

**THE EFFECTS OF A
NITRATE-RICH,
BEETROOT JUICE
ON COGNITION,
MOOD AND
CARDIOVASCULAR
RESPONSES IN
YOUNGER AND
OLDER ADULTS**



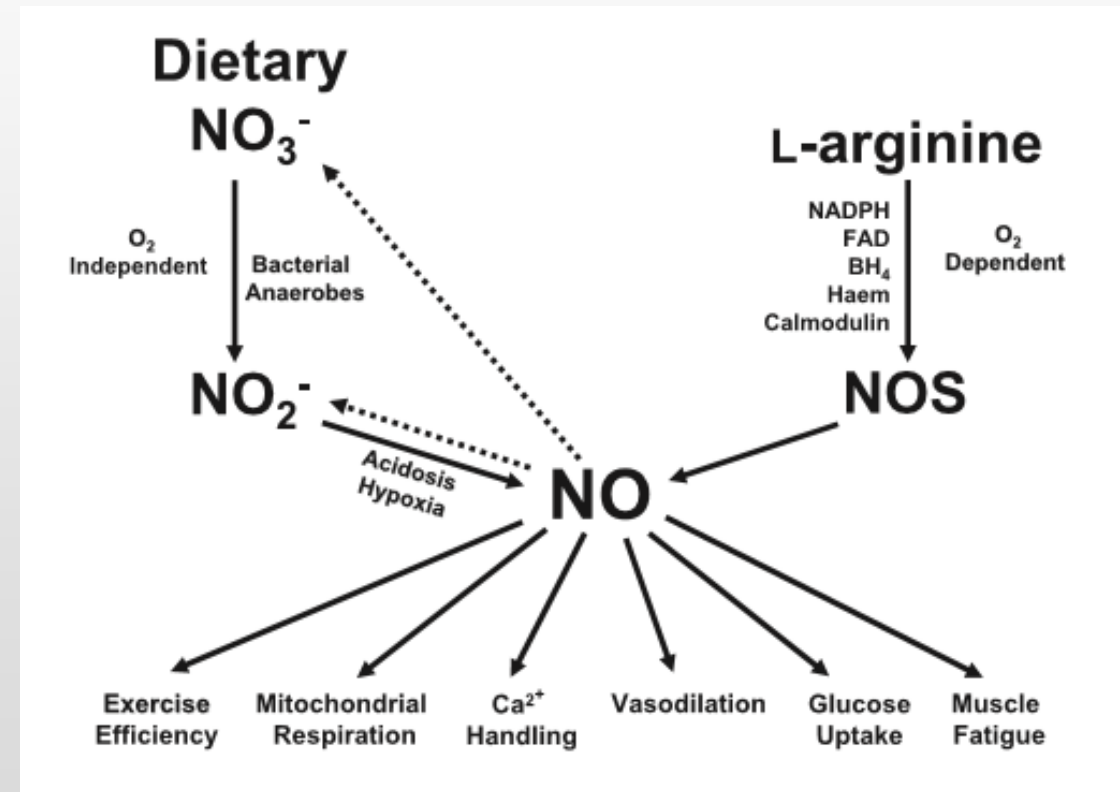
Background

- There has been a large increase in disease and age-related dysfunction over the past few decades
- Beetroot juice (BR) consumption has many benefits including:
 - Reduced blood pressure
 - Increased time to fatigue and improved exercise performance
 - Improved blood flow to the brain and cognitive performance
- Older adults have an age-related decrease in NO production leading to a reduction in endothelial function
- Few studies comparing younger versus older adults



Background - NO

- There are currently two main pathways known for NO production in the human body
 - Exogenous pathway
 - Endogenous pathway
- BR leads to greater production of NO via the exogenous pathway
- NO has many functions in the human body



Aims

- To examine the effects of acute supplementation with NO_3^- rich beetroot juice on:
 1. cardiovascular responses, cognition, and mood and perception
 2. compare these effects between younger and older adults

Method

- Randomised, double-blind, crossover design
- N = 24 (13 younger adults, 11 older adults)
- Beverages 150 ml of:
 - BR (651 mg NO_3^-)
 - PL (dilution of the BR with added concentrate, 65.8 mg NO_3^-)
- Measures:
 - plasma $[\text{NO}_3^-]$ and $[\text{NO}_2^-]$
 - blood pressure
 - heart rate
 - VO_2 kinetics
 - cognitive performance
 - mood and perception



Method – Cont.

