Effects of Glucose Supplementation and Submaximal Exercise on Short-Term Memory Recall

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Abstract

Introduction

Short-term memory recall is the ability to hold a limited amount of information easily accessible by the brain. Research has shown the positive trends of increased memory through aerobic exercise and regular blood glucose levels in separate studies. Reasons for increased memory from exercise and glucose include building stronger synapses which allows for increased communication between the hippocampus and cortical brain regions and glucose is the primary energy source of the brain.

In a study conducted by Sunram-Lea SI et al in 2001, it was found that glucose facilitation does improve cognitive performance in healthy young adults. The glucose facilitation effects refers to how the brain requires primarily uses glucose as a energy, and because of this enhanced amounts of glucose can increase short-term memory. It is essential glucose levels are properly regulated, too low or too high will decrease cognitive functions. In a study conducted by Rong et al, it was found that submaximal exercise improved short-term memory during exercise times of less than 20 minutes in young adults.

Research in regards to short-term memory, glucose, and exercise have a possible impact on the way dementia, mild cognitive impairment, and Alzheimer's can be treated and possible delay of further progression.

Purpose

The purpose of this research study was to find how glucose supplementation and submaximal exercise affect short-term memory recall skills.

Methods

Five female college students (age 21.75 ± 1.7 yrs) from UTA volunteered to do two trials of a 20 minute submaximal cycle ergometer test at 65% of their heart rate maximum. Each participant fasted for a minimum of four hours prior to participating and allowed for a minimum of 24 hours between each trial. Supplements (Cliff bars) with 24g of glucose were given on one of the two testing days. During exercise, heart rate (HR), blood pressure (BP) and rate of perceived exertion (RPE) was taken. RPE and BP was taken every three minutes, while HR was taken every minute. Participants were encouraged to keep their heart rate consistent with their target heart rate of 65% throughout the submaximal exercise test. Blood glucose levels were checked before and after exercise and again after the memory test with a Medtronic glucose meter. The memory recall tests created by the principal investigators based on other studies were given to participants after exercise was completed. The participants had one minute to study the words, and then one minute to write down all the words they could remember. This was done consecutively. There were two different short-term memory recall tests used. Each memory test consisted of 24 written words. The alpha level for significance was set at p ≤ 0.05.

Results

The average number of words remembered by the submaximal exercise with the supplement was 11 ± 2.28, while the average number of words remembered by the submaximal exercise with no supplement given was 12 ± 2.77 which shows no significance (p = 0.4). Blood glucose levels before exercise with supplementation 115 ± 35.71 mg/dl and without supplementation 91 ± 18.33 mg/dl was found to have no significance (p = 0.2). RPE values with supplementation came to be 10.8 ± 1.7 and showed ± 1.5 and also showed no significance (p = 0.51). The average value for HR with supplementation was 135.2 ± 6.7 (p = 0.79) and without supplementation 134.8 ± 40.7 (p = 0.69) both showing no significance.

Conclusions

Based on the results from this study, there is no significant evidence that glucose supplementation and submaximal exercise have an effect on short-circadian rhythms and short digestion times after taking the glucose supplement. Taking the glucose supplement after exercise instead of before may increase the glucose facilitation effect, which would affect cognition and memory.