The Relationship Between Caffeine Consumption and Visual Reaction Time

By: Allie Celauro, Julia Hurynovich, Sunehra Ibnat, Nicolle Jimenez

Introduction

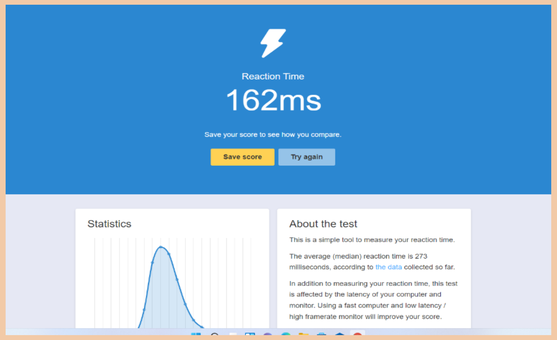
Caffeine is one of the most widely used psychoactive substances and is often consumed to increase alertness and mental performance. Research on its impact on reaction time, however, shows mixed results. Research conducted by Saville (2018) found that caffeine improves attentional and perceptual processing, though it does not significantly speed motor responses. Souissi (2014) reported improved reaction times under sleep deprivation, suggesting caffeine may be most effective when baseline alertness is low. In contrast, Judelson (2005) found no reaction-time benefits among chronic caffeine users, indicating that tolerance and individual differences can influence outcomes. Because simple visual reaction time tasks depend on both attention and motor output, they provide a clear measure for testing caffeine's effects. Our study examines whether consuming 100 mg of caffeine reduces reaction time compared to a placebo in a controlled, repeated-trial setting.

Motivations

Our motivation stems from wanting to understand whether caffeine truly enhances reaction speed, especially since reaction time plays a critical role in everyday activities. As college students who regularly consume caffeine to stay alert and manage our school work, we were interested in testing whether caffeine actually improves performance in a measurable way.

Methodology

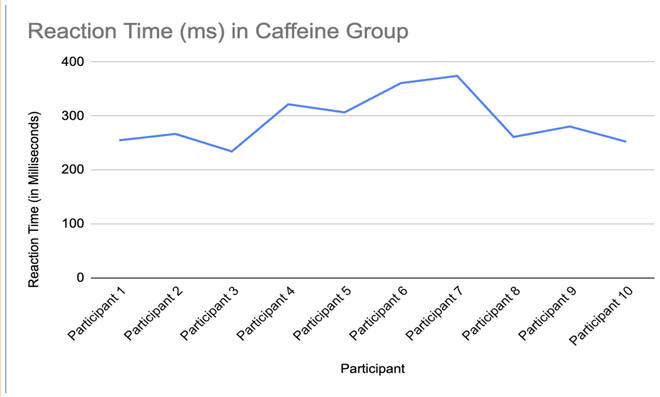
To examine whether caffeine consumption affects reaction time, we conducted a controlled experiment using an online reaction-time test. The independent variable was the amount of caffeine consumed (0 mg in the placebo condition vs. 100 mg in the caffeine condition). The dependent variable was reaction time, measured in milliseconds based on how quickly participants clicked when the screen changed color. Twenty individuals participated to ensure a sufficient sample size, with each assigned to either the caffeine or placebo group. To minimize outside influences, participants avoided caffeine for 8–12 hours and vigorous activity for at least two hours before testing. Those in the caffeine group consumed a small coffee containing 100 mg of caffeine and waited 30 minutes before beginning the trials, while the placebo group consumed decaf coffee. All participants completed the reaction-time test on the same device, under the same lighting, and at the same time of day to maintain consistency across sessions.

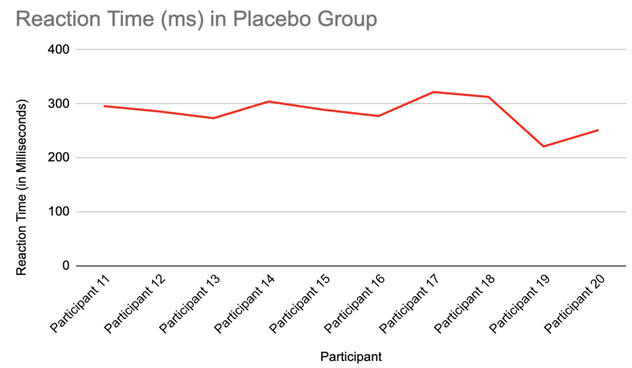


(The online reaction time test that was used.)

Results

Both line graphs plot the mean reaction time (ms) of 5 trials for each participant.





An independent samples Welch's t-test was done to compare the session means of each group.

P= .65

This p-value shows that the differences between each group are not statistically significant. There is a 65% probability that the differences are by random chance.

Variability: The caffeine group had a larger range in reaction times (234.4-374.4 ms) than the placebo (221-321.8 ms).

Conclusion

The findings of this study show that caffeine does not have statistically significant effects on reaction time. The trials conducted demonstrated that participants did not perform particularly better on the online reaction time test in comparison to those who did not ingest any caffeine prior. This lack of statistical significant differences in data between groups suggests that caffeine as a substance does not have as remarkable an effect on attentiveness, speed and attention as the general public may believe. The conclusions of this study have a variety of implications for future research regarding caffeine and its interactions with mental and motor processes. Prospective studies may benefit from manipulating the variables involved differently, using different dosages of caffeine, different measures of reaction time, brain imaging and making changes to the amount of time in between caffeine ingestion and trial completion. In doing so we can build upon existing research to understand further the extent to which caffeine alters performance as it relates to reaction time, and its significance in our daily lives.

References

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