Chronic Hemodynamic Response to Blood Flow Restriction Training on Geriatric Hypertensive Patients

Maggie Jackson
Exercise Science, Gardner-Webb University, Boiling Springs, NC 28017

Abstract

Purpose and Hypothesis: Studies have shown that BFRT has elicited improved hemodynamic characteristics associated with hypertension such as lowered systolic blood pressure (SBP) and diastolic blood pressure (DBP). The purpose of the research study was to determine the chronic hemodynamic effects from BFRT in geriatric, hypertensive patients. Engaged BFR walking and chair-stand conditions as a therapeutic modality. The perceived usefulness of this study is its positive influence on hypertensive patient's quality of life and their body's ability to mediate hypertension.
Methods: Participants (n = 80) who are diagnosed with stage 1 hypertension and were between the age of 65 and 85 years. Heart rate (HR), systolic and diastolic blood pressure (SBP and DBP), stroke volume (SV), and systemic vascular resistance (SVR) will be measured using ECG monitoring and a non-invasive hemodynamic monitor. Participants will perform BFR walking and chair-stand for 10-weeks and are reassessed 6-weeks after the final training session. The data collected will be analyzed using an independent group t-test and ANOVA correlation between RPE and cuff pressure to observe a statistically significant relationship.

Introduction

- Hypertension relates to increased incidence of all-caused and cardiovascular disease (CVD) mortality and is most prominent in those 50 years or older.
- Pinto and Polito (2016) suggest that those with hypertension are more susceptible to experiencing hemodynamic alterations during exercise as well as increase in sympathetic neural activity during arterial occlusion.
  - Yasuda et al. (2013) found that arterial stiffness was maintained through 12-weeks of BFRT which increases reliability for BFRT within the elderly population.
- Hypertension refers to a SBP of ≥140 mmHg and DBP ≥90 mmHg.
- Age and hypertension statistically increase linearly, especially in ages 65-75+ (McArdle et al., 2014).
  - Those ≥60 years of age with hypertension are limited to exercise intensity and hemodynamic benefit.
  - The accumulation of metabolites from BFR excites the afferent skeletal muscle nerves and arterial/pulmonary baroreceptors to encourage the CNS to mediate these materials by creating an acute hypotensive effect (Crisafulli et al., 2018).
- Ida et al. (2011) suggest that BFR walking increases physical activity more than endurance exercise but also changes hydrostatic force in the leg through BFR which may affect venous vascular function synergistically.

Methods

Baseline Assessment

- Informed consent
- Height (cm), weight (kg), age, resting HR (bpm), resting BP (mmHg), SVR (dynes/sec/cm^-5), CO (L/min), EDV & ESV (mmHg), and SV (ml)
- BFR familiarization
  - Five-minute walk on 64-meter track, two-minute rest, four sets of five squats
  - 100 mmHg cuff pressure

10-Week Exercise Protocol

- Initial training day occurred 48 hours after baseline assessment
- Two training sessions per week for 10-weeks
- 10-minute walk on 64-meter track, five-minute rest, three-minute chair-stand test
  - All completed with BFR except five-minute rest period; 13 total time under BFR
  - KAATSU cuffs initially set at 100 mmHg and increased by 5 mmHg per training session until 200 mmHg was achieved
  - RPE was measured after each exercise was completed

6-Week Reassessment

- Duplicate protocol from baseline assessment to gain comparable data variables
- Occurred 48 hours after final training session

Data Analysis and Materials

- ANOVA correlation
  - Independent Variable: RPE value
  - Dependent Variable: Applied cuff pressure (mmHg)
- Independent group t-test
- Filoza scale, aneroid meter, echocardiogram, subclavian catheter with pressure transducer, 12-lead ECG monitor, RPE Borg Scale, KAATSU elastic cuffs, stadiometer

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