

# Determining Optimal Assessment Battery for Collegiate Soccer and Lacrosse Athletes Experiencing Frequent Repetitive Head Impacts

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## Introduction

Female collegiate soccer and lacrosse athletes are subject to repetitive subconcussive head impacts; defined as “cranial impacts that do not result in known or diagnosed concussion on clinical grounds.”<sup>3</sup> These impacts may result in vestibulo-oculomotor (V-O) system dysfunction.<sup>4</sup> Identifying V-O dysfunction is critical in order to better understand the potential consequences of these impacts.

## Purposes

Retrospectively examine four years of pilot data to:

1. Describe the evolution of an assessment battery for cleared to play athletes.
2. Identify the assessment tools most frequently positive in cleared to play athletes and non-athletes.
3. Provide direction for clinical practice and future research endeavors.

## Participants

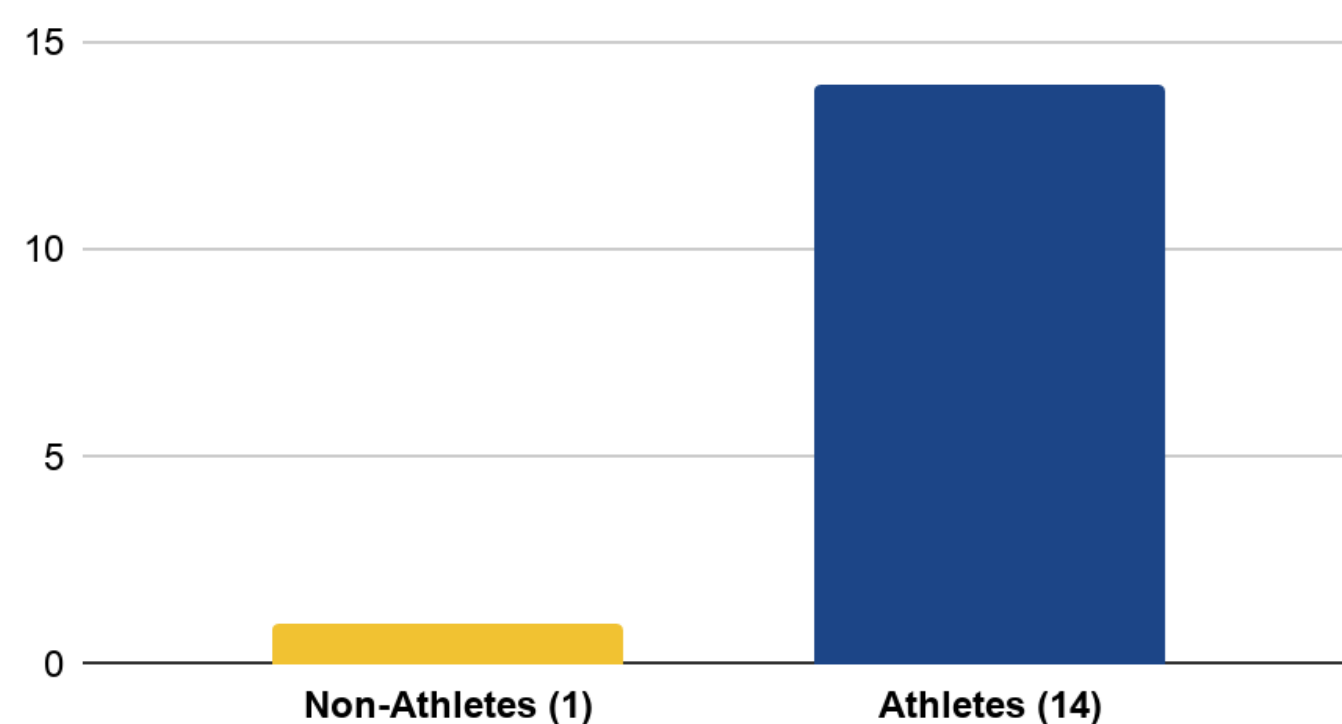
- 60 Division II female soccer and lacrosse players
  - 35 soccer, 25 lacrosse
- 21 non-athletes (2 years)

