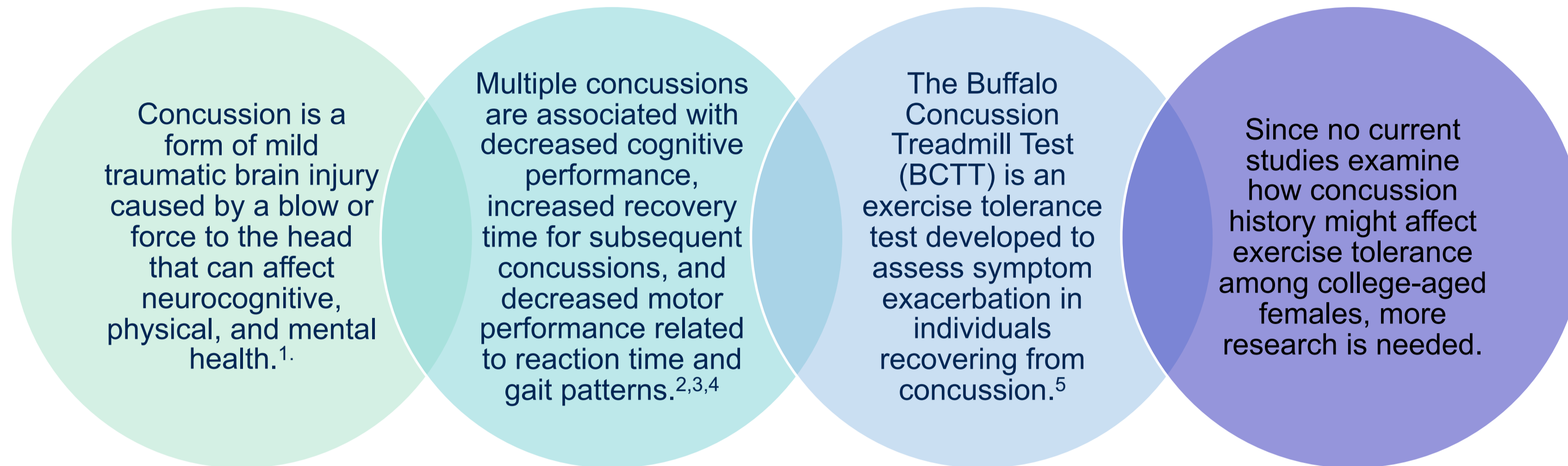


Role of Concussion History in Exercise Tolerance Among Collegiate Aged Females

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BACKGROUND



PURPOSE

The purpose of the present investigation was to determine if there are significant differences in performance on the Buffalo Concussion Treadmill Test between groups with and without a concussion history, regardless of how long ago the concussion(s) occurred.

METHODS

Study Design: Cross-sectional
Data Sources:

- The data utilized in this investigation were collected as a part of a larger pilot study in the STAR Heel Laboratory.
- Participants (n = 39) were 18 to 30-year-old females.

Measure	All Participants [range]	No concussion history [range]	Concussion history [range]
n	39	29	10
Sex	39/39 Female (100.0%)	29/29 Female (100.0%)	10/10 Female (100.0%)
Age (years)	22.69 ± 3.88 [18.0 – 30.0]	22.69 ± 3.87 [18.0-30.0]	22.70 ± 4.13 [18.0 – 30.0]
Hispanic/Latino	Yes = 2/39 (5.1%) Prefer Not to Answer = 1/39 (2.6%)	Yes = 1/29 (5.1%)	Yes = 1/10 (10.0%) Prefer not to Answer = 1/10 (10.0%)
American Indian or Alaska Native	Yes = 1/39 (2.6%)	Yes = 1/29 (3.4%)	Yes = 0/10 (0.0%)
Asian	Yes = 6/39 (15.4%)	Yes = 5/29 (17.2%)	Yes = 1/10 (10.0%)
Black or African American	Yes = 1/39 (2.6%)	Yes = 1/29 (3.4%)	Yes = 0/10 (0.0%)
Native Hawaiian or other Pacific Islander	Yes = 1/39 (2.6%)	Yes = 1/29 (3.4%)	Yes = 0/10 (0.0%)
White	Yes = 33/39 (84.6%)	Yes = 23/29 (79.3%)	Yes = 10/10 (100.0%)

Table 1. Participant demographic characteristics.

