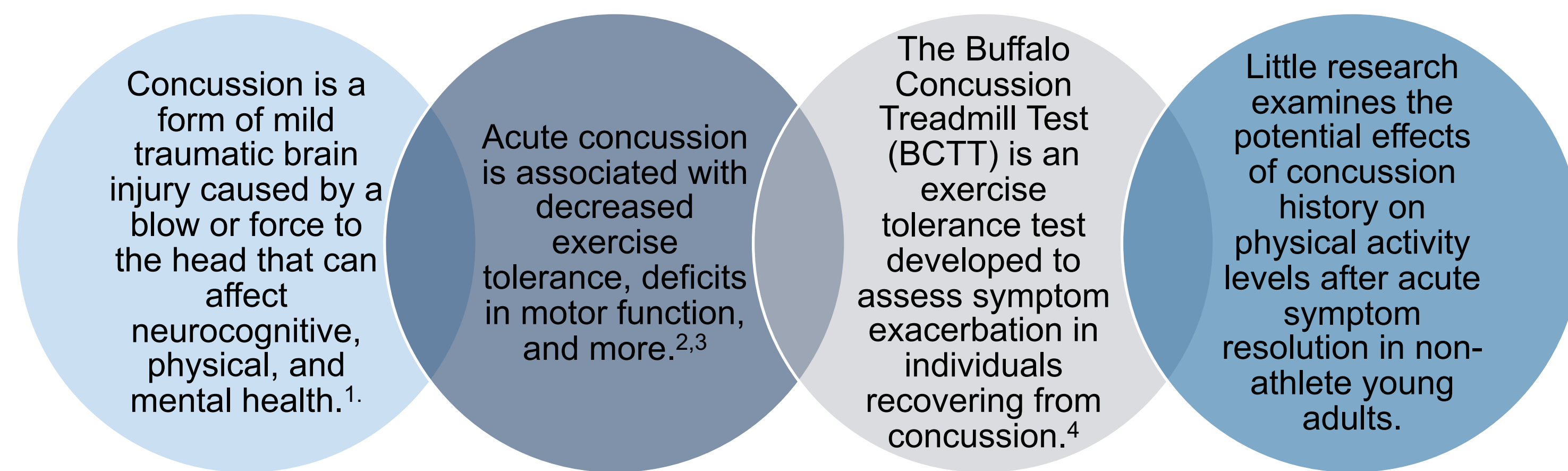


The Effect of Concussion History On Physical Activity and Exercise Tolerance In Young Adults

Bridget A. Treanor¹; Madison C. Chander^{1, 2}; Brittany A. Ingram¹; Abbie Smith-Ryan¹; Johna K. Register-Mihalik¹

¹UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL, NC; ²ELON UNIVERSITY, ELON, NC

BACKGROUND



PURPOSE

To determine the influence of concussion history on physical activity levels (Aim 1) and exercise tolerance (Aim 2) in young adults aged 18-30.

METHODS

Study Design: Cross-sectional

Data Sources:

- Data were collected in the STAR Heel Laboratory from 2021 to 2022.
- Participants (n = 58) were 18 to 30-year-old young adults with (n = 13) and without (n = 45) reported concussion history.
- Exclusion criteria included contraindications to physical activity (as indicated by the PAR-Q) and/or a history of moderate-severe TBI.

Data Collection:

- Upon consent, participants completed a virtual and an in-person visit.
- Instrumentation included a demographics survey, the IPAQ (short-form), a two-minute step test protocol, and the Buffalo Concussion Treadmill Test (BCTT).

Statistical Analysis:

- Sample descriptives were calculated on demographic, medical, and concussion history variables.
- For each aim, one Wilcoxon Rank Sum test was run for each outcome of interest due to the non-parametric nature of the sample.

