

The Effects of Repetitive Head Impacts on Reaction Time Tests in Law Enforcement Cadets

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INTRODUCTION

- Law enforcement cadets (LECs) may experience RHIs as part of combative training
- Reaction time is a vital skill for LECs who are often placed in situations requiring quick thinking and movement

AIM

- To examine the effect of RHIs on simple reaction time (SRT) and Go/No Go reaction time (GRT) in LECs

METHODS

- Participants were recruited from a sheriff's office training academy
- Defensive Tactics Assessment (DT) involves RHIs, while the Physical Abilities Test (PAT) is physically demanding but does not involve RHIs
- SRT and GRT tests were completed on the Bertec Vision Trainer (BVT, Bertec Corp., Columbus, OH) before (PRE) and after testing (POST) for both DT and PAT
- Data were analyzed using generalized estimating equation models using IBM SPSS (version 28, Chicago, IL, US) with an *a priori* alpha level of < 0.01

Participant Demographics

Test Performed	Total Participants	Age (Years)	Height (cm)	Weight (Kgs)	Sex (Males, Females)
Defensive Tactics Assessment	36	29.2±7.8	176.8±9.1	94.6±24.6	29, 7
Physical Abilities Test	31	29±8.3	177.1±9.1	95.9±24.9	25, 6



