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SIRC Concussion Symposium

The effect of balance control on dynamic visual acuity for female varsity cheerleaders with & without recent history of concussion.

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Varsity cheerleaders face an increasing incidence of sport-related concussion (SRC) due to high-risk elements

- SRC injury rates continue to increase despite a decrease in catastrophic injuries
- ~96% of SRCs are due to stunt-related mechanisms (e.g., person-to-person contact)
- Stunts involve high-level cognitive, dynamic balance and visual demands - considerations for return-to-competition following SRC

Objective:

To examine how different balance conditions effect dynamic visual acuity (DVA) for female cheerleaders with and without recent history of SRC.



Participants: Female cheerleading athletes competing on a university-level varsity team (N = 25; age = 18 to 22 years)



CONTROL (n = 12)

Cheerleaders without recent SRC history (> 6 years)



CONC (n = 11)

Cheerleaders with recent SRC history (1 to 5 years)

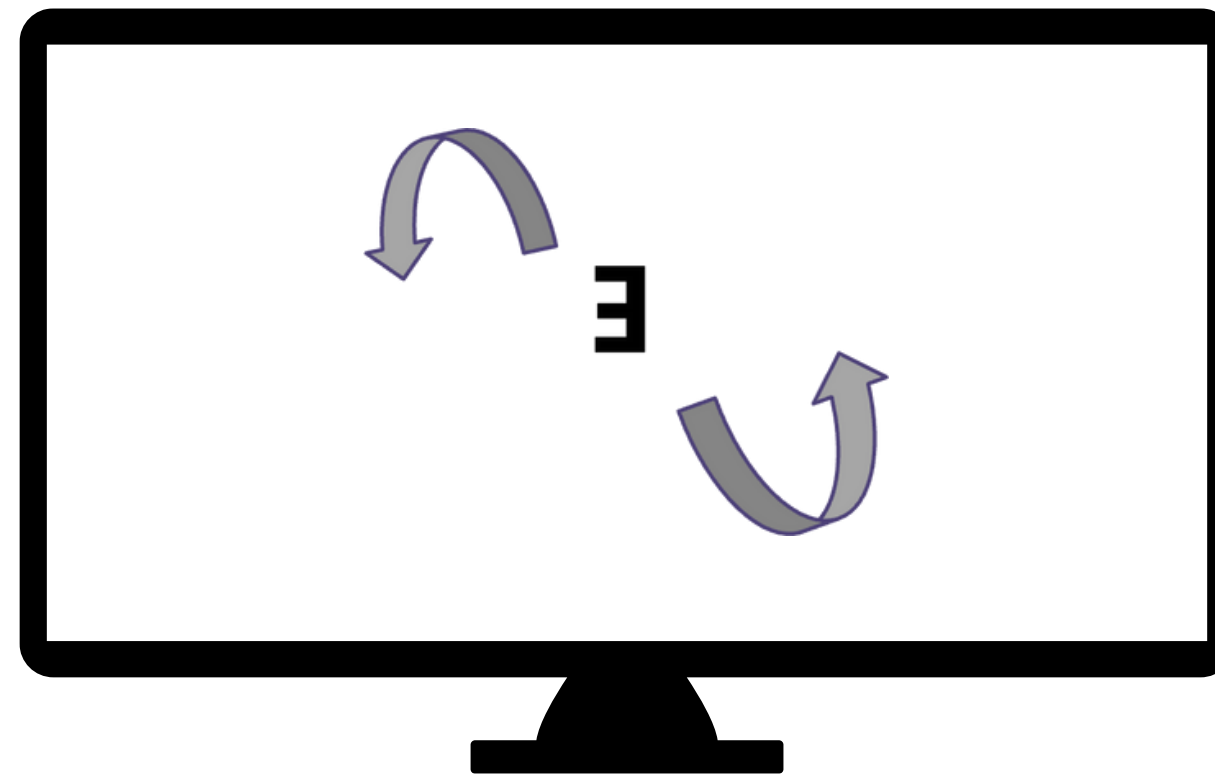
***Exclusion Criteria:** SRC < 1 year &/or persisting symptoms; previous history of neurological, vestibular-ocular, &/or binocular vision disorders (two (2) athletes were excluded)*

