

Stress and weight change in university students in the United Kingdom

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Abstract

Students in the US have been shown to gain weight during their first year at university. This study examined whether students in Britain have a similar weight change during their first year at university, and tested the hypothesis that stress plays a role. A cross-sectional survey was conducted to assess stress and perceived weight change. Two hundred and sixty eight students at University College London completed the questionnaire at the end of their first year of university. On average, students reported a significant weight increase ($1.53 \text{ kg} \pm 2.70$, $p < 0.001$), although there was considerable variation, with 55% of the sample reporting weight gain, 12% weight loss, and 33% remaining stable. Logistic regression analyses demonstrated that stress was associated with greater risk of weight gain (OR, 1.27, 95% CI, 1.12 to 1.44, $p = 0.001$) and weight loss (1.33, 1.10 to 1.61, $p = 0.003$), but associations were stronger among women. The associations remained unchanged after adjustment for health behaviours. Our findings confirm a modest weight gain over the first year at university, which was associated with higher levels of perceived stress in women. © 2007 Elsevier Inc. All rights reserved.

Keywords: Weight change; Psychosocial stress; Health behaviours; University environment

1. Introduction

The increase in obesity worldwide has led to a significant expansion in research on preventive measures to combat obesity [1]. Being clinically overweight increases the risk of conditions such as heart disease, diabetes, and certain types of cancer [2,3]. Young adults are an important group to consider in research on obesity prevention, since unhealthy behaviours often develop early in life, but are difficult to tackle once they become life-long habits [4].

Gaining weight at university may play a role in the increasing numbers of overweight young adults [5]. Studies conducted in American universities have found that students are not eating the recommended amount of fruit and vegetables, are not taking recommended amounts of physical exercise, and are consuming increasing amounts of high-fat foods [6,7]. The same pattern is emerging in Europe [4,8].

During the first year of university, students may be more vulnerable to weight change because of the change in lifestyle [9], and commencing university can also be a time of increased stress, which may make students more susceptible to weight change [5,10,11]. One study found that a quarter of first year students gained at least 2.5 kg during the first semester of college [9], although others have found a mean weight loss or a non-significant weight gain [12,13]. One reason for the inconsistencies may be that stress has bidirectional effects on weight and can cause some individuals to gain but others to lose weight [14], and the balance may vary across contexts.

Understanding the factors that contribute to weight gain at university could help to establish a framework for universities to promote positive health behaviours for students [15]. University students also provide the researcher with a relatively homogeneous sample in terms of socioeconomic status (SES), making it easier to examine processes that are subject to SES differences [16]. The aims of this study were to assess associations between stress and self-reported weight change over the first year in a university environment in Britain. Given the changes in lifestyle (e.g. diet, alcohol consumption) and psychological factors (e.g. moving away from home, building a new social network, academic pressures), we hypothesized that students would experience a significant weight

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change during their first year at university. Based on prior evidence for a bi-directional effect of stress on weight change [14] we also predicted that stress would be associated with both weight loss and weight gain.

2. Methods

2.1. Participants

Two hundred and sixty eight students participated in the study, of which 100 were men and 168 were women. Convenience sampling was used to recruit participants at a university in London. All first year undergraduate students (approximately 3500) were emailed a link to an online version of the survey, which gained a response rate of 5% over a 4 day period until it was inactivated. Questionnaires were also handed out during lectures over a two week period, which achieved participation rates ranging from 50 to 100%. Only students aged between 18 and 25 were included in the analysis. Ethical approval was granted by the University College London Research Ethics Committee.

2.2. Measures

The survey included questions assessing sociodemographic factors, health behaviours, stress and weight change.

2.2.1. Weight and weight change and health behaviours

Participants reported their weights and heights in their preferred metric, from which we calculated BMI. Two questions asked students whether they had ‘gained weight’, ‘lost weight’ or ‘neither’, and to estimate the amount of weight change since starting university. They were also asked how often they weighed themselves on a six point scale ranging from ‘daily’ to ‘never’. Brief questions assessed smoking (on a scale of 1 to 8, ranging from ‘never’ to ‘20 cigarettes per day’), meal patterns

(number of meals and snacks per day), exercise (how many times in the last two weeks), alcohol intake (on how many days per week and what amount), and hours of sleep per night, during their first year at university, and retrospectively at school prior to starting university. The questions were from the International Health and Behaviour Survey (IHBS) and have been shown to have short-term reliability [16].

