Predictors of Increased Concussion Symptoms in Male and Female Young Adults

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BACKGROUND

- Despite males having a higher absolute rate of sport-related concussions (SRCs), females have a higher relative concussion rate in both the athletic and general population.[1,2]
- Although research shows that females have higher reporting rates and concussion knowledge, evidence suggests that there may be other sex differences that may outweigh any discrepancies in reporting behaviors.[3]
- Studies evaluating sex specific neurophysiological or biomechanical risk factors have led to confounding evidence.[4,5]
- Females have higher reported baseline symptoms and hormonal differences that may impact reported concussion symptom severity.[6,7]
- It is not clear how much concussion history and other predictive factors affect symptom presence and severity in both males and females.

PURPOSE

The purpose of this study was to examine the association between the severity of self-reported symptoms and the number of concussions sustained in both males and females while accounting for potential predictors.

METHODS

Study Design: Cross sectional observational study
Participants: 80 young adults with mTBI history
Data Collection: Demographic and concussion history information was obtained from each participant. To assess concussion severity, the RPQ (Rivermead Post-Concussion Questionnaire) was also given. Higher scores indicate a higher symptom presence and severity.

Statistical Analysis

Descriptives were calculated for demographic variables (Table 1).

Univariate regression models, separate for males and females, assessed the relationship between concussion symptoms, concussion history, and potential predictors (mental health history, mechanism of most recent injury, concussion number, time since most recent concussion, and age).

Statistically significant predictors from each sex specific model were then used to create multivariable linear regression models and 95% confidence intervals

(Table 2 and Table 3).

Table 1. Means, SDs, and 95%CI of continuous demographic variables for the full sample (n=80).

	Mean	SD	95%CI
Age	21.39	2.59	20.78, 22.00
Number of concussion	2.50	1.50	2.17, 2.83
Time since most recent concussion	24.18	17.72	20.23, 28.13
Concussion symptom severity	22.26	12.43	19.50, 25.03
Number of concussion symptoms worse than before injury	6.80	0.50	5.72, 7.88
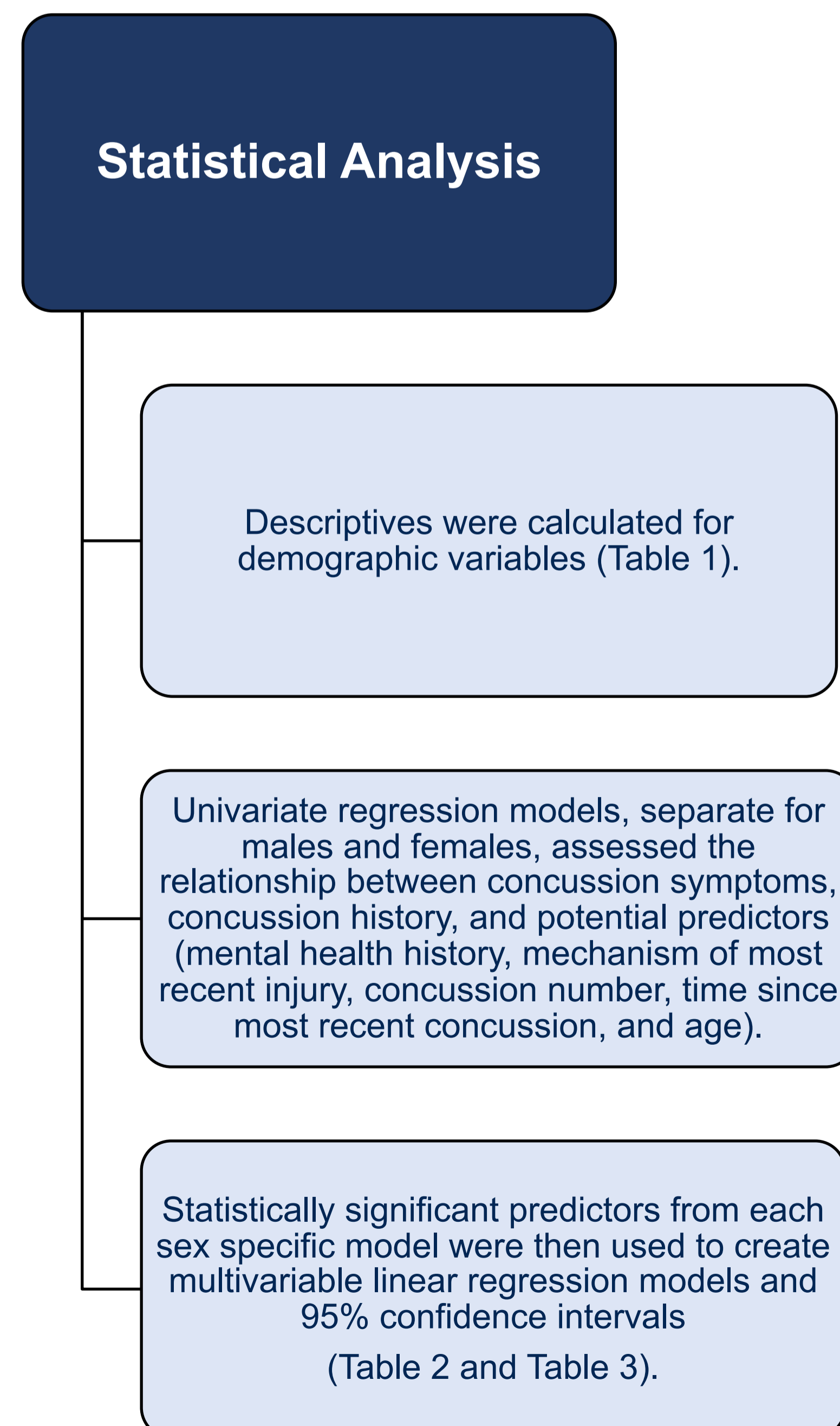
RESULTS