## Methods

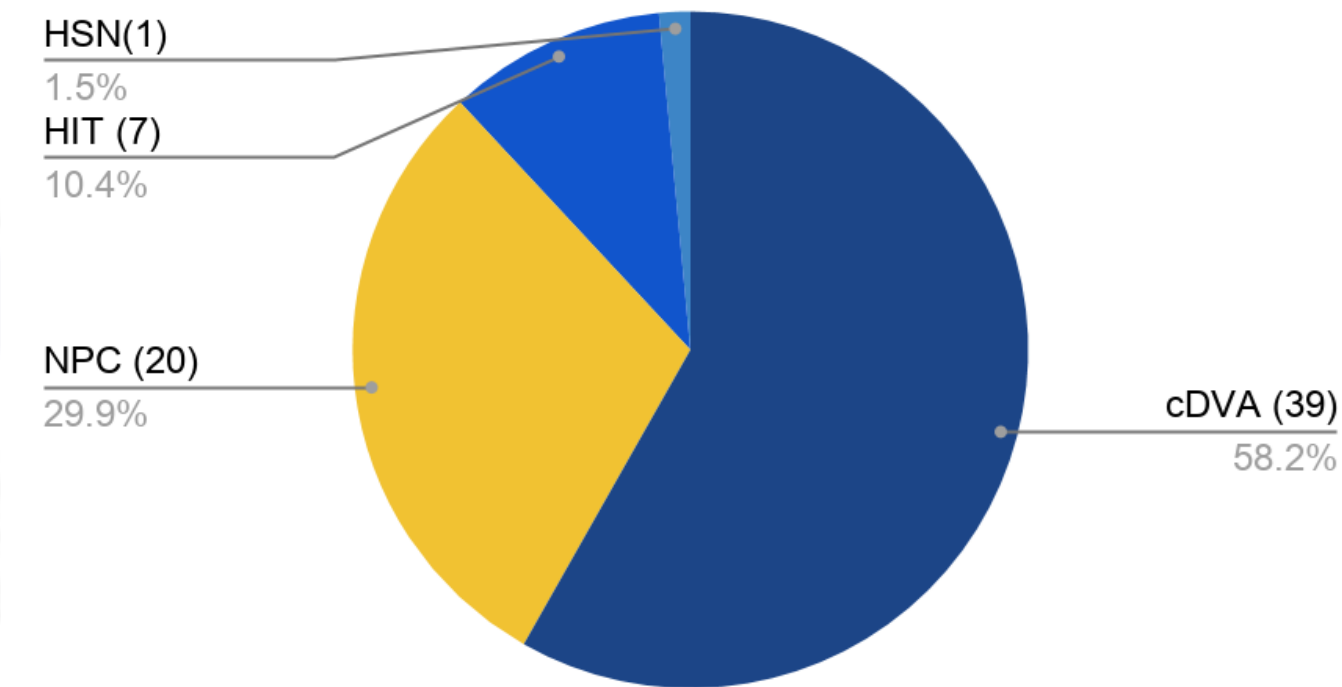
Each year tests were retained or discontinued depending on their evaluative strength. Alternate tests were added to capture a given or different domain. The following shows the evolution of assessments (additions bolded):

- Year One: non-instrumented (clinical) Dynamic Visual Acuity (cDVA), Head Impulse Test (HIT), Head Shake Nystagmus Test (HSN), Y-Balance Test, Balance Error Scoring System (BESS)
- Year Two: cDVA, HIT, HSN, Y-Balance Test, BESS, **Near Point Convergence (NPC)**
- Year Three: cDVA, NPC, HIT, HSN, **Trail-Making Test (TMT) A and B**
- Year Four: cDVA, NPC, TMT, **40-yard dash with and without head turns, T-agility Test**

Positive V-O Tests in Athletes vs. Non-Athletes



Positive V-O Tests in Athletes Over 4 Years



## Results

- Difference in V-O system function in athletes compared to non-athletes in first two years of data collection:
  - 14/21 of athletes had at least one positive test
  - 1/25 non-athletes had at least one positive test
- The cDVA and NPC tests were most frequently positive tests across the four years
- Repeat participants showed signs of V-O system dysfunction based on cDVA and NPC testing
  - 2-year participants (n=23): 70% showed dysfunction in at least one year
  - 3-year participants (n=5): 100% showed dysfunction in at least one year
- No significant results found with cognition, balance, or performance testing

## Conclusion

- Athletes had a much higher incidence of positive V-O tests than non-athletes
- Over half of cleared to play athletes had a positive V-O test; cDVA and NPC most frequently positive
- Highly trained athletes may require more challenging and sensitive assessment tools to identify cognitive and performance deficits

## Clinical Relevance

- Many cleared to play female collegiate athletes may be playing in the presence of V-O deficits
- Using specific V-O assessments may better identify athletes with V-O dysfunction and lead to subsequent treatment intervention
- Continued research needed to develop an optimal assessment battery to guide baseline, return to play, and intervention decisions

## References

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3. Reynolds BB, et al. Quantifying head Impacts in collegiate lacrosse. *Am J Sport Med.* 2016;44(11):2947-2956.
4. Kawata K, et al. Effect of repetitive sub-concussive head impacts on ocular near point of convergence. *Int J Sports Med.* 2016; 37(05): 405 - 410.