

# Daily Beet Root Juice Supplement and Exercise Training in Older Hypertensive Adults

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## Background : Beet Root Juice Pilot Study

Hypertension, diagnosed high blood pressure  $\geq 140/80$  mmHg, is a major health condition that leads to diminished blood flow to the brain and is associated with other high risk conditions such as Diabetes, Cardiovascular Disease, and brain lesions called 'white matter hyperintensities.' Often, lifestyle changes, including increased exercise and changes in diet, are the initial recommended strategies to control hypertension. Therefore, an intervention that resulted in improvements to exercise performance in hypertensive patients would possibly limit the increase in associated health risks. Beet root juice (BRJ) is a supplement that increases cerebral blood flow and enhances exercise tolerance by increasing oxygen flow to muscles. Thus, an intervention with BRJ and exercise could result in increased brain blood flow, decreased risk for health risks, and increased exercise performances in those with chronic high blood pressure.

The purpose of the BRJ pilot study was to determine whether, in sedentary older adults, the combination of regular exercise and nitrated BRJ would enhance exercise performance and decrease health risks associated with hypertension.

## Primary Aim and Study Design

The primary aim of this research project was to compare the effect of naturally nitrated beet root juice vs. nitrate free BRJ combined with chronic exercise on exercise performance in hypertensive overweight older adults. These variables were assessed for each participant via a Graded Exercise Test (GXT) before and after a 6 week treadmill walking intervention. Data were collected for exercise volume and peak oxygen consumption (VO<sub>2</sub>max).

## Inclusion/Exclusion Criteria

### Inclusion:

- Sedentary men and women ( less than 60 min of structured physical activity per week)
- $\geq 55$  years of age
- Systolic Blood Pressure= 140-160mmHg
- Currently taking no more than 2 hypertensive medications (excluding diuretics)
- Read and write in English
- Willingness to participate in interventions
- Provide own transportation to and from intervention site
- Normal cognitive function (MMSE $>80$ )
- Women must be post-menopausal

### Exclusion:

- Regular User of Tobacco products
- Participant in other research study
- Taking medications that affect stomach pH (i.e.: antacids)
- Diagnosis and treatment for Hyperthyroidism, Type I Diabetes, and/or active neurological dysfunction
- Alcohol and Drug Abusers
- Previous serious head trauma or surgery (i.e.: loss of consciousness  $> 5$  min)
- Prior Cardiovascular disease and/or stents
- Currently taking medications= phosphodiesterase, type 5 inhibitors, nitrate preparations, and/or proton pump inhibitors
- Exercise  $> 3$  days/week, 20 mins/day

Table 1. Participant Characteristics (Mean $\pm$ SD)

	Males	Females	Total
N	13	14	27
Age (years)	66.4 $\pm$ 3.1	64.3 $\pm$ 6.6	65.3 $\pm$ 5.2
Resting Supine Systolic Blood Pressure (mmHg)	142 $\pm$ 9.4	141 $\pm$ 12.3	141.5 $\pm$ 10.8

Figure 1. Exercise Intervention. Assessing exercising blood pressure, heart rate, and RPE.



Figure 2. Exercise Intervention Session v. Distance Walked

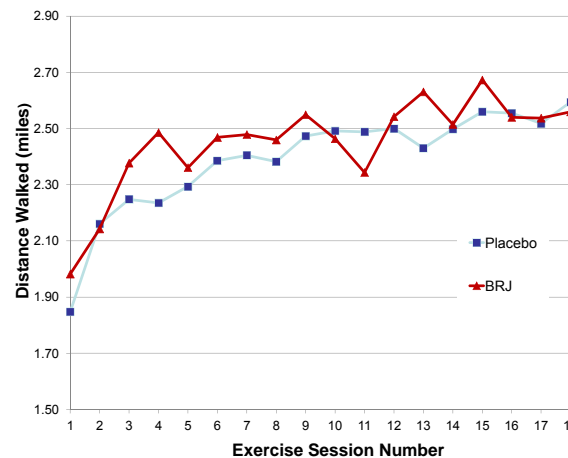
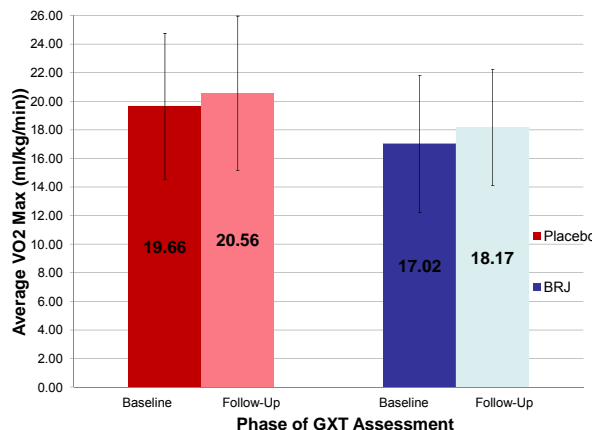


Figure 3. Effects of Exercise Intervention on VO<sub>2</sub>max



## Methods

### Assessment during Exercise Intervention--"Moderate" Paced Walking on Treadmill for a Maximum of 50 minutes:

#### Rate of Perceived Exertion using Borg Scale (RPE)

- Scale 6-20, where 6 = exertion level equivalent to sitting in chair and 20 = maximal exertion
- To ensure 'moderate' exercise, participants were encouraged to walk at a personalized pace that would maintain a RPE = 12-13 for a maximum of 50 min.
- At RPE = 12-13, participants may experience slight fatigue, perspiration, and breathing changes.
- RPE was recorded for each participant at the beginning (~5min.), mid-point (~25min.) and end (~48min.) of their walking session.

#### Blood Pressure Measurement

- Taken before, after, and during exercise (~25min.)- Figure 1.
- Restricted exercise session if resting blood pressure  $\geq 200/100$  mmHg and exercising blood pressure  $\geq 250/115$  mmHg.

#### Heart Rate Measurement

- Recorded before, after, and during exercise (~25 min.)
- Restriction of exercise session if resting HR  $\geq 120$  beats/min. or  $\leq 45$  beats/min.
- Shortness of breath, lightheadedness, and an exercising HR  $\geq 90\%$  of GXT maximal HR were cause for immediate discontinuation of exercise session.

#### Assessing Exercise Tolerance:

- Graded Exercise Tests were performed prior to and after a 6-week intervention
- Increase grade of treadmill every 2 min. until max grade=24.0 at set speed until exhaustion
- Analyzed peak oxygen consumption and time to exhaustion during aerobic exercise.

## Results

Table 2. GXT Time to Exhaustion Before and After Exercise Intervention

	Time to Exhaustion (min)	
	Pre Intervention	Post Intervention
BRJ	690.57 sec.	772.71 sec.
Placebo	504.15 sec.	648.67 sec.
<b>Average Difference</b>	<b>-186.42 sec.</b>	<b>124.04 sec</b>

## Conclusions

These data suggest that BRJ is not a significant component in the improvement of exercise capacity in older adults with hypertension. The results offer evidence that exercise volume completed by both the placebo and BRJ group were similar. There was not a large difference in average distance traveled per 50 minute session among the groups. The average increase in VO<sub>2</sub>max of the placebo group was 1.15ml/kg/min while the BRJ group had an average increase of 0.9ml/kg/min. ANCOVA analyses that controlled for baseline differences in VO<sub>2</sub>max or time to exhaustion revealed that there were no group differences. Further research is needed to determine the populations that will benefit from the physiological effects of BRJ.