DVA Assessment: moV&, V&MP Vision Suite



Tumbling 'E' presented at random with prongs facing either up / down / left / right while moving at a speed of 2.3m/s (30°/s)

Motion: Random Walk
(unpredictable)

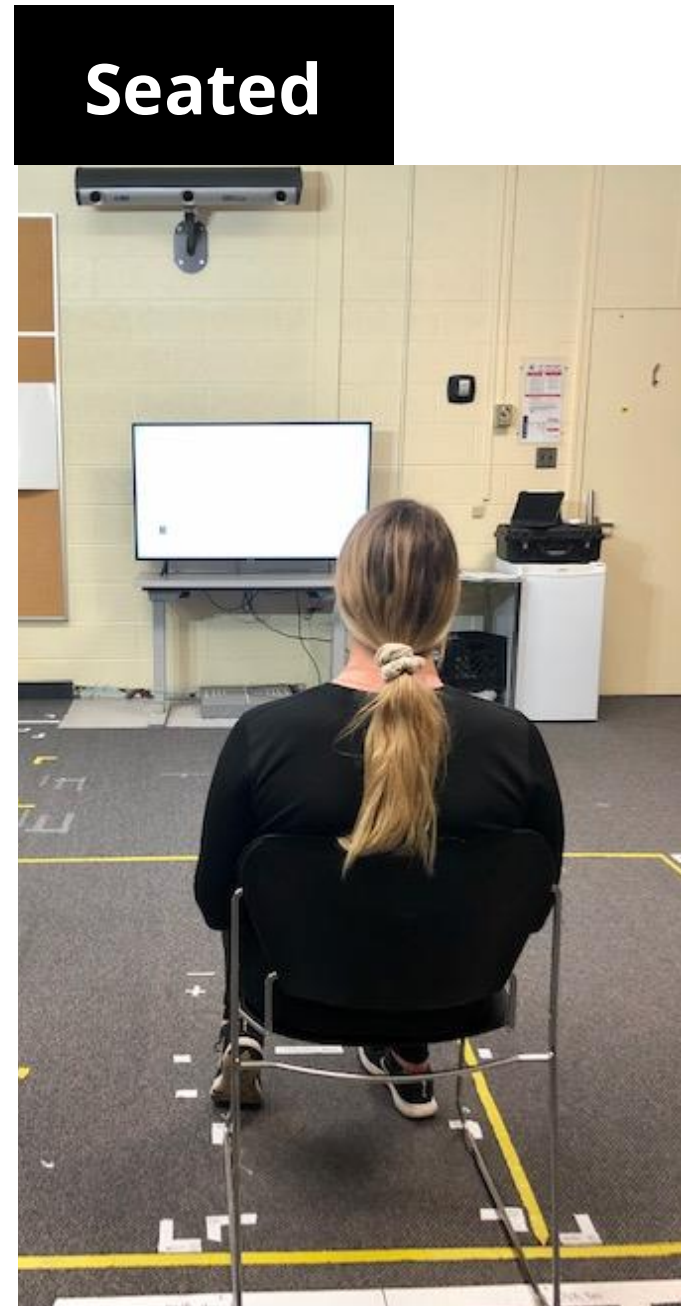


A minimum of 3/5 correct responses led to the target reducing in size by 0.1 logMAR



DVA Score: $\text{LogMAR} = \text{Lowest line read} - (-0.02) \times \# \text{ errors}$

