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Author manuscript

Health Educ Behav. Author manuscript; available in PMC 2017 April 01.

Published in final edited form as:

Health Educ Behav. 2016 April ; 43(2): 139–144. doi:10.1177/1090198115598983.

Stress, Health Risk Behaviors, and Weight Status among Community College Students

Jennifer E. Pelletier, MPH,

Doctoral Candidate, Division of Epidemiology and Community Health, University of Minnesota, Minneapolis, MN

Leslie A. Lytle, PhD, and

Professor and Chair, Division of Health Behavior, University of North Carolina, Chapel Hill, NC

Melissa N. Laska, PhD, RD

Associate Professor, Division of Epidemiology and Community Health, University of Minnesota, Minneapolis, MN

Abstract

The objective of this study was to describe the relationship between stress, weight-related health risk behaviors (e.g., eating behaviors, physical activity, sedentary behavior, sleep, cigarette smoking and binge drinking), and weight status using cross-sectional data on 2-year community college students enrolled in a randomized controlled weight gain prevention trial. Modified Poisson regression and linear regression were used to examine crude and adjusted cross-sectional associations. Higher stress was associated with higher prevalence of overweight/obesity (crude PR=1.05 [95% CI 1.01, 1.09]), though the relationship was no longer statistically significant after controlling for a wide range of weight-related health risk behaviors (adjusted PR=1.04 [95% CI 1.00, 1.08]). Stress levels were significantly associated with meal skipping and being a current smoker. Future research should investigate the mechanisms through which stress is related to obesity risk and examine the causes of stress among this understudied population to inform the design of appropriate interventions.

Keywords

obesity; college health; health behavior; mental health; diet; physical activity/exercise; sleep; smoking and tobacco use

Introduction

Young adulthood is an important transition period when long-term lifestyle behaviors may be established and risk of obesity increases (Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008). Two-year community college students are a particularly vulnerable group of young adults: Compared to 4-year college students, community college students have less

Correspondence to: Jennifer E. Pelletier.

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healthy eating and activity behaviors (i.e., more physical inactivity; more television viewing; and higher intakes of soda, fast food, and diet pills), have higher prevalence of overweight/obesity, and are more racially diverse and socioeconomically disadvantaged (Laska, Pasch, Lust, Story, & Ehlinger, 2011). Young adults ages 18–29, individuals with lower income, and individuals from racial minority groups also have higher levels of perceived stress, which may put them at risk for adverse health problems (Cohen & Williamson, 1988; Lee, 2012). Sources of stress among community college students may include financial instability, debt, and difficulty managing concurrent academic, employment, and familial responsibilities (Nelson, Lust, Story, & Ehlinger, 2008; Pelletier & Laska, 2012).

There is growing research on the correlation and possible physiological and behavioral mechanisms between stress and obesity risk. High stress has been linked to weight gain and adiposity (Sinha & Jastreboff, 2013) and appears to inhibit successful weight loss (Kim, Bursac, DiLillo, White, & West, 2009). Hormones that activate stress response also play a role in appetite regulation and reward-seeking, which may affect health behaviors like eating behavior, cigarette smoking, and alcohol use (Cohen & Williamson, 1988; Sinha & Jastreboff, 2013; Torres & Nowson, 2007). Stress has also been shown to influence metabolic function, including insulin resistance (Sinha & Jastreboff, 2013).

Not all individuals respond to stress the same way. Stress appears to have a greater effect on weight gain among individuals who are already overweight. A nationally representative study found that psychosocial stress increased the risk of future weight gain among adults ages 25–74 with higher baseline body mass index (BMI), but not for adults with lower baseline BMI (Block, He, Zaslavsky, Ding, & Ayanian, 2009). This finding is consistent with other studies showing that overweight individuals are more likely to increase food intake and eat more palatable foods in response to stress (Sinha & Jastreboff, 2013). Previous studies have also found associations between higher stress and fast food consumption (Sinha & Jastreboff, 2013), physical inactivity (Nelson, Lust, et al., 2008; Ng & Jeffery, 2003; Roberts & Danoff-Burg, 2010), poor sleep quality (Roberts & Danoff-Burg, 2010), alcohol use (Sinha & Jastreboff, 2013), and smoking (Ng & Jeffery, 2003; Sinha & Jastreboff, 2013), but results have not been consistent across studies (Ng & Jeffery, 2003; Torres & Nowson, 2007). Previous research has shown that community college students have particularly poor health behaviors (Laska et al., 2011), which may be exacerbated by high stress. Understanding how stress, health behaviors, and weight correlate in this vulnerable population may help colleges identify subpopulations in which stress is a risk factor for poor health behaviors and overweight/obesity, which would allow for targeted screening and health promotion services.

