



# IMPACT OF CAFFEINE AND PHYTOCHEMICAL INTERACTIONS ON MENTAL PERFORMANCE

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## BACKGROUND

The plant defence compound caffeine is widely consumed as a performance enhancer in a sporting context, with potential benefits expected in both physiological and psychological terms.<sup>1</sup> However, although caffeine modestly but consistently improves alertness and fatigue, its effects on mental performance are largely restricted to improved attention or concentration. It has no consistent effect within other cognitive domains that are important to sporting performance, including working memory, executive function, and long-term memory.<sup>2</sup> Although caffeine research often uses pure caffeine, this phytochemical is typically consumed alongside other bioactive compounds.

## CAFFEINE: MECHANISMS AND INTERACTIONS

Although caffeine's central nervous system effects are often attributed to blockade of the receptors for the inhibitory neuromodulator adenosine, it also inhibits a number of enzymes involved both in neurotransmission and in cellular homeostasis and signal propagation. It also modulates the pharmacokinetics of other endogenous and exogenous bioactive molecules, in part via interactions with shared Cytochrome P450 enzymes. Caffeine therefore enjoys interactive relationships with a wide range of bioactive medicinal and dietary compounds, potentially broadening, increasing, decreasing, or modulating the time course of their functional effects, or vice-versa.<sup>3</sup>

Evidence suggests that caffeine can increase the bioavailability and/or bioactivity of a range of phytochemicals.<sup>4,5</sup> Indeed, the most persuasive evidence for the physiological or psychological effects of the ubiquitous plant-derived polyphenols relates to extracts containing low doses of caffeine derived from caffeine synthesising plants such as cocoa (*Theobroma cacao*), guaraná (*Paullinia cupana*), coffee (*Coffea* genus) and tea (*Camellia sinensis*).<sup>6,7</sup>

## FUTURE DIRECTIONS

Whilst there is a clear case for caffeine's interactive properties with other bioactive compounds, more research designed in such a way as to disentangle the relative contributions of the component parts of these products is required.

It may be the case that the true utility of caffeine, even at low doses, is its ability to potentiate the bioactivity of other co-consumed compounds, including many that have not been investigated in this context to date.

## REFERENCES

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