2.2.2. The Undergraduate Stress Questionnaire (USQ)

Stress was assessed with the Undergraduate Stress Questionnaire (USQ) [17]. The original version consists of 83 items based on events/hassles that students are likely to experience (e.g. tests or deadlines). In the present study the 10 item version of the USQ was employed, as previously used elsewhere [18], and an 11th item was added to the questionnaire relating to ‘financial worries’. Participants reported each stressor’s occurrence in the last two weeks (yes or no) and rated the severity of each stressor on a scale from 0 — not at all stressful to 2 — very stressful. The total number of items endorsed was the event frequency measure and the sum of the ratings for each scale was the event severity measure, with a higher score indicating a higher level of perceived stress. Overall scores for the USQ ranged from 0–11 for event frequency and 0–22 for event severity. In the present sample, Cronbach’s alpha for the frequency and severity scales was 0.47 and 0.55 respectively.

2.3. Statistical analyses

Participants were excluded if they did not complete all of the items described in Section 2.2. Participants were divided into three groups based on whether they had reported weight loss, weight gain, or no change. Differences in demographics, perceived stress and health behaviours between groups were examined using Chi-squared tests and one-way analysis of variance (ANOVA). Repeated measures ANOVA was employed to examine changes

Table 1
Health behaviours and demographics in relation to weight change during first year at university

Variable	Weight losers (n=33)	Weight stable (n=88)	Weight gainers (n=147)
Age (years)	19.55±1.37	19.33±1.45	19.07±1.05
n female (%)	21 (63.6)	44 (50.0) ^{a,b}	103 (70.1)
Self reported BMI (kg/m ²)	21.75±4.57	21.61±3.61	22.12±3.02
Weight change (kg)	−2.91±1.30	0.00 ^{a,b}	3.45±1.83 ^c
% regularly weighing	36.4	33.0	40.1
USQ score (frequency)	4.45±1.80	3.64±1.60 ^{a,b}	4.63±1.86
USQ score (severity)	5.73±2.64	4.04±2.35 ^{a,b}	5.77±3.07
Sleep (h/per night)	7.06±1.24	7.39±1.30	7.31±1.50
% smokers	24.2	18.2	23.1
% regular alcohol drinkers	66.7	69.3	63.9
% regular exercisers	60.6	75.0	70.1
Exercise (number of sessions/2 weeks)	3.55±3.86	4.44±4.76	4.25±4.40
Number of meals per day	2.41±0.73	2.64±0.69	2.59±0.56
Number of snacks per day	1.39±1.21	1.55±1.26 ^b	2.05±1.34 ^c

(Mean±SD). BMI, Body mass index; USQ, Undergraduate stress questionnaire.

^a Denotes significant difference between weight stable and weight losers.

^b Significant difference between weight stable and weight gainers.

^c Significant difference between weight gainers and weight losers ($p<0.05$).

in health behaviours and eating habits over time (from school to university) between weight change groups. Logistic regression analysis was used to examine the association between weight change and stress. In each analysis the regression of stress (as a continuous predictor variable) on either weight gain or weight loss (dependent variable) was compared with the referent group of no weight change. We employed three regression models with various adjustments. The first model was adjusted for age and gender, the second contained further adjustments for current health behaviours (smoking, alcohol, exercise, sleep), and in the fully adjusted model, snack frequency and weighing frequency were also included. A gender-by-stress interaction term was introduced into the regression model to test whether the association between