Aim 1 Outcomes

Vigorous MET minutes per week

Total MET minutes per week

Sitting minutes per week

Aim 2 Outcomes

BCTT minutes completed

BCTT maximum HR

BCTT final HR

% of age-predicted HRM reached on BCTT

Steps completed on step test

Average HR during step test

MET=amount of energy expended carrying out physical activity, HR=Heart rate, HRM=Heart rate Max, BCTT=Buffalo Concussion Treadmill Test

RESULTS

Characteristic	All	No Concussion History	Concussion History
	Median [IQR]	Median [IQR]	Median [IQR]
Age (years)	21.00 [20 – 25.75]	21.00 [20 – 25]	21.00 [19.5 – 26]
Height (inches)	66.00 [63 – 67.25]	66.00 [63 – 67]	66.00 [62.5 – 68.5]
Weight (pounds)	140.00 [125.75 – 157]	140.00 [125 – 150]	140.00 [131 – 160]

Table 1. Sample Demographics.

Outcome	All	No Concussion History	Concussion History	p-value
	Median [IQR]	Median [IQR]	Median [IQR]	
Vigorous MET minutes per week	960.00 [0 – 2400]	960.00 [0 – 2340]	1080.00 [0 – 4020]	.532
Total MET minutes per week	3375.00 [4872 – 1965.25]	3360.75 [1875.75 – 4168.5]	4032.00 [2619.0 – 7204.5]	.165
Sitting minutes per week	420.00 [300 – 510]	420.00 [300 – 540]		

Table 2. Aim 1 Results and Analyses.

