

Background

- High blood pressure (BP), commonly known as hypertension (HTN), is defined as a systolic blood pressure (SBP) of ≥ 130 mmHg and/or a diastolic blood pressure (DBP) of ≥ 80 mmHg
 - In America nearly half (45%) of the population has HTN
 - HTN is strongly associated with the development of cardiovascular diseases (CVD)
- The American College of Sports Medicine suggests that HTN may be predictable via an exaggerated BP response
 - This abnormal BP response may be mediated by a heightened metaboreflex
 - Possibly due to abnormalities in autonomic nervous system (ANS) function
- The post exercise muscle ischemia (PEMI) test has been used to determine BP lability when the metaboreflex is invoked
 - A BP lability >22 mmHg is used to identify a hypertreactor which may help predict risk of future HTN

Methods

- Prior to the test, the client should avoid caffeine and strenuous exercise for at least 24 hours and food ≥ 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 separated by 10 seconds of rest
 - 30% MVC is calculated from the mean of the 3 trials calculated in order to determine intensity during isometric hand grip (IHG) exercise
- A BP cuff is wrapped on the upper dominant arm and another on the non-dominant arm to be used for assessment of BP via sphygmomanometry
- The participant is allowed a 10 minute seated, quiet rest to allow for resting levels of BP to be reached
- Following, IHG exercise is performed for 3 minutes at 30% MVC
 - BP is measured at the end of each minute
- In the final 5 seconds of IHG exercise, the upper BP cuff on the dominant arm is elevated to suprastolic (240 mmHg) levels for 2-3 minutes to invoke PEMI
- BP reactivity is calculated by subtracting BP at rest from highest BP during PEMI
 - An exaggerated response is defined as BP lability > 22 mmHg

Interventions in the Literature

- Schneider et al. (2018)
 - Nitrate supplement promotes vasodilation by increasing nitric oxide (NO)
 - Authors reported that nitrate supplementation once per day for 4 weeks:
 - Lowered BP responses during IHG and PEMI in older adults
 - Reduced activity of the metaboreflex
- Mulliri et al. (2014)
 - Ischemic preconditioning (IP) refers to periods of brief limb ischemia that are performed prior to exercise
 - It helps to prepare the heart for lack of oxygen and helps prevent its injury
 - In the study, IP was performed by placing a cuff on the upper arm and inflating it to 50mmHg for 5 min; repeated 3 times with 5 min of rest between
 - Authors concluded that when IP preceded PEMI, the BP response was reduced indicating less activity of the metaboreflex

Conclusions

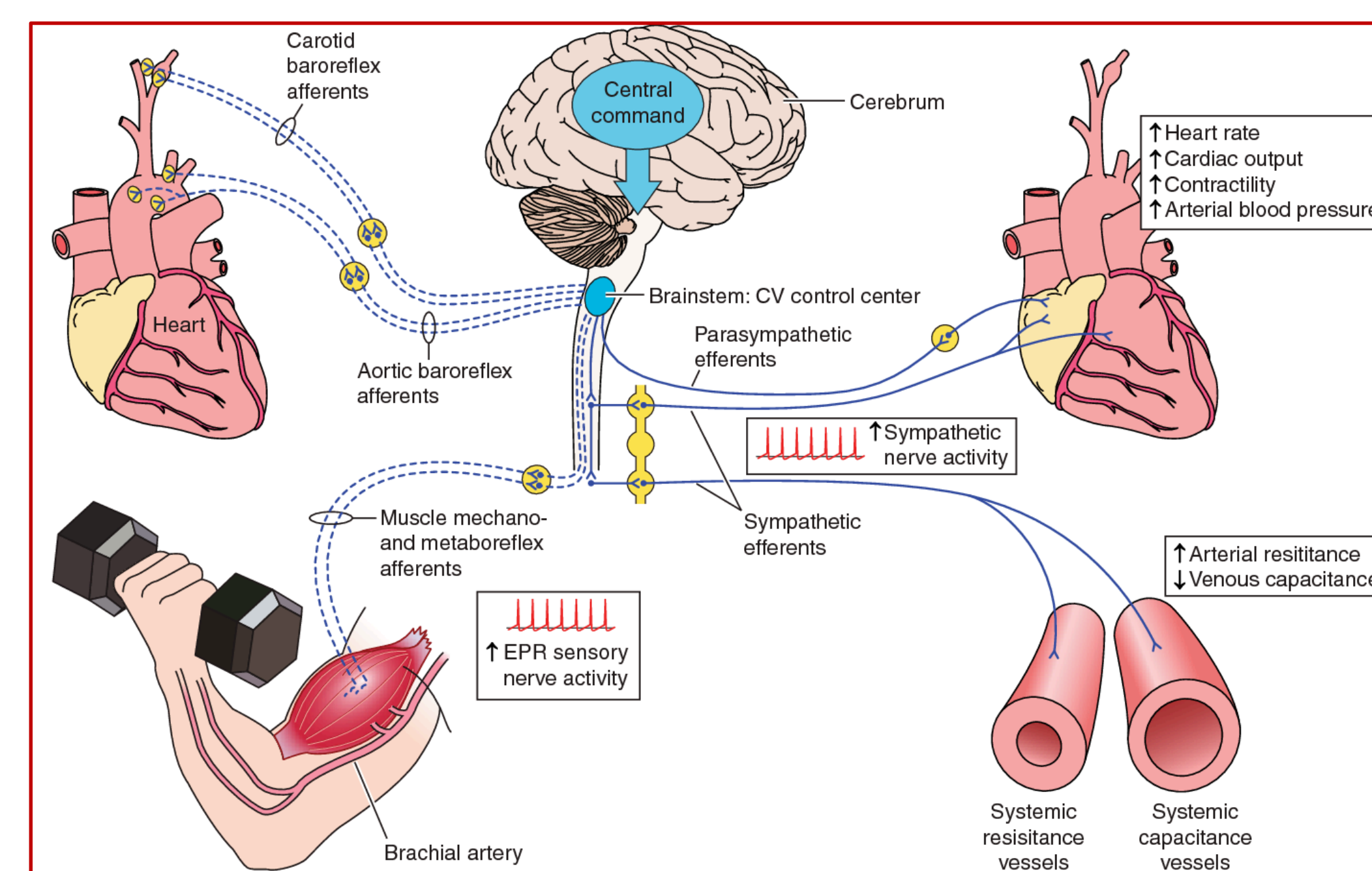
- HTN may be predictable via an exaggerated BP response
- A heightened metaboreflex, a component of the EPR may contribute to this
- PEMI following IHG exercise may be used to assess BP lability and identify hypertreactors
- Following a positive test, an intervention can be initiated, such as nitrate supplementation, or IP to improve BP lability and hypertensive risk

