

Relationship and Latent Factors Between Current Clinical Assessments and the Functional, Standardized Assessment of Reaction Time (StART): A Prospective Cohort Study

Landon Lempke PhD, ATC

The Micheli Center for Sports Injury Prevention
Division of Sports Medicine
Boston Children's Hospital

Landon B. Lempke, PhD, ATC; Scott Passalugo, BS; Ben T. Baranker, BS; Danielle Hunt, MS, ATC; Brant Berkstresser, MS, ATC; Francis Wang, MD; William P. Meehan II, MD; David R. Howell, PhD, ATC



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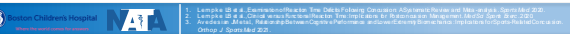
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Background

- Reaction time strong post-concussion deficit acutely¹
 - Computerized testing common
- *But...*
- Examined via simple motor demands
- Clinical measures do not relate to functional, sport-like movement^{2,3}
- Developed Standardized Assessment of Reaction Time (StART) to address



Purpose

1) examine relationship between StART and common clinical assessments
2) explore latent factors within StART, and between StART and clinical assessments among healthy collegiate student-athletes

H₁: StART would display non-significant to weak correlations with current clinical assessments

H₂: No hypothesis made due to the exploratory nature and factor analysis employed

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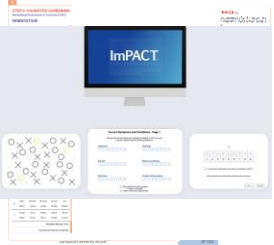
Methods – Study Design & Participants

- Cross-sectional cohort
 - part of a larger longitudinal project: Sex Differences in Brain Structure and Function After Sports-Related Concussion
- 89 healthy collegiate student-athletes
 - age: 19.5 ± 0.9 years
 - height: 178.2 ± 21.7 cm
 - mass: 80.4 ± 24.0 kg
 - 63% male
 - 72% no concussion history
 - 75% contact sports
 - 63% white

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Methods - Procedures

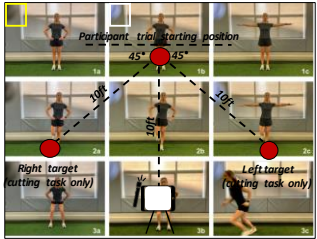
- Participants completed below during pre-season testing:
 - Sport Concussion Assessment Tool (SCAT) symptom checklist¹
 - Standardized Assessment of Concussion (SAC)¹
 - tandem gait (single- and dual-task)²
 - Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT)³
- StART



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Methods – Procedures: StART

- 3 movements under single- & dual-task (subtract 6 | 7)
 - 3 trials each condition
- Smartphone video recording @ 240Hz (4.2ms fidelity)
- Intra-rater, inter-rater, test-retest reliability ICCs ≥ 0.82 (in review, Lempke et al., 2022)
- Minimal extrinsic modifiers (Lempke et al., 2022, *J Athl Train*)
 - Only small age and sex effects




The diagram illustrates the StART procedure. A participant starts in a central position, indicated by a red dot. Two dashed lines extend from this position at 45-degree angles to the right and left, each ending at a red dot representing a target. The distance from the starting position to each target is 10 feet. Below the diagram, two panels show a participant performing a cutting task towards the right target and a kicking task towards the left target.

Methods – Main Outcomes

- SCAT symptom severity (0-132 range)
- SAC total score (0-30 range)
- Single- & dual-task tandem gait completion time (s)
- ImPACT domains (verbal memory, visual memory, visual-motor speed, reaction time)
- StART (ms) outcomes:
 - single- and dual-task standing, single-leg balance, and cutting
 - Single-task composite
 - Dual-task composite
 - StART composite

Methods – Statistical Analysis

- **Aim 1:** Pearson r correlations via correlogram
 - Within StART subtests & between StART & clinical measures
- **Aim 2:** Exploratory factor analyses (ProMax rotations & ML estimation)
 - Model 1: within StART subtests
 - Model 2: StART subtests & clinical assessment outcomes
 - Kaiser-Meyer-Olkin, Bartlett sphericity, & Scree plot with parallel analysis
- $\alpha=0.05$ and factor loading ≥ 0.40 *a priori*



Conclusions

Aim 1

- Some potential StART redundancy
 - Healthy cohort examined
- StART not related to current clinical measures
 - May add value

Aim 2

- StART provided unique constructs to current concussion assessment paradigm
 - Post-concussion evaluations needed for validation

Thank you – Questions?

Research Team

Contact Information:
randon.lempke@childrens.harvard.edu
 @blempke
