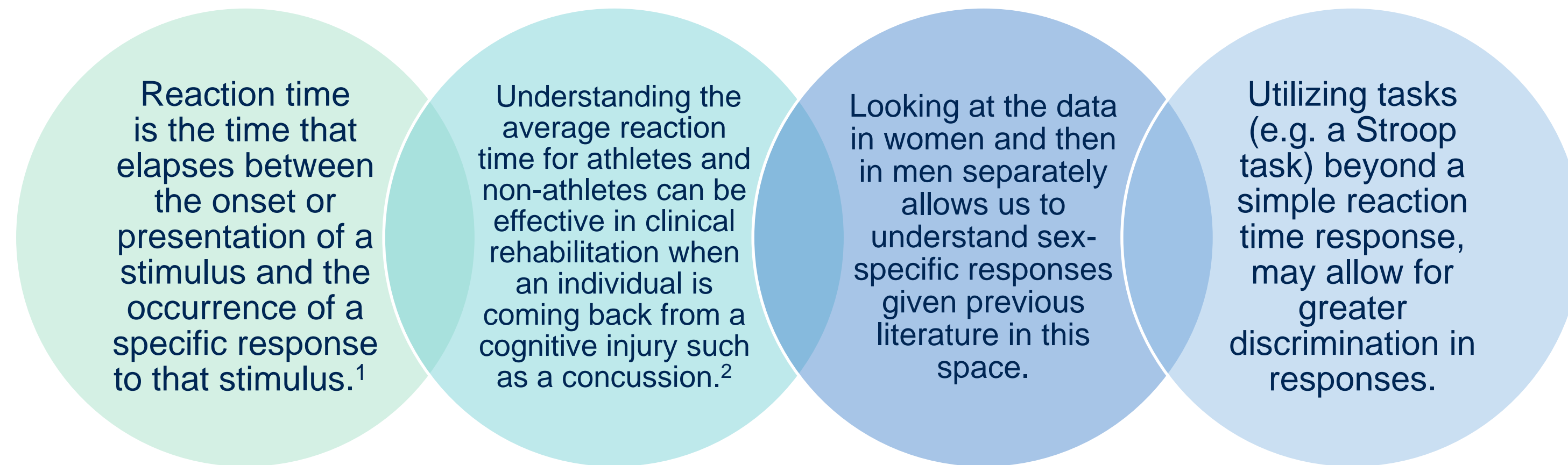


A Comparative Analysis of Stroop Reaction Times Between Male and Female Collegiate Athletes and Non-Athletes in the Young Adult Population

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BACKGROUND



PURPOSE

The purpose of this study was to evaluate the effect of athletic history, examined in males and females separately, on complex reaction time metrics.

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=75, 23 males[13 athletes]; 52 females[22 athletes]; Aged(18-24)

Measure	Male Athletes	Male Non-Athletes	Female Athletes	Female Non-Athletes
n	13	10	22	30
History of Reported Concussion	5/13 (38.5%)	4/10 (40.0%)	12/22 (54.5%)	11/30 (36.7%)
History of Learning Disorders	1/13 (07.7%)	3/10 (30.0%)	5/22 (22.7%)	7/30 (23.3%)
Hispanic/Latino	1/13 (07.7%)	1/10 (10.0%)	2/22 (09.1%)	4/30 (13.3%)
American Indian or Alaska Native	1/13 (07.7%)	0/10 (0.0%)	0/22 (0.0%)	0/30 (0.0%)
Asian	1/13 (07.7%)	2/10 (20.0%)	3/22 (13.6%)	4/30 (13.3%)
Black or African American	3/13 (23.1%)	2/10 (20.0%)	1/22 (04.5%)	2/30 (06.7%)
Native Hawaiian or other Pacific Islander	0/13 (0.0%)	0/10 (0.0%)	0/22 (0.0%)	0/30 (0.0%)
White	11/13 (84.6%)	6/10 (60.0%)	19/22 (86.4%)	24/30 (80.0%)

Table 1. Participant demographic characteristics.

METHODS

Data Collection:

- Exclusion criteria for this cross-sectional study included having an active concussion or currently experiencing persistent concussion symptoms as indicated by a single question in the screener. Inclusion criteria were being within 18-25 years of age and identifying as a college student.
- Participants first completed surveys that involved demographic information, including current age, height (inches), concussion history, learning disorders, academic year, biological sex assigned at birth, and NIH Race/Ethnicity as seen as in Table 1.
- The participants completed the Stroop test from Central Nervous System Vital Signs (CNS Vital Signs LLC; Chapel Hill, NC) twice, before and after a functional reaction time task (not included in current study).
- All data included in this study were collected in an on-campus research laboratory.