References

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Mechanisms

Figure 2. The Exercise Pressor Response (EPR)



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 .

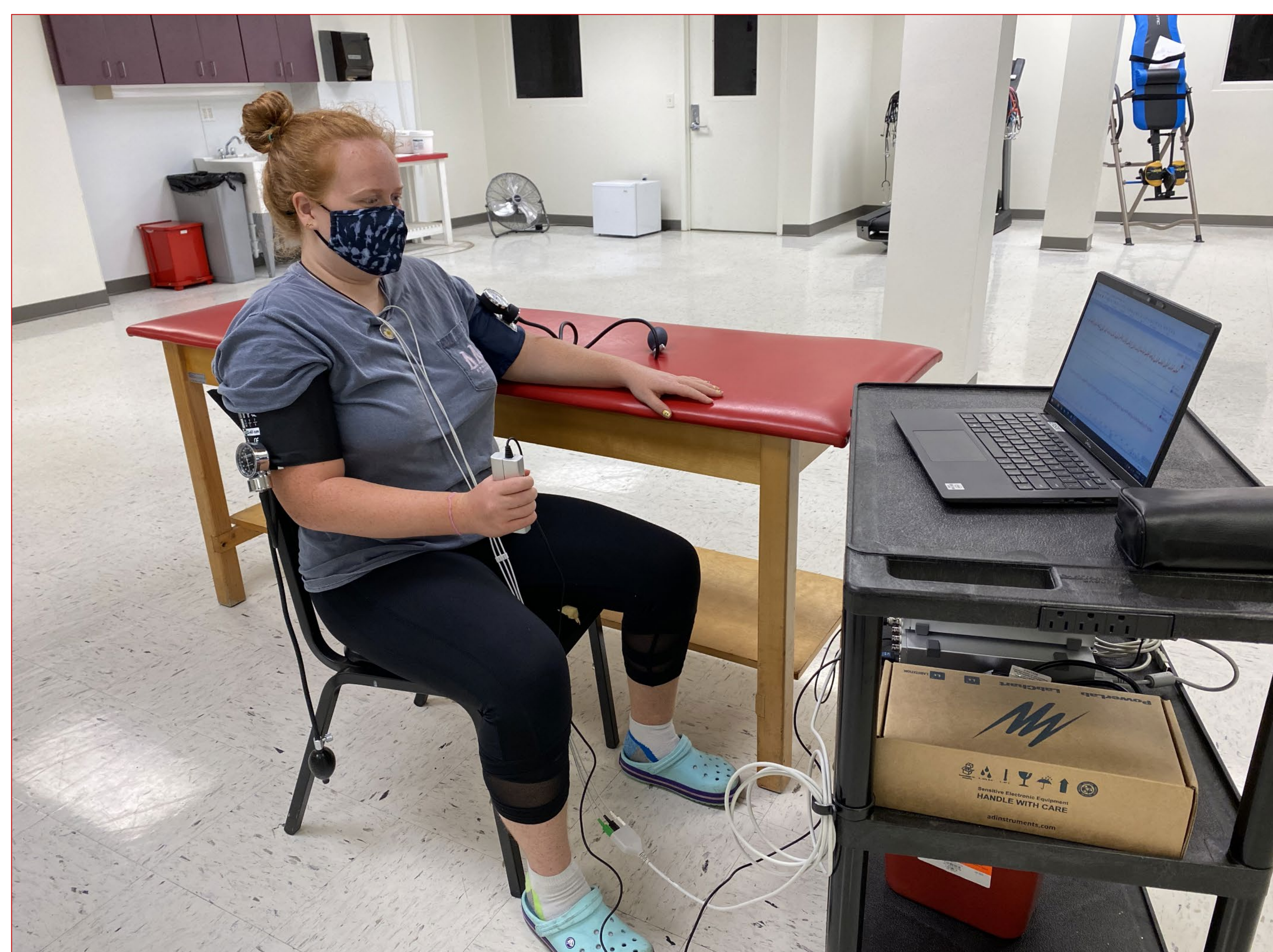


Figure 1. Post exercise muscle ischemia testing