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# Examining The Use of Two Novel Recovery Techniques on Reaction Time

Jack Hensley, Dustin Keltsch, Markus Roberts, Nolan Gardner, Trevor Durfee  
Faculty Mentor: Dr. Brian Rider

## Abstract

Box Breathing is a breathing technique in which a person inhales, holds, exhales, and holds, in four-second increments. It is believed to help improve an individual's focus. Purpose: This study was conducted to determine if Box Breathing would improve reaction time in lacrosse players after an exhaustive bout of exercise, compared to active recovery and passive recovery. Methods: Participants were familiarized with the components of the study, and then they returned on three separate days, approximately 2-10 days apart for three additional testing visits. Participants performed a 10-minute exhaustive bout of exercise on a cycle ergometer, then performed one of three recovery methods—passive recovery, active recovery, and Box Breathing—on separate days. Following the recovery bout, participants performed the ruler drop test to measure their reaction time. Nine participants (male n=6, female n=3) completed the study. Results: There were no significant differences in reaction time across conditions, passive recovery (359.6 ± 118.9 mm), active recovery (351.1 ± 111.0 mm), and Box Breathing (364.9 ± 92.8 mm). However, there were differences in the percentages of times the participants failed to catch the ruler (counted as “drops”). Specifically, Box Breathing resulted in the highest (28.9%) number of drops whereas active recovery resulted in the fewest (10%). Conclusions: Box Breathing does not appear to improve reaction time following an exhaustive bout of exercise when compared to traditional recovery techniques.

## Background

Reaction time can be defined as the time it takes to initiate a behavioral response after the presentation of a sensory stimulus

Reaction time has been tested in various ways. One of the most popular is the ruler drop test

Prior studies have shown that guided breathwork pre and post exercise had positive effects on concentration, focus, and heart rate

The Box breathing technique has been used by Navy Seals in high stress situations across generations and involves a series of 4-second breath exhales and inhales.

We believe that improvements in reaction time would benefit lacrosse performance and that Box Breathing could potentially improve reaction time.

## Purpose

To determine if Box Breathing would improve reaction time in lacrosse players after an exhaustive bout of exercise, compared to traditional active recovery and passive recovery techniques.



Figure 1. Hope College lacrosse athletes

## METHODS

### Week 1

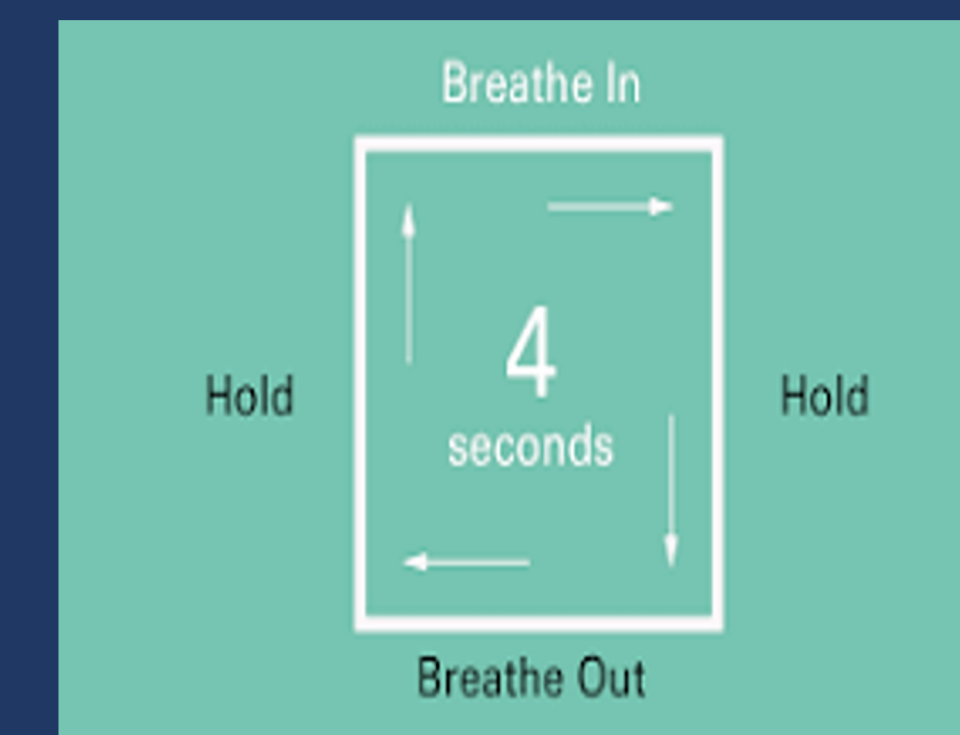
#### Familiarization

Participants completed necessary consent and health history forms.