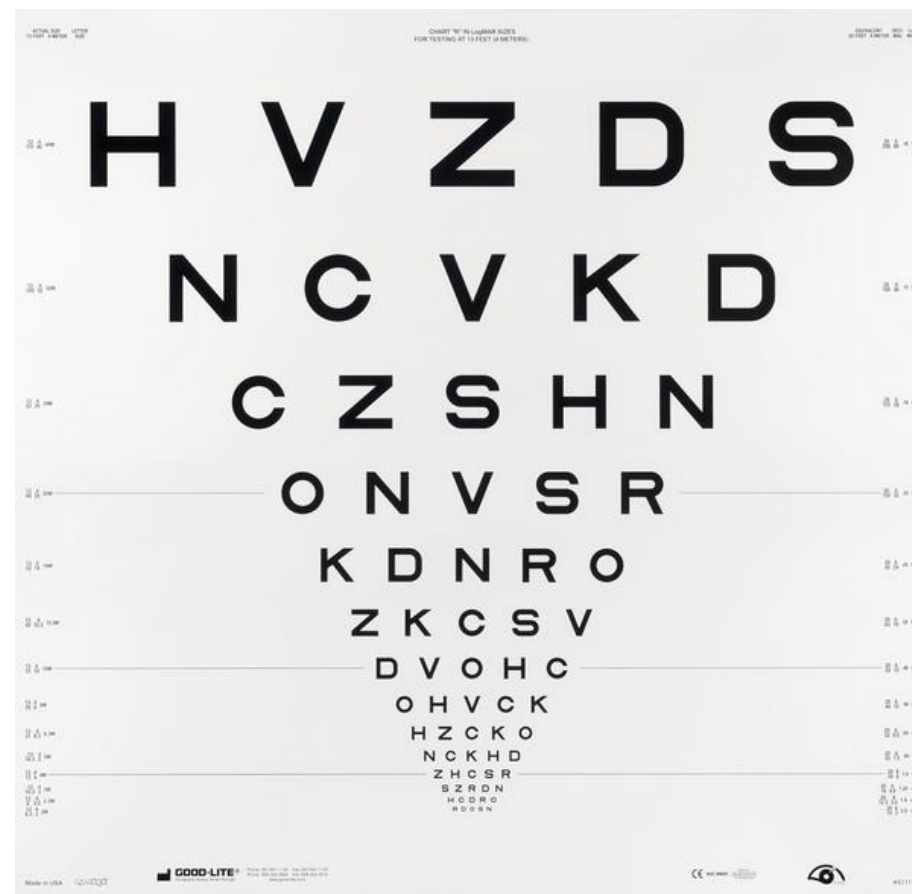
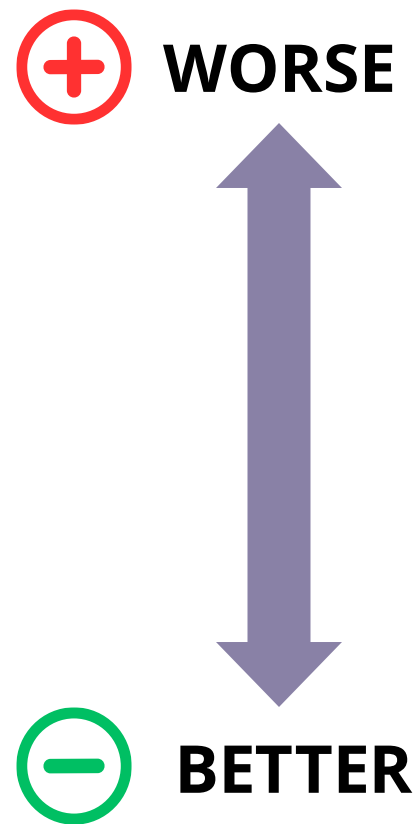
Experimental Protocol: Athletes completed one DVA trial in seated & during four standing conditions



Dual-task performance was characterized by a change in DVA score from Seated & balance control analysis (dCOP)