- Cognitive tests:
 - Choice reaction test (CRT)
 - Rapid visual information processing test (RVIP)
 - Stroop test

- Mood and Perceptual tests:
 - Profile of Mood States (POMS)
 - Feeling scale (FS)
 - Felt arousal scale (FAS)
 - Rating of perceived exertion (RPE)

FEELING SCALE

+5 Very good
 +4
 +3 Good
 +2
 +1 Fairly good
 0 Neutral
 -1 Fairly bad
 -2
 -3 Bad
 -4
 -5 Very bad

FELT AROUSAL SCALE (FAS) (Svebak & Murgatroyd, 1985)

Estimate here how aroused you actually feel. Do this by circling the appropriate number. By "arousal" we meant how "worked-up" you feel. You might experience high arousal in one of a variety of ways, for example as excitement or anxiety or anger. Low arousal might also be experienced by you in one of a number of different ways, for example as relaxation or boredom or calmness.

1 LOW AROUSAL

2

3

4

5

6 HIGH AROUSAL

Profile of Mood States-Short Form (POMS-40)

Refer to the definitions below. Consider how you are feeling right now, when circling the appropriate response. Please make sure you have responded to all items.

FATIGUE	Not at all	A little	Moderately	Quite a bit	Extremely
Worn out	0	1	2	3	4
Weary	0	1	2	3	4
Bushed	0	1	2	3	4
Fatigued	0	1	2	3	4
Exhausted	0	1	2	3	4

