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File: ■ Cocoa (*Theobroma cacao*)
■ Cognition
■ Mood

HC 031321-469

Date: March 29, 2013

RE: High-dose Cocoa Polyphenols Improve Calmness and Contentedness after One Month of Supplementation in Healthy Subjects

Pase MP, Scholey AB, Pipingas A, et al. Cocoa polyphenols enhance positive mood states but not cognitive performance: A randomized, placebo-controlled trial. *J Psychopharmacol.* January 29, 2013; [epub ahead of print]. doi: 10.1177/0269881112473791.

Cocoa (*Theobroma cacao*) contains polyphenolic compounds that have been shown to positively affect anxiety and enhance calmness, and cocoa polyphenols have also been shown to increase blood flow to the brain and improve cognition. This randomized, double-blind, placebo-controlled, parallel study sought to assess the neuropsychological effects of high and low doses of cocoa polyphenols by examining both acute and sub-chronic effects on cognition and mood in healthy, middle-aged subjects. Cognitive, neurocognitive, and cardiovascular performance, as well as mood, were measured in this trial; this paper reports on the results for cognition and mood, while neurocognitive results are reported in another paper.¹

Healthy, middle-aged adults (aged 40-65 years), free from age-related diseases such as dementia and cardiovascular disease, and not pregnant or smokers or taking any supplements, were recruited. Participants were randomly assigned to receive a dark chocolate drink mix containing either 500 mg (high dose), 250 mg (low dose), or 0 mg (placebo) of cocoa polyphenols once daily for 30 days. The drink mixes differed only in their polyphenol content, but were otherwise matched for their taste, energy, and calories. The high-dose treatment consisted of Acticoa™ cocoa powder (Barry Callebaut; Zurich, Switzerland). It is unclear from where the other treatments were obtained or how the drink mix was consumed (i.e., mixed with a beverage or food). The study was funded by Barry Callebaut.

Measures of cognition and mood included the Cognitive Drug Research (CDR) system, which rates quality of working memory, quality of episodic secondary memory, power of attention, speed of memory, and continuity of attention. Self-rated mood was tested with 16 total scales of the Bond-Lader Visual Analogue Scale (VAS). Both were taken at

baseline and after receiving 30 days of treatment. For the acute part of the study, measures were taken for each treatment at 1, 2.5, and 4 hours after the first dose.

Participants completed a total of 3 testing sessions. On the first day, they took the tests 4 times to minimize the effects of practice on the study days. On the second day, baseline and acute measures were taken following acute treatment. On the final day, measures were taken after the 30 days of treatment. Subjects were instructed to refrain from eating other foods containing polyphenols or drinking caffeine- or alcohol-containing beverages on test days, but were allowed a light breakfast. Throughout the study, they were asked to eat no other sources of chocolate and kept a food diary recording other sources of polyphenols consumed. Dietary polyphenolic content was calculated after the 30 days and was found to be comparable between the groups (153.7-161.5 mg/day).

Of the 87 participants recruited, 72 completed the study, and 71 were included in the analysis (high dose, n=24; low dose, n=25; placebo, n=22); most were lost to follow-up at baseline or 30 days. For the acute testing, there were no significant time by treatment interactions for any dose on cognition or mood. For the sub-chronic testing, there were no significant effects of cocoa at any of the polyphenolic doses on any of the cognitive factor scores.

There were significant effects on certain aspects of mood, including the calmness ($F [2, 68]=3.62, P<0.05$) and contentedness ($F [2, 68]=3.66, P<0.05$) VAS scores. Calmness was significant for the high-polyphenol group ($t=-2.36, P<0.05$), but not for the low-polyphenol ($t=1.89, P=0.07$) or placebo ($t=-1.05, P=0.31$) groups when measured by paired t-test. Contentedness was also found to be significant for the high-polyphenol group ($t=-2.54, P<0.05$), but not for the low-polyphenol ($t=1.02, P=0.32$) or placebo ($t=0.03, P=0.76$) groups.

The authors note that this trial is the first to show a benefit for positive mood states following cocoa polyphenol supplementation in healthy subjects, and thereby provides a rationale for investigating whether cocoa polyphenol supplementation can also benefit clinical anxiety. That there were no acute effects on either cognition or mood at any time point may be because 1 acute dose is too small to cause detectable changes. The fact that subjects ate a lunch meal in between the first and remaining acute time points may have affected the results due to postprandial interference. A larger study with longer supplementation periods and determination of the optimal dose will help to strengthen the findings of this study.

—Risa Schulman, PhD

Reference

¹Camfield DA, Scholey A, Pipingas A, et al. Steady state visually evoked potential (SSVEP) topography changes associated with cocoa flavanol consumption. *Physiol Behav.* 2012;105(4):948-957.

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