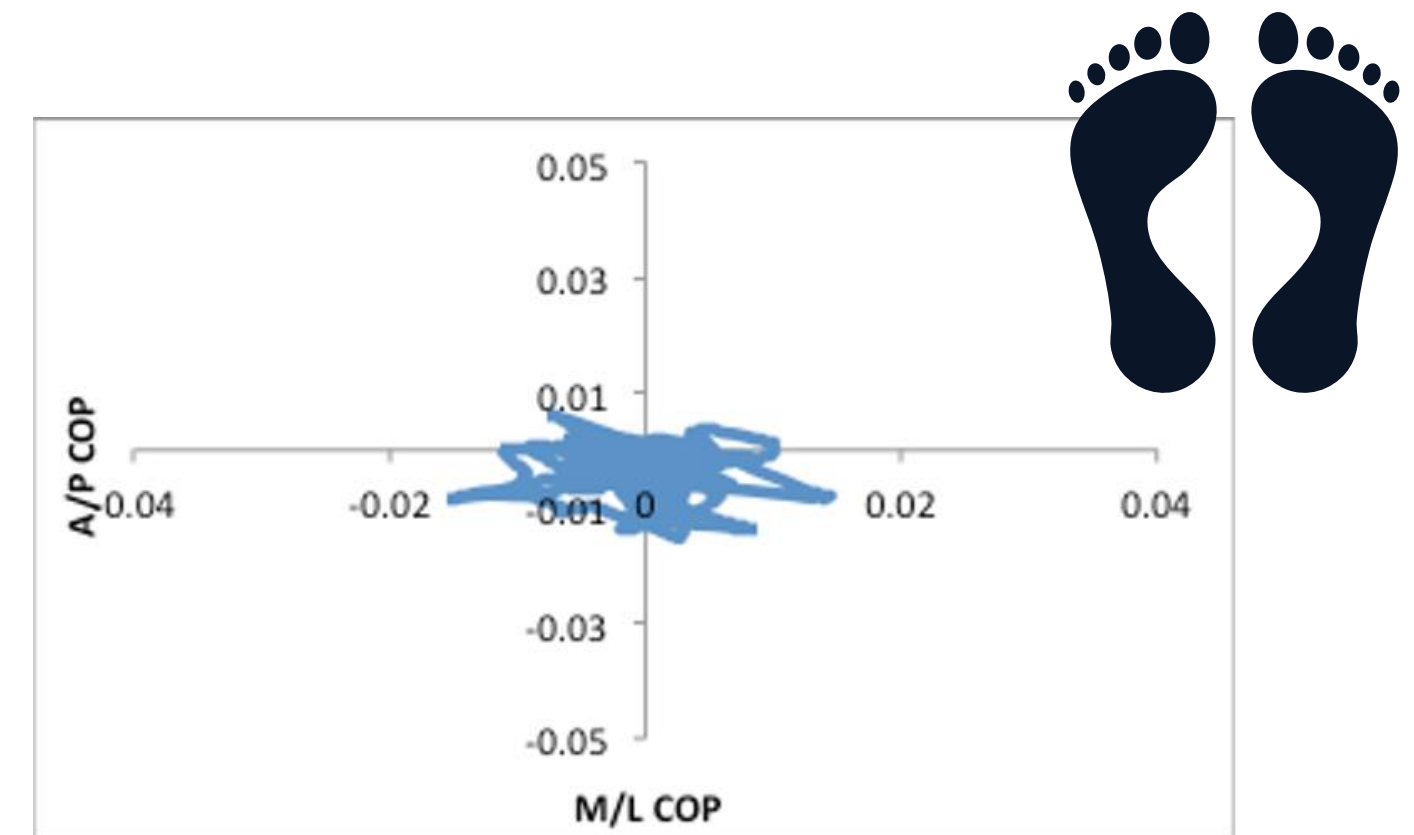
1. Change from Seated DVA score

(+/- 0.1 logMAR change = clinically meaningful)