Participants were familiarized with the recovery methods (active, passive, Box Breathing)

Participants completed a submaximal cycle test to determine 60% and 80% of their heart rate max.

Participants practiced the ruler drop test



a.



b.

Figure 2. a) Box Breathing method diagram b) Cycle test

### Week 2

Participants completed 3 testing sessions (at least 48 hours between sessions)

Participants completed a 10-minute exhaustive cycling protocol

Following the cycling protocol participants engaged in one of three recovery methods

- Placebo
- Active Recovery
- Box Breathing

Following the recovery method they completed 10 trials of ruler drop test



Figure 3. Participants performing the drop test

Table 1. Participant Characteristics reported as means and standard deviation

	Height (cm)	Weight (kg)	Age (y)
Males (n=6)	181.5	81.47	20
	8.5	8.0	2.0
Females (n=3)	169	81.63	19
	3.0	6.0	1.0

#### Statistical Analysis

Repeated Measures ANOVA

Paired T-Tests for between device comparisons with a post hoc Bonferroni correction

## Results

- There were no difference in reaction time across recovery conditions (Figure 4)
- Participants dropped more rulers following box breathing compared to other recovery conditions (Figure 6)

## RESULTS

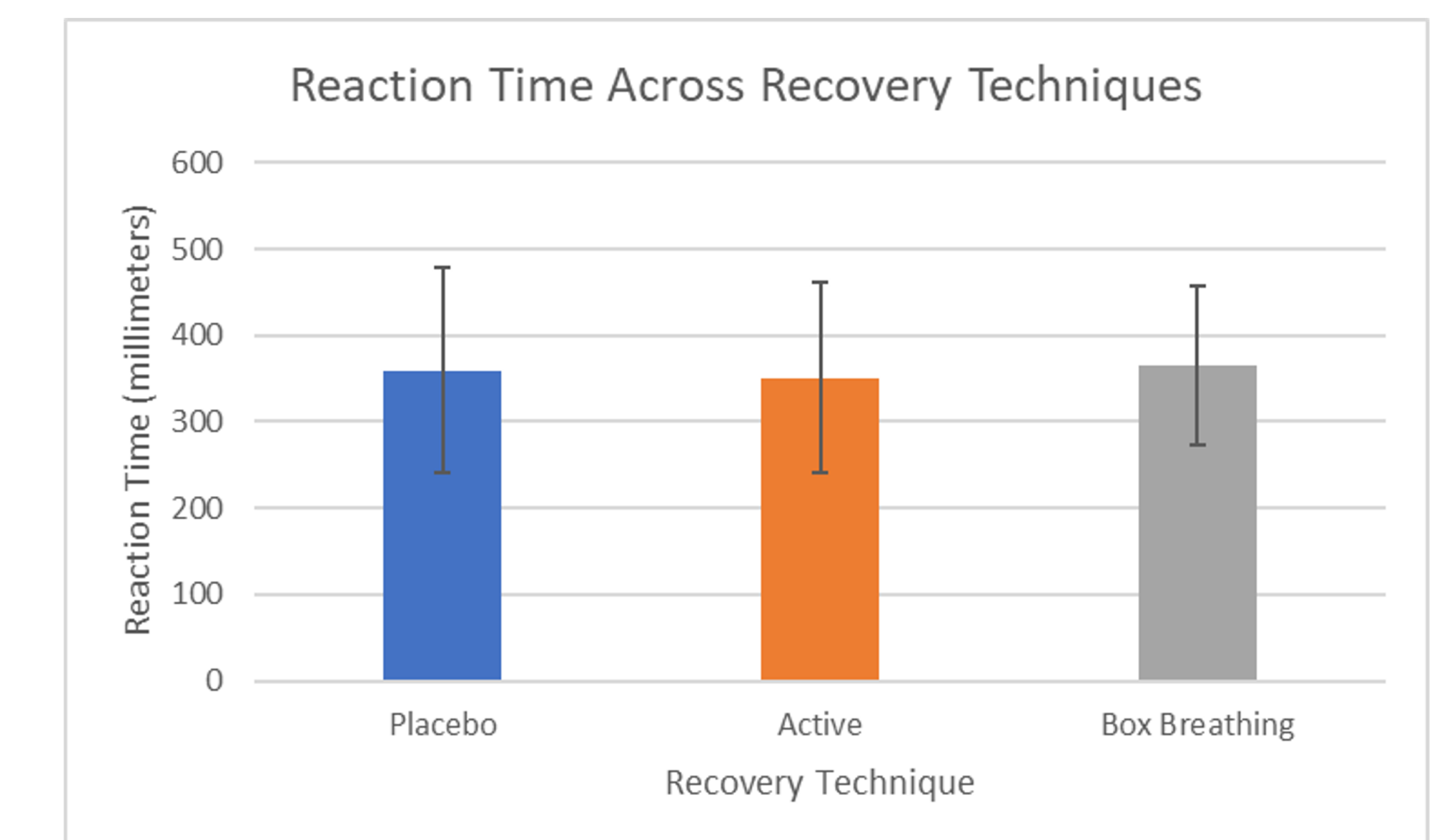


Figure 4. Reaction time across recovery techniques.

