



## Review

## The effects of experimentally manipulated social status on acute eating behavior: A randomized, crossover pilot study



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## HIGHLIGHTS

- Experimentally manipulated low social status resulted in 130 more calories consumed.
- Low social status condition resulted in higher % of daily calorie needs consumed.
- Low social status condition resulted in decreased feeling of pride and powerfulness.

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## ABSTRACT

Both subjective and objectively measured social status has been associated with multiple health outcomes, including weight status, but the mechanism for this relationship remains unclear. Experimental studies may help identify the causal mechanisms underlying low social standing as a pathway for obesity. Our objective was to investigate the effects of experimentally manipulated social status on ad libitum acute dietary intakes and stress-related outcomes as potential mechanisms relating social status and weight. This was a pilot feasibility, randomized, crossover study in Hispanic young adults ( $n = 9$ ; age 19–25; 67% female; BMI  $\geq 18.5$  and  $\leq 30$  kg/m<sup>2</sup>). At visit 1, participants consumed a standardized breakfast and were randomized to a high social status position (HIGH) or low social status position (LOW) in a rigged game of Monopoly™. The rules for the game differed substantially in terms of degree of 'privilege' depending on randomization to HIGH or LOW. Following Monopoly™, participants were given an ad libitum buffet meal and energy intakes (kcal) were estimated by pre- and post-weighing foods consumed. Stress-related markers were measured at baseline, after the game of Monopoly™, and after lunch. Visit 2 used the same standardized protocol; however, participants were exposed to the opposite social status condition. When compared to HIGH, participants in LOW consumed 130 more calories ( $p = 0.07$ ) and a significantly higher proportion of their daily calorie needs in the ad libitum buffet meal (39% in LOW versus 31% in HIGH;  $p = 0.04$ ). In LOW, participants reported decreased feelings of pride and powerfulness following Monopoly™ ( $p = 0.05$ ) and after their lunch meal ( $p = 0.08$ ). Relative to HIGH, participants in LOW demonstrated higher heart rates following Monopoly™ ( $p = 0.06$ ), but this relationship was not significant once lunch was consumed ( $p = 0.31$ ). Our pilot data suggest a possible causal relationship between experimentally manipulated low social status and increased acute energy intakes in Hispanic young adults, potentially influenced by decreased feelings of pride and powerfulness. Increased energy intake over time, resulting in positive energy

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balance, could contribute to increased risk for obesity, which could partially explain the observed relationship between low social standing and higher weight. Larger and longitudinal studies in a diverse sample need to be conducted to confirm findings, increase generalizability, and assess whether this relationship persists over time.

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## 1. Introduction

The prevalence of obesity in the United States (U.S.) has increased substantially over the last four decades [1]. In 2012, more than one-third of adults and 17% of youth in the U.S. were obese [1]. Obesity is overrepresented among Hispanic Americans, with Hispanic persons exhibiting higher obesity rates (22.6%) than non-Hispanic Blacks (22.1%), Whites (19.6%), and Asians (11.1%) [1]. Our previous work [2] observed that Hispanic families have lower socioeconomic status (SES) – an objectively measured assessment of social standing reflecting reduced wealth, occupational prestige, and education – relative to Whites, with 23.6% of Hispanic families falling below the poverty line in 2014 [3]. Since low SES has been associated with higher rates of obesity and cardiometabolic outcomes [4–6], low SES represents one potential driver of higher obesity rates among Hispanic persons.

Low SES is associated with lower health literacy, decreased access to purportedly healthier foods such as fruits and vegetables [4,7,8], and poor diet quality as assessed by increased consumption of calories, fat, sugar, and sodium [9–11]. Additionally, low SES families often live in neighborhoods characterized by higher concentrations of fast-food restaurants, which offer a variety of foods high in calories, fat, sugar and sodium [12,13]. Interventions attempting to overcome these presumptive obesity-related barriers in low SES populations have yielded unsatisfactory results. For example, Leroy and colleagues tested the effects of a cash and in-kind transfer program intended to improve food availability and health education by randomly assigning participants to the provision of food baskets plus nutrition education, food baskets only, or cash plus nutrition education in low SES women in rural Mexico for a period of 23 months [14]. Results showed that women in all three intervention groups gained significantly more weight relative to the control group and the effect was even more pronounced among overweight and obese women [14] – a pattern that is the opposite of the original aims of the study. Findings from these studies, and others, indicate

that additional factors beyond access to material resources affect susceptibility to obesity in socially disadvantaged populations.

Self-perception of social standing is an important, but often overlooked factor when exploring the relationship between social status and health. Unlike traditional measures of SES, which often assess income, education, and occupational prestige at one point in time to reflect position within a social hierarchy [15], subjective measures of social status account for a culmination of earlier life and family circumstances, perceived prospects for social mobility, and internalization of relative social standing and/or subordinate status [16–18]. Internalization of low subjective social status may be a psychosocial stressor that negatively alters health-related behaviors [19]. Therefore, a measure of one's *perceived* relative social standing and internalization of subordination may be a better measure for exploring the associations between social status and health outcomes [20,21].

Subjective measures of social standing have been associated with a variety of health-related outcomes in adults including self-rated health [22–26], mortality, diabetes [24], mental health [23,26], depression [24], and cardiovascular disease risk [20,24,27] among others. Subjective measures of social standing have also been associated with weight status cross-sectionally [28] and longitudinally [29] in non-Hispanic Black and White youth, but to our knowledge has not been investigated in adults or Hispanic persons. Cumulatively, these findings support the idea that perceived social standing may represent an appropriate framework for exploring associations between social status, SES, and health outcomes; however, the mechanism for the relationship between perceived social standing and obesity-related outcomes remains unclear.

Experimental manipulation of social standing would offer insight into the relationship between SES, internalization of relative social standing and/or subordinate status, and obesity-related outcomes and may help identify the causal mechanisms underlying low social status as a pathway for obesity. Therefore, the objective of this pilot study was to investigate the effects of experimentally manipulated social

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