Unique Ketogenic Medium Chain Triglyceride Product Rapidly Enhances Brain Function: A Pilot Investigational Study

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ABSTRACT

Purpose: As one ages, ketones and fats become more important relative to glucose in brain metabolism. A highly concentrated Medium Chain Triglyceride (MCT) product, with a proprietary fractional concentration greater than 90% caprylic acid, was tested because extensive research demonstrated benefits in a variety of areas from basic cognition to risk reduction for neurological diseases. Since previous studies have tended to focus more on older adults with positive results, it was theorized that this type of compound may also enhance cognition and global function in younger subjects.

Methods: Eighteen (18) volunteers, aged 30-55 years old, were studied. Thirteen (13) subjects consumed Fuel For Thought®, a proprietary high-concentration MCT ketogenic product, and five (5) controls consumed a placebo. Subjects were prospectively and randomly placed in either the placebo or intervention groups and were blinded as to group assignment. At both baseline and at 30 days, cerebral electroencephalographic (EEG) function was recorded via a four test battery, and a four-test sports vision profile was measured.

Results: The subjects who received the intervention improved to statistically significant levels in three of the four EEG profile measures and the sports vision percentile ranking compared to the placebo group. The primary cognitive measures included EEG potentials, auditory reaction time, and two trail making tests. The sports vision assessments included visual reaction time, multiple object tracking, target capture and perception span which were combined into a percentile ranking. All improvements, except auditory reaction time, were significant (P=<0.05), using paired student's t-tests.

Conclusion: In this pilot study, consumption of a ketogenic high concentration MCT product produced significant improvements in brain/EEG function as well as in select sports vision measures in the intervention group within a relatively short time period. While these findings are consistent with previous research on MCT's and cognitive and visual function, this study assessed a younger population. Further investigation in similar age groups attempting to improve basic thinking and sports reaction measures is warranted with respect to MCT products.

INTRODUCTION

Strategies to improve visual and cognitive abilities can have a major impact on quality of life, or performance in educational, business and sporting pursuits. MCT products have had a positive effect on older individuals, especially those with headache syndromes, cognitive decline or even Alzheimer's dementia. The current study tested if a proprietary ketogenic MCT product boosts brain function in younger individuals.

MCT supplements have flooded the market in recent years and have an abundance of health and performance claims. However, claims and their effectiveness can be tied to the specific type and concentration of fatty acids found in MCT products. The compound most responsible for ketone production, and thus increased availability for the brain is caprylic acid, normally denoted as C8. Coconut oil is the usual form of MCT oil utilized, and normally contains up to 15% C8. Thus, while it may have metabolic and other functions, it is not likely to spur adequate ketone production which is associated to potentially increased brain function.

METHODOLOGY

The study was designed as a human clinical pilot trial performed with a prospective, randomized, blinded, placebo-controlled design. The mean age for the control group was 39, +/– 9.42 years and 40 +/= 6.42 years for the intervention group. Among participants, 52% were female and 48% were male. The subjects had to agree that they would not alter dietary or exercise regimens while in the study. All subjects read and signed an informed consent form and the study was approved by the CCHSS Institutional Review Board.

Subjects were assigned by a 2.5:1 randomization ratio to either the intervention group (N=13) or the placebo group (N=5). Pre and post assessment occurred at time zero and after four weeks. The profile included an EEG test for basic brain function (WaviMed, Boulder, CO). In this part of the profile, the subjects were informed of what to expect with both headgear placement and testing. In accordance with manufacturer directions, the correct size headgear was measured, and then the electrode socks were placed in saline solution prior to placement in the headgear, and then onto the subject. Before measurement, electrical contact points were assessed. Once contact was adequate, the test was started with an auditory reaction time test which simultaneously not only measured reaction time to the auditory signal (time to test completion), but also voltage potentials (tens of millivolts). The subjects then completed two trail making tests (both of which used time to completion as the metric), which recorded time to completion. Each test was precluded by a practice test to ensure the subject understood the instructions.