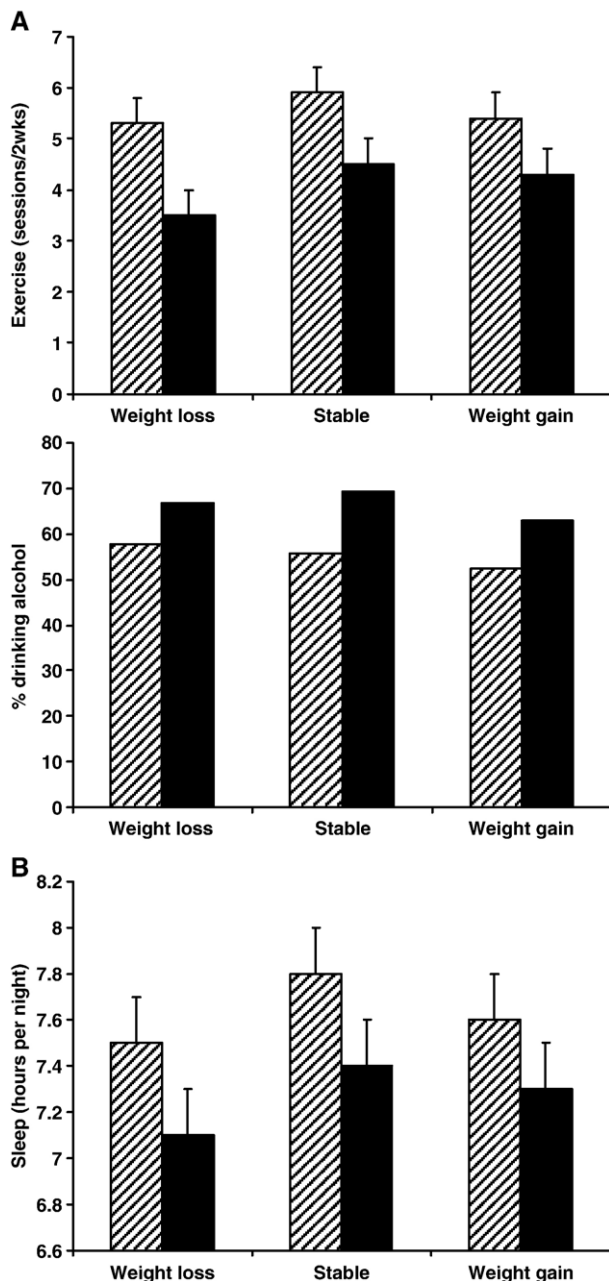


Fig. 1. Change in health behaviours from school to university. Data are presented as mean \pm SEM. Hatched bars represent school and filled bars at university.

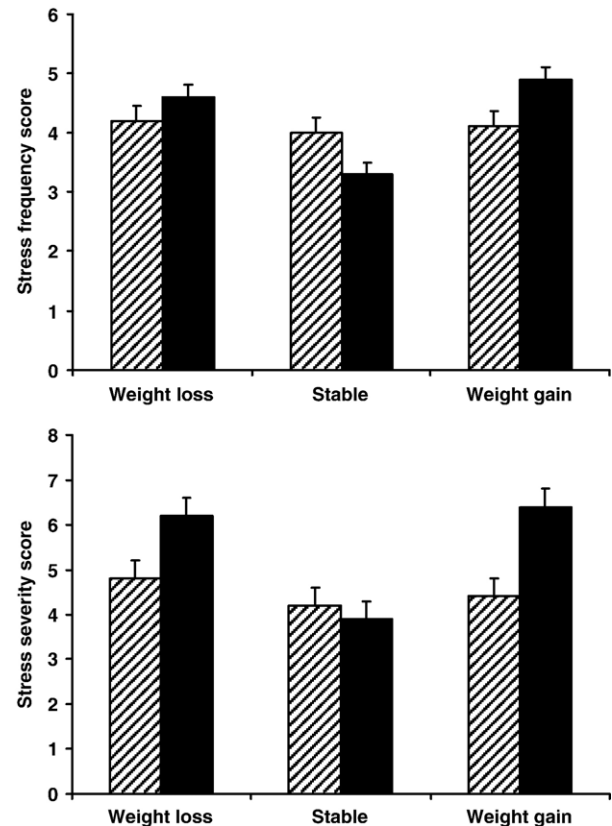


Fig. 2. The association between stress and weight change among male and female students. Data are presented as mean \pm SEM. Hatched bars represent men and filled bars women.

stress and weight change was gender specific. Data were analysed using SPSS for Windows (Version 13.0).

