Assessment of the Effects of Metabolism of Caffeine on Reaction Time by Age Group

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Objectives

In the context of recent concerns over the caffeine content in pharmaceutical products, which prompted a regulatory review in Australia, this study aims to investigate the correlation between age and the rate of metabolism of caffeine, as reflected in the reaction times of people of different age groups.

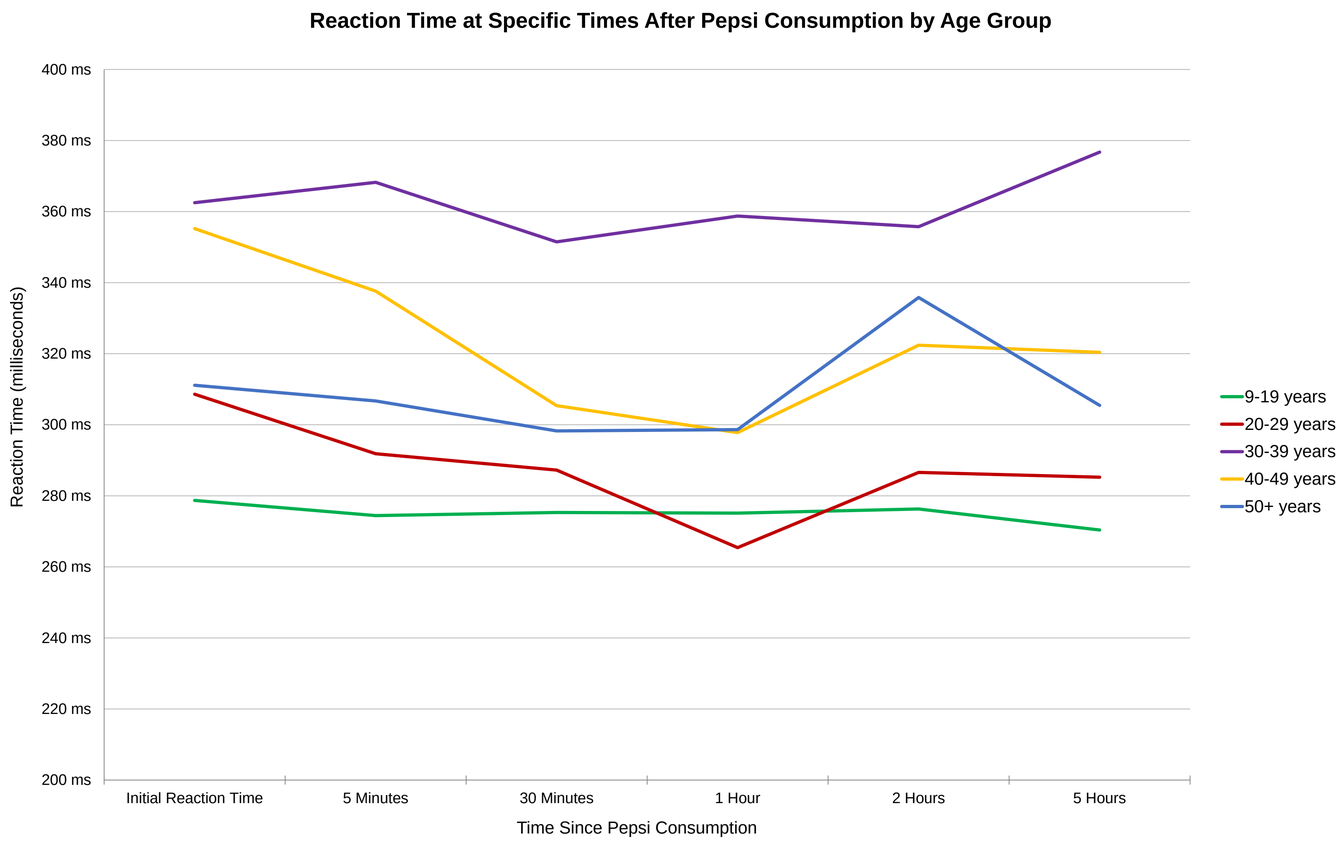
Methods

An opportunity sample of residents of London, United Kingdom, was recruited for the experiment. Participants completed an online reaction time test at predetermined intervals before and at 5 minutes, 30 minutes, 1 hour, 2 hours and 5 hours after drinking a 300ml can of sugar-free caffeinated Pepsi Max. At each interval, the reaction time test was completed three times in quick succession and the mean time calculated by the reaction time software was recorded.

Results

The group aged 9-19 years had the fastest average reaction time overall and experienced little change from baseline. There was a rapid effect on reaction times in this age group, with a decrease in reaction time already observed at 5 minutes after drinking the caffeinated drink from 279 milliseconds (ms) to 274 ms. The decrease in reaction time was also sustained for this age group through all of the predetermined time intervals and the reaction time actually dropped at 5 hours to 270 ms, which was below not only the average initial reaction time but also the average reaction time at 2 hours.

The average reaction time in the 20-29 age group started to decrease at 5 minutes and only began to rise at the 2-hour measurement point after caffeine consumption. However, the reaction time at 5 hours was still noticeably lower than the initial reaction time.



The 30-39 age- group on average experienced a decrease in reaction time only 30 minutes after caffeine intake and the effect began to wane after 1 hour. In this age group, reaction time then began to increase again at 2 hours. At 5 hours the reaction time had exceeded the initial reaction time.

The 40-49 age group had a steady decrease in reaction time until 1 hour after caffeine consumption (from 355 ms to 298 ms). After that there was an increase in reaction time at 2 hours which continued until reaction time reached an average of 320 ms at 5 hours after the intake of caffeine. The reaction time at 5 hours was still much lower than the initial reaction time.

Reaction time in the 50+ age group declined from baseline only for the first 30 minutes (from 311 ms to 298 ms), before starting to rise. The reaction time at the 5-hour measurement of 305 ms was slightly lower than the initial reaction time in this age group.

Age Category (years)	Initial Reaction Time	5 Minutes	30 Minutes	1 Hour	2 Hours	5 Hours
9-19	279 ms	274 ms	275 ms	275 ms	276 ms	270 ms
20-29	309 ms	292 ms	287 ms	265 ms	287 ms	285 ms
30-39	363 ms	368 ms	352 ms	359 ms	356 ms	377 ms
40-49	355 ms	338 ms	305 ms	298 ms	322 ms	320 ms
50+	311 ms	307 ms	298 ms	299 ms	336 ms	305 ms

Conclusions

All age groups except 30-39-year-olds had a lower reaction test time at 5 hours compared to baseline. Notably, while reaction time improved across all age groups after caffeine consumption, the magnitude and longevity of the impact varied. In particular, younger people, with faster metabolisms and fewer years of pre-existing exposure to caffeine, were found to experience a positive caffeine impact on reaction times faster than other age groups, but the magnitude of improvement in reaction time was lower. This study builds on the findings of prior research examining the effects of caffeine on reaction time by age group and of the overall effects of caffeine on the body. While further testing on larger randomised samples is needed, the results of this experiment can inform research into caffeine content requirements for medicines.