Table 2. Male (n=18) multivariable linear regression models assessing the association of concussion symptom severity and number of concussion symptoms worse than before injury with their statistically significant predictors.

		Model			Parameter Estimate		
		p-value	R²	Adjusted R²	β	95% CI	*p*-value
Concussion symptom severity	Number of Concussions	0.03**	0.38	0.29	1.36	-1.87, 4.60	0.38
	Age				2.07	-0.27, 4.40	0.08*
Number of concussion symptoms worse than before injury	Number of Concussions	0.07*	0.29	0.20	0.76	-0.75, 2.28	0.30
	Age				0.65	-0.44, 1.74	0.22

Table 3. Female (n=62) multivariable linear regression models assessing the association of concussion symptom severity and number of concussion symptoms worse than before injury with their statistically significant predictors.

		Model			Parameter Estimate		
		p-value	R²	Adjusted R²	β	95% CI	*p*-value
Concussion symptom severity	Number of Concussions	0.07*	0.09	0.05	1.66	-0.48, 3.80	0.13
	Time Since Most Recent Concussion				-0.14	-0.33, 0.05	0.15
Number of concussion symptoms worse than before injury	Mental Health History	0.06*	0.09	0.06	2.05	-0.43, 4.53	0.10
	Number of Concussions				0.50	-0.35, 1.34	0.25

CONCLUSIONS

- By better understanding the effects of concussions on young adult males and females separately, clinicians may be better suited to acknowledge specific risks and symptom presentations.
- Findings suggest that concussion symptom presence is largely associated with a higher number of concussions in both males and females, and mental health history may play a role in explaining sex differences in concussion symptoms.
- A larger focus can be put onto mental health during treatment since mTBIs have a known psychological impact, especially in patients with preexisting conditions.
- Future research should include larger, more inclusive studies to strengthen these findings, as well as further evaluating the effect of age on symptom presence in males.

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