

# Comparison of Heart Rate Recovery Following Two Maximal Graded Exercise Test Protocols in Adult Male Recreational Runners



Adrienne A. East, Andrew D. Fields, Hallie T. Chojnacki, Matthew A. Mohammadnabi, Logan Minor, Michael R. Esco

The University of Alabama, Department of Kinesiology

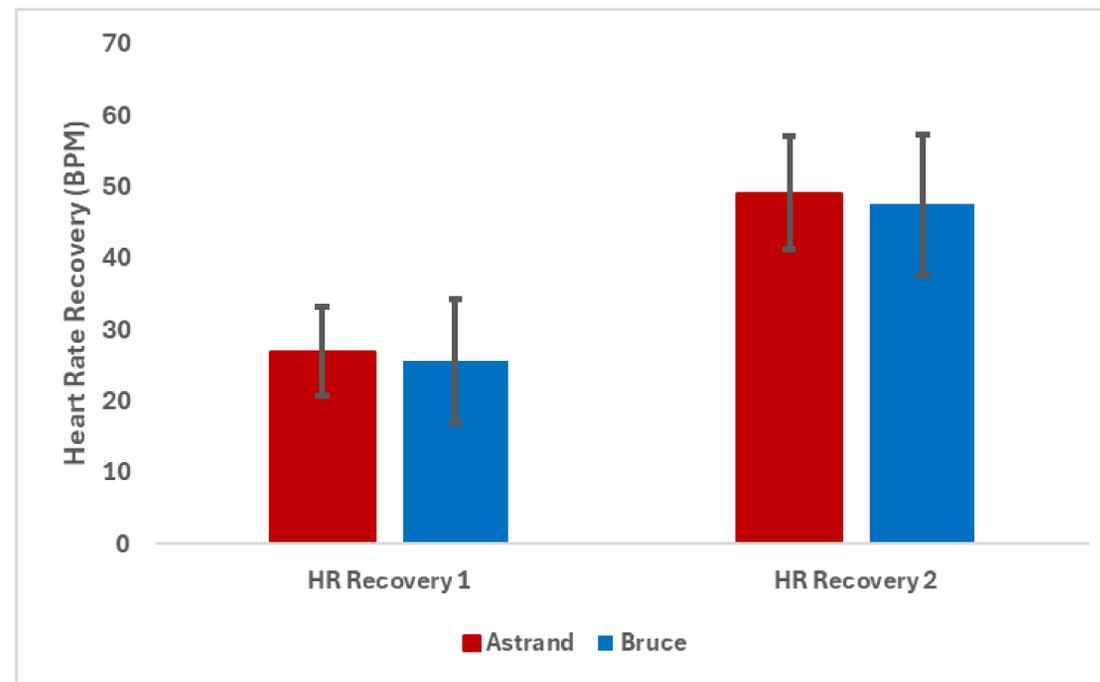
## Introduction

- Heart rate recovery (HRR) is a non-invasive marker of parasympathetic rebound and is an indicator of cardiovascular fitness.
- A faster HRR following exercise reflects a faster return to baseline heart rate, which suggests greater autonomic recovery and cardiovascular health.
- The purpose of this study was to compare HRR values following two different maximal graded exercise test (GXT) protocols.

## Methods

- Nine adult male participants (age =  $22.6 \pm 5.4$  years, height =  $163.8 \pm 6.4$  cm, weight =  $83.8 \pm 10.8$  kg) were recruited for this study.
- Participants completed two randomized GXT protocols separated by 72 hours to one week.
- The first protocol was the Astrand method, which maintained constant speed and increased grade every 3 minutes until exhaustion.
- The second protocol was the Bruce method, which increased both speed and grade every 3 minutes until exhaustion.
- Heart rate was continuously monitored throughout the GXT and during a 3-minute active recovery period.
- The heart rates during the first and second minutes of the active recovery period were subtracted from maximal heart rate (MHR) and recorded as HRR1 and HRR2, respectively.

## Results



	Astrand GXT Protocol	Bruce GXT Protocol
HR Recovery 1	26.9 ± 6.2	25.5 ± 8.7
HR Recovery 2	49.1 ± 8.0	47.5 ± 9.8

No difference was found in HRR between protocols ( $p > 0.05$ ).

Data are reported as means ± standard deviation (BPM).

## Conclusions

- Following the Astrand and Bruce protocols, HRR1 was  $26.9 \pm 6.2$  beats.min<sup>-1</sup> and  $25.5 \pm 8.7$  beats.min<sup>-1</sup>, respectively.
- HRR2 was  $47.5 \pm 9.8$  beats.min<sup>-1</sup> and  $26.9 \pm 6.2$  beats.min<sup>-1</sup> for the Astrand and Bruce protocols, respectively.
- There were no significant mean differences between the two GXT protocols for either HRR1 ( $p = 0.46$ ) or HRR2 ( $p = 0.75$ ).
- The correlation values shown for both HRR1 ( $r = 0.83$ ,  $p = 0.01$ ) and HRR2 ( $r = 0.78$ ,  $p = 0.02$ ) were significant.
- Both the Astrand and Bruce protocols produced similar HRR values
- This indicates that the type of GXT protocol may not substantially influence HRR outcomes.

## Practical Applications

- Practitioners can confidently use either the Astrand or Bruce protocol to assess HRR in recreationally active individuals.
- Since both protocols produced similar results, the choice of protocol may depend on logistical considerations or the specific goals of the testing session.

## References

**Available upon request**