Does obesity drive greater pleasurable food intake to achieve stress relief? A rodent model of human comfort feeding behaviors.

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Introduction: Obesity is a leading preventable cause of disability in the United States, but the relationship between stress, comfort feeding, and obesity is not fully understood. Previous rodent research indicates that lean rats exhibit decreased responses to acute stress after *volume-limited* sucrose exposure, while obese rats do not exhibit this decreased stress after the same exposure.

Hypotheses: We hypothesized that obese rats need more sucrose to achieve stress relief. We predicted that rats with diet-induced obesity would drink more 30% sucrose solution than lean rats with access to the same solution during a time-limited paradigm of sucrose exposure that allowed for escalation in sucrose intake. Additionally, we predicted that this increased sucrose consumption would recover the stress-relieving effects of comfort feeding previously seen in lean rats with volume-limited sucrose.

Methods: First, obesity was induced via long-term placement on a high-fat, high-sugar Western diet (WD) vs controls that were maintained on a normal chow diet (CD). Then, rats from each diet group received twice-daily exposure to 30% sucrose (vs. water controls) for 15 days, with assessment of drink and food intake, body weight, and body composition. The following day, rats were given an acute restraint stress with assessment of blood glucose, plasma corticosterone, and behavioral struggling during the restraint.

Results: Contrary to our hypothesis, WD rats drank less sucrose solution than CD controls. However, while CD rats reduced their food intake to compensate for the calories provided by the sucrose, WD rats did not. Sucrose exposure reduced the plasma corticosterone response to restraint in both WD and CD rats and exacerbated the stress-induced hyperglycemia only in WD rats.

Conclusions: The results indicate that escalated sucrose intake effectively reduces the response to stress regardless of diet. When taken with our previous finding that volume-limited sucrose intake is not effective in the context of WD-obesity, this data suggest that larger amounts of sucrose may be required to blunt stress in the context of obesity. Moreover, this stress relief comes at a cost to metabolic health, as escalated sucrose intake worsened metabolic indices, particularly in the context of WD-obesity.

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