3. Results

3.1. Sample characteristics

Participants were aged between 18–25 years (mean age 19.20 ± 1.22 years). They represented over fifteen disciplines, with the highest numbers studying mathematics, medicine and psychology. Most of the students were living in university halls of residence (74%) with the others living at home (12.5%) or in a private accommodation (13%). Approximately 20% of the students were smokers and 66% reported regular alcohol consumption. Most (70%) reported that they had exercised in the past two weeks, with the mean number of times being slightly greater than four. The mean reported weight for men was 73.25 ± 11.59 kg and for women was 59.10 ± 10.44 kg. Body mass index in men was 22.74 ± 3.29 kg/m² and in women 21.47 ± 3.4 kg/m².

3.2. Weight change

On average, students reported a significant weight increase (1.53 kg ± 2.70 , $p < 0.001$), although there was considerable variation. Approximately 55% of the sample reported gaining

weight, 12% lost weight and 33% remained stable (responding as ‘neither’ gaining nor losing weight). A higher proportion of women (61%) than men (44.0%) reported gaining weight. Table 1 compares demographics, health behaviours, and perceived stress between weight change groups. Stress frequency and severity scores were significantly greater among weight loss and weight gain groups compared with stable weight, [F ’s (2, 265)=8.78, 11.09 $p<0.001$], respectively. The weight gain group also reported consuming significantly more snacks between meals [F (2, 265)=5.85, $p=0.003$]. Thirty seven percent of students reported weighing themselves regularly, although there were no differences between groups.

3.3. Changes in health behaviours and eating habits from school to university

Exercise frequency [F (1, 256)=12.14, $p=0.001$] and sleep duration [F (1, 261)=14.57, $p=0.001$] were significantly reduced since being at university compared with the last year at school and a higher proportion of students drank alcohol at university than school [F (1, 265)=13.36, $p=0.001$]. However, these trends were evident across all weight change groups (see Fig. 1). There were no significant changes in smoking [F (1, 264)=0.15, $p=0.70$] (data not shown). In relation to eating habits, students reported a significantly lower number of meals per day at university [F (1, 265)=28.39, $p=0.001$], although there were no changes in snacking across time [F (1, 262)=2.89, $p=0.091$] (data not shown). Again these trends were evident across all weight change groups and did not differ by gender.

3.4. Linear associations and logistic regression analyses

Students who reported snacking more at university had greater reported weight gain (unadjusted $r=0.18$, $p=0.004$). Stress (USQ) scores were also positively correlated with weight change ($r=0.11$, $p=0.07$ for event frequency; $r=0.13$, $p=0.04$ for event severity). Given that students living in halls of residence have a large proportion of their meals provided, we examined the possibility that this may have been related to weight change, but it was not.

In logistic regression analyses, stress severity (per unit change in scale score) was associated with both a greater risk of weight gain (odds ratio, OR=1.27, 95% CI, 1.12 to 1.44, $p=0.001$) and weight loss (OR=1.33, 1.10 to 1.61, $p=0.003$), after adjustment for age and gender. Similarly, stress frequency (per unit change in scale score) was associated with both a greater risk of weight gain (OR=1.40, 1.16 to 1.69, $p=0.001$) and weight loss (OR=1.39, 1.05 to 1.83, $p=0.02$). These associations did not change after further adjustments. There were significant gender by stress interactions, both for stress frequency ($p=0.002$) and severity ($p=0.003$), indicating a stronger association between weight change and stress in women (see Fig. 2).

4. Discussion

The aim of this study was to assess associations between perceived stress and weight change among first year students in a university environment in the UK. First year students experi-

enced a significant weight change at university, with a mean weight gain of 1.53 kg, but there was considerable variability, with 55% gaining, 33% staying the same and 12% losing weight. As predicted, stress levels were associated with both weight gain and weight loss. Health behaviours such as exercise, alcohol intake, and sleep changed significantly between school and the first year at university, but they were not associated with weight change, nor did they explain the association between stress and weight change. Snacking was associated with weight gain, but it did not alter the relationship with stress.