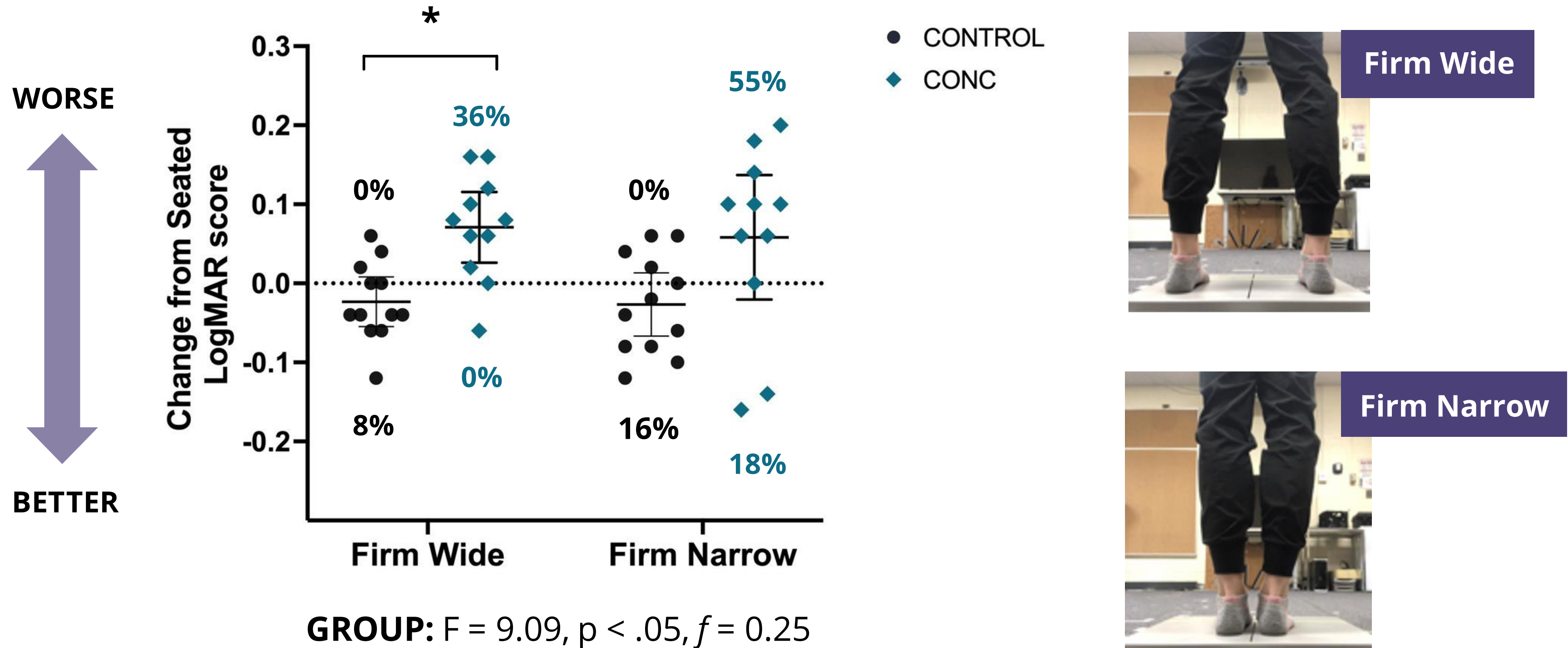


2. Balance Control (Berotec®, 1000Hz)

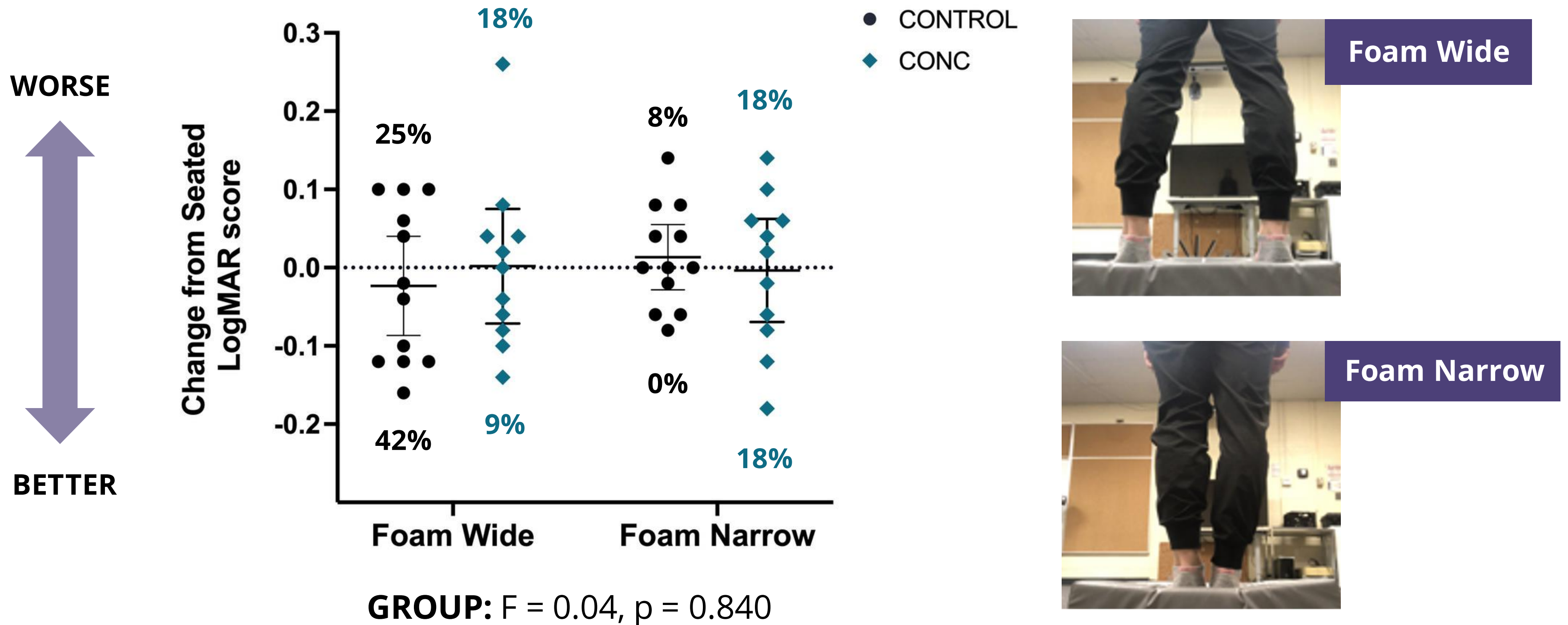
Root Mean Square (RMS) of COP Displacement (dCOP) (A/P & M/L Directions)



