

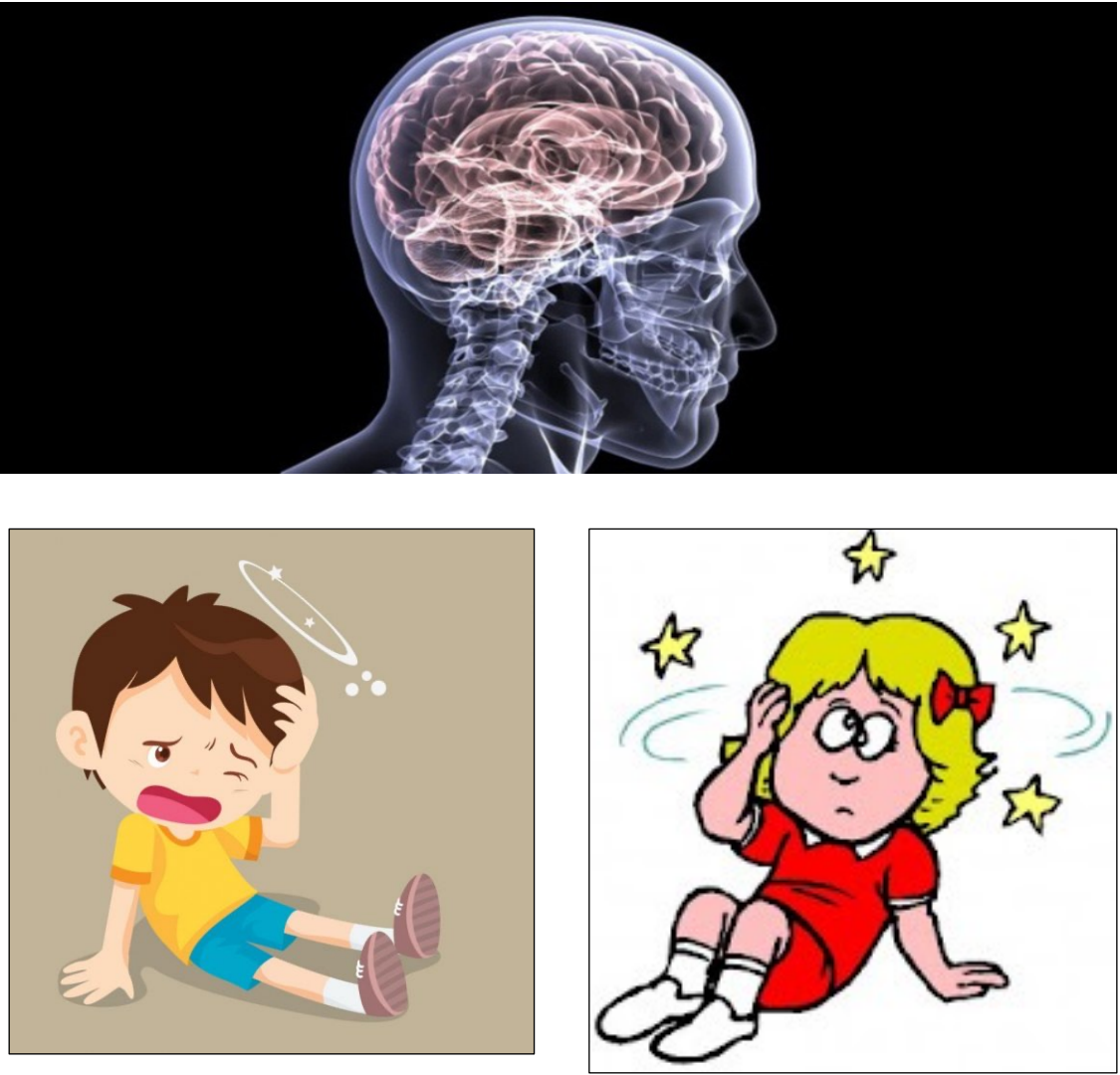
# Increased Symptom Scores & Prolonged Course of Recovery for Female Patients with Concussion Injuries seen at a University Sport Medicine Clinic

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## BACKGROUND

Concussion presents multiple challenges in diagnosis and management.<sup>1</sup>  
**FEMALES** are thought to incur more severe injuries, report more symptoms and take longer to recover than do **MALES**<sup>2-8</sup>. This is a critical area for future research<sup>9</sup>.



