

Coffee, Caffeine and Cognitive Performance

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SUMMARY

We studied the role of caffeine in action monitoring as expressed by the error-related negativity (ERN), an event-related brain component that reflects anterior cingulate cortex (ACC) activity. In a double-blind, placebo-controlled, within-subjects experiment, two caffeine doses (3 and 5 mg/kg BW) and a placebo were dissolved in a cup of decaffeinated coffee and administered to 15 habitual coffee drinkers. Compared with placebo, both caffeine doses enlarged the ERN. The P2 and P3 amplitudes were not affected by caffeine. Thus, the enlarged ERN after caffeine reflects a specific effect on action monitoring. We conclude that consumption of a few cups of coffee intensifies central information processing, specifically the monitoring of ongoing cognitive processes for signs of erroneous outcomes.

We also studied the effects of caffeine on task switching in alternated task (AABB) blocks and single-task (AAAA) blocks. Participants alternated between two tasks (A and B) in a predictable manner. Reaction time switch costs were reduced compared to placebo. ERPs revealed a negative deflection that developed within the preparatory interval, which was more negative for switch compared to repeat trials. This switch-related difference was increased under caffeine compared to placebo. These results suggest that a few cups of coffee improve task-switching performance by enhancing anticipatory processing such as task-set updating.