The Effects of Pre Workout Supplement on Fitness Assessment Tests

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Honors Thesis
A special thank you to Dr. Michael, my thesis chair, for his guidance and support throughout this whole semester. I would also like to thank Dr. Weideman for her invaluable discussion, feedback and ideas.
Introduction

★ Popularity of pre workout began in 1980’s
  ○ Countless studies
  ○ Physiological vs psychological research
★ Used to acutely enhance performance
  ○ Focus
  ○ Reaction time
  ○ Stamina
  ○ Power
★ Countless pre workout brands
  ○ Varying ingredients
  ○ FDA does not need to approve
JYM® PRE JYM Supplement

- Creatine Hydrochloride (HCl), 2 grams
- Beta-Alanine, 2 grams
- Betaine, 1.5 grams
- Taurine, 1 gram
- N-Acetyl L-Cysteine, 600mg
- Alpha-GPC, 300mg
- Citrulline Malate, 6 grams
- Beet Root Extract (Beta vulgaris L.), 500mg
- BCAAs, 6 grams (3g leucine, 1.5g isoleucine, 1.5g valine)
- L-Tyrosine, 1.5 grams
- Caffeine Anhydrous, 300mg
- Huperzine A, 50mcg
- BioPerine (to aid in absorption of the above ingredients), 5mg

What ingredients are we focusing on?

➔ Caffeine
➔ Creatine
➔ BCAAs (branched chain amino acids)
➔ Beta-alanine
Caffeine

★ Stimulant
  ○ Tied to alertness (coffee, energy drinks)
  ○ *Increases heart rate and blood pressure*
  ○ Stimulates lipolysis

★ Ergogenic effects
  ○ *Aerobic performance*
  ○ *Anaerobic performance*

★ Blocks adenosine receptors
  ○ *Less fatigue*
Creatine

★ Effects
  ○ Decreases body fat
  ○ Increases fat free mass (FFM)

★ Aids in increasing ATP during high intensity workouts

★ Ergogenic effects
  ○ Increase power
  ○ Increase strength
  ○ Increase in muscle phosphocreatine (PCr)

★ Does not show to improve:
  ○ Aerobic exercise
  ○ Rate of maximal force
  ○ Maximal isometric strength
Branched Chain Amino Acids (BCAAs)

★ What are BCAAs?
  ○ Leucine, valine, isoleucine
  ○ BCAAs are 3 of the essential amino acids that the body cannot produce
  ○ Obtained via food

★ What do BCAAs do?
  ○ Aid in muscle protein synthesis
  ○ Reinforce recovery times
  ○ Aid in physical and mental fatigue
Beta-Alanine

★ Non essential amino acid (AA)
  ○ Low amounts in body naturally
  ○ High amounts of AA, histidine
  ○ Combined = increase in carnosine in skeletal muscle

★ Effects
  ○ Supports an increase in exercise capacity
  ○ Carnosine buffers against acid build up
    ■ Counteracts fatigue
Purpose & Hypothesis

★ The purpose of this study was to observe how a serving of pre-workout can affect various fitness assessments.

★ Assessments that measure:
  ○ Heart rate (HR), systolic blood pressure (SBP) and diastolic blood pressure (DBP)
  ○ Aerobic endurance
  ○ Flexibility
  ○ Muscular endurance
  ○ Strength

★ Our hypothesis is that there will be an overall increase in performance in the (6) chosen fitness assessment tests.
SUBJECTS

- 18 participants total
- 8 women
  - Age: $20.88 \pm 1.1$ y
- 10 men
  - Age: $21.63 \pm .64$ y

★ Recruited via Western Michigan University
Sessions

First Session

- Orientation session
  - Consent document
  - Preparticipation screening
  - Descriptive measurements taken
  - Familiarization
  - Randomized supplement
- Begin tests

Second Session

- Randomized supplement
- Begin tests
## FITNESS ASSESSMENT TESTS

<table>
<thead>
<tr>
<th>Test</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Resting HR and BP</td>
<td>Beats per min, force of blood against arteries (mmHg)</td>
</tr>
<tr>
<td>2. Queen’s College Step Test</td>
<td>Aerobic endurance</td>
</tr>
<tr>
<td>3. YMCA Sit and Reach</td>
<td>Flexibility</td>
</tr>
<tr>
<td>4. Curl-up</td>
<td>Muscular endurance</td>
</tr>
<tr>
<td>5. Vertical Jump Test</td>
<td>Power</td>
</tr>
<tr>
<td>6. YMCA Bench Test</td>
<td>Muscular endurance</td>
</tr>
</tbody>
</table>
Data Analysis

★ Dependent paired sample T-test
  ○ Assessments with Pre-workout supplement (T1) vs with placebo (T2)
★ Data was considered significant at $p < .05$
TEST 1 is the Pre-workout supplement, TEST 2 is the placebo