## OUTCOME MEASURES

- Demographics, incidence, method of injury (MOI), wait times
- Concussion severity, as measured by Standardized Concussion Assessment Tool (SCAT 3/5): Total Symptoms (n/22); Total Symptom Score (n/132)<sup>1</sup>
- Recovery timelines for return-to-learn (RTL) and return to sport/activity (RTS)

## MAIN RESULTS



Mechanism of Injury	Females	Males	TOTAL
Activities of Daily Living (ADLs)	36	24	60
Organized Sports	185	292	477
Recreational Activities	42	40	82
<b>TOTAL</b>	<b>263</b>	<b>356</b>	<b>619</b>

**Age at Presentation**

**FEMALES:** 21.5 ± 10.7 years

**MALES:** 18.5 ± 7.6 years

*P* < 0.0001

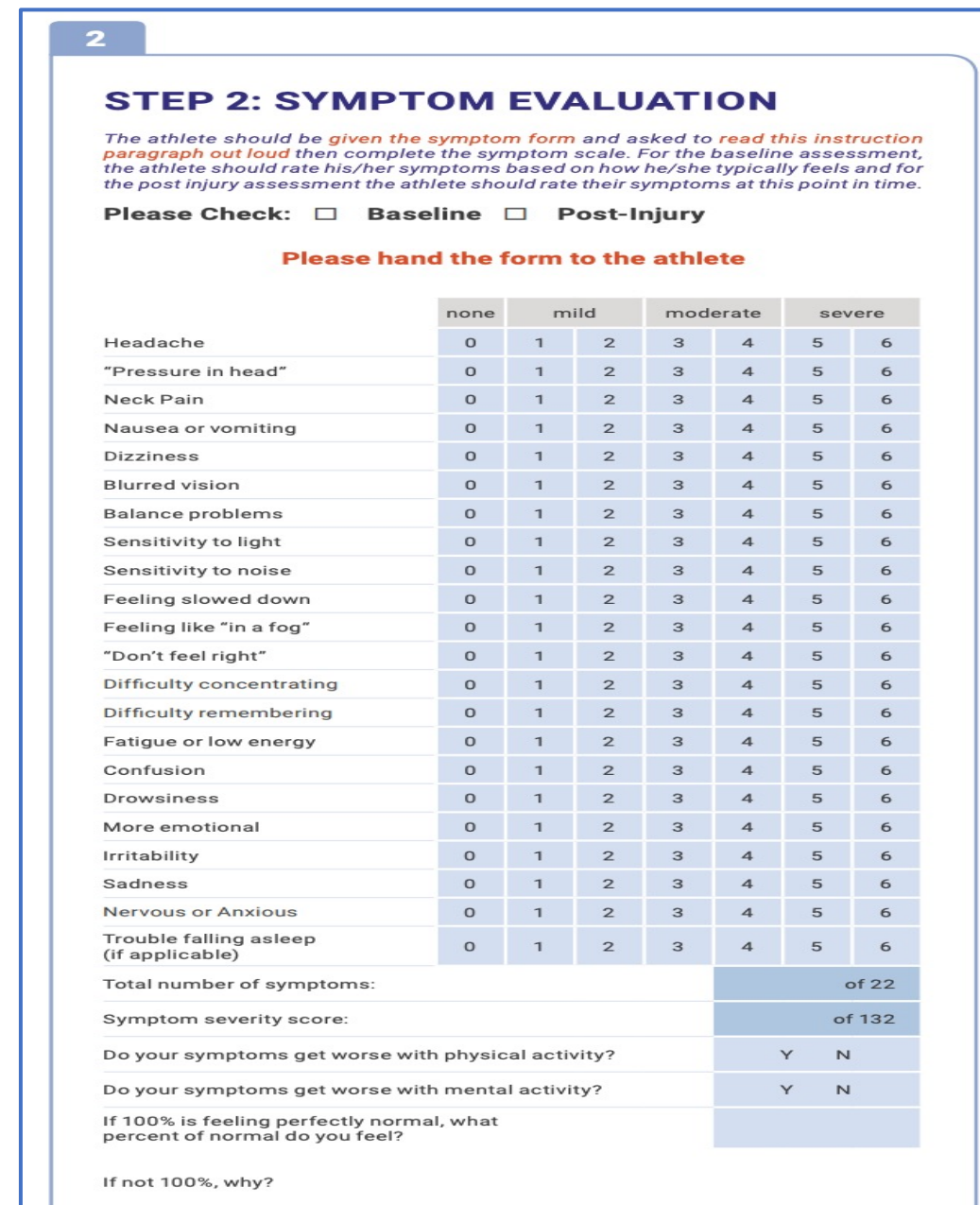
## MAIN RESULTS

### Concussion Severity at Initial Visit

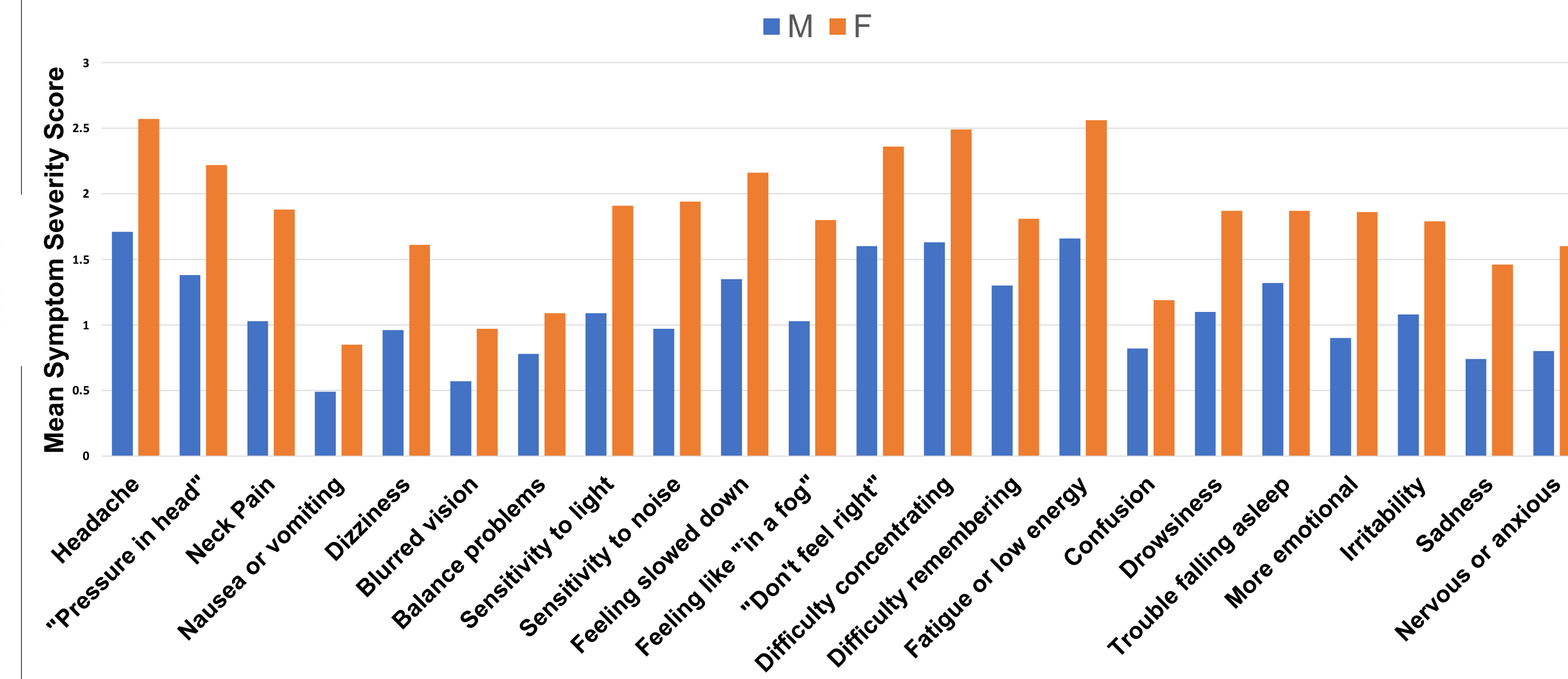
MEAN SYMPTOM SCORE (n/22)	TOTAL SYMPTOM SCORE (n/132)
<b>FEMALES</b> (n=231): 14.2 ± 6.5	<b>FEMALES</b> (n=231): 39.8 ± 28.2
<b>MALES</b> (n=302): 10.0 ± 6.8	<b>MALES</b> (n=304): 24.3 ± 23.7
<i>p</i> < 0.00001	<i>p</i> < 0.00001