Figure 1: Stimulating a law enforcement encounter

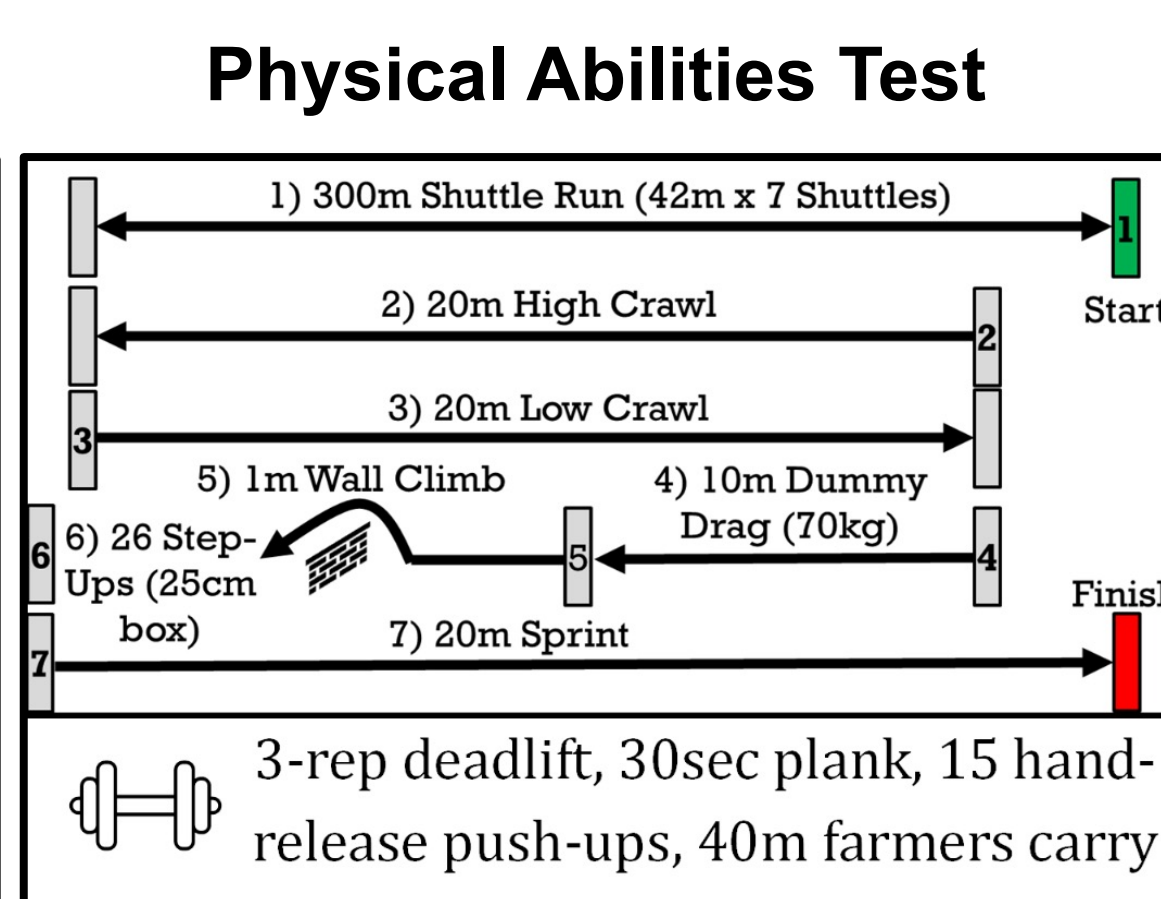


Figure 2: Law enforcement specific fitness test

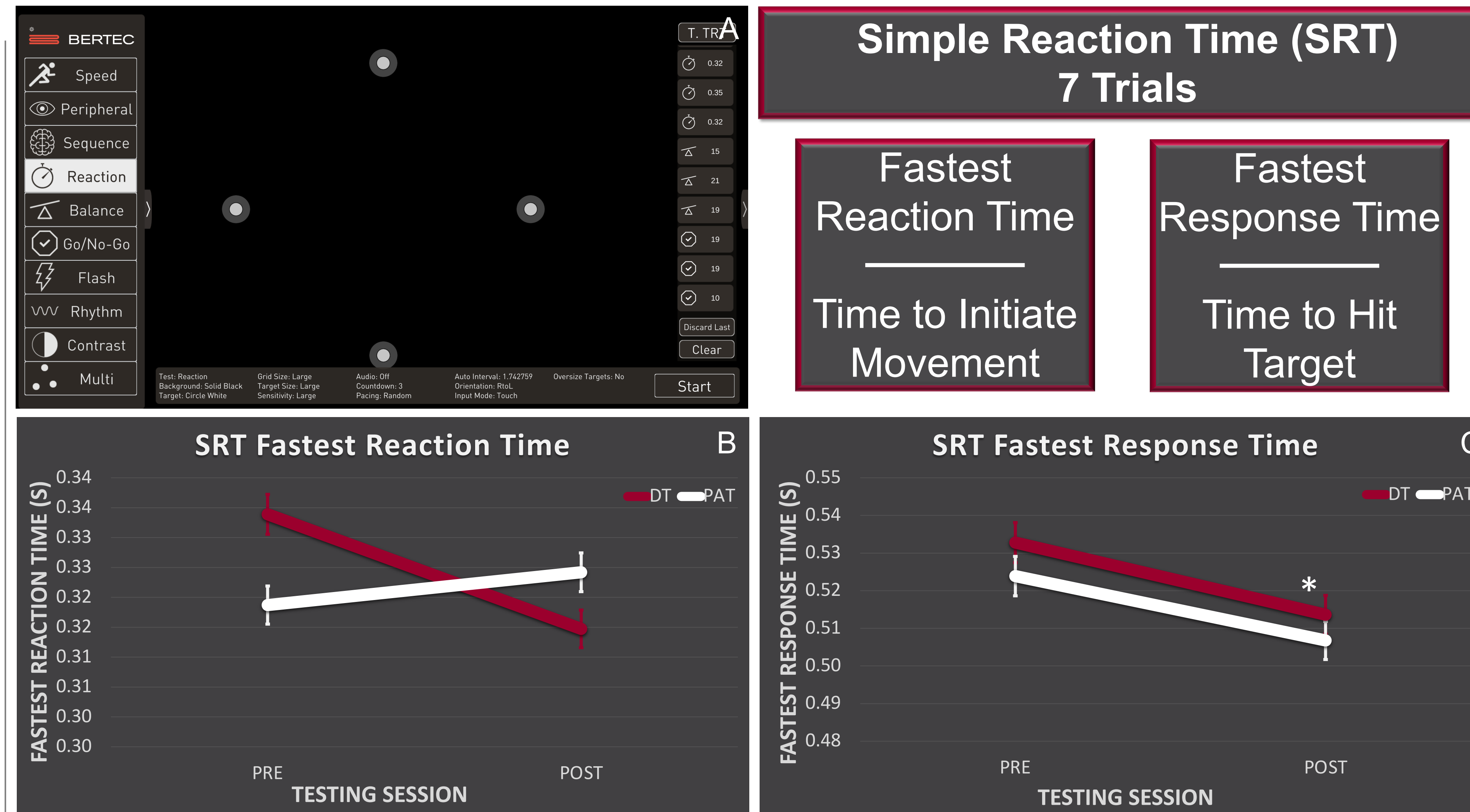


Figure 3: (A) Simple Reaction Time Test screen on BVT and group means and 99% confidence intervals for (B) simple reaction time and (C) simple response time



Figure 4: (D) Go/No Go Reaction Time Test screen on BVT and group means and 99% confidence intervals for (E) "Go" targets captured and (F) Go/No Go response time

RESULTS

- ✓ SRT Fastest response time: Faster response times POST compared to PRE for DT and PAT ($p < 0.003$)
- ✓ GRT Average response time: Faster response times at POST compared to PRE for DT and PAT ($p < 0.001$)
- No other main effects of time or correct targets captured were significant ($p > 0.01$)

CONCLUSIONS

- Our results suggest that the capacity of LECs to execute appropriate decision-making under such circumstances is likely unimpaired
- Further research is necessary to investigate the long-term effects of repeated exposures on reaction time, including potential cumulative effects

PRACTICAL APPLICATIONS

- Incorporating training applications may be beneficial to ensure sustained performance
- Training of LECs may include interventions to improve/sustain reaction time that combine cognitive and visual training with motor tasks to help with performance in real-life settings²

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REFERENCES

1. Jansen, A. E., McGrath, M., Samorezov, S., Johnston, J., Bartsch, A., & Alberts, J. (2021). Characterizing Head Impact Exposure in Men and Women During Boxing and Mixed Martial Arts. *Orthopaedic journal of sports medicine*, 9(12), 23259671211059815. <https://doi.org/10.1177/23259671211059815>
2. Pichierri, G., Wolf, P., Murer, K., & de Bruin, E. D. (2011). Cognitive and cognitive-motor interventions affecting physical functioning: a systematic review. *BMC geriatrics*, 11, 29. <https://doi.org/10.1186/1471-2318-11-29>