DBP only significant value

What I found interesting

<table>
<thead>
<tr>
<th>Measure</th>
<th>TEST</th>
<th>Mean</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
<th>95% Confidence Interval</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP (mmHg)</td>
<td>1</td>
<td>120.4±2.15</td>
<td>115.848</td>
<td>124.977</td>
<td>.14</td>
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<tr>
<td></td>
<td>2</td>
<td>117.6±1.97</td>
<td>113.417</td>
<td>121.783</td>
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<tr>
<td>DBP (mmHg)</td>
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<td>79.9±2.05</td>
<td>75.528</td>
<td>84.222</td>
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<td>75.9±1.63</td>
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<td>79.351</td>
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<td>RHR (bpm)</td>
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<td>79.8±3.74</td>
<td>71.897</td>
<td>87.753</td>
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<td>78.8±3.29</td>
<td>71.804</td>
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<tr>
<td>Sreach (in)</td>
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<td>17.8±1.02</td>
<td>15.638</td>
<td>19.944</td>
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<tr>
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<td>17.7±0.98</td>
<td>15.641</td>
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<tr>
<td>VJump (in)</td>
<td>1</td>
<td>18.3±0.91</td>
<td>16.358</td>
<td>20.236</td>
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<td>18.5±0.80</td>
<td>16.815</td>
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<td>BT (reps)</td>
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<td>CU (reps)</td>
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<td>52.147</td>
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<td>StepHR (bpm)</td>
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<td>VO2max (ml/kg/min)</td>
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<td>40.2±1.12</td>
<td>37.801</td>
<td>42.554</td>
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<tr>
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<td>40.4±0.93</td>
<td>38.405</td>
<td>42.360</td>
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</table>

Table 1. Systolic blood pressure (SBP); diastolic blood pressure (DBP); resting heart rate (RHR); sit and reach (Sreach); vertical jump (VJump); YMCA bench test (BT); curl up (CU); Queens College Step Test (StepHR).
Resting Diastolic Blood Pressure (DBP)

![Graph showing comparison between Pre-workout supplement and Placebo groups in mean resting DBP (mm Hg)].

- **Mean Resting DBP (mm Hg)**
  - Pre-workout supplement
  - Placebo

- Tests

* indicates statistical significance.
Results

★ Diastolic blood pressure was the only variable that was affected by the treatment (significant difference, p= .04)
★ Some subjects had relative significance for their personal results, but overall no significance in other assessments.
Discussion - DBP & SBP

★ Supplementation seems to cause an increase in DBP prior to any physical activity
★ Interesting that DBP increased rather than SBP or both
★ Supplementation has stimulants in it that increases blood pressure
  ○ Caffeine
★ One study found similar findings (3)
  ○ 15 active females
  ○ 21.5 ± 1.7 y
  ○ Multi-ingredient pre-workout supplement
  ○ Increase in DBP under resting conditions and post exercise conditions
  ○ Attributed findings to the differences in caffeine dosage combined with varying ingredients and caffeine being a vasoconstrictor (1500 mg total of “Other Ingredients” including caffeine)
Discussion - Potential Factors

Potential factors that could have affected results:
- Sleep
- Nutrition
- School/work stressors
- Being aware of what pre workout tastes like (psychological)
- Strenuous activities/exercise prior

Sought consistency between sessions per participant.
Discussion - Population Size & Population

★ An increase in the number of participants could have shown more interesting results.
★ Some assessments were trending towards significance, thus, a larger sample would have been ideal.
★ The population of our study was college aged students. Students tend to have higher stress levels, poor sleep health, and poor nutrition making a controlled study with this population increasingly difficult.
Discussion - Subjective effects of pre workout

★ Few subjective effects observed during and after
★ Side effects
  ○ “Jitteriness”
  ○ “Tingling”
★ Due to stimulants
  ○ Caffeine
  ○ Beta- Alanine (tingling/pins and needles)
Conclusion

★ Pre workout supplementation **solely** increased resting DBP. Previous studies reported increases in aspects of aerobic endurance, muscular endurance and muscular strength. We did not have similar findings within our study.

★ Possible reasons for this may be due outside influences that were not controlled in this study, such as, previous exercise, diet, previous and/or current supplement use, psychological stress and sleep health. Caffeine is also a potential attribute for the results.
Future Research

➔ Additional research should be done to further examine the significant changes that pre workout has physiologically on the body.
➔ Additional research could directly support individuals in what exercises they should engage in when consuming supplements to gain the most benefit out of their exercise sessions.
➔ Future studies should increase population size to further increase significance.
➔ Future studies should include some sort of subjective measurement for participants during and after sessions to more accurately record outcomes.
Questions?
References


