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# Heuristic Thought Fluctuates with Blood-Glucose Levels – Lower Metabolic Energy Predisposes to Simplistic Thought

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**ABSTRACT**

*Three studies supported the hypothesis that low glucose increases reliance on heuristic thought. In Study 1, lower levels of glucose in the bloodstream predicted a larger correspondence bias, or the tendency to attribute the cause of a woman's behavior to her personality rather than the envi-ronment. In Study 2, participants who completed a task found to deplete glucose showed in-creased primacy in impression formation, compared to participants who completed a nondeplet-ing task. In Study 3, consuming a glucose drink (vs. a placebo) reduced the tendency to ignore base rate information when estimating probability and assume probability based on the ease with which relevant examples come to mind.*

**KEYWORDS :**

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The brain uses glucose as a primary source of metabolic energy. Extremely low glucose can result in brain damage or death, and hence evolutionary selection has ensured a constant supply of glucose to the brain. A textbook assumption widely accepted in the biological sciences thus is that changes in glucose availability typically are relatively minor and do not influence many subprocesses within the organism, such as psychological thought (Booth, 1994). The current reports evidence that falsifies this assumption. One of the most widely studied and well-established ideas in psychology is that of mental heuristics. People conserve mental energy by frequently using quick mental shortcuts and resource-efficient strategies. The current hypothesis was that heuristic thought would fluctuate with glucose levels in the bloodstream, being more likely when glucose levels are lower.

Study 1 – Increased Correspondence Bias with Lower Blood-Glucose

One popular and robust heuristic is the correspondence bias – people underestimate the influence of external factors when judging personality (Gilbert, Pelham, & Krull, 1988). An initial experiment showed that lower blood-glucose levels among 70 undergraduates predicted a larger correspondence bias. Lower measurements of glucose in a blood droplet from the finger (69 < mg/dLs > 156) predicted increased ratings of the extent to which a woman shown talking during a video appeared to be an anxious person, when she was said to be discussing topics likely to induce anxiety (e.g., sexual fantasies), $r(39) = -.39$, $p < .05$, but not when discussing neutral topics (e.g., good books), $r = .09$, $p = .67$ ($z = 1.89$, $p < .05$). Lower glucose thus predicted failures in correcting for situational factors (the anxious topics) when making attributions about another's behavior.

Study 2 – Increased Primacy in Impression Formation After Having Completed a Glucose-Depleting Task

People save mental energy by quickly forming impressions of others. A self-regulatory task known to deplete blood-glucose (Gailliot et al., 2007) increased primacy in impression formation – a shortcut in judgment. Specifically, 143 undergraduates who had (v had not) stared at a podium and suppressed all emotional expression while watching a 15 minute comedy video subsequently formed stronger initial impressions, rather than considering all information. Ratings of introversion-extraversion for a person described in a paragraph as introverted and in another as extraverted (Landau et al., 2004) were determined by the order in which participants had read the paragraphs and whether they had regulated their attention and emotions, $F(1, 137) = 6.03$, $p < .05$. The first paragraph tended to shape judgments (e.g., having read the introverted paragraph first increased ratings of introversion) – but only among participants who had self-regulated previously, $F(1, 73) = 5.91$, $p < .05$, and not among those who had watched the video normally, $F(1, 66) = 1.07$, $p = .30$.

Study 3 – Reduced Heuristic Thought After Having Imbibed a Glucose Drink

A final study showed that consuming a sugar drink reduced heuristic thought – ignoring base rate information when estimating probability and assuming probability based on the ease with which relevant examples come to mind (Kahneman & Frederick, 2002, 2005) – therefore providing direct causal evidence for the hypothesis. Among 30 respondents in a park, a double-blind procedure showed that those who had consumed a drink that did, rather than did not, contain glucose (Sprite v Sprite-Zero) were less prone to rate more likely a tennis player's losing the first set but winning the match (less probable outcome), rather than losing the first set alone, and were less prone to rate salient causes of death (e.g., homicide) as being more likely than less

salient, yet equally frequent, causes (e.g., Diabetes), $t(28) = 2.70$, $p = .01$.

**General Discussion**

Heuristics often are described in the social sciences as relying on vague or mysterious 'mental resources'. Here, we pinpoint these resources as tangible glucose. Individual or transient differences in metabolism (e.g., diabetes, premenstrual syndrome) may influence heuristic thought – whether people are either controlled and effortful or heuristic thinkers. The assumption that typical changes in glucose do not influence psychological thought is justified no longer. Heuristic thought fluctuated with normal blood-glucose levels, increased after completing everyday tasks that deplete glucose, and decreased after people consumed a common sugar drink.

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