Subjective Social Status Stability and the Effects of Subjective and Socioeconomic Status on Eating Behaviors

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The study objective was to determine the stability of subjective social status over time as well as to investigate the effects of experimentally manipulated social status and subjective social status on eating behaviors. This was a randomized, crossover pilot study in Hispanic American young adults (n=9; ages 19 to 25; BMI between 18.5-30 kg/m2). Each participant underwent a telephone screening to determine eligibility. subjective social status and socioeconomic status were reported during the telephone screening and in each of two study visits. In both study visits, fasted participants were provided a standardized breakfast. Participants were then randomized to a high or low social status condition within a "rigged" game of Monopoly. After 40 minutes of Monopoly, the participants received an ad libitum buffet lunch, which was weighed before and after meal consumption. During the three time points within the study (telephone screening, visit 1, and visit 2), no significant change in subjective social status was observed (p=0.51). Additionally, there was no significant interaction between subjective social status and the experimentally manipulated social status condition with regards to energy intake. This data suggests that subjective social status is stable over a 3 –month period in Hispanic American young adults and there is no interaction between experimentally manipulated social status, subjective social status, and energy intake. However, further research in a larger sample is needed.

INTRODUCTION

The prevalence of obesity is disproportionately higher in the Hispanic American population[1]. Non-Hispanic Blacks (22.1%) and Whites (19.65%) exhibit lower rates of obesity relative to Hispanic Americans (22.6%)[1]. Studies show that lower socioeconomic status (SES) has been associated with increasing rates of obesity. Traditional SES measures reflect income, education and occupational prestige[1]. Since 2002, obesity rates have declined in youth of higher SES, but they have continued to increase youth of lower SES[2].

An often overlooked component of social status is subjective social status (SSS), which has been associated with obesity[3]. SSS is defined as a person's perception of where they fall on the social ladder in society[3]. SSS is related to health in adults as well as weight status in non-Hispanic black and white youth[3], but to our knowledge, it has not been investigated in relation to obesity in the Hispanic American population. Additionally, the stability of SSS over time has not been studied in Hispanic Americans.

Experimentally manipulated social status can offer insight into the relationship between SSS, SES, obesity, and eating behaviors; however, limited research has explored this. Therefore, the objective of this study was to investigate the stability of SSS over approximately 3 months and to explore the interaction between experimentally manipulated social status, SSS, and dietary intake, all of which can impact obesity. Given the stability of SSS observed in most non-Hispanic black and white adolescents[3] close in age to our study population, we have hypothesized that the SSS of Hispanic American young adults would be stable over the 3 time points in a 3-month period. We have also hypothesized that adolescents with low SSS would consume more calories, including a greater percentage of their daily calorie needs, a greater percentage of calories from saturated fat, and an increased amount of sodium when placed in an experimentally manipulated low social status condition as opposed to their counterparts with high SSS and experimentally manipulated high social status condition.

METHODS

Participants

Participants included nine Hispanic American young adults between the ages of 19 and 25 in the Denver, Colorado area in 2015. Participants were required to have a body mass index (BMI) between 18-30 kg/m^2 and were excluded if they were not born in the United States, had any strict dietary restrictions, used tobacco or marijuana, or had lost or gained more than 10 pounds in the previous 3 months. Additional exclusion criteria included pregnancy, medications known to influence appetite or body composition, severe psychiatric disorders, known substance abuse or eating disorders, any major diseases known to affect metabolism or cardiac function, or never having played the game of Monopoly before.

Procedure

The study protocol is described in detail elsewhere[5]. In brief, each participant went through a detailed telephone screening to determine study eligibility. All participants were asked to fast overnight for 12 hours and to avoid strenuous exercise for 72 hours prior to their first visit. Participants were blinded to the main aim of the study to minimize bias and were informed that the purpose of the study was to examine the influences of financial circumstances on subtle behaviors during a game of Monopoly. Following completion of the study, participants were fully debriefed and informed of the true nature of the study.