Sports vision skills were measured with a Senaptec Sensory Station (Beaverton, Oregon). Four specific tests were measured including visual reaction time, perception span, target capture and hand-eye coordination. These four parameters were selected because they measure sub-abilities which are important for life events like learning as well as routine activities and sports performance. In each instance, the test was explained to the subject, and then the subject watched a short video of how to perform the test before a short practice trial. After the testing was complete, information was stored and compared to a database of over 1500 individuals who were in the general population category, not elite athletes in any particular sport. This resulted in a percentile ranking which combined the four measures.

Subjects were instructed to find the best time per day to take the supplement or placebo, and then use that regimen for the study time.

Figure 1: Product Label/Bottle

RESULTS

Table 1: All Results Comparison

Table 1 All Measures Comparison Variable	Pre ± Sd	Post ± Sd	Average Δ	Sig P=<0.05
Sports Vision % Rank - Intervention	41.3 ± 16.57	50.62 ± 19.58	+ 9.32	.0257
Sports Vision % Rank-Control *Percentile Rank*	33.4 ± 14.51	32.6 ± 14.94	- .80	
EEG Auditory Reaction Time-I	344.77 ± 45.83	306.38 ± 26.37	-38.39	.240
EEG Auditory Reaction Time-C *Time in Milliseconds*	322.8 ± 42.26	350 ± 57.32	+27.2	
Voltage-I	10.03 ± 4.8	13.02 ± 5.91	+2.99	.048
Voltage-C *Tens of mV*	8.9 ± 4.4	8.34 ± 4.59	-.56	
Trail Making 1-I	77.14 ± 13.6	52.23 ± 10.34	-25.27	.045
Trail Making 1-C *Time in seconds*	71.4 ± 15.24	79.4 ± 12.4	+8.0	
Trail Making 2-I	104.23 ± 20	87.92 ± 20.1	-16.31	.0499
Trail Making 2-C	84 ± 10.8	84 ± 11.3	0	

Results and scores were tabulated for the pre-assessment (0), and the 30-day project finish. The subjects who received the intervention improved to statistically significant levels in the sports vision percentile ranking, and three of four of the brain/cognitive measures compared to the placebo group. Auditory reaction time improved significantly for the intervention group, yet deviations in post-study scores for the placebo group meant this variable trended strongly, but outside of strict statistical significance. The included topographic brain maps, which illustrate brain activation by color and were also generated to give a further graphical representation of changes.

Figure 2: Sports Vision Percentile Ranking

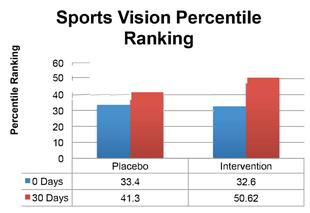


Figure 3: Auditory Reaction Time

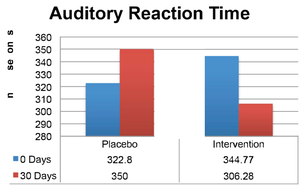


Figure 4: Average Voltage

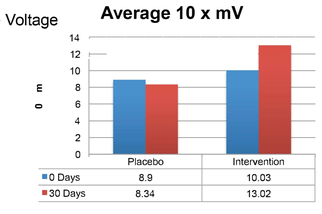


Figure 5: Combined Trail Making Test Scores/Means

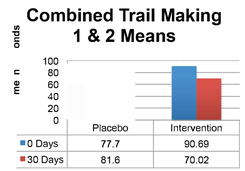
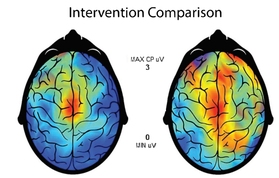


Figure 6:Topographic Brain Map Comparison



DISCUSSION/CONCLUSION

With the limited subject numbers, this pilot study may be considered an investigational trial. It would be anticipated that these results could be projected on a larger population. However, given the wide range of benefits from MCT products reported in the past, including positive cognitive changes, these results are not surprising.

Strongly ketogenic MCT products, as exemplified by the proprietary formulation used in this study, which contains a very high concentration of caprylic acid demonstrate particular promise for increased cognitive and visual function in middle aged adults.

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Competing Interests
NW and JC have no competing interests. GMH became a scientific advisor to the product company unrelated to this study, and after the study design was developed and first implemented.

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