Study Protocol

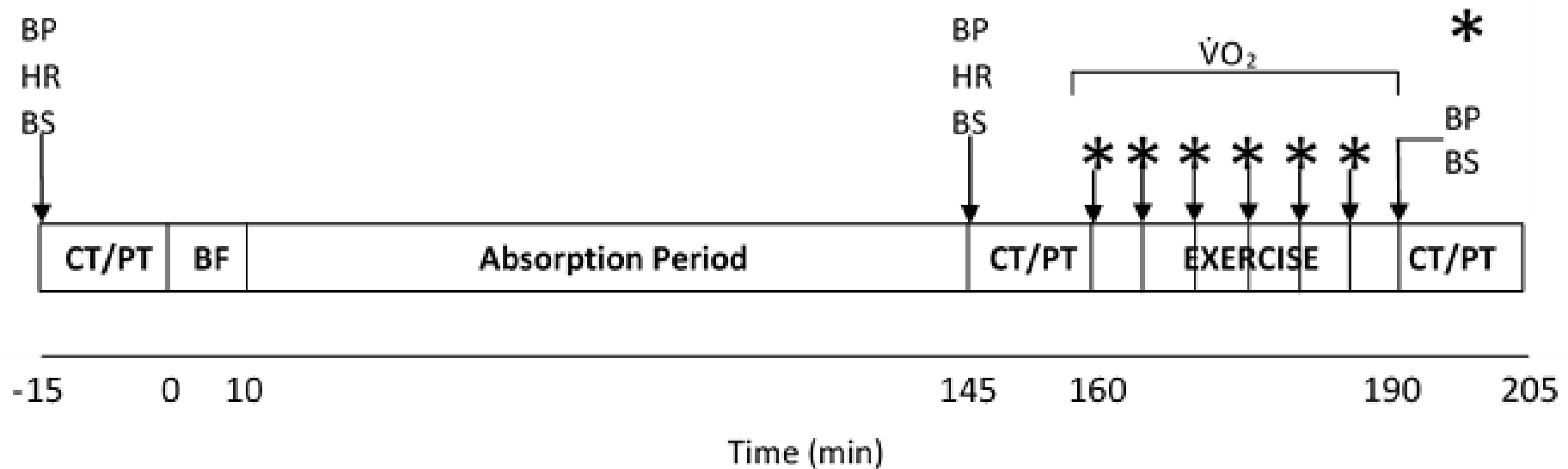