The purpose of this manuscript was to describe the relationship between stress, weight-related health behaviors (e.g., eating behaviors, physical activity, sedentary behavior, sleep, cigarette smoking and binge drinking), and weight status using cross-sectional data from community college students. We hypothesized that students with higher stress levels would engage in more health risk behaviors and have higher prevalence of overweight/obesity.

Methods

This analysis used baseline data from the Choosing Healthy Options in College Environments and Settings (CHOICES) trial, an in-person and web-based intervention to prevent unhealthy weight gain among 2-year community college students (Lytle, Moe, Nanney, Laska, & Linde, 2014). Students were recruited from three community colleges in the Twin Cities, Minnesota, metropolitan area in 2011–2012 through e-mail invitations, on-campus posters, and information tables staffed by CHOICES staff members on campus. Eligibility screenings occurred on campus prior to study enrollment; 46% of interested students were eligible and enrolled in the study ($n = 441$). The most common reasons for ineligibility were age >35 years (27%), BMI ≥ 35 kg/m^2 (19%) or <20 kg/m^2 (13%), and non-attendance in one of the participating colleges during the following semester (16%). The University of Minnesota Institutional Review Board approved the study protocol.

All data were collected by trained staff. Height and weight were assessed using standardized protocols using Shorr height boards (Irwin Shorr, Olney, MD) and Tanita scales (Tanita TBF-300A Body Composition Analyzer, Arlington Heights, IL). These measurements were used to calculate BMI (kg/m^2) and classify students as overweight (BMI ≥ 25 and <30) or obese (BMI ≥ 30). Participants completed a survey that measured established behavioral and psychosocial correlates and predictors of obesity among young adults, including eating and activity patterns, tobacco and alcohol use, sleep, and stress. Measures were previously validated and described in detail elsewhere (Nanney et al., 2015). Stress was measured using the Cohen Perceived Stress Scale (4 items; scale range 0–16) (Cohen & Williamson, 1988). With the exception of average hours of sleep/night, all behavioral variables had skewed distributions and were dichotomized based on prior research, national recommendations, and/or the distribution of data here to facilitate analysis (Larson, Neumark-Sztainer, Hannan, & Story, 2007; Nanney et al., 2015; Nelson, Lust, et al., 2008; Physical Activity Guidelines Advisory Committee, 2008; Piernas & Popkin, 2010). Participants also self-reported demographic characteristics (age, sex, race), socioeconomic status (three separate items assessing household income, financial strain (i.e., difficulty living on household income), and parental education) (VanKim & Laska, 2012), weekly hours of paid work, relationship status, and presence of children at home.

Wald tests were used to examine bivariate differences in stress by student characteristics. Modified Poisson regression was used to estimate prevalence ratios for engaging in unhealthy weight-related behaviors (meal skipping, eating dinner away from home, frequent snacking, fast food and sugar-sweetened beverage consumption, low physical activity, high sedentary behavior, smoking, and binge drinking) as a function of stress level for all students and stratified by weight status (normal weight versus overweight/obese). Linear regression was used to estimate the association between stress and hours of sleep/night. Next, prevalence ratios for being overweight/obese (versus normal weight) were estimated as a function of stress, student characteristics, and behaviors. P-values <0.05 were considered statistically significant. All analyses were performed in Stata 13.1 (StataCorp, College Station, TX).

