L-theanine and Caffeine Improve Sustained Attention, Impulsivity and Cognition in Children with Attention Deficit Hyperactivity Disorders by Decreasing Mind Wandering (OR29-04-19)

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Objectives: Our previous research corroborate the work of others to indicate that L-theanine and caffeine are known to improve sustained attention in healthy adults. The effects of these substances have not been studied in relation to attention deficit hyperactivity disorders (ADHD). We aimed to examine the effects of L-theanine, caffeine and their combination on sustained attention, impulse control and overall cognition in male children with ADHD in a four-way, placebo-controlled repeated measures crossover study.

Methods: Five male children (8–17) years with ADHD, who have responded to stimulants were recruited via advertisement. L-theanine (2.5 mg/kg body weight), caffeine (2.0 mg/kg body weight), their combination and a placebo were administered in a randomized crossover design on four separate days. Functional magnetic resonance imaging (fMRI) was performed 55 minutes post-dose, while the subjects engaged in a Go/NoGo continuous performance task (CPT) and a stop-signal reaction time (SSRT) task. NIH Cognition Toolbox was administered 110 minutes post-dose. Data were analyzed using two-level regression models constructed using R and FSL software to compare the three treatments vs. the placebo on all measured outcomes.

Results: L-theanine, caffeine and their combination improved hit rate in CPT ($p < 0.001$) and total cognition composite in NIH Cognition Toolbox ($p < 0.05$) compared to placebo. L-theanine and caffeine, when administered alone, increased SSRT ($p = 0.007$ and $p = 0.018$ respectively), while the combination decreased SSRT compared to placebo ($p = 0.012$). L-theanine, caffeine and the combination decreased task-related fMRI reactivity of the default mode network in the brain, which is known to show increased activity during mind wandering.

Conclusions: L-theanine, caffeine and their combination seem to improve sustained attention and overall cognitive performance in children with ADHD, possibly via decreasing mind wandering during exertion of attention. While L-theanine alone and caffeine alone seem to increase impulsivity, the combination seems to decrease (i.e., improve) impulsivity in children with ADHD. As such, the combination of L-theanine and caffeine may have the potential to be used as a therapeutic and/or dose sparing agent to manage symptoms in children with ADHD.

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