

THE CHEMOSENSORY IMPACT OF COFFEE AND CAFFEINE ON HEART ACTIVITY

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Caffeine has been reported to stimulate 5 of the 25 bitter taste receptors (hTAS2Rs) located in the human oral cavity as well as receptors found in the intestinal STC-1 cells lines. Therefore caffeinated beverages have the potential to elicit reflex autonomic nerve system (ANS) responses affecting the cardiovascular system (CVS) due to caffeine's chemosensory impact on gustatory and gastro-intestinal tract (GIT) hTAS2Rs. Coffee's bitter taste is due primarily to the presence of quinides formed during roasting rather than caffeine.

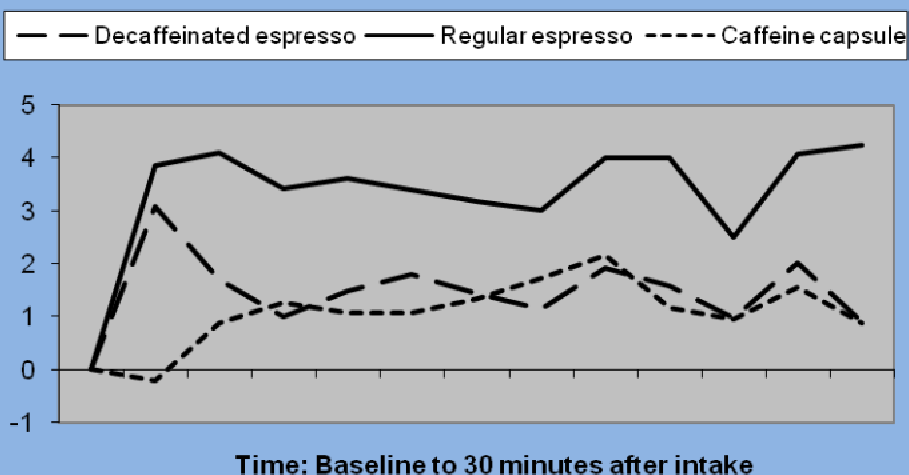
Test substances and Procedure

Participants were tested with regular (\approx 130 mg caffeine) and decaffeinated "medium roasted Columbia" espresso coffees (16.5 mg beans, 67 ml) and two capsules (134 mg caffeine and a placebo). After abstaining from food and drink (excluding water) for two hours participants were seated with a haemodynamic monitoring system (*Finometer PRO*, *Finapres Medical Systems, Amsterdam, The Netherlands*) attached to their left hand. Mean parameter values were extracted from the continuous recording for a pre-ingestion measure and for three functionally distinct post-ingestion measures: Phase 1: 0 to 5 minutes; Phase 2: 10 to 15 minutes; Phase 3: 25 to 30 minutes.

Parameter	Intervention	Pre-ingestion	Phase 1	Phase 2	Phase 3
HR	PC	67.6 \pm 5.3	66.5 \pm 4.6	66.0 \pm 4.3	66.0 \pm 4.1
bpm	DC	69.2 \pm 7.6	70.7 \pm 7.5**	70.0 \pm 8.0	70.1 \pm 6.8
	RC	68.3 \pm 7.0	71.6 \pm 7.2***	70.4 \pm 6.7**	71.1 \pm 6.4*
	CC	65.7 \pm 6.5	-	65.5 \pm 6.0	65.5 \pm 5.8
DP	PC	74.4 \pm 6.6	74.9 \pm 7.4	74.6 \pm 7.1	75.2 \pm 6.9
mmHg	DC	74.9 \pm 6.3	75.9 \pm 6.1	76.5 \pm 5.4	78.3 \pm 5.9
	CC	74.5 \pm 7.2	-	76.4 \pm 5.4*	76.8 \pm 5.1
	RC	75.7 \pm 4.7	76.8 \pm 4.5	76.5 \pm 4.4	77.6 \pm 4.9
AC	PC	1.71 \pm 0.36	1.69 \pm 0.38	1.70 \pm 0.35	1.69 \pm 0.36
MU	DC	1.68 \pm 0.41	1.65 \pm 0.39	1.62 \pm 0.41	1.57 \pm 0.43
	RC	1.68 \pm 0.41	1.66 \pm 0.39	1.66 \pm 0.40	1.63 \pm 0.36
	CC	1.67 \pm 0.37	-	1.61 \pm 0.35*	1.60 \pm 0.34

PC = placebo-control capsule, DC = decaffeinated coffee, RC = regular coffee, CC = caffeine capsule, HR = heart rate, DP = diastolic pressure, AC = arterial compliance, bpm = beats per minute, Lpm = liters per minute, MU = medical unit = mmHg s ml⁻¹. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

HR (bpm) changes from baseline minus placebo



Conclusions

The drinking of hot caffeinated coffee elicits ANS responses due to the impact of caffeine on the oral hTAS2Rs. These responses include, but are not limited to, increased heart rate. The tasting of caffeine is likely to contribute to coffee's wide ranging effects on behaviour. Caffeine released in the gut also elicits ANS responses, via the GIT hTAS2Rs, producing decreases of arterial compliance and increases of diastolic pressure. These CVS changes are associated with an increased GIT blood flow.