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**ACUTE PHYSIOLOGICAL EFFECTS OF CAFFEINE
ON CARDIOVASCULAR SYSTEM AND COGNITIVE FUNCTIONS
IN REGULAR CONSUMERS VS RARE CONSUMERS**

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Relevance. Caffeine is the most widely consumed psychoactive substance, which is known for its stimulation effects on cardiovascular effects and cognitive functions. But its effects vary from a person who has built tolerance by regular consumption and on people who don't consume it. This differential effect remains poorly quantified. Most existing studies examine very general consequences leaving a gap whether everyone will experience the same side effects or not.

Aim: to study acute physiological effects of caffeine in regular consumers and rare consumers on cardiovascular system (systolic and diastolic pressure, heart rate) and cognitive functions (memory, focus and alertness).

Materials and methods. 40 healthy, normotensive participants aged between 18 to 30 years, weighed between 50 to 75kg were divided into Regular Consumer and Rare Consumers (less than 3 times a month). Participants were requested to follow an 8 hour fast, 24-hour break from caffeine, have had a good sleep of 8 hours, and absence of any mental stress and emotional disturbance which may impact the transparency of results. Blood pressure parameters were recorded using a digital blood pressure apparatus and cognitive functions were recorded using computerized games such as N-back test, Digital symbol substitution test (DSST), and recognition memory pattern games. These parameters were checked 15mins before caffeine consumption. Later candidates were served 250ml of americano (120mg of caffeine). And all the measurements were repeated again at intervals of +30mins, +1hr and +2.5hrs. Between these time periods, participants were provided with a calm environment so as to avoid any physical activity that may impact the results. The statistical analysis was performed using program Statistica. Sequential measurements within groups were estimated by Wilcoxon Signed-Rank Test, differences between groups – by Mann-Whitney U test.

Results and their discussion. Rare Consumers showed significant increases at 30 minutes: systolic blood pressure $+16.5 \pm 0.8$ mmHg (range 16-21), diastolic blood pressure $+12.4 \pm 0.7$ mmHg (11-13), heart rate (HR) $+9.2 \pm 0.5$ bpm (8-11), N-Back $+17.9 \pm 0.8\%$ (16-21), PRM -0.38 ± 0.02 sec (faster), and DSST $+10.7 \pm 0.8$ symbols (9-13) (all $p < 0.001$). At 1 hour, indices remained elevated: systolic blood pressure $+9.8 \pm 0.9$ mmHg, N-Back $+8.9 \pm 0.7\%$ ($p < 0.001$). At 2.5 hours, near-baseline values were observed. In contrast, Regular Consumers showed blunted responses at 30 minutes: systolic blood pressure $+6.4 \pm 0.8$ mmHg (5-10), HR $+4.0 \pm 0.2$ bpm (4-7), and N-Back $+3.0 \pm 0.5\%$ (2-5) representing 61% lower systolic blood pressure, 56% lower HR, and 83% lower cognitive responses compared to Rare Consumers ($p < 0.001$ for all comparisons between groups). By 1-hour, Regular Consumers had returned to baseline. Statistical analysis revealed biphasic responses: during absorption period (0-30 min), Rare Consumers showed rapid increases (systolic blood pressure $+0.55$ mmHg/min, HR $+0.31$ bpm/min, N-Back $+0.60\%/min$); during elimination period (30-150 min), effects decayed steadily (systolic blood pressure -0.103 mmHg/min, N-Back $-0.112\%/min$). Regular Consumers showed flatter elimination curves (systolic blood pressure -0.042 mmHg/min, 59% slower).

Conclusions. The study shows that regular use fundamentally changes how the body responds, with development of a significant tolerance. Unlike rare consumers who experience clear, temporary spikes in blood pressure, heart rate, and cognitive performance, regular consumers show blunted effects that fade faster and never reach the same peak. This suggests the body adapts to caffeine, dampening the response with repeated exposure. Clinically, it matters because individuals who become adapted may unknowingly escalate their dose chasing an effect they can no longer fully achieve.