

Background

- Concussion management has shifted from a rest-is-best to an exercise-is-medicine mindset.
- Current evidence shows exercise treatment improves time to symptom recovery by nearly 5 days, however, the mechanisms behind these improvements remain unclear.^{1,2}

Objectives

1. To describe minute ventilation (VE) and respiratory rate (RR) during acute sub-maximal exercise in youth with concussion.
2. To compare the above parameters in youth with concussion to healthy controls.

Methods

Participants

- Youth aged 12-17 years diagnosed with concussion within the prior 4 weeks, as well as healthy controls.
- Participants could not have history of concussion.

Testing Procedures

- Participants completed the Buffalo Concussion Treadmill Test (BCTT) to evaluate cardiorespiratory response.
- VE, RR were measured using a calibrated metabolic cart.

Results

Table 1. Participant Demographics

	Concussion	Control
n (% female)	16 (56.3%)	15 (33.3%)
Age (years)	14.3 ± 2.1	15.4 ± 1.9

- A 2 x 5 (Group x Time) mixed-model ANOVA was used to test for differences over time in VE and RR.
- No significant main effect of group was found for either VE or RR.
- Significant interaction effects (Group X Time, $p < 0.001$), were observed for both outcomes of interest.
- VE (Figure 1) and RR (Figure 2) appear to increase at slower rates in the concussed group during exercise.

During exercise, children with concussion increase their breathing at a slower rate than healthy children.

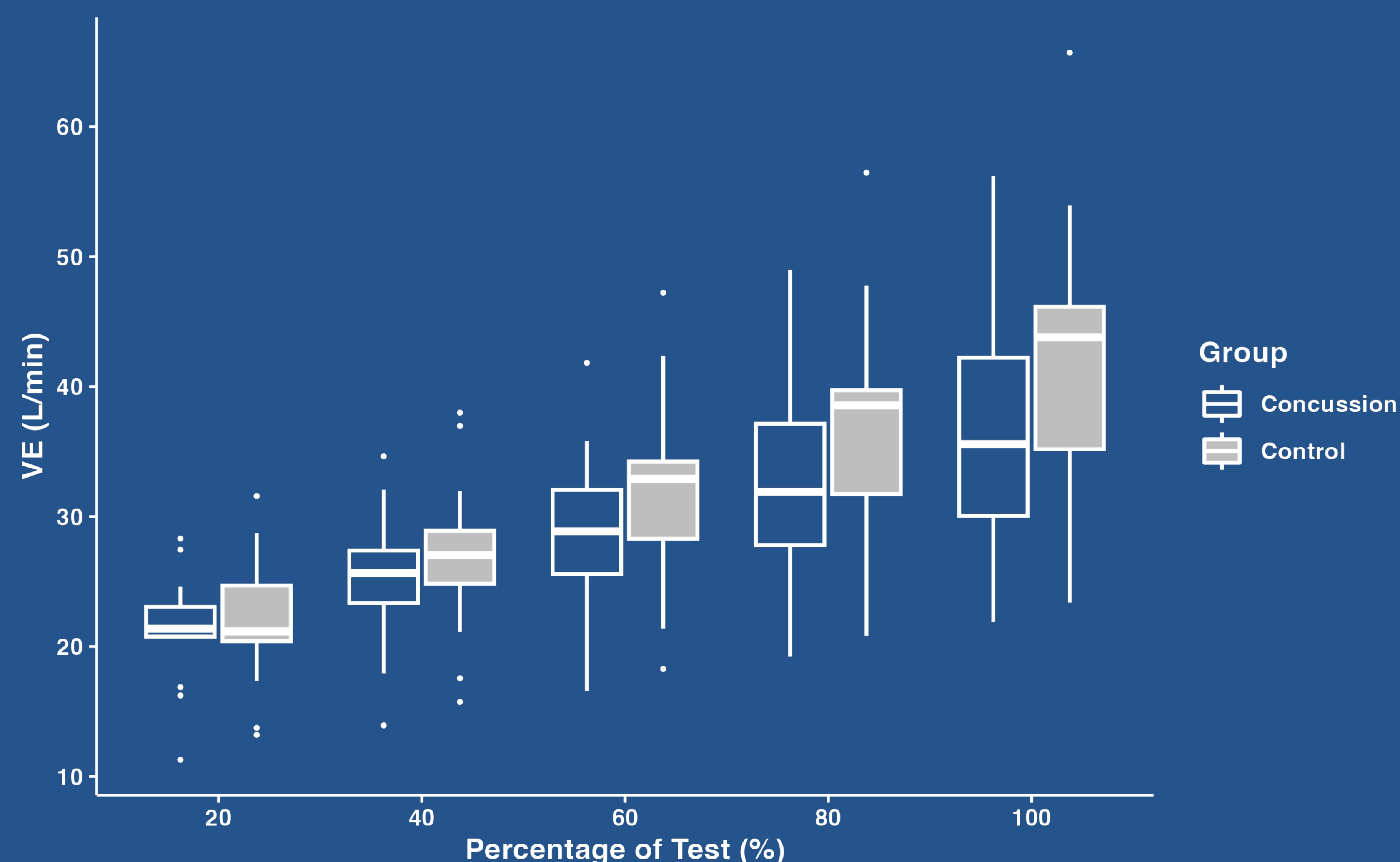


Figure 1. Minute ventilation (VE) by group, reported as a percentage of individual test duration.