METHODS

Data Collection:

- Exclusion criteria included active vertigo and/or vestibular dysfunction, past moderate or severe traumatic brain injury, or medical recommendations against physical activity.
- Participants first completed surveys that involved demographic information, including current age (years), height (inches), number of past concussions, and biological sex assigned at birth.
- NIH Race/Ethnicity categories were used to determine racial and ethnic backgrounds of participants, as seen in Table 1.
- Participants then completed the BCTT. Protocol is described in Figure 2.
- Starting speed was 3.2 miles per hour for individuals with height < 70 inches and 3.6 miles per hour for individuals with height ≥ 70 inches.

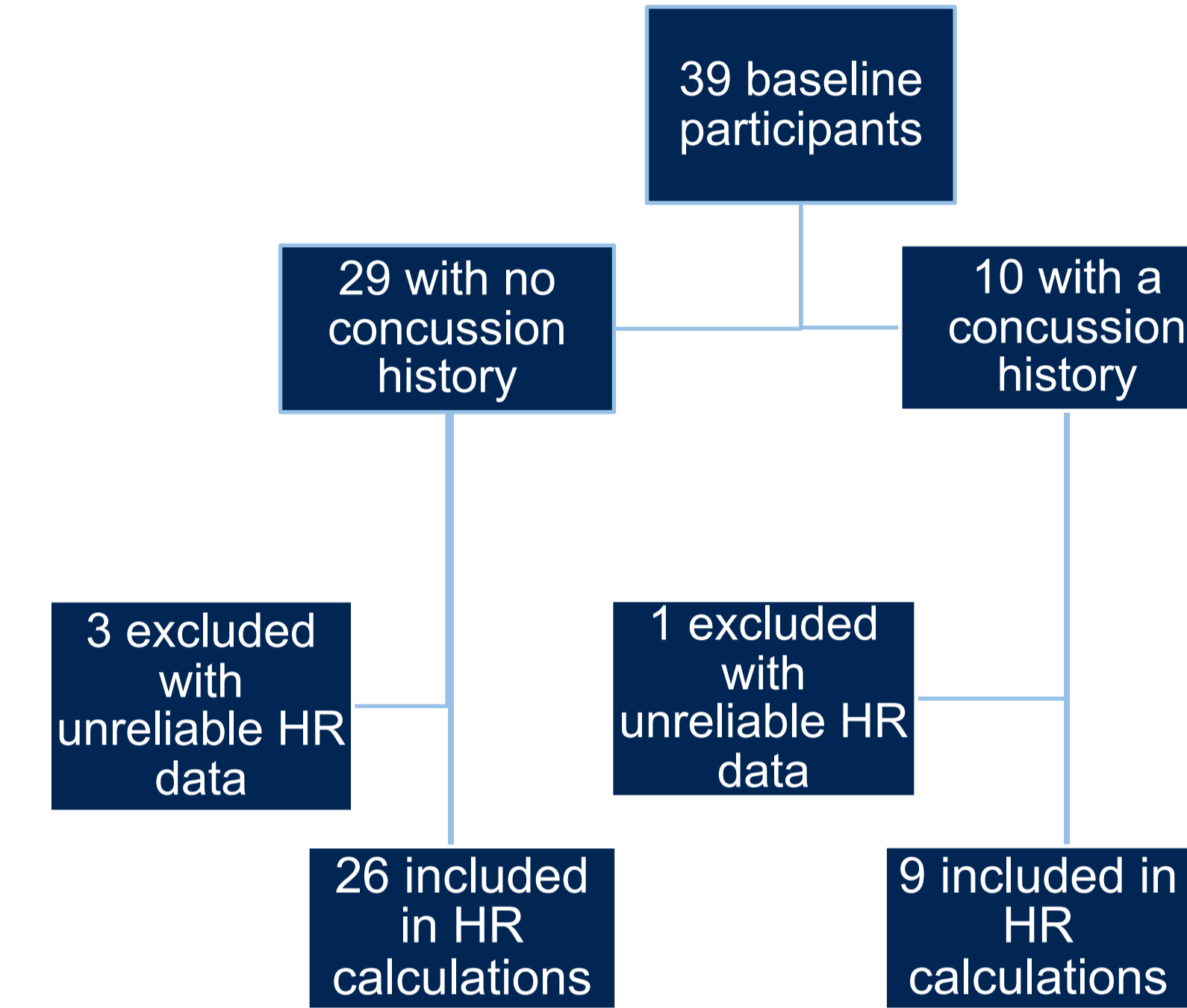


Figure 1. Participant Inclusions.



