

Letters to the Editor

Author's Reply to: Comment on “Orthostatic Tachycardia in Children With and Without Persisting Postconcussion Symptoms Following Mild Traumatic Brain Injury: A Prospective Controlled Study”



Dear Editor

We thank Dr. Dedeepya and colleagues for their comments on our study of postural orthostatic tachycardia syndrome (POTS) after mild traumatic brain injury (mTBI). A key strength of our study is that groups were similar in age, sex, sport-related injury, concussion history, and time seen postinjury. We did not assess groups on preinjury physical activity levels. Using a mixed effect model to adjust for any effects of age, sex, and number of previous concussions, there were no between group (control, asymptomatic mTBI, persisting postconcussion symptoms after mTBI) differences on heart rate response over time during the Active Standing Test (AST). The adjusted effect estimates and 95% confidence intervals are reported in Table. We used resting lying heart rate as a proxy for fitness level,¹ and found a positive effect on heart rate during the AST but no effect of concussion group.

We agree that reliance of fixed cutoffs for change in heart rate in pediatrics, although practical, could be problematic. The production of age- and sex-specific centiles curves was outside the limits of our study; however, we reference a large study in China which reported 95 percentiles for HR and blood pressure changes in 1449 children and adolescents during the AST.² Here, maximum heart rate change had occurred by 3–6 minutes and the 95th percentile was 38bpm. This is in keeping with the cutoff value used in our study at 5 minutes. We report violin curves of HR change which better describes distributions of HR change within and between groups in Figure.

Heart rate variability can provide more information about autonomic changes after a concussion. Recently, Ji et al.³ have also failed to find differences in HR variability early after recovery in a smaller control study of adolescents with sport-related concussion. Here, finger photo-plethysmography was used as suggested

TABLE.

Mixed Effects Modeling was Used to Estimate the Effect of mTBI Group on Heart Rate Changes During the Active Standing Test

Estimates of Fixed Effects on Heart Rate						
Parameter	Estimate	t	Sig.	95% Confidence Interval		
				Lower	Upper	
Intercept	42.410	3.943	<0.001	21.085	63.735	
Age at injury	0.116	0.259	0.796	−0.771	1.002	
Sex	−1.292	−0.550	0.583	−5.947	3.364	
Resting lying heart rate	0.694	7.161	<0.001	0.501	0.886	
Number of previous concussions	−0.327	−0.257	0.798	−2.851	2.197	
Healthy controls*	−4.219	−1.426	0.157	−10.086	1.648	
Asymptomatic mTBI*	−0.273	−0.093	0.926	−6.077	5.530	
	Mean HR estimate	SE	df	95% confidence interval		
Healthy controls	87.639 ^b	2.429	105	82.823	92.455	
Asymptomatic mTBI	91.584 ^b	2.428	105	86.770	96.398	
PPCS mTBI	91.857 ^b	1.524	105	88.835	94.880	

Abbreviations:

df = Degrees of freedom

HR = Heart rate

mTBI = Mild traumatic brain injury

PPCS = Postconcussion symptoms

SE = Standard error

Covariates appearing in the model are evaluated at the following values: age at injury = 13.74, gender = 1.52, resting lying HR = 72, number of previous concussions = 0.52.

* Compared to PPCS mTBI group.

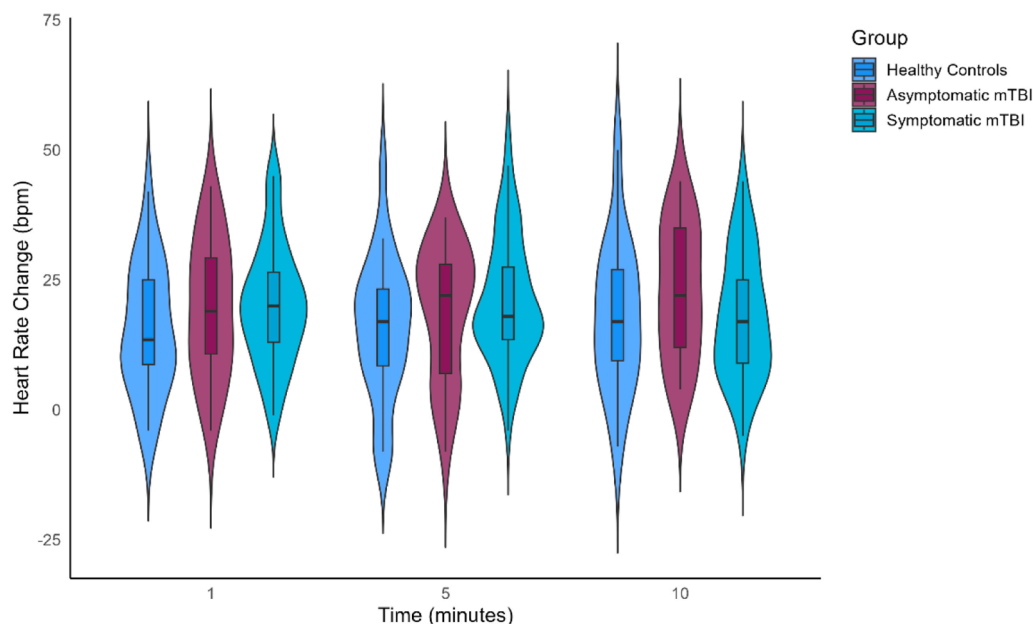


FIGURE. Violin curves demonstrating the change in heart rate (beats per minute, bpm) in children with and without persisting symptoms (symptomatic) following mTBI when compared to health controls of similar age and sex. Middle line = median, box edges = 25th and 75th percentiles (interquartile range, IQR), whiskers = $1.5 \times$ IQR; mTBI = Mild traumatic brain injury.

by Dedeepya et al. While we accept that our study could have been improved by the use of photo-plethysmography, it is unlikely to have changed our findings that POTS is not overly represented in children with persisting postconcussion symptoms and consideration should be given to other potential etiologies/contributing factors for POTS such as weight loss and deconditioning.

Declaration of competing interest

The authors declare no conflict of interest or financial disclosures concerning the materials or methods used in this study or the findings specified in this article.

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Karen M. Barlow, MBChB, MSc, PhD
 Acquired Brain Injury in Children Research Program, Child Health
 Research Centre, South Brisbane, Queensland, Australia
 E-mail address: k.barlow@uq.edu.au.

Athena Stein, MPhil, PhD
 Honorary Research Fellow, Acquired Brain Injury in Children Research
 Program, Child Health Research Centre, South Brisbane, Queensland,
 Australia

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