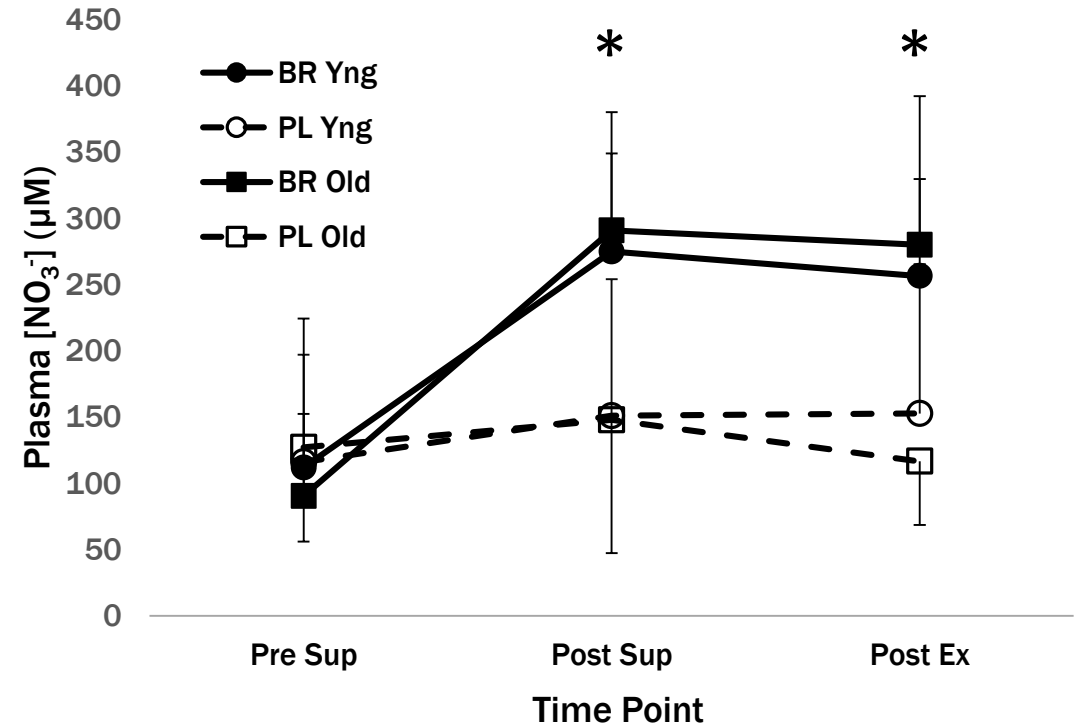
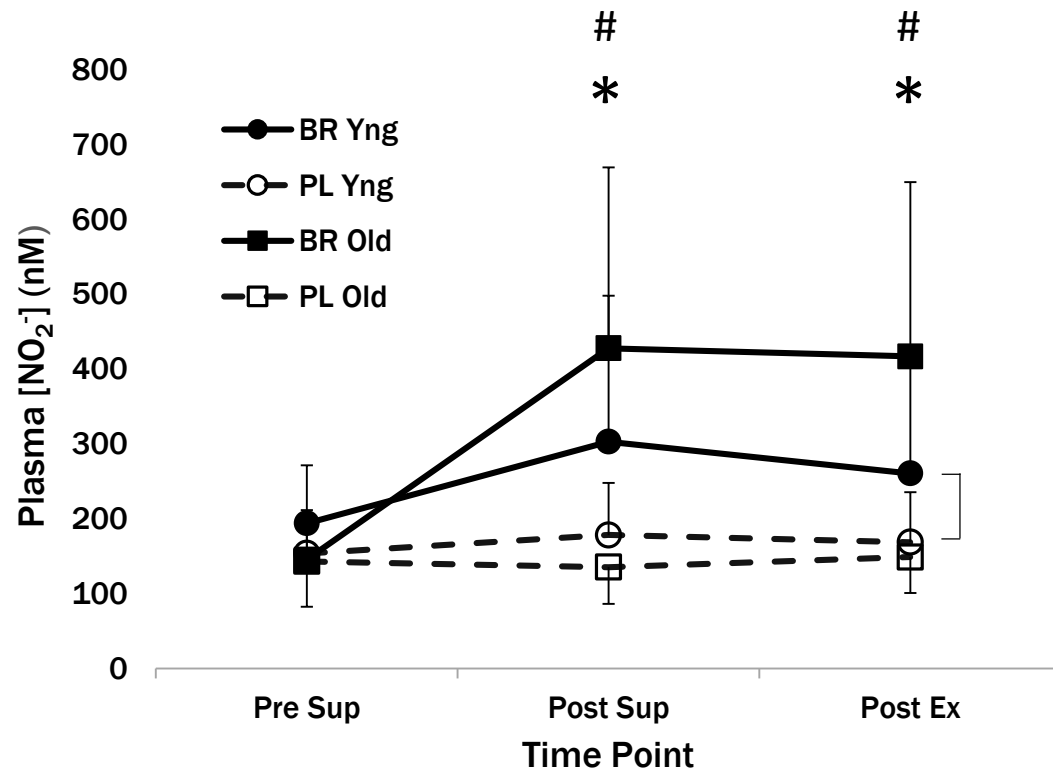