During the first study visit, each participant arrived around 9 AM. Participants were asked to leave all personal belongings in the waiting room and confirm a fasted state. Informed consent was obtained while the participant rested. Anthropometric measurements, BMI, blood pressure and heart rate were assessed. Participants then reported on perceptions of stress, hunger, pride, and powerfulness through visual analog scales, and completed various questionnaires focused on health behaviors and SES[6,7]

The researchers then randomly assigned the participant to either a high social status condition or low social status condition for the Monopoly game. If the participants were assigned to the high social status condition, they were given the Rolls Royce piece, and if the participants were assigned to the low social status condition, they were given the shoe piece. Participants were brought to a room, where they played Monopoly for 40 minutes using the specific piece they were assigned against another participant.

During the game of Monopoly, alternate rules were provided depending upon the experimentally manipulated social status condition the participant was randomly assigned. The rules for the high social status condition included starting with $2000, rolling both die each turn, collecting $200 when passing go, and assignment as the banker throughout the entire game. The rules for the low social status condition included starting with $1000, rolling only one die each turn, and collecting $100 when passing go. Participants were also told not to help each other during the game. Given the differential in provided resources, this "rigged" game of Monopoly provided a different experimentally manipulated social status condition based on randomization.

After the 40-minute Monopoly game, the researchers brought the participants back to their rooms and assessed heart rate, blood pressure, and provided an additional visual analog scale for participants to complete. Participants were then given an *ad libitum* buffet lunch, and left alone for 20 minutes to consume the lunch. After 20 minutes, the researchers again assessed heart rate, blood pressure, and provided a third visual analog scale to the participants.

Participants were asked to come back for a second visit 4 weeks after the first visit. The same protocol was followed with the exception of participant placement in the opposite social status positon.

Subjective Social Status (SSS)

During the telephone screening, subjective social status (SSS) was measured with the MacArthur scale[9]. This scale measures a person's perceived standing in their community and within society. Scores range from 1 being the lowest SSS to 10 being the highest SSS. SSS was also measured during both study visits. The 3 time points SSS was examined included the telephone screening, the first study visit, and the second study visit. The telephone screening was approximately 1 week before the first visit and each visit was approximately 1 month apart.

Dietary Intake Assessment

Participants were given a standardized breakfast at the beginning of their visit. At the *ad libitum* buffet lunch, participants were given a variety of food and drink options. The foods provided were meat lasagna, green beans, macaroni and cheese, Doritos, applesauce, white chocolate chunk macadamia cookies, bottled water, cola, and pink lemonade. To assess consumption, all foods were weighed before and after the participant ate. Diet data was entered in the Nutrition Data System for Research (Nutrition Coordinating Center, University of Minnesota). Dietary variables of interest included calories (kcal), percent of daily calorie needs consumed, percent of calories from saturated fat, and total sodium (mg) intake. Percent of daily energy needs was assessed using Mifflin-St. Jeour equation[8.]

Additionally, the interaction between participants' experimentally manipulated social status condition and SSS were analyzed to determine their relationship to dietary intake.

Statistical Methods

All analyses were conducted using SAS 9.4 (SAS Institute, Cary, NC). Given this is a pilot study with limited sample size, the MacArthur scale of SSS was reported for one telephone screening and two study visits of each individual participant. Variables measuring food intakes of individual subjects were reported in tables by experimentally manipulated social status condition and SSS. These variables were also plotted as scatter plots to observe trends and patterns between experimentally manipulated social status, SSS, and food intake. SAS procedure PROC GLM was used to determine any interaction between experimentally manipulated social status and SSS. Comparisons are considered statistically significant if p-value ≤ 0.05.

RESULT

Participants had a mean age of 22.3±1 years, were 67% female and had a mean BMI of 22.8 kg/m^2. The majority of participants (55%) were students or employed full time, 77% completed some college or were college graduates, and 89% reported a household income below $41,000 per year. More than half of the participants (55%) reported high SSS with a score of ≥6 on the MacArthur SSS Scale[4].

Table 2 examines the MacArthur SSS measure at 3 different time points throughout the study. There was no significant change of participant's reported SSS between the 3 time points (p=0.51). Four out of six subjects who completed both visit 1 and 2 had identical MacArthur SSS scores.

