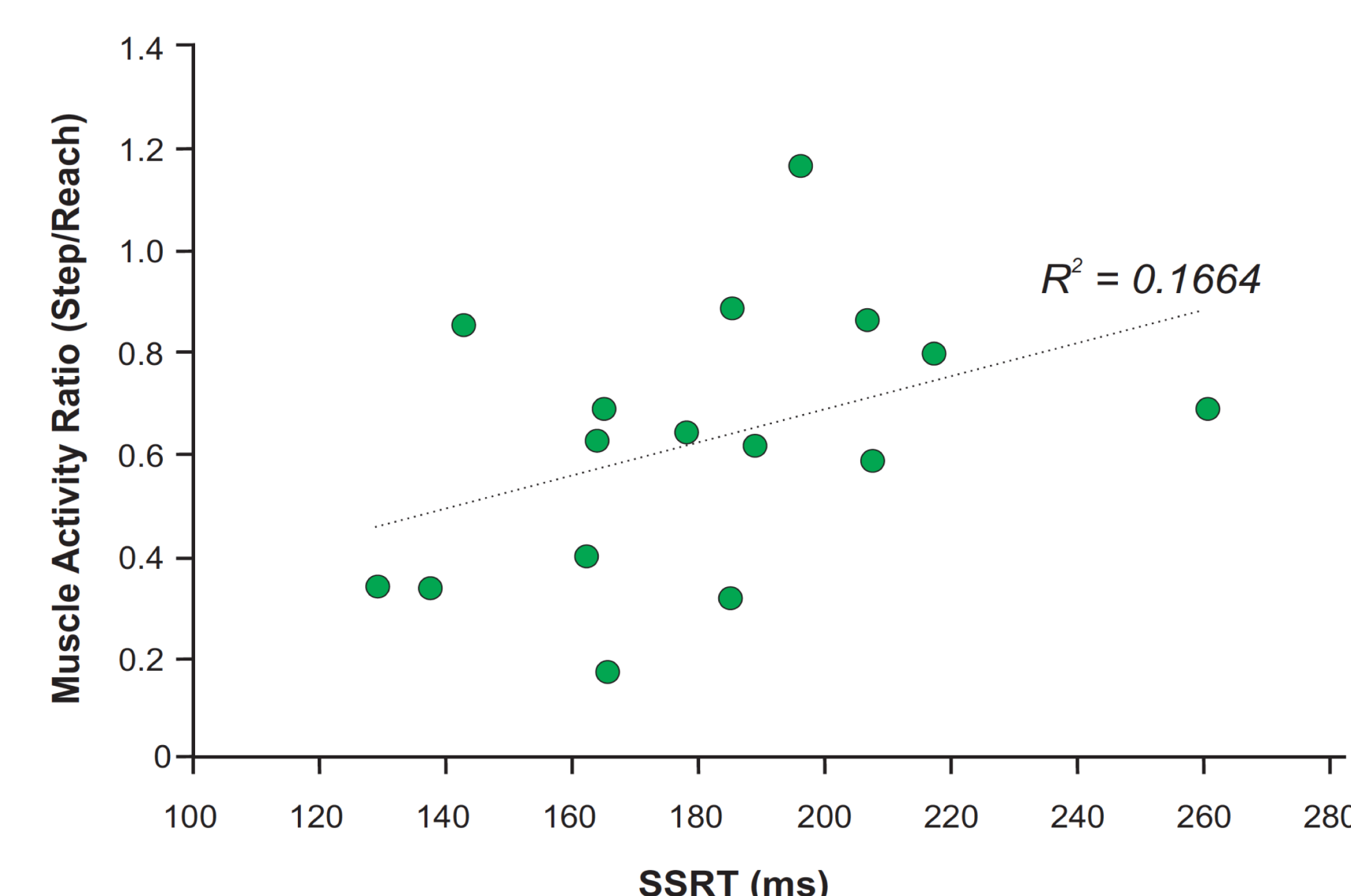


Fig. 1.
Stop Signal Task

Results

- There was evidence for a positive correlation between each individual's SSRT and their postural response at the 600ms SOA (Stimulus Onset Asynchrony).
- Earlier SOAs (200ms and 400ms) failed to show any relationship between muscle activity and SSRT.

Muscle activity in the stepping leg (600ms SOA)



Conclusions

- SSRT was correlated to step errors when a leg block was unexpectedly present.
- This indicates that performance on a standardized test of response inhibition is related to performance on a choice-demanding, reactive balance test, and highlights a common underlying neural mechanism for stopping action across different behavioral contexts.



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Study conducted with funding from a USU Undergraduate Research and Creative Opportunity Grant. Thanks to Jayme Warner for assistance in data collection.