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File: ■ Lion's Mane (*Hericium erinaceus*, Hericiaceae)
■ Cognitive Function
■ Stress

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RE: Lion's Mane Mushroom May Improve Cognitive Performance Speed and Lower Stress Levels

Docherty S, Doughty FL, Smith EF. The acute and chronic effects of lion's mane mushroom supplementation on cognitive function, stress and mood in young adults: A double-blind, parallel groups, pilot study. *Nutrients*. November 2023;15(22):4842. doi:10.3390/nu15224842.

Lion's mane (*Hericium erinaceus*, Hericiaceae) is an edible mushroom with antioxidant, antimicrobial, and anticancer qualities. It contains the constituents hericenones and erinacines, which have shown positive effects on nerve growth factor synthesis and secretion. These constituents have also demonstrated neuroprotective properties and cognition-enhancing effects in animal trials due to their ability to easily cross the blood-brain barrier. In human trials, effects on pro-brain-derived neurotrophic factor have been found in conjunction to memory and mood enhancements. There also have been positive effects in individuals with mild cognitive impairment; however, trials have indicated that prolonged supplementation may be needed for beneficial effects. There has been a lack of trials investigating these effects fully. The authors conducted a pilot randomized, placebo-controlled, double-blind, parallel group study to analyze the efficacy of acute lion's mane supplementation on cognitive performance and the chronic effects of four-week supplementation in young and healthy individuals.

This study took place at the Brain, Performance, and Nutrition Research Center, (Northumbria University, Newcastle upon Tyne, United Kingdom) between April – July 2023. Inclusion criteria included men and women between the ages of 18–45 years who self-reported that they were in good health and spoke English. Exclusion criteria included the use of certain prescription medications, a pre-existing diagnosed medical condition, psychiatric disorder, substance abuse, or neurological condition, uncorrected visual impairment, an allergy or intolerance to the study ingredients, pregnancy or lactation; use of nicotine or nicotine replacement products, antibiotics or dietary supplementation consumption within the prior four weeks, an inability to perform cognitive tasks, intake of > 300 mg per day of caffeine, or a body mass index outside of 18.5–35 kg/m². Participants were randomized into one of two groups. Those in the treatment group consumed three 600 mg capsules of a proprietary blend of lion's mane (SO-D2X1®; Sempera Organics Inc.; Morgan Hill, California) and those in the placebo group consumed three capsules of micro-crystalline cellulose. Participants were instructed to take the capsules with breakfast each morning for 28 days.

Cognitive tasks were measured using immediate and delayed word recall, numeric working memory, choice reaction time, Stroop task, peg and ball, and delayed word recognition. These tasks were conducted on the Computerized Mental Performance Assessment System (COMPASS) designed by Northumbria University. The Stress Visual Analogue Scales (S-VAS), Visual Analogue Mood Scales (VAMS), and Perceived Stress Scale (PSS) were utilized to assess mood and psychological state.

Participants reported to the researchers for their screening appointment, a training visit, and two testing visits. The screening appointment was conducted via telephone. The training visit included assessing physiological data and training participants on the cognitive tasks and mood assessment scales. The initial testing visit was on Day 1 and the final testing visit was on Day 29 at the laboratory. Participants were instructed to consume a standardized breakfast and refrain from caffeine in the morning and alcohol for 24 h before arriving at the laboratory. At the testing visits, participants completed the PSS and a baseline cognitive assessment. Afterwards, participants consumed their treatment for the day and completed a second cognitive assessment after one hour. It was not clear when the other mood and psychological tests were completed and is assumed to be when the PSS was filled out. At the initial testing visit on Day 1, participants received a treatment diary and their treatments, and on Day 28, participants returned the bottle and their diary to assess compliance.

Of the 231 individuals that inquired about the trial, 54 were screened, and 43 were randomized into the lion's mane group ($n = 22$) and the placebo group ($n = 21$). One participant withdrew from each group due to an adverse event, leaving 21 participants in the lion's mane trial and 20 participants in the placebo group. Seven participants in the lion's mane group were excluded in analysis due to issues scheduling second visit ($n = 2$), compliance ($n = 2$), antibiotic-related issue ($n = 2$), consumed treatment before the second visit ($n = 1$), leaving 14 participants included in analysis. Three participants in the placebo group were excluded in the analysis due to issues scheduling second visit ($n = 1$), issues scheduling second visit and using over the counter medication ($n = 1$), and issues scheduling the second visit and compliance ($n = 1$), leaving 17 participants included in analysis.

It was indicated that after one hour of lion's mane consumption, participants had a significant improvement in the speed of performance on the Stroop task ($P = 0.005$); however, after one hour of lion's mane consumption participants had a significant decrease in immediate word recall accuracy ($P = 0.013$). In addition, after one hour of placebo consumption participants had a significant decrease in immediate word recall errors ($P = 0.002$). No other significant effects were found.

There was a significant improvement in S-VAS scores after 29 days for the lion's mane group ($P = 0.051$), specifically in the subjective stress subgroup ($P = 0.033$). After 29 days, participants in the placebo group had a significant improvement in word recall accuracy compared to baseline ($P < 0.001$). No other significant effects were found.

The authors conclude that lion's mane supplementation could improve speed of cognitive performance and lower stress. Limitations included the small sample size and analyzing individuals who are healthy which could have subtle effects on cognitive and mood behavior results. These trial results should be considered preliminary due to the small sample size. Larger trials with individuals who have a chronic illness, mental impairment, or higher stress are needed in order to understand the effects of lion's mane on these factors. The authors declare no conflict of interest.

—*Dani Hoots*

Peer Reviewer Comments

Performing quicker on the Stroop task test is not that significant, especially in healthy and younger healthy adults whose performance on these tests could vary widely among participants, and even depending on what they had for breakfast, their expectations, and the opinions they held about natural medicines and medicinal mushrooms. The "trend towards reduced subjective stress" is really not anything to hang one's hat on either. Lion's mane, for the most part, is widely oversold in the marketplace and seems to be flying under the regulatory radar for benefiting cognitive performance, mood, and more. This is what Sempera Organics has to say about their new Lion's Mane product:

- Reduced stress
- Improved cognitive function
- Improved mood
- Reduced tension from stress
- Improved wellbeing
- Start feeling results within a month of consistent use

The company appears to be reaping the rewards for the money spent on the study in making more bold structure-function claims for their product. After looking over the product, it seems to be un-standardized and could contain a mixture of substrate, starch, mushroom mycelium, and perhaps some fruiting bodies. There is no indication of how much of each or the levels and consistency of diterpenes in the product. The study results should be interpreted with caution, as there are not many substantial other studies out there to support these claims.

Referenced article can be accessed at <https://www.mdpi.com/2072-6643/15/22/4842>.

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