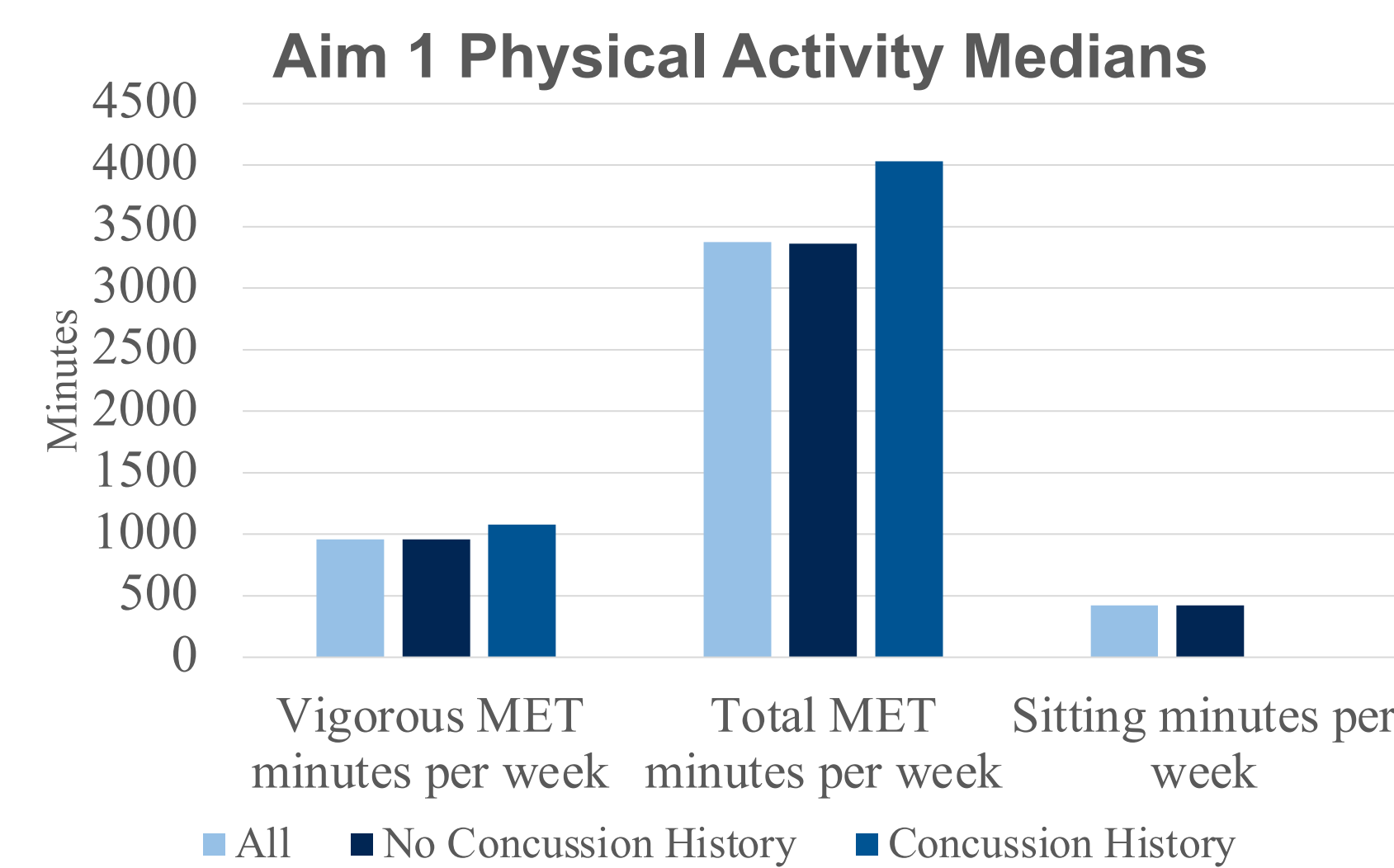


Figure 1. Comparison of Aim 1 outcome medians among groups with and without concussion history.

Outcome	All	No Concussion History	Concussion History	p-value
	Median [IQR]	Median [IQR]	Median [IQR]	
BCTT minutes completed	15.00 [11 – 17]	15.00 [11 – 17.5]	14.00 [11 – 15.5]	.264
BCTT max HR (bpm)	177.00 [166 – 183]	178.00 [168 – 187]	172.00 [164.5 – 178.5]	.275
BCTT HR at completion (bpm)	176.50 [165.75 – 184]	178.00 [168 – 187]	168.00 [159.5 – 178]	.105
% of age-predicted max reached on BCTT	89.87 [84.04 – 93.73]	90.91 [84.42 – 93.81]	86.60 [75.0 – 102.0]	.087

Table 3. Aim 2 Results and Analyses for BCTT outcomes.

RESULTS

Outcome	All	No Concussion History	Concussion History	p-value
	Median [IQR]	Median [IQR]	Median [IQR]	
Steps completed on step test	209.00 [164.5 – 235.5]	206.00 [152 – 234]	227.00 [178.5 – 247.5]	.946
Average HR on step test	123.12 [113.95 – 133.13]	122.85 [114.15 – 134.25]	126.18 [112.165 – 130.935]	.264

Table 3. Aim 2 Results and Analyses for step test outcomes.