- This Stroop test was taken on a laptop computer equipped with a standard wired keyboard and the participants response was measured once they clicked the space bar once the correct option was on the screen. Timing and accuracy were collected via key stroke data.
- Participants first completed a simple reaction time task (not included in current study), followed by a congruent Stroop task, and lastly an incongruent Stroop task (Figure 1). They completed each of these twice during the testing session. (Figure 2)

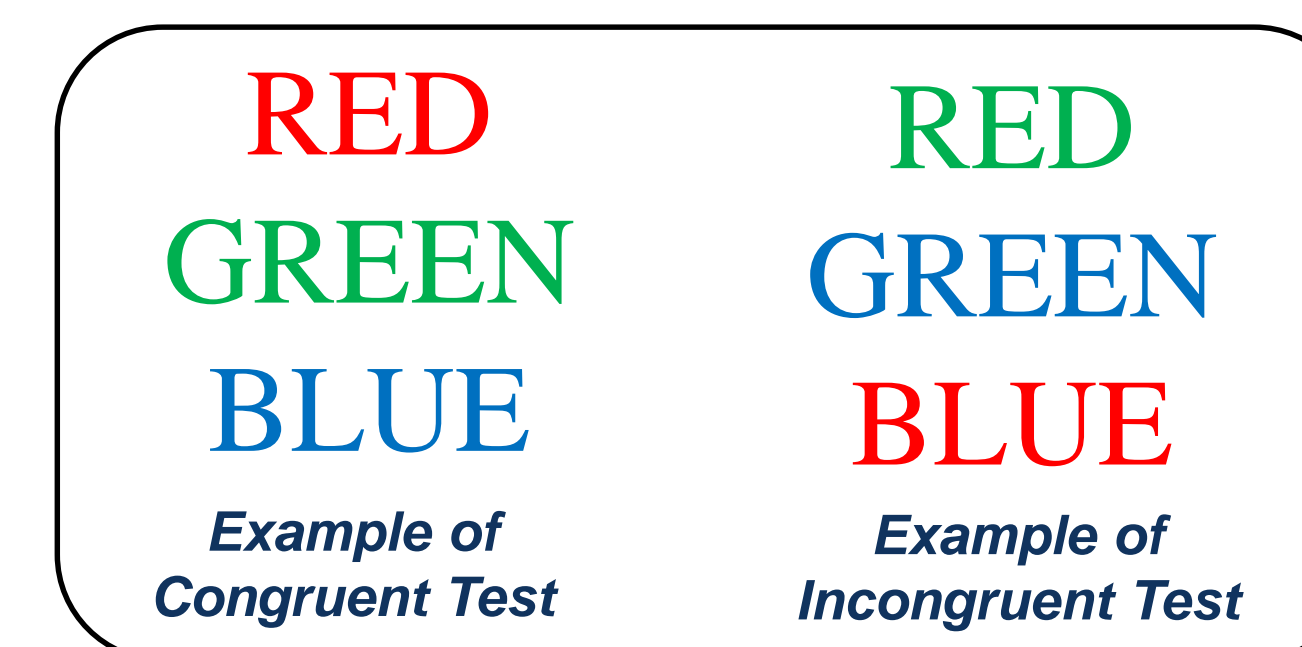


Figure 1. Example of congruent and incongruent Stroop presentations

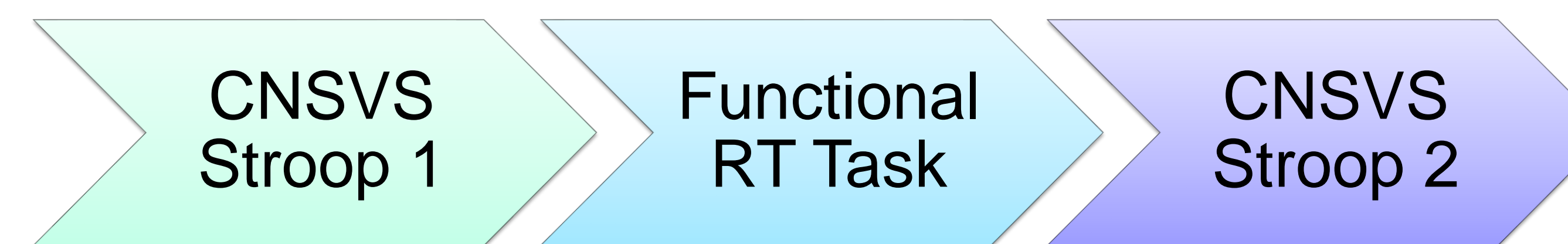


Figure 2. Testing Order (RT=reaction time)

- We compared athletes (previous athletic history in past year) to non-athletes (no previous athletic history in the past year) on the four reaction time outcomes in males and females separately via separate T-tests for each outcome. Effect sizes were reported for all comparisons. (Table 2)