Figure 3.1. Schematic of the study protocol.

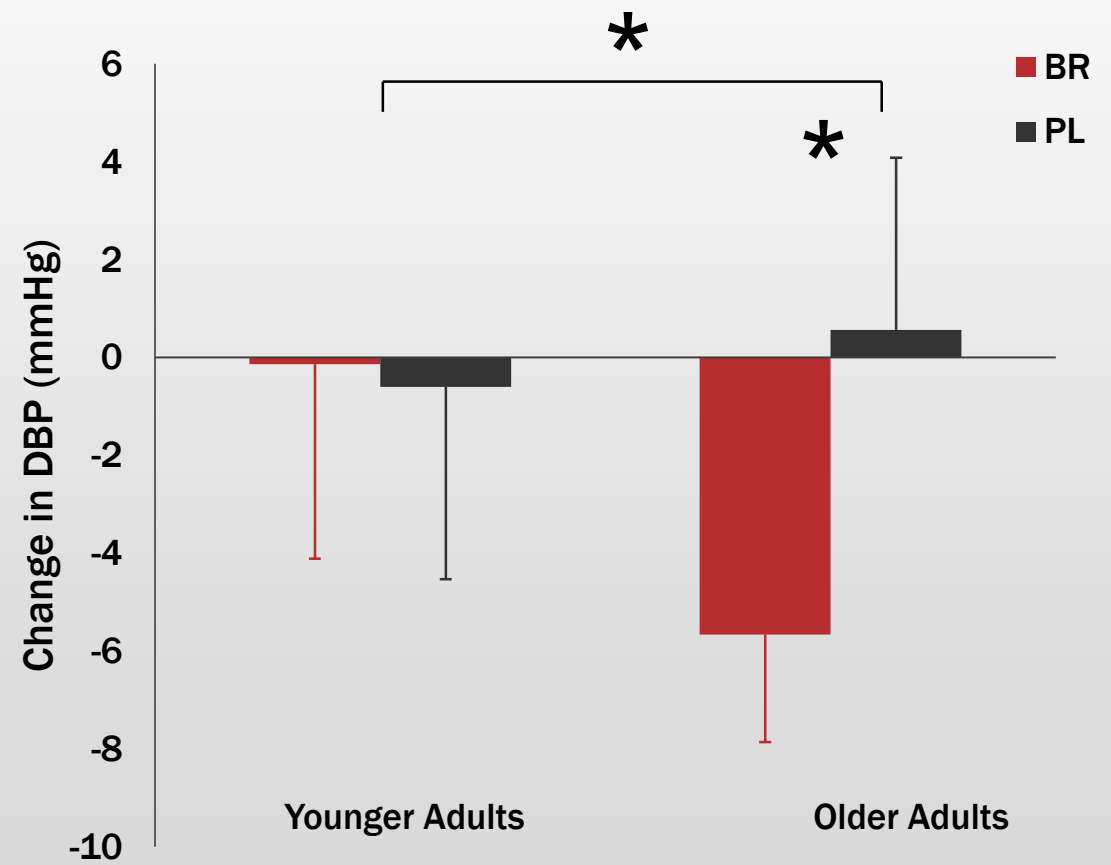
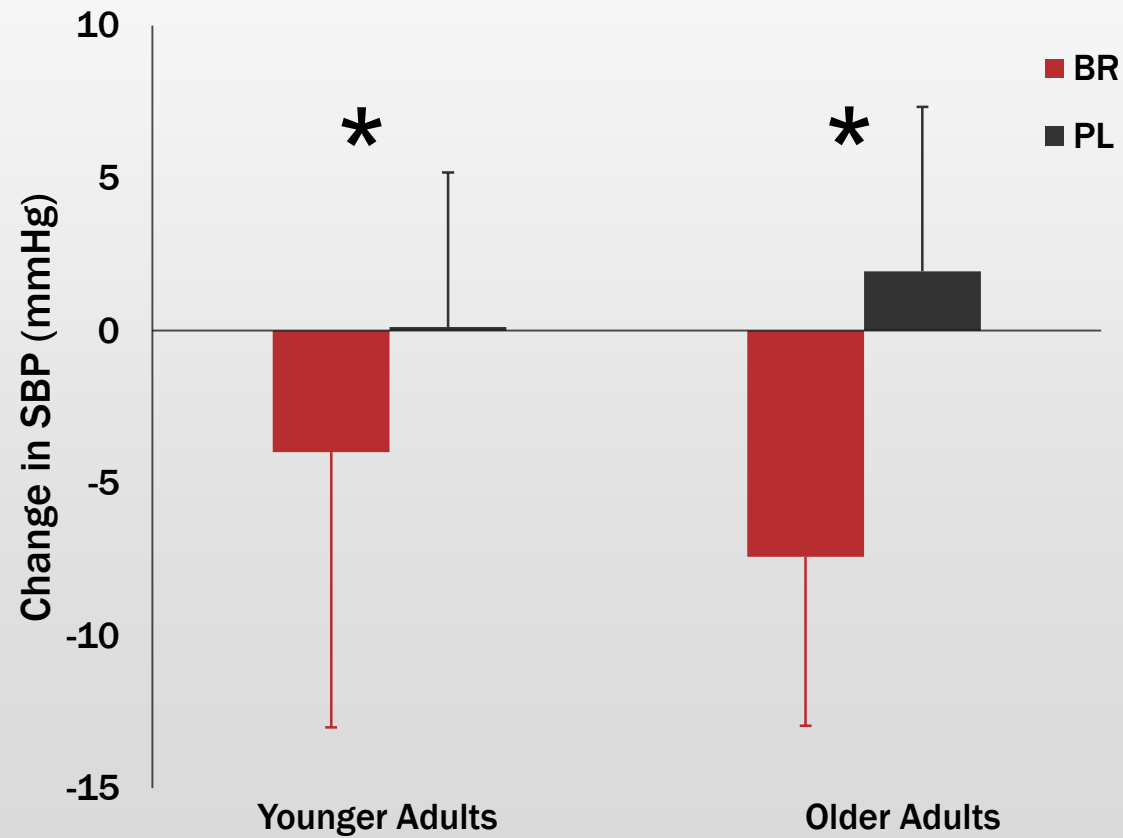
CT, cognitive tests; PT, perceptual tests; BF, breakfast; BP, blood pressure; BS, blood sample; HR, heart rate; $\dot{V}O_2$, oxygen uptake

* indicates measurements of HR, RPE (rating of perceived exertion), FS (feeling scale), and FAS (felt arousal scale).