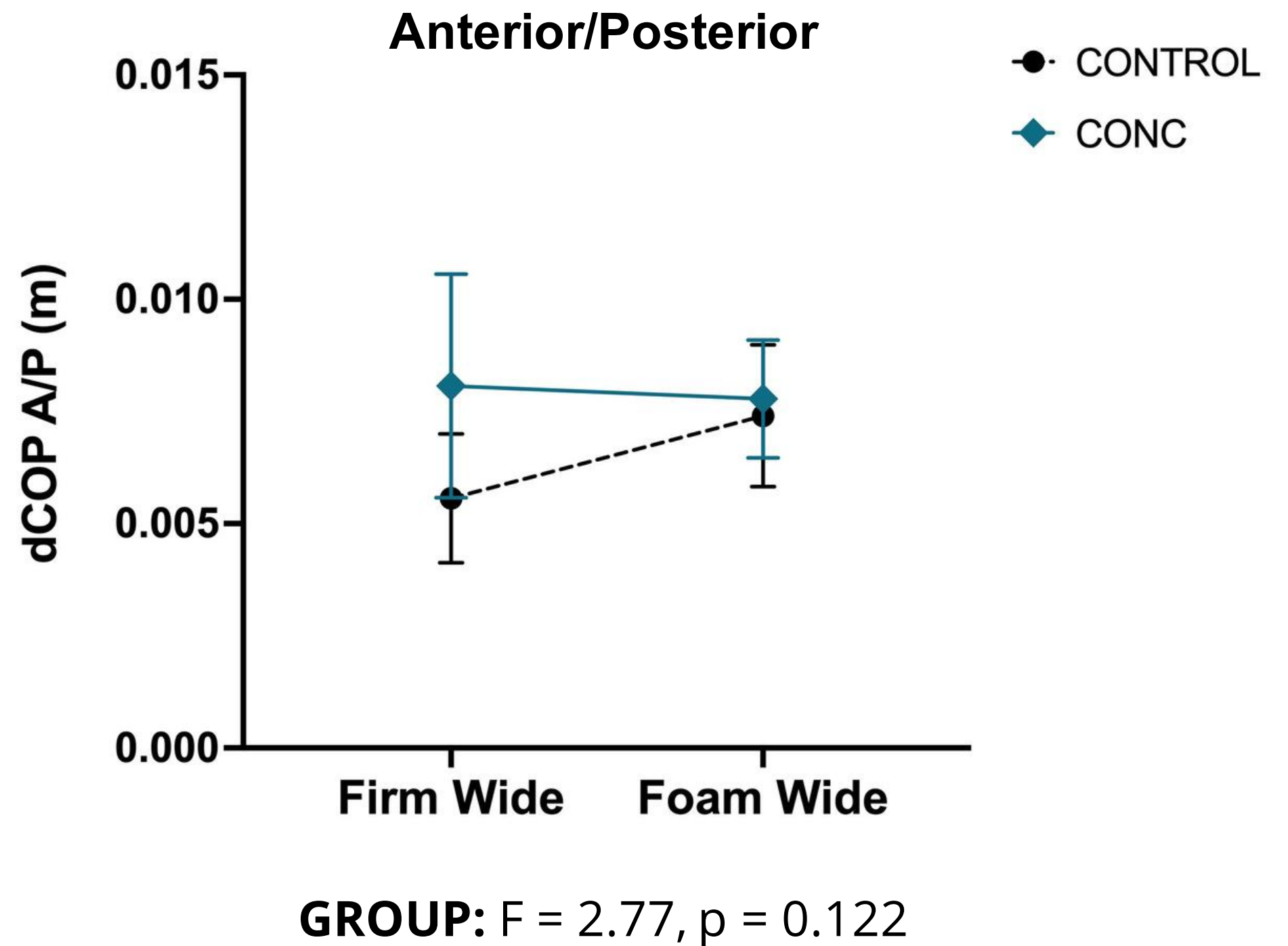
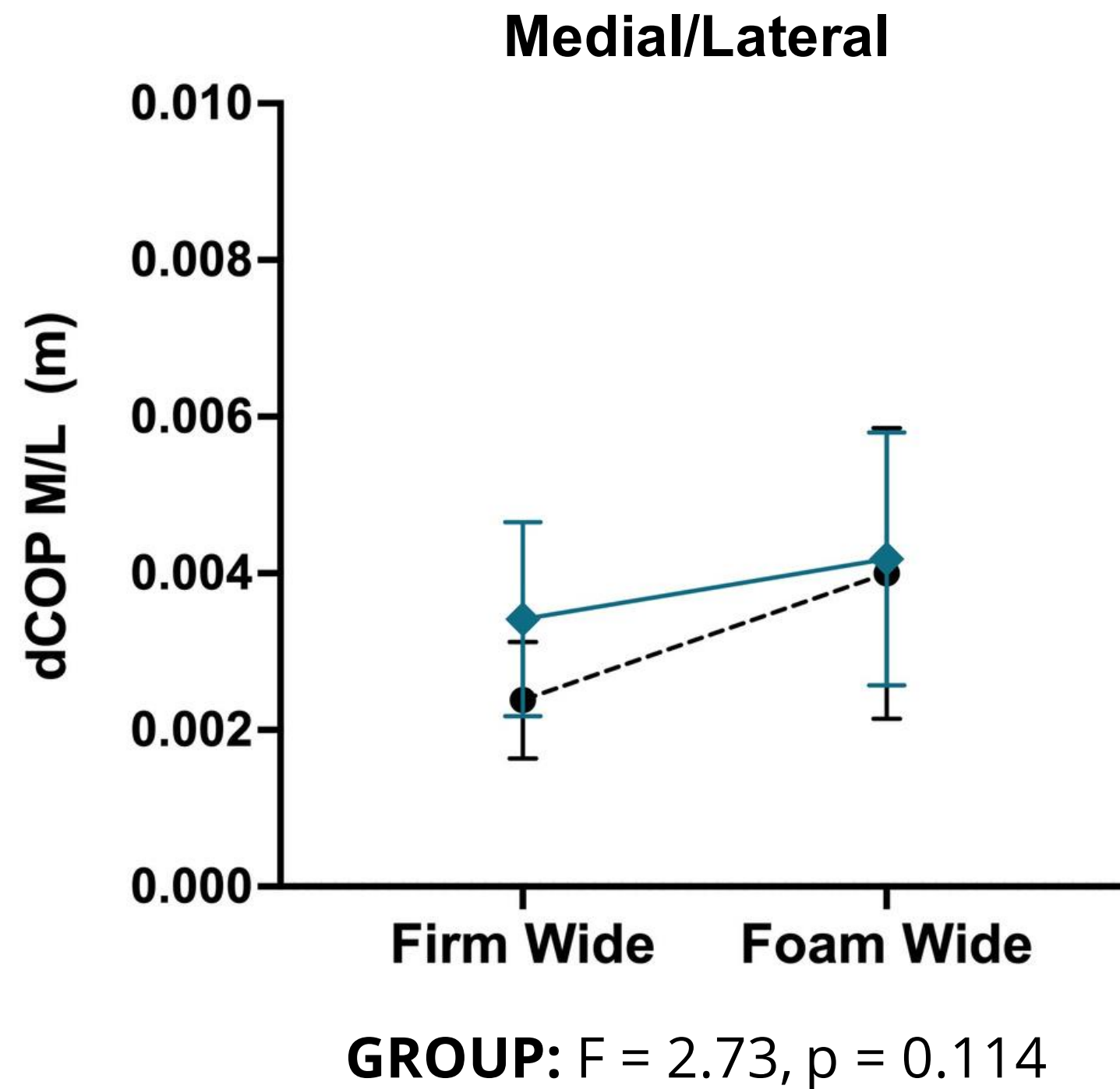
Results: Cheerleaders with recent SRC history had a worse change in DVA score from seated to standing (Firm Wide $p < .05$)