### Return to Learn / Return-to-Sport/Activity

Return to Learn	Return-to-Sport/Activity
<b>FEMALES</b> (n=58): 14.2 ± 17.7 days	<b>FEMALES</b> (n=104): 81.7 ± 163.9 days
<b>MALES</b> (n=105): 11.6 ± 14.4 days	<b>MALES</b> (n=167): 39.4 ± 63.1 days
<i>n/s</i>	<i>p</i> = 0.003



### Symptom Severity Scores at Initial Visit



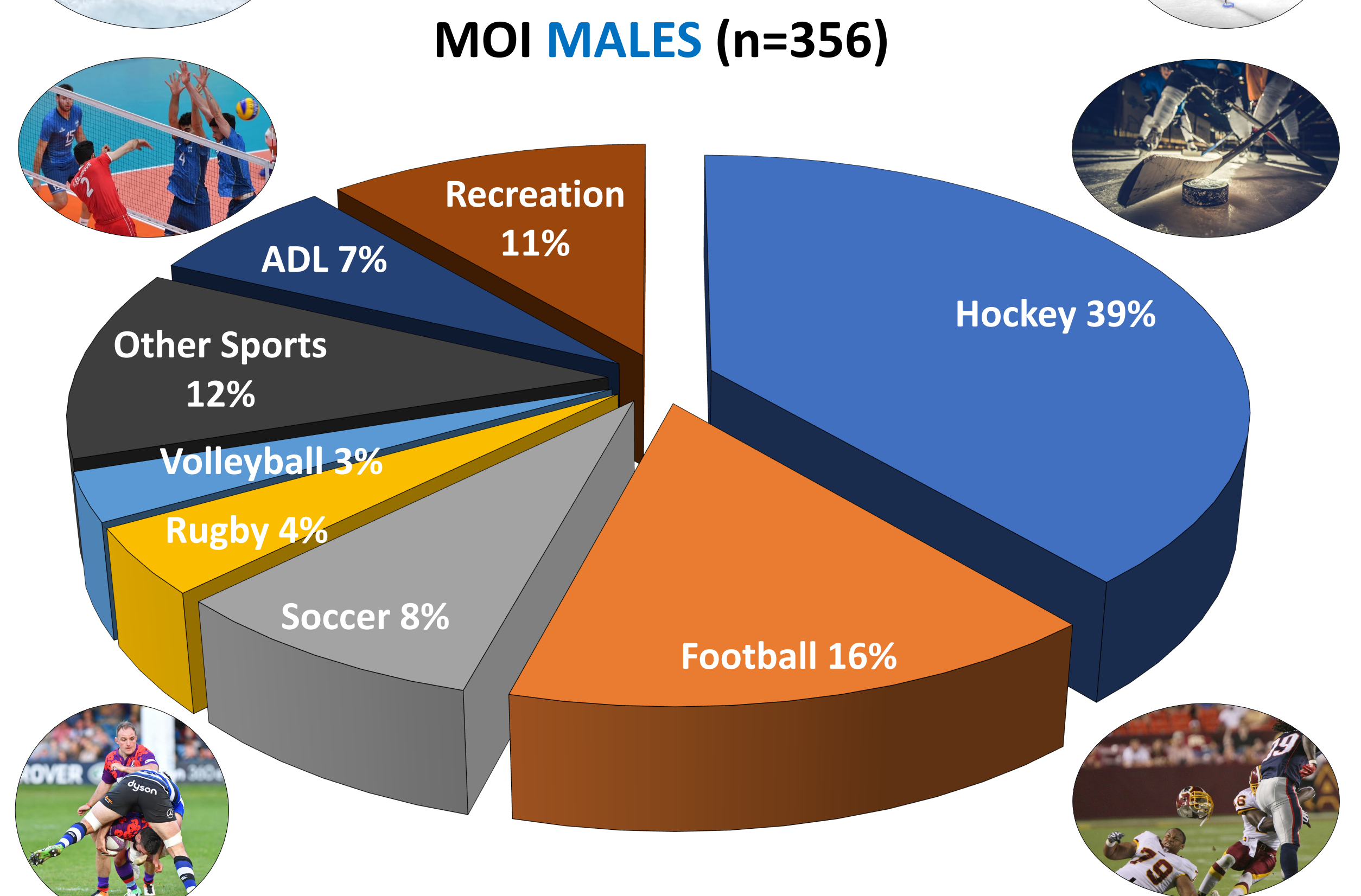
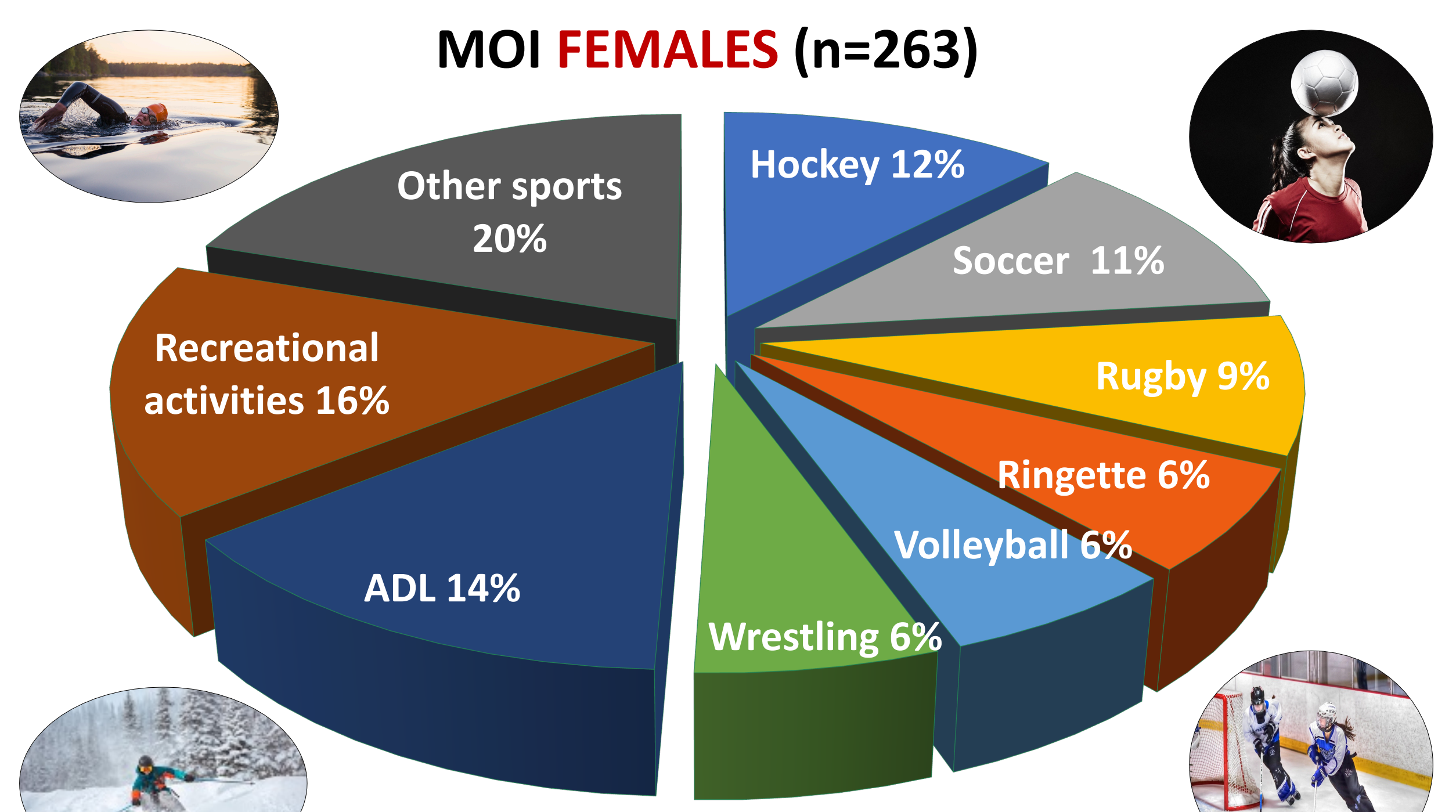
## OBJECTIVE

