

Shifts in Mood and Brain Activity was Linked to Five Minutes of Coffee Aroma

A recent study examined [electroencephalographic](#) (EEG) activity, subjective mood, heart rate (HR), and heart rate variability (HRV) following short-term exposure to the aroma of coffee, using a multi-modal approach.



Study

Coffee is widely consumed worldwide, and its aroma contains numerous volatile compounds produced mainly during roasting and brewing. Existing research suggests coffee aroma can influence physiological activity and [psychological states](#). Studies suggest that coffee aroma may influence cognitive performance, mood, brain activity, and stress-related responses.

Some studies reported improvements in mood following exposure to the aroma of coffee. EEG, widely used to study psychophysiological responses to fragrances, provides information on cortical electrical activity. By comparison, HR and HRV provide information regarding cardiovascular and autonomic responses. This enables the study of different aspects of the response to [olfactory stimulation](#).

Previous studies have investigated responses in mood, [salivary cortisol](#), and working memory to exposure to coffee aroma. Work to date has typically focused on selected response domains, making it challenging to assess how changes appear when multiple domains are considered simultaneously in the same individual. The authors note that responses across physiological and psychological domains need not necessarily occur in tandem. Studying these domains in the same individual may lead to a more complete characterization of the changes observed following olfactory exposure to coffee.

The current study employed a single group of twenty [healthy adults](#) (aged 20-29 years) in a laboratory at Showa Pharmaceutical University between March 2024 and March 2026. The sample comprised 8 men and 12 women. For the same participants, psychological and physiological measurements were obtained before and after short-term exposure to aroma.

For each experiment, freshly brewed coffee was placed approximately 50 cm from the participants, who were exposed continuously to the coffee aroma for 5 min while breathing

normally. No additional odor source was intentionally introduced into the room, which was ventilated before each experiment. Using the [Profile of Mood States](#) (POMS), mood was assessed immediately before and after exposure to coffee aroma. EEG activity was analyzed using alpha (α), beta (β), and theta (θ) frequency components, and HR was also obtained using a portable device. An additional wearable device measured HRV, assessed using the low-frequency/high-frequency (LF/HF) ratio.

Findings

Regarding changes in mood states, Total Mood Disturbance (TMD) decreased, while reductions were also observed in the [Tension-Anxiety](#), Anger–Hostility, Fatigue, Confusion, and Depression–Dejection subscales. Vigor, by comparison, showed no statistically significant change. After adjustment for multiple comparisons, the reduction in Anger–Hostility was no longer statistically significant. These results, showing reductions in several negative mood dimensions, are broadly consistent with previous reports suggesting that coffee aroma can influence subjective psychological states.

Quantitative EEG changes have been reported in previous research during exposure to coffee aroma. In this study, the EEG-derived relaxation index rose from about 0.74 pre-exposure to 0.78 post-exposure. Although the change was modest, it was consistent across participants. The physiological significance of this difference has not been established, and the index reflects relaxation-related EEG activity rather than directly measuring [relaxation](#).

The HR and [HRV measurements](#) showed no statistically significant pre–post differences. The present finding concerning HR is consistent with some existing research, though differences in study design limit direct comparability across studies. Given the small sample size, the results do not rule out cardiovascular autonomic responses.

Exploratory Pearson correlation analyses revealed no statistically significant associations between changes in mood, EEG activity, HR, and HRV. The authors caution that the concurrent group-level changes should not be interpreted as evidence of a common underlying mechanism across these domains. Rather, the findings show the value of concurrently assessing multiple domains, as these measures may capture complementary but distinct aspects of the response to [coffee aroma](#).

Conclusion

The findings in this exploratory within-subjects study highlighted the value of [multi-modal assessment](#) in examining complementary psychological and physiological changes following short-term exposure to the aroma of coffee. To establish the specificity and physiological significance of these findings, controlled studies with larger sample sizes are required.

The main strength of this study is the concurrent assessment of physiological and psychological changes under the same experimental conditions. The main limitation is the lack of a control condition, so the results cannot be causally attributed to exposure to coffee aroma. Time, quiet rest, repeated measurement, expectation, adaptation to the experimental [environment](#), or other nonspecific factors may have contributed to the observed changes.

A second limitation concerns the small sample size, which limits the precision of the point estimates. Finally, the sample's exclusive inclusion of healthy adults aged 20–29 years limits the generalizability of the findings. The study also did not systematically assess [habitual coffee](#)

[consumption](#), coffee preference, aroma familiarity, or olfactory sensitivity, and did not quantitatively monitor aroma concentration or airflow. The consumer-grade EEG device also has technical limitations compared with laboratory-grade EEG equipment.

Source:

<https://www.news-medical.net/news/20260910/Five-minutes-of-coffee-aroma-was-linked-to-shifts-in-mood-and-brain-activity.aspx>