Figure 2. BCTT protocols.

- At the end of every minute, participants were asked to rate concussion symptom severity with the Visual Analogue Scale (VAS) to rate symptoms from a severity of 0 (minimal) to 10 (maximal).
- Participants also rated their exertion at the end of every minute with the Borg Rating of Perceived Exertion (RPE) on a scale of 6 (minimal) to 20 (maximal).
- Heart rate (beats per minute) was also recorded at the end of every minute.
- Possible reasons for BCTT termination are summarized in Figure 3.

BCTT Termination Causes

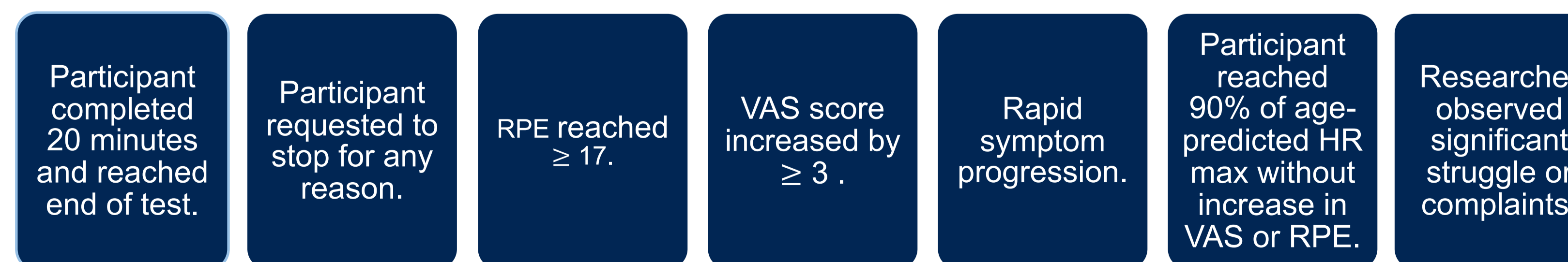


Figure 3. BCTT Termination Causes.

Statistical Analysis:

- Independent Samples t-tests were performed to determine the significance of differences in maximum heart rate (bpm) and exercise tolerance (minutes completed on the BCTT) between those with and without a concussion history.

RESULTS

Measure	All Participants [range]	No Concussion History [range]	Concussion History [range]	t-test P-value
Minutes Completed of BCTT	14.31 ± 3.96 [4.0 – 20.0]	14.55 ± 4.04 [4.0 – 20.0]	13.60 ± 3.81 [6.0 – 19.0]	0.502
Maximum Heart Rate During BCTT (bpm)	177.31 ± 13.332 [151.0 – 205.0]	178.66 ± 12.21 [158.0 – 205.0]	173.40 ± 16.25 [151.0 – 205.0]	0.649

Table 2. Comparison of exercise tolerance (minutes of BCTT completed) and maximum heart rate during BCTT (bpm) between groups with and without a concussion history.

Results

- 4 participants had unreliable heart rate data (1 from concussion history group, 3 from group with no concussion history) and were excluded from the maximum HR calculation.
- The most common reasons across both groups for stopping the test were voluntary exhaustion (n = 16) and the participant requesting termination of the test (n = 17).
- The mean number of minutes completed by each group on the test did not vary significantly (p = .649), nor did the maximum heart rate at the end of the test (p = .444).

CONCLUSIONS

No significant differences exist in exercise tolerance between those with and without a concussion based on minutes completed or maximum heart rate during the Buffalo Concussion Treadmill Test.

More research is needed to determine if performance would differ significantly with group stratification based on the number of past concussions.

It should also be noted that length since the last concussion may impact the minutes completed or HR max on the Buffalo Concussion Treadmill test.

Future research on this assessment should also focus on how physical activity level impacts an individual's performance.

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