Pilot Study to Evaluate the Effects of an Evidence-Based Practice Intervention on Athlete Neurocognitive Outcomes in Youth Football

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INTRODUCTION

- Concussions are a prevalent public health concern in youth football
- Repetitive, non-concussive exposure to head acceleration events (HAEs) and head impacts may have similar effects on athletes' neurological health as concussions[1]
- It is unknown if reduction in exposure to HAEs mitigates deficits in neurocognitive outcomes
- **Study Objective**: Evaluate the preliminary effectiveness of an intervention program, COmmunities Aligned to reduce Concussion and Head impact exposure (COACH), to mitigate changes in neurocognitive outcomes of youth football athletes.

METHODS

Participants

- Control Arm (2021)
  - 12U & 13U Teams: 25 athletes
- Intervention Arm (2023)
  - 12U & 13U Teams: 21 athletes

Biomechanical Data

- Instrumented with a mouthpiece-based head acceleration sensor for one season
  - 5g recording threshold
- A time synchronized camera was placed on sidelines at all sessions to collect video data
- All recorded events were transformed to the head center of gravity and video-verified to remove false-positive events

Neurocognitive Data

- Athletes completed neurocognitive assessments pre- and post-season
  - Conners' Continuous Performance Test Third Edition (CPT-3)[2]
  - Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT)[3]
  - Select assessments from National Institutes of Health Toolbox (NIH Toolbox) Cognition Domain[4]
    - Flanker Inhibitory Control and Attention Test
    - List Sorting Working Memory Test
    - Pattern Comparison Processing Speed Test
    - Picture Vocabulary Test

- Linear regression analyses with biomechanical frequency metrics

RESULTS & DISCUSSION

Control Arm

- 5,347 true-positive HAEs
- 35% head impacts
- Mean HAEs per athlete per practice: 5
- Mean HAEs per athlete per game: 8

Intervention Arm

- 2,138 true-positive HAEs
- 44% head impacts
- Mean HAEs per athlete per practice: 3
- Mean HAEs per athlete per game: 4

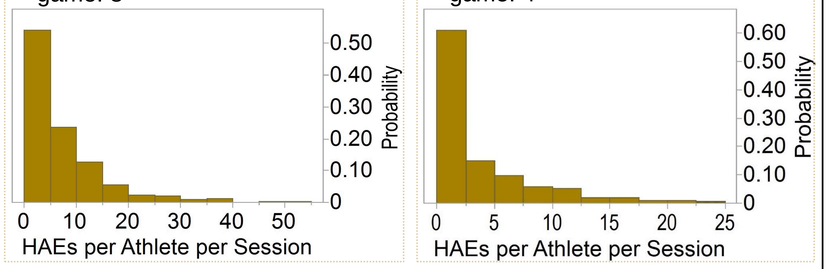

Figure 1. Histograms for the number of HAEs per athlete per season for the control arm (left) and intervention arm (right).

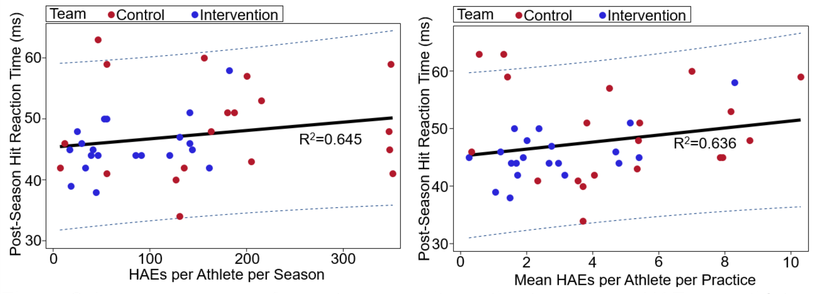

Figure 2. Linear regressions for post-season hit reaction time versus HAEs per athlete per season (left) and mean HAEs per athlete per practice (right).

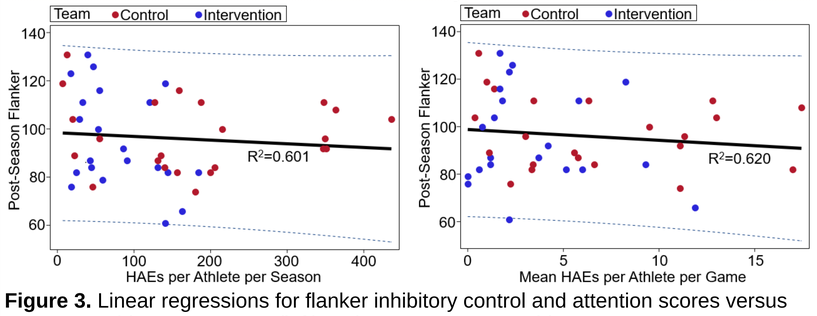

Figure 3. Linear regressions for flanker inhibitory control and attention scores versus HAEs per athlete per season (left) and mean HAEs per athlete per game.

RESULTS & DISCUSSION CTD.

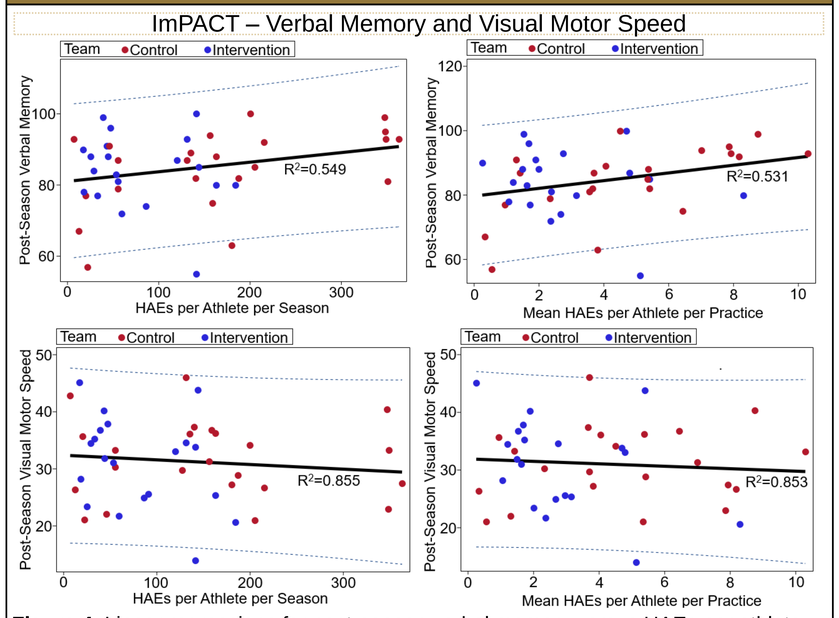

Figure 4. Linear regressions for post-season verbal memory versus HAEs per athlete per season (upper left) and mean HAEs per athlete per practice (upper right), and linear regressions for post-season visual motor speed versus HAEs per athlete per season (lower left) and mean HAEs per athlete per practice (lower right).

- Data suggests that the COACH intervention may help to mitigate the impact of cognitive changes after a season of football
- Based on this sample, the COACH intervention appears to reduce the number of HAEs collected by athletes

LIMITATIONS & FUTURE WORK

Limitations include different seasons for data collection, small sample size, and use of multiple film reviewers

Future Work

- Compare HAE magnitude among control and intervention athletes
- Longitudinal data collection
- Make adaptations and expand the intervention

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[3] https://impactconcussion.com/ [4] https://nihtoolbox.org/