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Poster presentation

An evaluation of the effects of inositol-stabilized arginine silicate (ASI; Nitrosigine®) on cognitive flexibility

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Abstract

Background: The Trail Making Test (TMT) is a widely-used instrument to assess cognitive processing speed and executive functioning. The test consists of two parts, A and B. Each test is measured by the time to completion, with lower scores indicating greater performance. TMT-A involves connecting an ascending sequence of 25 numbers, while TMT-B involves connecting an alternating sequence of 25 numbers and letters. While Part A of the TMT is a simpler test, Part B is a more complex test that requires the ability to mentally switch between tasks. Cognitive flexibility, or the mental ability to switch between concepts, is important for task-switching. Therefore, the difference between TMT-B and TMT-A scores, the TMT B-A score, has been established to emphasize the complexity of TMT-B and be a more direct measure of cognitive flexibility. A reduction in the TMT B-A score demonstrates higher cognitive flexibility, which is vital for performance in various sports that require constant shifting between cognitive tasks. Because ASI (inositol-stabilized arginine silicate; Nitrosigine®) has been shown to significantly improve TMT A and B scores individually compared to placebo [1], this post hoc analysis was carried out to examine the effects of ASI on the TMT B-A score.

Materials & Methods: A randomized, crossover, double-blind, placebo-controlled trial was conducted to evaluate the acute effects of ASI (1,500 mg) on cognitive function in sixteen healthy, active male subjects (aged 18 to 35 years, BMI 19 to < 30 kg/m²) [1]. TMT B-A scores were calculated in each group before and after supplementation by subtracting TMT-A time from TMT-B time.

Results: After a single dose, the decrease in the mean TMT B-A score from baseline was significantly greater in the ASI group (-14.4 sec; -45%) compared to placebo (-1.5 sec; -4%) (Figure 3) ($p < 0.05$ between groups).

Conclusions: The results of this analysis show that ASI significantly improves TMT B-A scores, supporting the use of ASI to boost cognitive flexibility and improve athletic performance. Cognitive flexibility is vital for various performance activities, from video games to traditional sports such as soccer that require task switching and rapid reactions to various visual and auditory cues. Therefore, supplementation with ASI may heighten gamers' and other athletes' performance by enhancing cognitive flexibility after just a single dose.

Background

Executive functions, or the cognitive processes that are needed for thought and action in non-routine scenarios, are important for success in athletic activities that require the ability to process various inputs and make quick decisions in a frequently changing environment [2]. One type of executive function is cognitive flexibility, or the ability to quickly and effectively adapt to dynamic environments. Cognitive flexibility is fundamental for successful performance in various types of sports, from e-sports to traditional sports like soccer, that require a flexible mindset to switch between different tasks and rapidly adapt to complex scenarios. Studies have shown that experienced athletes exhibit higher cognitive flexibility than those who are less experienced, and that cognitive flexibility is associated with success in performance [2,3,4].

Inositol-stabilized arginine silicate (ASI; Nitrosigine®) is a popular sports nutrition ingredient that has been shown to significantly increase mental acuity, focus and processing speed within 15 minutes of taking a single dose [1]. ASI's effect on cognitive function has been assessed via the Trail Making Test (TMT), which is a standard test for the measurement of cognitive processing speed and executive functioning. It is made up of two parts, A and B, with the latter being a more complex test that requires task-switching and cognitive flexibility. Therefore, the TMT B-A score, or the difference between TMT-B and TMT-A, is used to highlight TMT-B's complexity and assess cognitive flexibility, with a reduction in scores indicating higher cognitive function [5]. The following post hoc analysis was carried out to test the effect of a single dose of ASI on cognitive flexibility using the TMT B-A score.

Materials & Methods

A double-blind, placebo-controlled, crossover clinical trial of an inositol-stabilized arginine silicate (ASI; Nitrosigine®) dietary supplement on sports nutrition endpoints. Sixteen healthy males (aged 18-35, 19 ≤ BMI ≤ 29.9 kg/m²) received oral ASI (1500 mg/day) or placebo for a 4 day test period, with a 7-day washout between test products. Trail Making Test parts A and B were administered at baseline, after a single dose, and after 4 days of supplementation. TMT-A connects an ascending sequence of 25 numbers, while TMT-B connects an alternating sequence of 25 numbers and

letters in numerical and alphabetical order, alternating between the numbers and letters. (Figure 1). TMT completion was timed. Lower times identified higher cognitive function. A post hoc analysis was carried out to evaluate the change in TMT B-A scores from baseline to approximately 10 minutes after a single dose. TMT B-A scores were calculated by subtracting TMT-A scores from TMT-B scores.

Results

Trail Making Test A and B

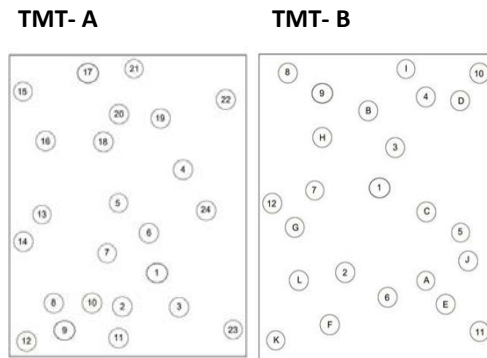


Figure 1. Structure of Trail Making Test (TMT) parts A and B. For TMT-A, lines are drawn from 1 to 2, 2 to 3, and so on until completion. For TMT-B, lines are drawn from 1 to A, A to 2, 2 to B and so on until completion.

TMT-B Time

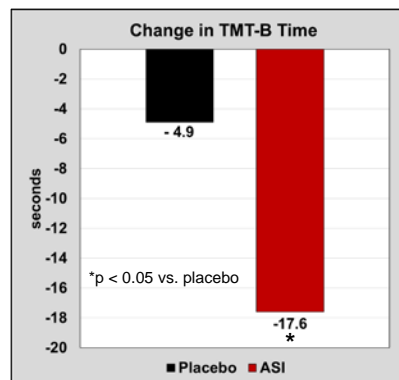


Figure 2. Change in TMT-B time from baseline to within 10 minutes after a single dose. TMT-B time improved by 33% more in the ASI group compared to placebo.

TMT B-A Score

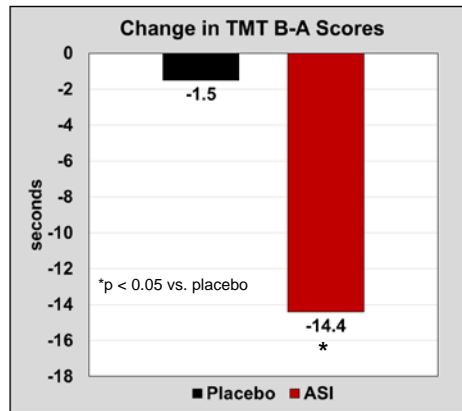


Figure 3. Change in TMT B-A scores from baseline to within 10 minutes after a single dose. The TMT B-A score decreased by 45% in the ASI group, versus 4% in the placebo group.

Discussion and Conclusions

In a clinical study, ASI was shown to significantly improve mental flexibility, processing speed, and executive functioning as demonstrated by a greater reduction in TMT-B time compared to placebo after a single dose. Results from the present post hoc analysis showed that in addition to improving TMT-B time, ASI significantly improved the TMT B-A score after a single dose compared to placebo. The TMT B-A score is an indicator of cognitive flexibility, which is important for performing well in sports that require the ability to switch between tasks and adapt to unpredictable scenarios. The results of this analysis support the use of ASI as a sports nutrition ingredient to improve cognitive flexibility, which has been associated with performance enhancement in various sports.

References

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