To characterize patients with concussion injuries seen at a university sport medicine clinic and compare initial presentation and recovery between **FEMALES** and **MALES**, to identify any potential sex-related differences.



## METHODS

- DESIGN:**
- Retrospective chart review of patients with concussion injuries seen by a Sport and Exercise Medicine (SEM) physician from **January 1, 2015, to May 31, 2021**.
- SETTING:**
- University-based sport medicine clinic in Edmonton, Alberta Canada
- PARTICIPANTS:**
- **552** patients with **621** unique injuries (**263F:358M**); overall age **19.8 ± 9.2** years; seen over **1607** visits)
- RISK FACTORS:**
- Patients seen at the clinic with concussions were subdivided by sex into **FEMALE (F)** or **MALE (M)**.



## CONCLUSIONS

- In this cohort of patients seen at a Sport and Exercise Medicine Clinic, **FEMALES** reported **greater concussion severity** with **more symptoms at initial visit** than did **MALES**.
- **FEMALES** also **took longer to return to sport/activity** than **MALES**.
- Underlying injury mechanisms and implications for therapy remain to be explored.

## REFERENCES

1. McCrory P, Meeuwisse W, Dvořák J, et al. Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016. Br J Sports Med. 2017;51(11):838-847. doi:10.1136/bjsports-2017-097699.
2. Covassin T, Elbin RJ. The female athlete: the role of gender in the assessment and management of sport-related concussion. Clin Sports Med. 2011 Jan 1;30(1):125-31.
3. Brown DA, Elsass JA, Miller AJ, Reed LE, Reneker JC. Differences in symptom reporting between males and females at baseline and after a sports-related concussion: a systematic review and meta-analysis. Sports Med. 2015 Jul;45(7):1027-40.
4. Covassin T, Savage JL, Bretzin AC, Fox ME. Sex differences in sport-related concussion long-term outcomes. Int J Psychophysiol. 2018 Oct 1;132:9-13.
5. McGroarty NK, Brown SM, and Mulcahey MK. Sport-related concussion in female athletes: A systematic review. Ortho J Sports Med. 2020;8(7):1-12. 2325967120932306 doi: 10.1177/2325967120932306.
6. Koerte IK, Schultz V, Sydnor VJ, Howell DR, Guenette JP, Dennis E, Kochsieck J, Kaufmann D, Sollmann N, Mondello S, Shenton ME. Sex-related differences in the effects of sports-related concussion: a review. J Neuroimaging. 2020 Jul;30(4):387-409.
7. Rizzone KH, Ackerman KE. Female athlete and sports-related concussions. Clin Sports Med. 2021 Jan 1;40(1):133-45.
8. Bretzin AC, Esopenko C, D'Alonzo BA, Wiebe DJ. Clinical recovery timelines after sport-related concussion in men's and women's collegiate sports. J Athl Tr. 2022 Jul;57(7):678-87.
9. D'Lauro C, Jones ER, Swope LM, Anderson MN, Broglio S, Schmidt JD. Under-representation of female athletes in research informing influential concussion consensus and position statements: an evidence review and synthesis. Br J Sports Med. 2022 Sep 1;56(17):981-7.