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Effect of Nootropic Guarana (*Paullinia Cupana*) Supplement on Simple and Choice Reaction Time in Young Healthy Adults

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ABSTRACT

Guarana (*Paullinia Cupana*), a climbing vine found in the Amazon basin of Brazil is a stimulant frequently used in energy drinks and sodas and contains caffeine, theobromine, and theophylline. Previous studies have found that guarana affects cognitive performance, speed of attention, task accuracy and fatigue tolerance. PURPOSE: The purpose of this study was to determine the effect of guarana on simple reaction time (SRT) and choice reaction time (CRT).

PROCEDURE: Subjects (n=47) (age 20±1.2yrs) were randomly placed into the experimental group and the control group prior to the onset of the study. Both groups underwent a SRT test and a CRT test. All assessment were computer generated and scored.

The SRT test involved tapping a computer mouse when, on the screen a red circle switched from red to green. Scores were recorded in milliseconds and averaged for five rounds. The CRT assessment involved coordinated control of eye movement with hand reaction. The assessment consisted of 20 rounds starting from easy and progressing to hard and was scored by accuracy. On a double-blind format, the experimental group was given 500 mg guarana and the control group was given an inert placebo. Full absorption was enhanced by an eight-hour post-prandial format and a 40 min. absorption period.

RESULTS: No significant pre-test difference was found between groups for the SRT test (p>0.05). For SRT, the Guarana group improved 7.3% from pre- to posttest (303.5ms – 281.4ms) (Figure 1) while the placebo group only improved 1.1% (295.2ms – 292.1ms). This difference did not reach significance (p>0.05). For the CRT assessment there was no pre-test significance between the groups. For pre- to post- test the guarana group improved 13.4% (50.8-57.5 correct) and the placebo group scored only .03% correct (58.1- 58.3), but did not reach significance (Figure 2).

CONCLUSION: The guarana group surpassed the control group in both SRT and CRT indicating that the guarana supplement positively affected the speed of simple reaction time and accuracy in choice reaction time over the placebo. This is consistent with others[1-3] who found Guarana ingestion improved simple and choice reaction time, accuracy and response time. The effect of Guarana may be beneficial in sports and activities that require accuracy and fast response time.

Keywords: Reaction; Time; Supplement; Performance; Vision

INTRODUCTION

Competitive sports demand strict and disciplined physical training to increase endurance, strength, agility, and technique proficiency. Additionally, nutritional intervention related to activity has also received much attention. Research involving cardiovascular endurance and muscle strength has been conducted for decades employing various approaches. While both endurance and strength development have multiple aspects to maximize development, the core basics have not changed. For instance, endurance enhancement generally involves continuous activity at a certain level of intensity or high intensity interval training. Strength development is a matter of subjecting the muscle to overload with specified numbers of sets and repetitions. This can be done with simple "free" weights or elaborate pieces of equipment, as long as the resistance is greater than what is encountered in normal day-to-day activities. The combination of resistance and speed will ultimately result in developing power, which is the rate at which work is done.

A large part of the preparation for sport is in the form of nutritional ergogenic aids. Nutritional ergogenic aids refer to any substance that improves energy production, recovery, or performance. Typically, nutritional ergogenic aids include protein powders and bars, amino acids, creatine, energy drinks, ginseng, and many other much less common supplements[1]. The global sports nutrition market was valued at $59.3 billion in 2025 and is projected to grow to $114.52 billion in 2034[2]. In a national survey of 1,248 students age 16 yrs. and older found that 66% reported use of supplements to increase strength, enhance performance, and increase endurance[3]. In a similar survey of nearly 21,000 college athletes, respondents reported using protein (47%), energy shots (28.6%), creatine (14.0%), amino acids (12.1%) along with lesser usage of beta-hydroxy-beta methylbutyrate, dehydroenpiandrsterone and others[4].

While attempts to augment physical performance with selected nutritional supplements variable results have been achieved. The area of visual performance enhancement has also received some attention. Most sport activities require good visual processing. Indeed, visual processing and a high reaction speed are two elements that are typically required in many activities. Athletes with a better visual reaction speed can see the game almost 'in slow motion', and thus will be able to react and make decisions in fractions of seconds, positively influencing performance[5]. For example, carotenoids, zeaxantin and lutein has been shown to positively affect human visual processing speed, chromatic color discrimination, and critical flicker fusion frequency (Jacobson, 2025)

Among any less familiar types of nutritional ergogenic aids, guarana (*Paullinia Cupana*), a noothropic supplement derived from a climbing vine found in the Amazon basin of Brazil, has been a subject of only a few studies. Guarana is a stimulant frequently added to energy drinks and sodas and contains caffeine, theobromine, and theophylline, the latter two found in chocolate and tea. Several studies have been published regarding caffeine and reaction time[6-8], but guranana has not been subject to as many investigations. Regarding gurarana,

Rekik et al.[9] found improved pre-exercise technical performance in football players following ingestion of 300 mg guarana. Specific to reaction time, Kennedy and associates[10] found that guarana decreased choice reaction task time in male undergraduate volunteers. In a similar study Gurney and associates[11] also found improvement in reaction time following guarana consumption. The purpose of the current study was to compare simple reaction time (SRT) and choice reaction time (CRT) between subjects consuming guarana and those given a placebo.

METHODS

Participants

Participants were recruited by introducing the study to a college lecture class. A total of 47 college age males and females age (20±2.3 yrs) volunteered for the study after reading and signing a university Institutional Review Board consent document. The volunteers were randomly assigned to either the experimental or the placebo condition and were provided directions on the simple and choice reaction protocol.