Table 2 Participants reported SSS using the MacArthur SSS Scale across 3 time points

Participant Number	Telephone Screenings	Study Visit 1	Study Visit 2
1	6	6	6
2	6	5	5
3	6	7	7
4	5	5	8
5	8	6	.
6	5	6	6
7	7	5	.
8	5	3	.
9	4	6	5

Table 3 shows the interaction between participants' experimentally manipulated social status condition and SSS and their relationship to dietary intake as an exploratory analysis. There was no significant interaction between experimentally manipulated social status condition and SSS on any dietary variable of interest.

Table 3. Model coefficients (SE) and P-values for interaction between participants' experimentally

Variable	Model Coefficient	Standard Error	p-value
Total Energy (kcal)	4.3403	161.5733	0.9796
% Daily Calorie Need	-0.0073	0.0887	0.9377
% Calories from Saturated Fat	-2.2631	2.6966	0.4396
Total Sodium (mg)	123.9603	344.4659	0.7337

The data presented in Table 3 is shown graphically in Figure 1. This figure demonstrates that although the exploratory analysis of an interaction between experimentally manipulated social status condition and participants' SSS with dietary intake was not significant, there appears to be a pattern in eating behavior based on SSS and experimentally manipulated social status condition. Participants who were randomized to the low social status condition and who reported a lower SSS tended to consume more energy relative to individuals randomized to the high social status condition and who reported a high SSS.

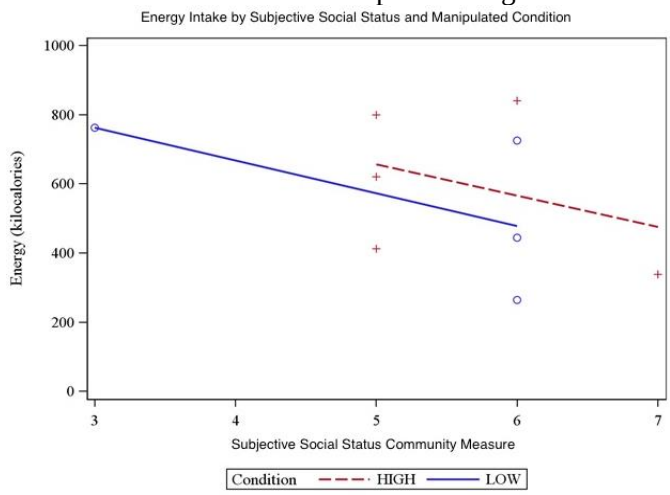

Figure 1. Effects of experimentally manipulated social status condition and SSS on energy intake.

To further depict the relationship between experimental social status conditions and SSS, the average mean of dietary intakes based on experimentally manipulated social status condition and SSS was examined in Figure 2. Participants randomized to the high social status condition and who reported high SSS consumed, on average, 589 kcal. Participants randomized to the low social status condition and who reported low SSS consumed on average, 762 kcal. Table 4 represents theses means in percent daily calorie need, percent calories from saturated fat, and total sodium intake.

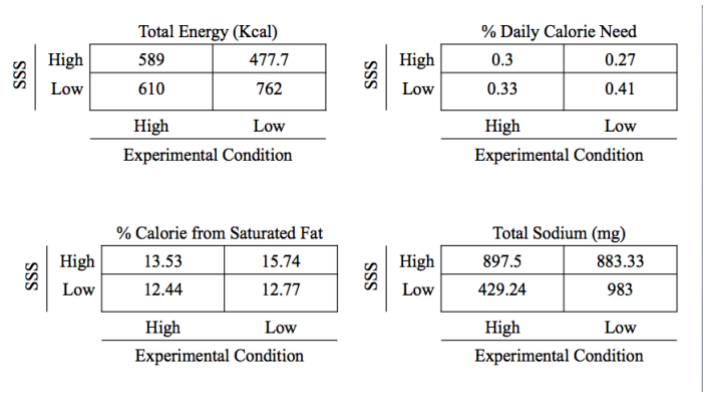

Figure 2. Averages of dietary intake for each experimentally manipulated social status condition and reported SSS.

