

Using the Isometric Handgrip to Predict and Treat Future Hypertension

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Background

- Hypertension (HTN) is defined as:
 - Systolic blood pressure (SBP) ≥ 130 mmHg and/or a diastolic blood pressure (DBP) ≥ 80 mmHg
- Approximately 45% of adults in America suffer from HTN
 - HTN is a known risk factor of Cardiovascular Disease (CVD), the leading cause of death in Americans
- According to the American College of Sports Medicine, HTN may be predictable and is associated with an exaggerated blood pressure (BP) response
- The Isometric Hand Grip Test (IHGT) has been demonstrated to assess the exaggerated BP response

Methods

- Prior to testing, the client should abstain from caffeine and strenuous exercise for at least 24 hours and food for at least 3 hours
- The client is seated for measurement of maximal voluntary contraction (MVC) using hand grip dynamometry
 - Using the dominant arm the participant performs 3 MVC trials each separated by 10 seconds of rest
 - The peak of each MVC is determined, then the average of all the peaks is calculated; 30% MVC is calculated in order to determine intensity during IHGT
- Next, the client is prepared with a 3-lead electrocardiogram (ECG) to allow for measurement of heart rate (HR)
- A BP cuff is placed on the non-dominant arm for assessment of BP via sphygmomanometry
- The participant is allowed a 5-10 minute seated, quiet rest to allow for resting levels of HR and BP
- Following, IHGT is performed for 3 minutes at 30% MVC (Figure 1)
 - HR and BP are measured at the end of each minute and following a 5 minute recovery
- BP reactivity is calculated by subtracting BP at rest from highest BP during IHGT
 - An exaggerated response is defined as BP reactivity > 22 mmHg

Interventions

Exercise training has been demonstrated to reduce BP reactivity:

- Millar et al. (2012)
 - Individuals with HTN completed 3 sessions/week for 8 weeks of IHG training; 4 sets of 2 min IHG at 30% MVC separated by 4 mins of rest
 - Reduced SBP by ~ 5 mmHg and MAP by 3mmHg
- Ogbutor et al. (2019)
 - Individuals with pre HTN completed 2 min IHG at 30% MVC for 24 consecutive days
 - Reduced SBP by ~ 8 mmHg and DBP by ~ 6 mmHg

Conclusions

- Future HTN may be predictable via an exaggerated BP response during exercise
- The IHGT is a useful tool in assessment in future HTN risk
- Augmentation of the EPR may be responsible for the exaggerated BP response
- IHG training could help to reduce BP reactivity and therefore development of future HTN

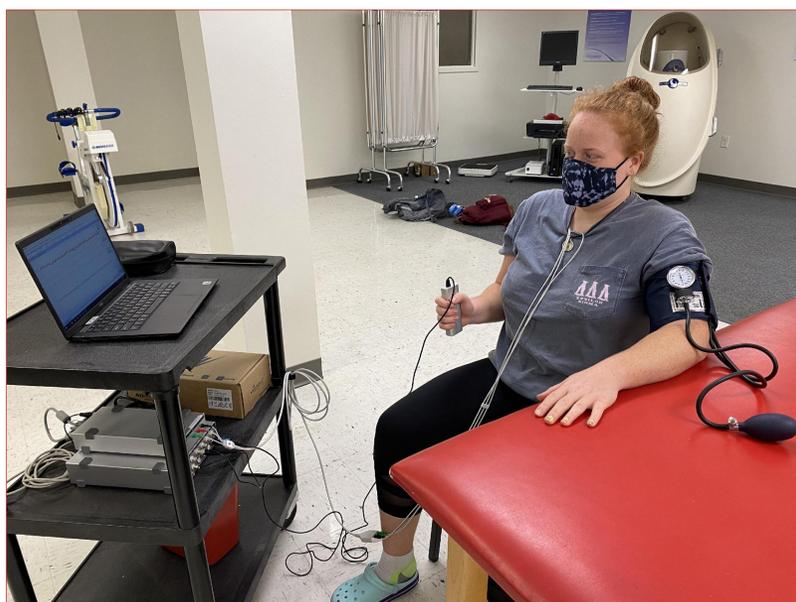


Figure 1. The isometric hand grip test

Mechanisms

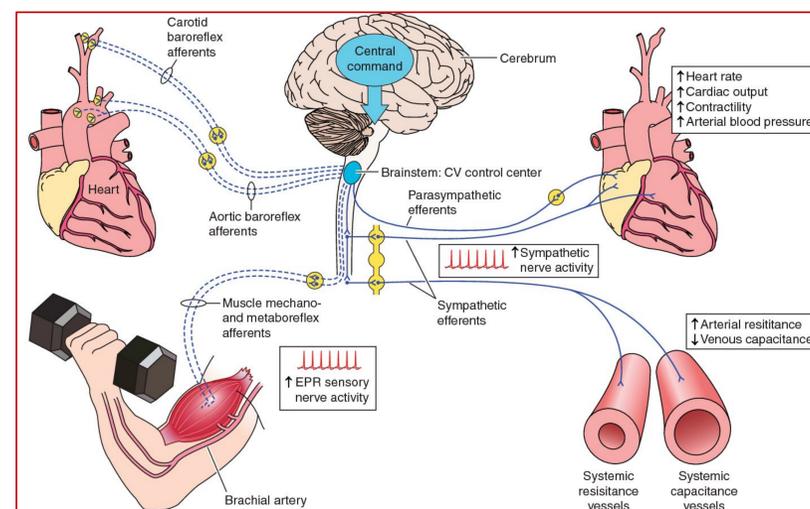


Figure 2. The Exercise Pressor Response

Adapted from: Spranger, M.D., Krishnan, A.C., Levy, P., O'Leary, D., & Smith, S. (2015). Blood flow restriction training and the exercise pressor reflex: a call for concern. *American journal of physiology. Heart and circulatory physiology*, 309 9, H1440-52.

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