Intervention

All assessments were conducted on 40.64 cm Dell laptop monitors. Participants were seated in front of a computer screen and the chair was adjusted for each participant so that the position of the screen top was level with their eyes and with a consistent distance of 60 cm from the face. Prior to pre-testing, all participants were given three practice trials on each of the assessment tasks.

The SRT test consisted of a large green circle on the computer screen. The task consisted of clicking a computer mouse as quickly as possible when a green circle switched to red. The intervals to react to the change were at random, so no learned anticipation was possible. Scores were recorded in milliseconds and averaged for 10 rounds

The CRT involved coordinated control of eye movement with hand reaction. For this assessment the computer illustrates an open circle in the screen. A ball moves vertically up and down while another ball moves horizontally back and forth through the circle. The object is to stop the balls inside the circle. The test consisted of 20 rounds starting from slow ball movement and increasing in speed with each round. One ball continuously moved vertically up and down and a separate ball moved horizontally back and forth. The object was to pause each ball within the circle. If both balls were paused inside the circle two points were earned, if only one ball landed inside the circle one point was earned and if no balls were stopped inside the circle no points were earned. The rounds started from slow oscillating balls and progressing to faster movement with each trial up to 20 trials.

Following training, and on a double-blind random format, the experimental group was given 500 mg guarana and the control group was given an inert placebo. Full absorption was enhanced by an eight-hour post-prandial format and a 45 min. absorption period. After the absorption time the groups were retested

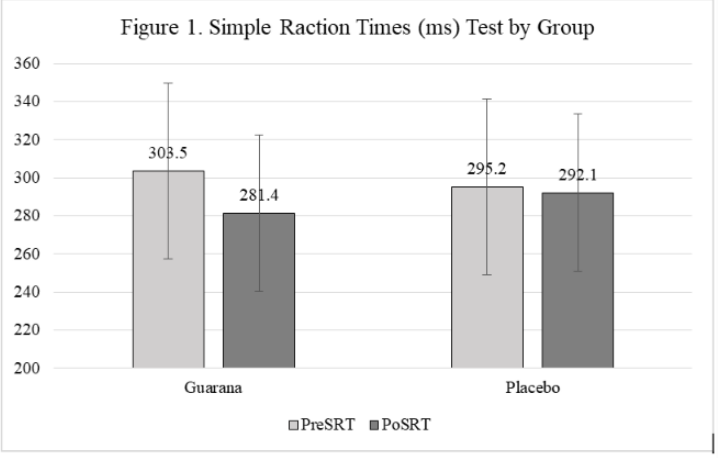
Statistical analysis

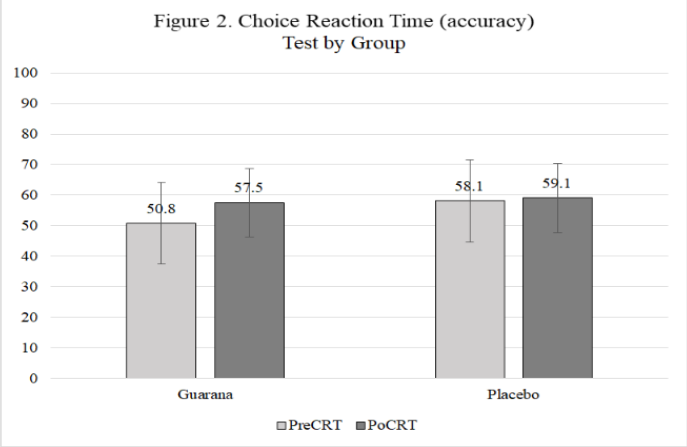
Collected data was entered into a spreadsheet and repeated ANOVAs were used in analyzis using a SPSS Version 28, IBM Armonk, NY. The data assessed was the pre- to posttest results between guarana ingestion and placebo ingestion for both SRT and CRT.

RESULT

For the SRT, there was no significant pre-test difference (p>0.05) between groups. Results of the posttest found that the guarana group improved slightly by 7.3% (303.5ms – 281.4ms) from pre- to posttest (Figure 1) while the placebo group only improved 1.1% (295.2ms – 292.1ms). However, these results did not reach significance. For the CRT assessment, there was no pre-test significance between the groups. For pre- to post test, the guarana group improved 13.4% (50.8-57.5 correct) (Figure 2). The placebo group improved 0.03% correct (58.1- 58.3). The comparison did not reach significance (p=0.07)

The guarana group surpassed the control group in both SRT and CRT indicating that the guarana supplement positively affected the speed of simple reaction time and accuracy in choice reaction time over the placebo.





DISCUSSION

In similar studies, Talik and associates[12] found no statistical benefit to SRT following ingestion of 500mg guarana. Others[13] have also posited that "there exists an overwhelming lack of evidence" to verify suggestions that guarana contributes to the improvement of physical and cognitive performance. Conversely, others have investigated selected effects of guarana and have found that guarana ingestion can increase speed in specific task performance[10], enhance processing speed[14] decrease SRT and CRT following maximal intensity cycling[15].

The current study found small improvements in both SRT and CRT following 500mg guarana supplementation. This is in agreement with Rekik et al.[9] who also noted "small improvement" in reaction time. While the degree of improvement in performance is still being investigated, even small performance enhancement may enhance be beneficial in sports that require accuracy, and fast response time. For example the degree of difference in timed events often rests on milliseconds. Any time enhancement may be the difference between first place and the rest of the participants. Faster reaction may also prevent many injures in that the player may avoid a split second collision. Further research should determine the most effective dose of guarana based on body weight. Additionally, more sophisticated reaction time assessments may be warranted.

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