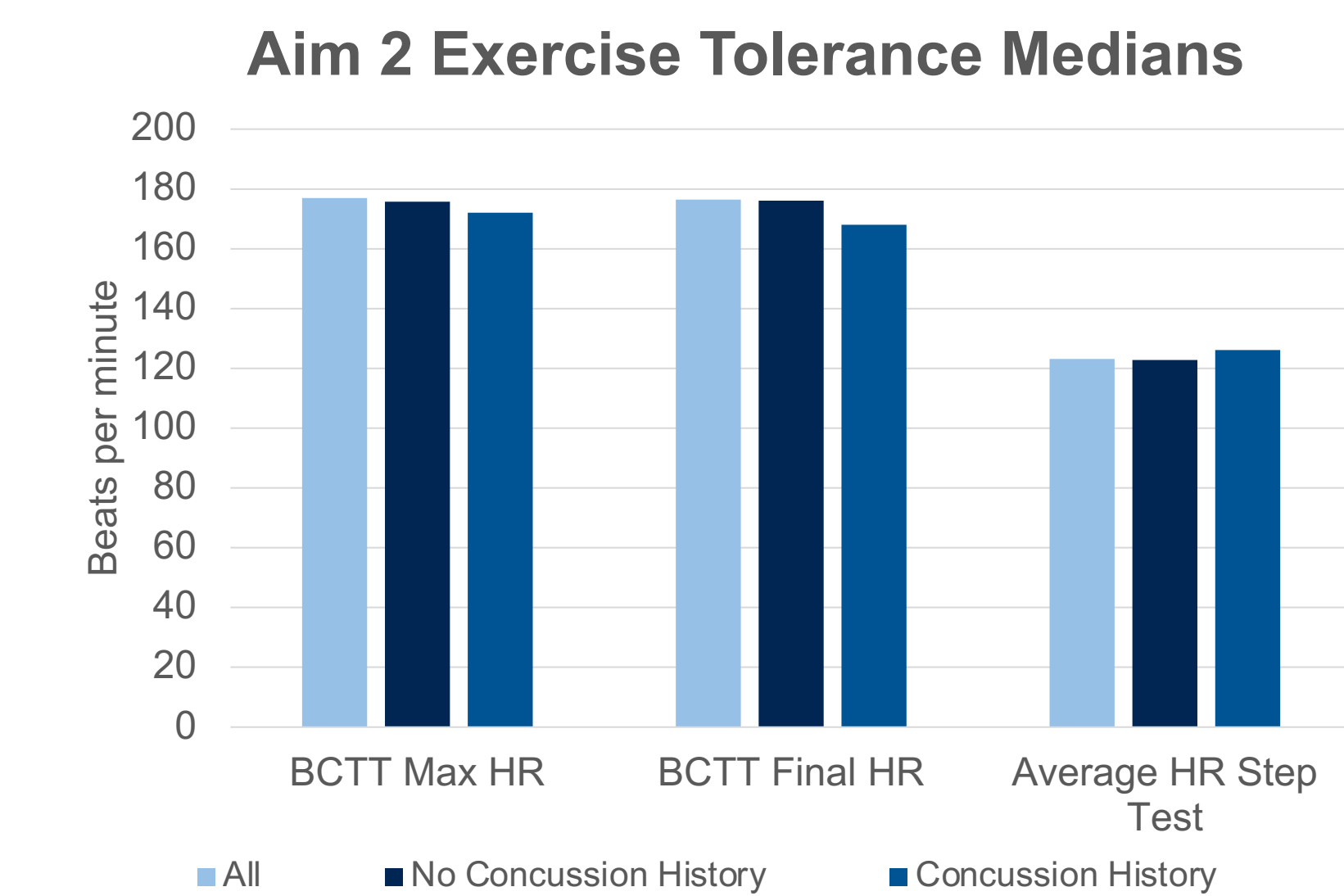


Figure 2. Comparison of Aim 2 heart rate outcome medians among groups with and without concussion history.

- No significant differences were found between groups for physical activity levels or exercise tolerance outcomes (all p > 0.05).
- Concussion history group reported slightly more physical activity per week (Aim 1) and reached slightly less completed on the BCTT (Aim 2) than those without concussion history.

CONCLUSIONS

Significant differences were not observed in any physical activity or exercise tolerance outcomes between groups with and without reported concussion history

Percentage of age-predicted maximum heart rate reached by participants on the Buffalo Concussion Treadmill Test was the outcome closest to reaching significance (p = 0.087).

Limitation: Participants were not stratified based on number/severity of previous concussions or time since last concussion.

Future Research: More research is needed on concussion history with more diverse samples, relative to sex-specific outcomes, and in larger sample sizes.

REFERENCES

- Patricios JS, Schneider KJ, Dvorak J, et al. Consensus statement on concussion in sport: the 6th International Conference on Concussion in Sport-Amsterdam, October 2022. *Br J Sports Med.* 2023;57(11):695-711. doi:10.1136/bjsports-2023-106898
- Leddy JJ, Hinds AL, Miecznikowski J, et al. Safety and Prognostic Utility of Provocative Exercise Testing in Acutely Concussed Adolescents: A Randomized Trial. *Clin J Sport Med.* 2018;28(1):13-20. doi:10.1097/JSM.0000000000000431
- Buckley TA, Vallabhajosula S, Oldham JR, et al. Evidence of a conservative gait strategy in athletes with a history of concussions. *Journal of Sport and Health Science.* 2016;5(4):417-423. doi:10.1016/j.jshs.2015.03.010
- Haider MN, Leddy JJ, Wilber CG, et al. The predictive capacity of the Buffalo Concussion Treadmill test after sport-related concussion in adolescents. *Frontiers in Neurology.* 2019;10. doi:10.3389/fneur.2019.00395

Contact Information

+1 (908) 235-7974 | btreanor@email.unc.edu