Results

Nearly half of students in the sample were overweight or obese, approximately two-thirds were female, and 27% were non-white (Table 1). The mean stress level in the sample was 5.4 (SD =2.7; range: 0–13). Significant differences in stress level were found by weight status ($p = 0.036$), race ($p = 0.032$), household income ($p = 0.032$), and financial strain ($p < 0.001$). Students who were overweight or obese, were non-white, had household income $< \$12,000/\text{year}$, and reported that it was difficult, very difficult, or extremely difficult/impossible to live on household income had higher stress levels than their peers (data not shown).

Table 2 shows the prevalence of engaging in less healthy behaviors and the relationship between these behaviors and stress. Each additional point on the perceived stress scale was associated with an 8%, 10% and 11% higher prevalence of frequent breakfast, lunch, and dinner skipping, respectively. After stratifying by weight status, the association with breakfast and dinner skipping was significant only for normal weight students, while the association with lunch skipping was significant for both normal weight and overweight/obese students. Stress was positively associated with prevalence of eating within 1 hour of bedtime among normal weight students (PR=1.07, 95% CI: 1.01, 1.13). Students with higher stress were also more likely to be current smokers (PR=1.09, 95% CI: 1.01, 1.18). Stress was not associated with any other health behaviors.

Table 3 presents crude and adjusted prevalence ratios for overweight/obesity by stress level. In all models, students with higher stress had higher prevalence of overweight/obesity (crude PR=1.05; adjusted PR=1.04). The magnitude of this relationship remained unchanged after adjusting for student characteristics and a range of health behaviors, but was no longer statistically significant after adjusting for eating behaviors (Model 3, $p = 0.052$) and all health behaviors (Model 4, $p = 0.077$). In the fully adjusted model (Model 4), only financial strain was significantly associated with overweight/obesity. Students for whom it was difficult, very difficult, or extremely difficult/impossible to live on household income were 58% more likely to be overweight/obese than students who experienced less financial strain.

Discussion

This sample of community college students had a mean stress level that was slightly higher than 18–29 year olds nationally (mean (SD)=4.9(3.0)) (Cohen & Williamson, 1988) and was significantly associated with race and economic hardship. Two-year community college students are more likely than 4-year students to represent racial minorities and economically disadvantaged groups (Laska et al., 2011), which suggests that high stress levels may be common among community college students in general. Stress levels were not cross-sectionally associated with most of the health behaviors examined in this population except for meal skipping and being a current smoker. These associations were stronger among normal weight students than overweight/obese students, which may indicate differential responses to stress by weight status. Indeed, prior research indicates that stress can both increase and decrease food intake and that this effect may differ by weight status (Torres & Nowson, 2007). Normal weight students, despite lower stress levels overall, appear to be

more susceptible to stress-related behaviors that could have an impact on overall caloric intake.

Previous literature has reported mixed findings on the relationship between stress levels and health risk behaviors, including eating and physical activity patterns, smoking, and alcohol use (Cohen & Williamson, 1988; Nelson, Lust, et al., 2008; Ng & Jeffery, 2003; Roberts & Danoff-Burg, 2010; Sinha & Jastreboff, 2013; Torres & Nowson, 2007). Individual differences in stress response, variations in how stress and health behaviors are measured, and differences in the populations studied all likely contribute to these inconsistent findings. More objective measures of behaviors (e.g., objectively measured physical activity, measure of overall caloric intake) and stress (e.g., cortisol levels) in longitudinal datasets are needed to examine the potential mechanisms of the stress-weight status relationship more closely.

In this sample, higher stress was associated with higher prevalence of overweight/obesity, even after controlling for student characteristics and a range of weight-related health behaviors. In other research higher stress has consistently been linked to higher risk of overweight/obesity, though the mechanisms are not clear (Block et al., 2009). Our research showing that few weight-related behaviors are associated with stress, particularly among overweight/obese students, suggests that other mechanisms triggering unhealthy weight gain with stress may be occurring. Larger longitudinal studies examining weight-related behaviors as mediators between stress and obesity might be fruitful in understanding the mechanisms.

Strengths of this study include the use of validated measures of perceived stress and health behaviors, objectively measured height and weight, and examination of a vulnerable and understudied population. The cross-sectional analysis limits our ability to examine temporal relationships between the variables of interest.