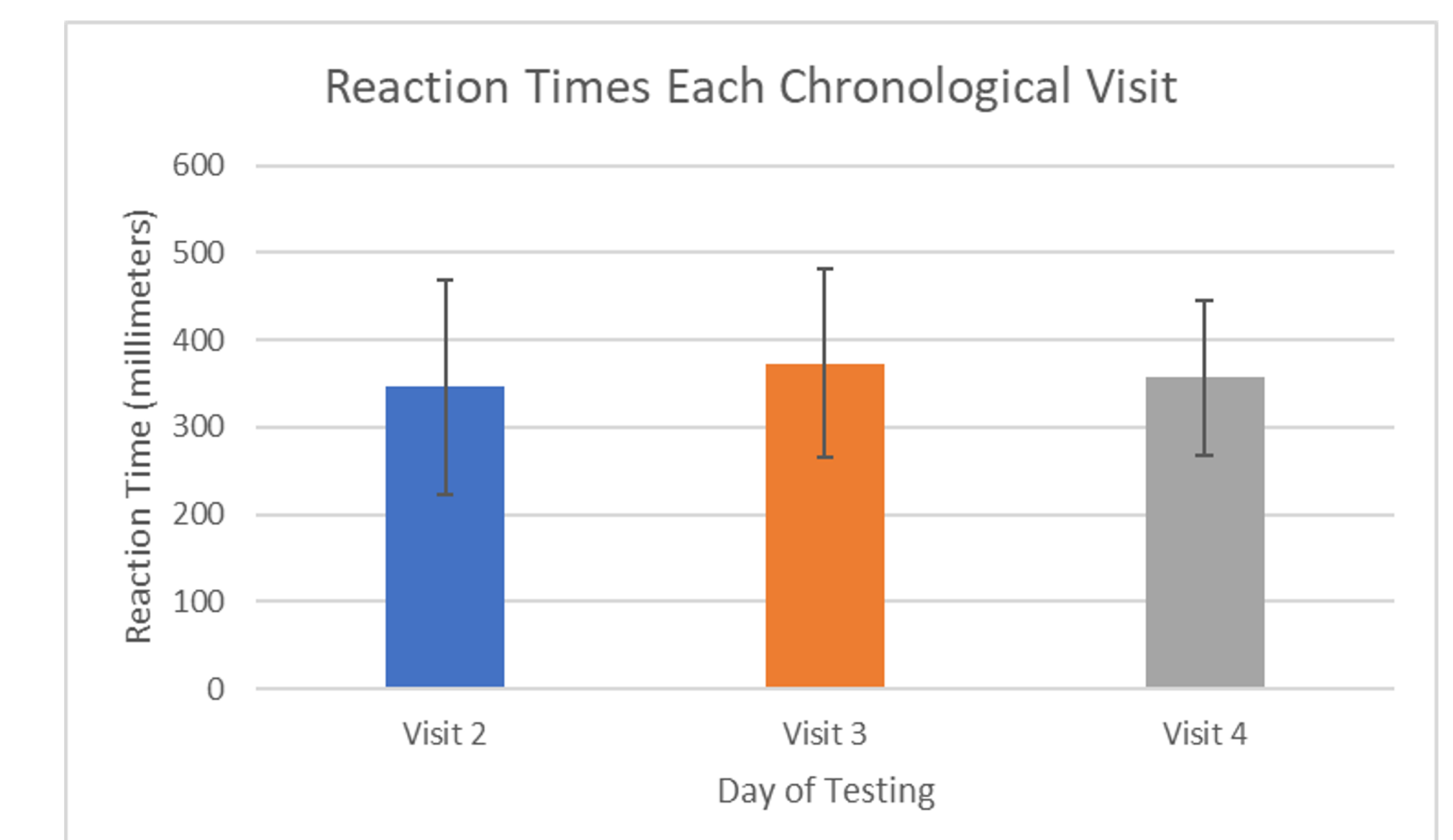


Figure 5. Reaction time based on visit time

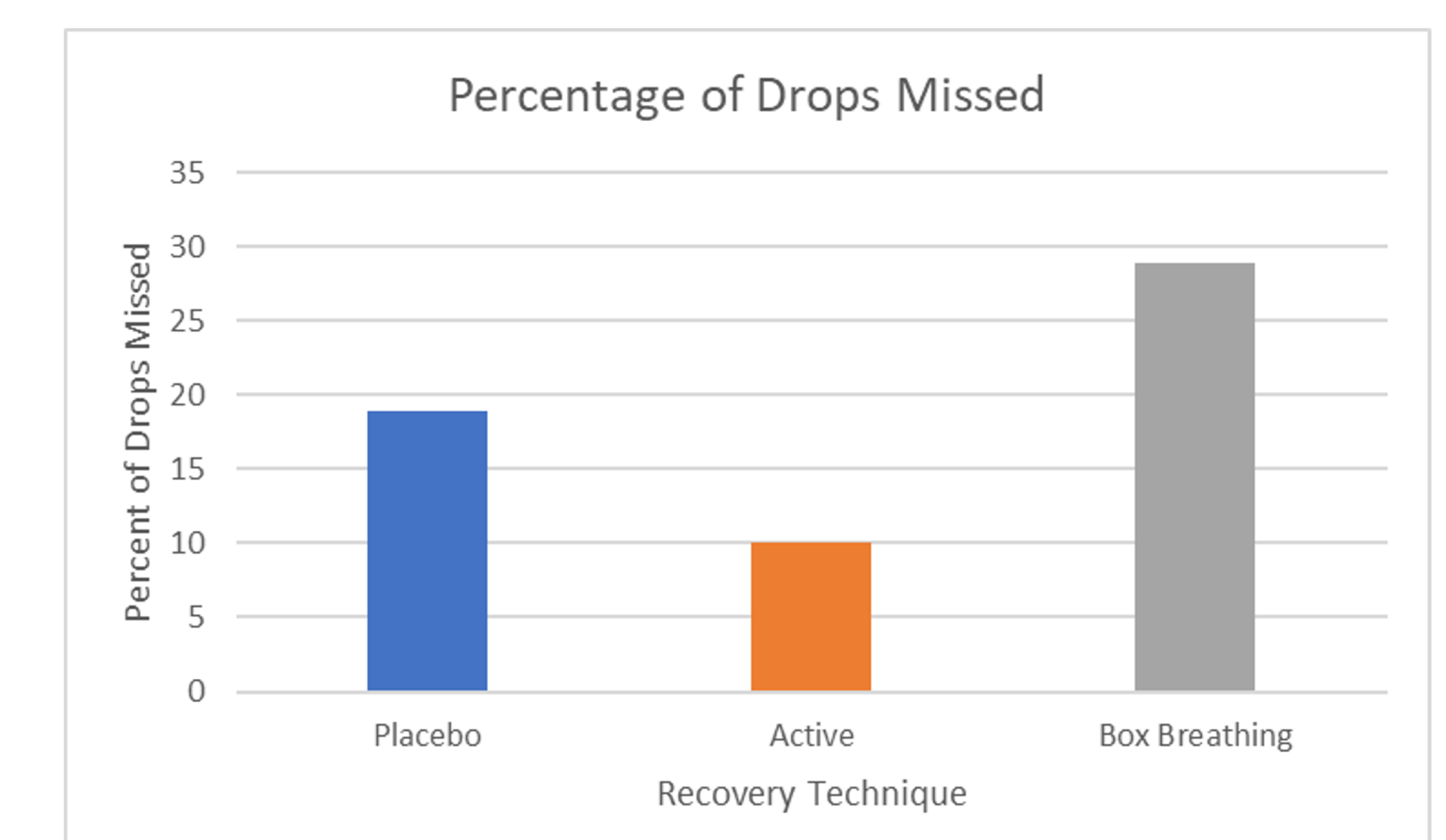


Figure 6. Percent of drops missed across conditions

## CONCLUSIONS

There was no significant difference in reaction time between conditions.

It is unclear why participants dropped more rulers following box breathing.