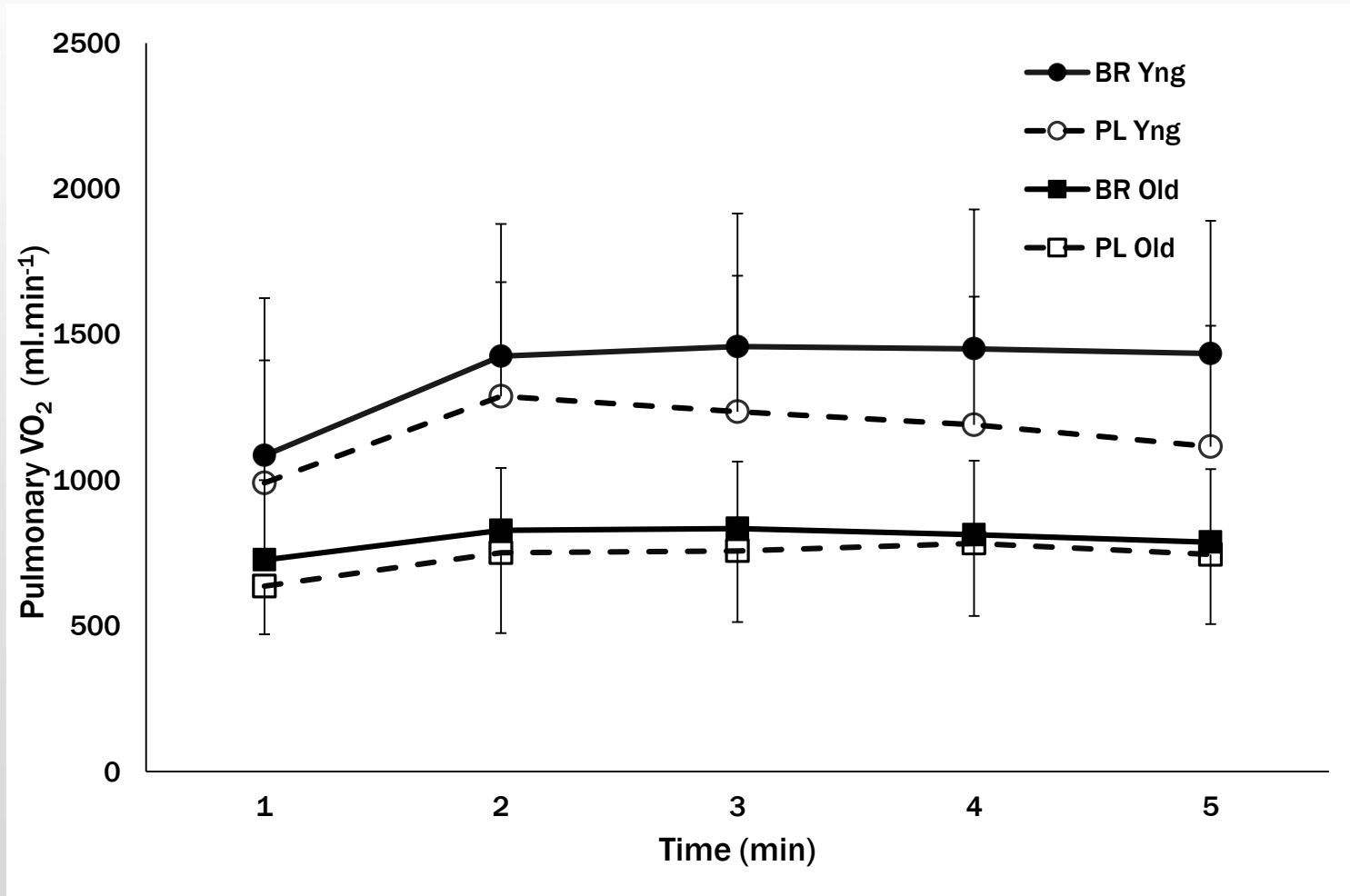
Results – Plasma $[\text{NO}_3^-]$ and $[\text{NO}_2^-]$