DISCUSSION

The stability of SSS was assessed across 3 different time points during a period of approximately 3 months. Consistent with the hypothesis, participants' reported SSS remained stable. Oftentimes, SES is used as a proxy or predictor of health trajectory in young adults. However, this measure lacks youth-specific indicators as SES in this population often reflects parental income, parental education, or parental occupational prestige rather than any component reflecting the young adult. However, SSS is a

more relevant measure for young adults because it allows them to assess their perceived standing in the social milieu, which can account for cumulative life experiences and perceived opportunities and trajectories rather than parental SES measures[3]. This study demonstrated SSS is a stable measure over a 2-3 month period and can be directly assessed with Hispanic American young adults rather than relying on parental SES variables.

The relationship between SSS and experimentally manipulated social status condition on eating behaviors was also examined. The data indicate that total energy, percent daily calorie need, percent calories from saturated fat and total sodium intake were not statistically significant. However, showing the data graphically and taking averages of dietary intakes demonstrates potential patterns to be explored in a larger, adequately powered sample. The average total energy consumption among those who reported high SSS, regardless of experimentally manipulated social status condition, was lower than the average total energy consumption of those who reported low SSS. The greatest energy consumption, percent daily calorie need and total sodium intake was among those who were randomized to the low social status condition and who reported low SSS. This is consistent with the hypothesis that those randomized to the low social status condition and who reported low SSS will consume the greatest amounts of energy.

The synergistic combination of low SSS and low experimentally manipulated social status condition appears to be related to increased caloric intake, greater consumption of percent daily calorie needs, and increased sodium intake. However, this study is not sufficiently powered to detect these relationships, which is a significant limitation. Thus, further research should be conducted in a larger sample with adequate power to explore these relationships.

For future directions, this research group has received funding to conduct this research as a randomized controlled trial in 150 Hispanic American adolescents, which will provide the appropriate sample size needed to further evaluate these relationships with sufficient power. In the larger study, investigations of these relationships will also examine differences by sex.

ACKNOWLEDGMENTS

The authors would like to thank the University Scholars Program at the University of Florida for the opportunity to conduct research.

REFERENCES

C.L. Ogden, M.D. Carroll, B.K. Kit, K.M. Flegal, Prevalence of childhood and adult obe- sity in the United States, 2011–2012, J. Am. Med. Assoc. 311 (2014) 806–814.

Morales, Leo S. et al. “Socioeconomic, Cultural, And Behavioral Factors Affecting Hispanic Health Outcomes.” *Journal of health care for the poor and underserved* 13.4 (2002): 477–503. *PMC*. Web. 6 Mar. 2017.

E. Goodman, S. Maxwell, S. Malspeis, N. Adler. Developmental Trajectories of Subjective Social Status . *Pediatrics* 2015;136;e633; originally published online August 31, 2015; DOI: 10.1542/peds.2015-1300

N.E.Adler,E.S.Epel,G.Castellazzo,J.R.Ickovics,Relationship of subjectiveand objective social status with psychological and physiological functioning: preliminary data in healthy white women, Health Psychol. 19 (2000) 586–592.

Cardel MI, et al. (2016) The effects of experimentally manipulated social status on acute eating behavior: A randomized, crossover pilot study. Physiol Behav 162: 93–101.

R. .J. Stubbs, D.A. Hughes, A.M. Johnstone, E. Rowley, C. Reid, M. Elia, R. Stratton, H. Delargy, N. King, J.E. Blundell, The use of visual analogue scales to assess motivation to eat in human subjects: a review of their reliability and validity with an evaluation of new hand-held computerized systems for temporal tracking of appetite ratings, Br. J. Nutr. 84 (2000) 405–415.

A. Akyol, H. Dasgin, A. Ayaz, Z. Buyuktuncer, Besler H., β-Glucan and dark chocolate: a randomized crossover study on short-term satiety and energy intake, Nutrients 6 (2014) 3863.

M.D. Mifflin, S.T. St Jeor, L.A. Hill, B.J. Scott, S.A. Daugherty, Y.O. Koh, A new predic- tive equation for resting energy expenditure in healthy individuals, Am. J. Clin. Nutr. 51 (1990) 241–247.

N.E.Adler,E.S.Epel,G.Castellazzo,J.R.Ickovics,Relationship of subjectiveandobjective social status with psychological and physiological functioning: preliminary data in healthy white women, Health Psychol. 19 (2000) 586–592.