The mean weight change for the total sample was slightly lower than the figures reported in past studies [5,11]. This may reflect differences between countries, because the previously cited studies have all been conducted in the U.S. For example, it is possible that differences in social norms for lifestyle in American and British universities may partly explain the higher levels of weight gain seen in American students. Several of the US studies have suggested that the increasing availability of high-fat snacks and the dining facilities on American campuses contribute to students’ weight gain [11,19]. An example given by Levitsky and colleagues [11] are cafeterias with ‘all you can eat’ promotions targeted at students living on campus. Another factor could be the method used to assess weight change. In the current study, weight change data were collected by self-report, while many of the American studies used objective measurements. Self-report measures may have resulted in an underestimation of weight gain since students are likely to have felt reluctant to report how much weight they had gained. Furthermore, 63% of students reported not weighing themselves regularly, therefore they may not have realised that they had gained weight during the year, particularly if the weight change was relatively small. A further possibility relates to selection bias, that is, students prone to large weight gain may not have participated.

Given that the present study was cross-sectional and not prospective, we cannot determine whether there was a causal relationship between stress and weight change. The directionality of this relationship also remains unclear. Previous studies have suggested that psychophysiological mechanisms may be involved. For example, poorer cardiovascular recovery from mental stress was shown to predict increases in central adiposity in men and women over 3 years follow up [20]. Cortisol responses to acute mental stress [21–23], stress-related daytime cortisol secretion [24], and the cortisol morning response [25] have been consistently related to central adiposity. Thus, it is possible that chronic neuroendocrine and sympathetic dysregulation is causally related to the accumulation of fat in visceral adipose tissues. We found no evidence that health behaviours, such as physical activity, smoking, alcohol intake, and sleep mediated the association between stress and weight change. However, our measures of behaviour were fairly limited, and stress may work through a range of biological and behavioural routes [26].

There is evidence that stress is associated with both increased and decreased intake of food [27–30], which may mediate the bidirectional relationship between stress and weight change. Also, Kandiah and colleagues [28] found that in a sample of

female university students 80% reported they usually ate healthily, although only 34% reported eating healthily when they were stressed. In the present study higher levels of stress were associated with both weight gain and weight loss, a pattern observed in past studies examining weight change under stressful conditions [14,31].

One unexpected finding of the current study was that the stress-weight change association was stronger in women. This may be partly explained by the fact that female participants had a higher USQ score (for event severity) than men. Other studies have also found that female students have higher levels of perceived stress than male students [17,32]. Restrained eaters have been shown to consume more food or more high-energy foods, than unrestrained eaters under stressful conditions [33,34]. Previous studies show women are more likely to be dieting than men, [35] which may help to explain the higher reports of weight gain in women if stress induced eating plays a role. It has also been suggested that women have different eating patterns under stressful conditions than men [36,37], and may be more susceptible to weight gain from stress-induced eating [38].

The present study has a number of limitations. Our findings are based on self-report data, which has the potential to be affected by social desirability bias or recall. In particular perceived weight change may have been affected by social desirability bias and therefore may not have reflected accurate weight measurements. However, the strengths of using a survey to collect data rather than weighing students is that it increases anonymity, increases participation rates, and eliminates the problem of high drop-out rates during follow-up assessments. Furthermore, several studies have shown self-reported weights to be correlated with objective weight measurements [15,39]. Errors in self-reports are systematic instead of random, reflecting both rounding to the nearest point of heaping and a tendency to report weights closer to ideal weight [40]. We were unable to identify any previous analyses of the accuracy of change in self-reported weight, and so cannot judge whether errors in reporting changes over time are smaller or larger than errors in weight at a point in time. However, if respondents tended to understate their weight by a fixed amount, change in weight could be more accurate than self-reported weight at a point in time. This study used students from one university, which makes it difficult to generalize results to the wider student population. However, the student population is relatively homogeneous in factors such as age and SES, which makes it likely that there would be similar results in other UK student samples. The poor internal reliability of the short version of the USQ scale would have decreased the chance of finding significant associations and makes it important to replicate the study using alternative and more reliable stress scales. Lastly, we did not measure any biological stress indicators, such as HPA-axis activity, and we can therefore only speculate about the potential mechanisms of stress and weight change.

In conclusion, these results provide further evidence that university students are susceptible to weight gain in their first year at university. Unlike previous research, this study incorporated stress as a potential determinant of weight change.

The results indicate that perceived stress was likely to be one of the causal factors in weight change particularly among female university students.

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