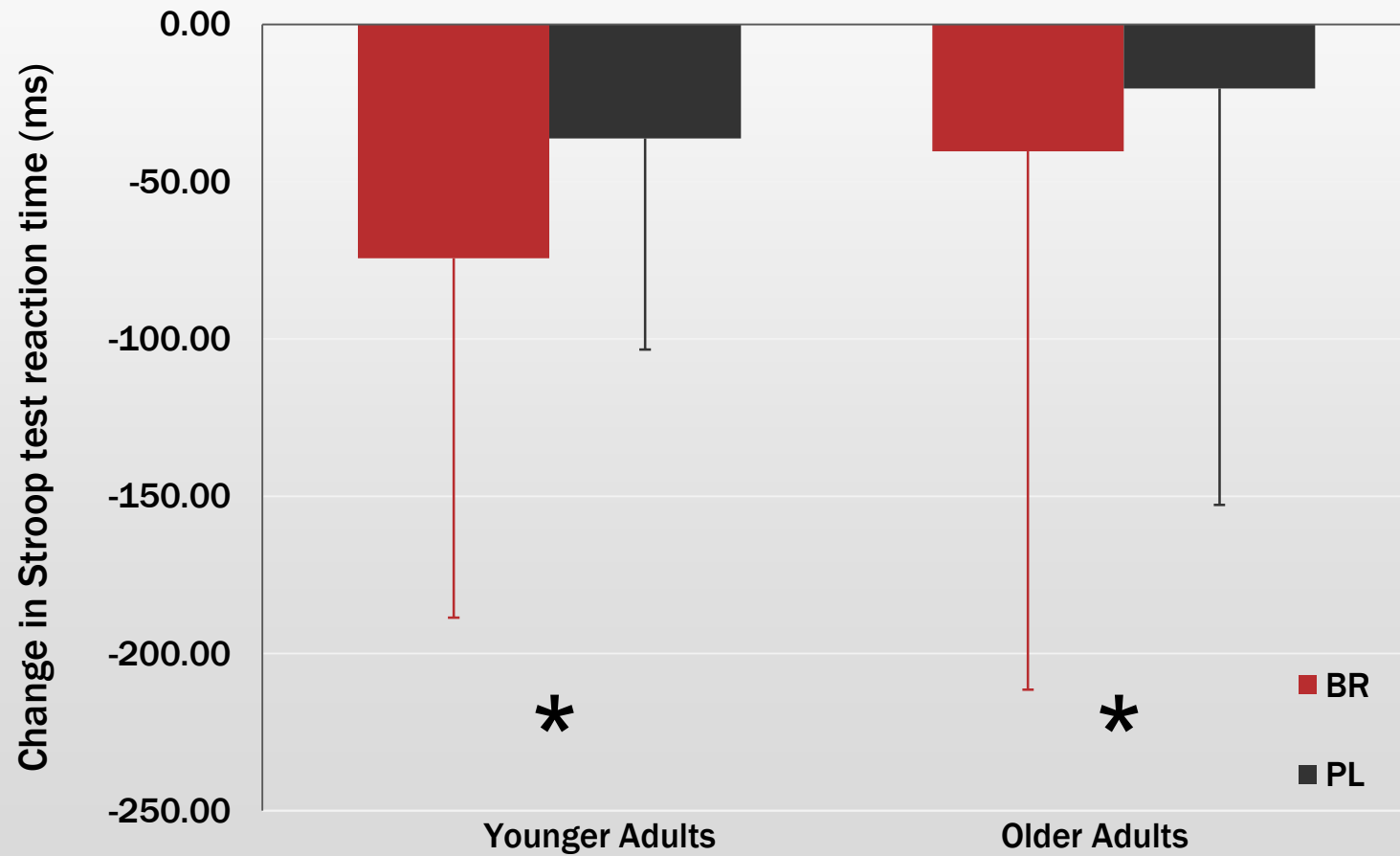
Results – Blood Pressure



Results – Oxygen Uptake Kinetics



Results – Cognitive Performance



Conclusions

- Acute supplementation with NO_3^- rich BR increased plasma $[\text{NO}_2^-]$ and $[\text{NO}_3^-]$ and reduced SBP and DBP
- The increase in plasma $[\text{NO}_2^-]$ was greater in older compared to younger adults
- The reduction in DBP was greater in older adults compared to younger adults
- BR supplementation improved cognitive performance in the Stroop test



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