Results: No significant differences for change in DVA score from seated while standing on a foam surface between groups



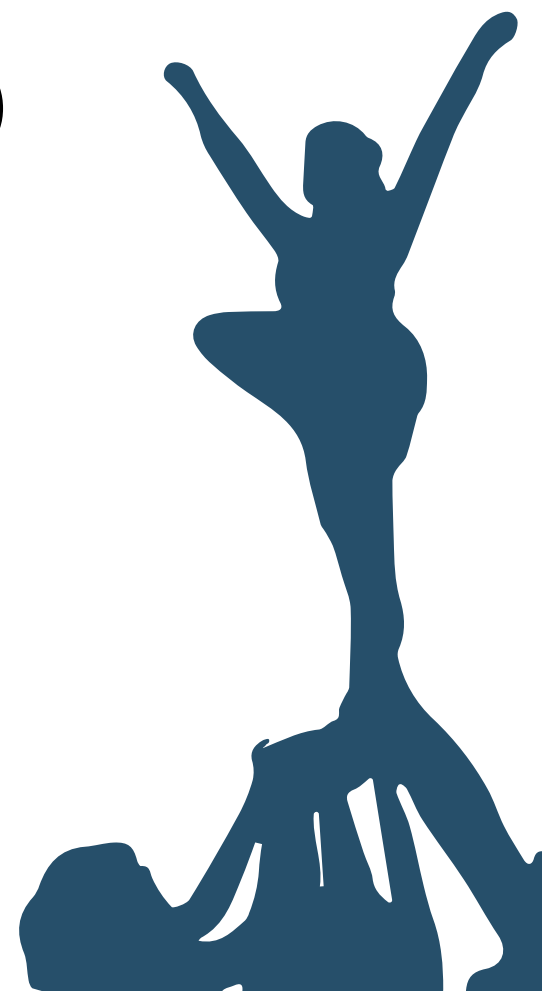
Results: No significant differences in balance control between groups with similar strategies utilized for each condition



Take Home: The DVA task may be sensitive to persisting cognitive & visual deficits for cheerleaders beyond recovery of SRC

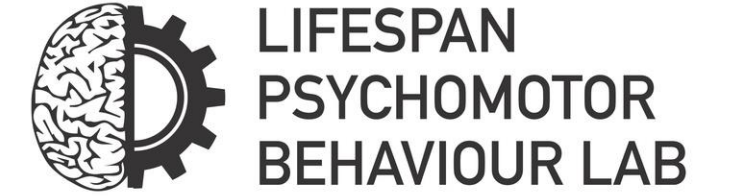
- A portion of cheerleaders with recent SRC prioritized balance control at the cost of DVA score accuracy while standing
- Keep it simple: Challenging balance conditions may be affected by sport-specific training and/or musculoskeletal (MSK) injury history
- Female cheerleaders reported a **high incidence of recent SRC history** (48%)
 - Long-term effects, prevention strategies, &/or individual factors

Overall: More rigorous clinical assessments are needed to identify persisting deficits for this unique athlete population following SRC





Thank you!



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