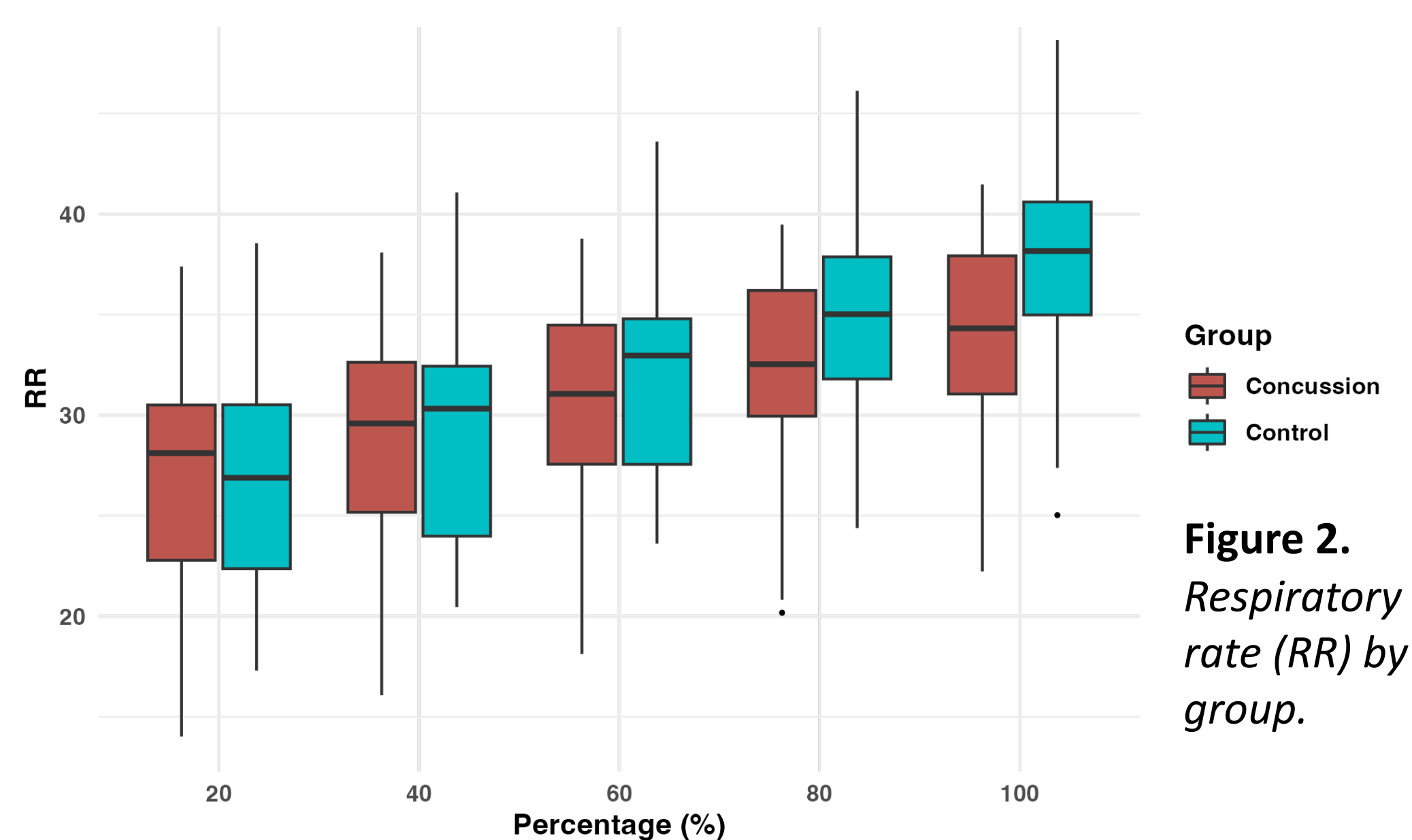


Figure 2. Respiratory rate (RR) by group.

Discussion

- The autonomic nervous system (ANS) is largely responsible for the regulation of breathing patterns and respiratory rate.³
- Our findings suggest potential alterations in ANS functioning in patients with concussion, aligning with current evidence.
- Further research is required to elucidate the mechanisms in which exercise addresses ANS dysfunction in concussion.

References

1. Leddy JJ, Burma JS, et al. *Br J Sports Med* 2023;57:762–770.
2. Lal A, et al. *Am J Sports Med*. 2018;46(3):743-752.
3. Wehrwein EA, et al. *Compr Physiol*. 2016 Jun 13;6(3):1239-78.

Acknowledgments

Special thanks to participants and their families.
The ConExNet study team.
The CHEMP team.