Implications for Research and Practice

Stress levels are quite high for many 2-year community college students. Campus-based health promotion strategies could include stress management curricula and provision of other resources to ease the burden on students, particularly low-income students and students of color, who are more likely to experience adverse health outcomes. For example, health educators may assist students in alleviating the sources of stress by providing enrollment assistance for the Supplemental Nutrition Assistance Program (for students who qualify), teaching financial management skills, and/or offering social and academic support services. Campus health promotion staff could also participate in efforts to ensure a welcoming campus climate for students from racial minorities. To mitigate the adverse impacts of stress on health behaviors, students may benefit from tools for meal planning and smoking cessation.

In addition to promoting general health and well-being by reducing stress, stress management skills have been linked to weight loss maintenance in adults (Elfhag & Rossner, 2005) and improved results in a pilot weight loss trial (Cox et al., 2013). Future research should examine the causes of stress, particularly among understudied and at-risk groups like

community college students, to inform the design of appropriate interventions, as well as continue to investigate the mechanisms through which stress is related to obesity.

Acknowledgments

The authors would like to acknowledge the dedicated study measurement and data management team: Stacey Moe, William Baker, Pamela Carr, Jennifer Nadeau, and Dawn Nelson. The authors would also like to thank the students and the staff at Anoka-Ramsey Community College, Inver Hills Community College, and St. Paul College for the support and help with this project. This research was supported through a grant from NHLBI (1 U01 HL096767-01). Additional salary support was also provided by Grant Number K07CA126837 from the National Cancer Institute.

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Table 1

Characteristics of sample of 2-year community college students

Characteristic	N	%
All Students	441	100.0
Weight Status		
Normal weight	235	53.3
Overweight	145	32.9
Obese	61	13.8
Age		
Under 21	223	50.6
21 and older	218	49.4
Sex		
Male	143	32.4
Female	298	67.6
Race		
White	320	72.6
Black	68	15.4
Asian	27	6.1
Other/Multiple Races	26	5.9
Household Income		
Less than \$12,000	292	66.4
\$12,000 or more	119	27.0
Financial Strain *		
High	121	27.5
Low	319	72.5
Highest Parent Education		
Less than college	215	48.8
College grad	206	46.7
Hours/Week Work for Pay		
Less than 20	253	57.5
20 or more	187	42.5
Current Relationship Status		
Single/Dating	240	45.5
Other	200	54.6
Number of Children in Home		
None	238	54.1
1 or more	202	45.9

* High financial strain: difficult, very difficult or can barely get by, or extremely difficult or impossible to live on household income. Low financial strain: not at all or somewhat difficult to live on household income.

Table 2
Associations between stress and prevalence of health risk behaviors among 2-year community college students

Behavior	All		Normal Weight		Overweight/Obese		
	Prevalence (%)	PR 95% CI	PR 95% CI	PR 95% CI	PR 95% CI	PR 95% CI	
Eating Behaviors							
Eats breakfast <3–4 times/week	68.3	1.08*	[1.03,1.14]	1.13*	[1.05,1.21]	1.05 [0.97,1.12]	
Eats lunch <5–6 times/week	31.1	1.10*	[1.05,1.16]	1.13*	[1.04,1.23]	1.07* [1.01,1.14]	
Eats dinner <5–6 times/week	17.0	1.11*	[1.03,1.19]	1.16*	[1.06,1.28]	1.07 [0.96,1.19]	
Eats dinner at home <5 times/week	31.1	1.02	[0.97,1.07]	1.03	[0.95,1.12]	1.00 [0.94,1.07]	
Eats within 1 hour of bedtime 3–4times/week	39.7	1.01	[0.97,1.06]	1.07*	[1.01,1.13]	0.97 [0.90,1.03]	
Eats >2 snacks/day	18.6	1.03	[0.96,1.11]	1.05	[0.95,1.16]	1.03 [0.92,1.16]	
Eats fast food 1–2 times/week	50.6	1.01	[0.97,1.04]	1.00	[0.94,1.05]	1.01 [0.97,1.05]	
Drinks 1 sugar-sweetened beverage/day	34.9	1.04	[0.99,1.09]	1.04	[0.97,1.12]	1.04 [0.97,1.11]	
Other Health Behaviors							
Performs <150 min moderate physical activity/week	50.7	1.03	[0.99,1.07]	1.01	[0.96,1.07]	1.04 [0.99,1.09]	
Engages in 5 hours of sedentary behavior/day	48.4	1.00	[0.96,1.04]	0.96	[0.91,1.02]	1.03 [0.98,1.09]	
Current smoker	17.5	1.09*	[1.01,1.18]	1.12	[0.98,1.28]	1.06 [0.96,1.16]	
Had 1 binge drinking episode in past 30 days	24.2	1.05	[0.98,1.11]	1.09	[0.99,1.19]	1.01 [0.93,1.09]	
Average hours of sleep/night	Mean	β	95% CI	β	95% CI	β	95% CI
	8.4	-0.01	[-0.05,0.04]	0.01	[-0.05,0.07]	-0.02	[-0.09,0.04]