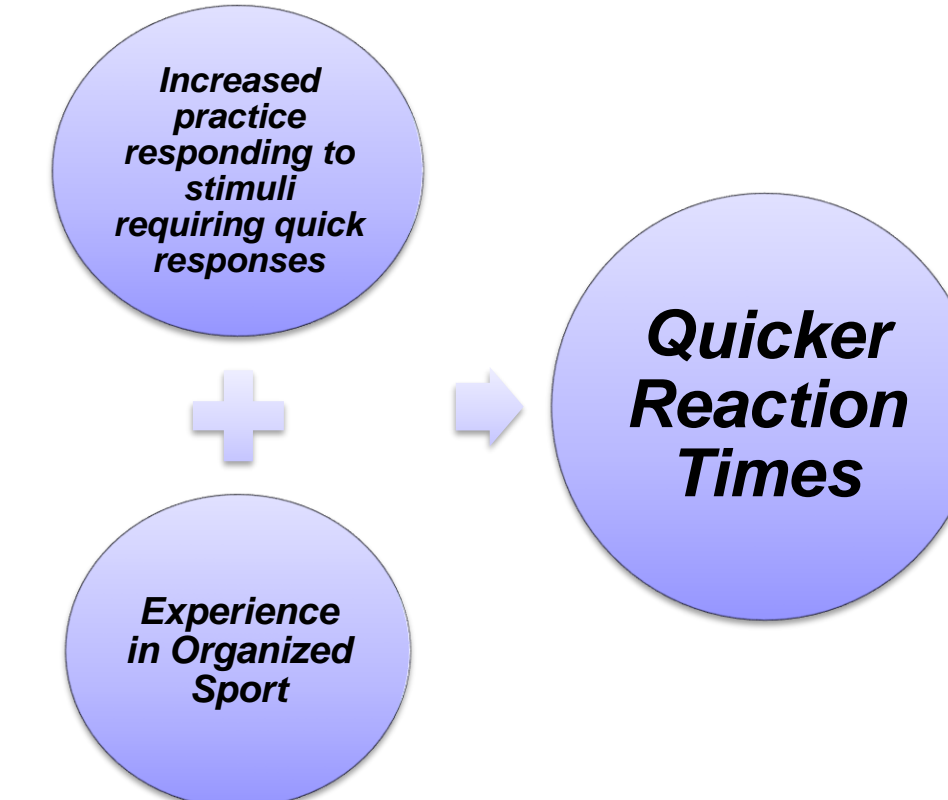


Figure 3. Figure with hypothesized impact of athletic experience on reaction time

Basis for the study:

- We hypothesized previous athletic experience would allow the athletes to react quicker than the non-athletes on the basis that being involved in the repetition of sport would yield faster reaction time responses. (Figure 3)
- We also hypothesized these responses may be sex specific and that magnitude of effect may differ by sex, given previous literature identifying sex specific responses to various cognitive stimuli.

RESULTS

Variable of Interest	Females				Males				Full Sample
	Athlete	Non-Athlete	p	Cohen's D	Athlete	Non-Athlete	p	Cohen's D	
Incongruent RT1 (ms)	Mean (SD) 627.4 (80.8)	Mean (SD) 640.9 (66.8)	0.513	-0.1849	Mean (SD) 605.9 (52.1)	Mean (SD) 631.7 (67.9)	0.314	-0.434	Mean (SD) 629.7 (68.9)
Congruent RT1 (ms)	545.7 (59.7)	566.0 (58.4)	0.225	-0.3445	521.7 (39.8)	549.3 (55.4)	0.178	-0.586	550.2 (56.8)
Incongruent RT2 (ms)	632.9 (95.0)	629.2 (59.2)	0.862	0.0492	609.0 (67.7)	628.1 (100.5)	0.592	-0.229	626.7 (77.3)
Congruent RT2 (ms)	545.8 (82.7)	559.0 (35.8)	0.437	-0.2198	526.5 (39.4)	561.3 (56.9)	0.098	-0.728	549.8 (56.9)

Table 2. Reaction time (correct) data comparisons between athletes and non-athletes in the study sample.

Results

- There were no significant differences in any reaction time outcomes for athlete vs. non-athlete comparisons in males or in females.
- However, in males, the effect sizes for all comparisons were greater, with 2 of 4 outcomes illustrating moderate effects sizes (>0.5) while none of the female comparisons illustrated an effect size over 0.4.

CONCLUSIONS

No significant differences in Stroop reaction times were observed between athletes and non-athletes in males or in females.

Effects sizes were greater in males, illustrating potential differences in the magnitude of effects by sex.

These findings indicate the need for continued exploration of sex and potentially sport specific outcomes of reaction time metrics to further inform their clinical use.

This study was limited by the number of athletes in each group; future research should include larger and more diverse samples.

This research highlights the need for more research concerning reaction time responses given their frequency of use in concussion management.

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