Notes: PR: prevalence ratio; CI: confidence interval; β: beta coefficient

Reference categories: Eats breakfast 3–4 times/week, eats lunch 5–6 times/week, eats dinner 5–6 times/week, eats dinner at home 5 times/week, eats within 1 hour of bed <3–4 times/week, eats 2 snacks/day, eats fast food <1–2 times/week, drinks <1 sugar-sweetened beverage/day, moderate physical activity 150 min/week, sedentary behavior <5 hours/day, non-smoker, no binge drinking episodes

* p <0.05

Table 3 Associations between stress and prevalence of overweight and obesity (BMI ≥ 25 kg/m²) among 2-year community college students

	Model 1		Model 2		Model 3		Model 4	
	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Perceived stress (scale range: 0–13)	1.05 *	[1.01,1.09]	1.04 *	[1.00,1.08]	1.04	[1.00,1.08]	1.04	[1.00,1.08]
High financial strain			1.49 *	[1.22,1.83]	1.51 *	[1.22,1.85]	1.58 *	[1.27,1.98]
Age (years)			1.00	[0.98,1.02]	1.00	[0.98,1.02]	1.00	[0.98,1.02]
Female			0.80 *	[0.65,0.97]	0.80 *	[0.66,0.98]	0.83	[0.67,1.04]
White			1.21	[0.95,1.54]	1.18	[0.92,1.51]	1.29	[0.98,1.69]
Eats breakfast <3–4 times/week					0.90	[0.72,1.13]	0.89	[0.70,1.13]
Eats lunch <5–6 times/week					1.24	[0.99,1.55]	1.23	[0.96,1.58]
Eats dinner <5–6 times/week					0.91	[0.67,1.24]	0.93	[0.67,1.29]
Eats dinner at home <5 times/week					1.02	[0.81,1.28]	0.99	[0.78,1.28]
Eats within 1 hour of bedtime 3–4 times/week					0.87	[0.70,1.07]	0.82	[0.65,1.04]
Eats >2 snacks/day					0.91	[0.68,1.22]	0.99	[0.73,1.33]
Eats fast food 1–2 times/week					1.21	[0.97,1.50]	1.26	[0.99,1.59]
Drinks 1 sugar-sweetened beverage/day					0.97	[0.79,1.20]	0.96	[0.76,1.21]
Performs <150 min moderate physical activity/week							1.04	[0.84,1.29]
Engages in 5 hours of sedentary behavior/day							0.95	[0.76,1.18]
Current smoker							1.04	[0.79,1.38]
Had 1 binge drinking episode in past 30 days							1.12	[0.88,1.44]
Average hours of sleep/night							1.00	[0.91,1.10]

Notes: PR: prevalence ratio; CI: Confidence Interval

Reference categories: Low financial strain (not at all or somewhat difficult to live on household income), male, non-white, eats breakfast 3–4 times/week, eats lunch 5–6 times/week, eats dinner 5–6 times/week, eats dinner at home 5 times/week, eats within 1 hour of bed <3–4 times/week, eats 2 snacks/day, eats fast food <1–2 times/week, drinks <1 sugar-sweetened beverage/day, moderate physical activity 150 min/week, sedentary behavior <5 hours/day, non-smoker, no binge drinking episodes

* p < 0.05