

Eating habits associated with body weight gain in female university students: a UK-based study of Slimming World members

SPRAKE, Eleanor, LAVIN, Jacquie, GRABOWSKI, Peter, RUSSELL, Jean, FEATHERSTONE, Megan and BARKER, Margo <<http://orcid.org/0000-0002-1016-5787>>

Available from Sheffield Hallam University Research Archive (SHURA) at:

<https://shura.shu.ac.uk/21910/>

This document is the Accepted Version [AM]

Citation:

SPRAKE, Eleanor, LAVIN, Jacquie, GRABOWSKI, Peter, RUSSELL, Jean, FEATHERSTONE, Megan and BARKER, Margo (2017). Eating habits associated with body weight gain in female university students: a UK-based study of Slimming World members. *British Food Journal*, 119 (12), 2571-2582. [Article]

Copyright and re-use policy

See <http://shura.shu.ac.uk/information.html>



British Food Journal

Eating habits associated with body weight gain in female university students: a UK-based study of Slimming World members

Journal:	<i>British Food Journal</i>
Manuscript ID	BFJ-10-2016-0495.R1
Manuscript Type:	Research Paper
Keywords:	Alcoholic drinks, Convenience Foods, Cooking, Fast food, obesity, Students

SCHOLARONE™
Manuscripts

1 Eating habits associated with body
2 weight gain in female university
3 students: a UK-based study of
4 Slimming World members

5
6 Key words: slimming; cooking; students; convenience food; alcohol consumption; physical activity

7 Running head: Body weight gain in university students

10

11 Summary

12 Objective: This study explored factors associated with body weight gain among
13 British university students who were members of a slimming club.

14 Method: Student members of a national commercial slimming programme
15 completed an online survey about cooking ability, weight gain, eating habits and
16 physical activity levels. Non-parametric statistical tests and regression analysis
17 were employed to examine factors associated with weight gain.

18 Results: The dataset comprised 272 current students. The majority of students
19 (67%) reported weight gain between 3.2 and 12.7 kg during university: 20.4%
20 reported to have gained >12.7 kg. Students commonly attributed their weight gain
21 to academic stress and nearly all identified with needing support to learn to cook
22 on a budget. Students reporting greatest weight gain had most frequent
23 consumption of ready meals & convenience foods, take-away & fast foods, and
24 least frequent consumption of fruits & vegetables. Weight-stable students reported
25 lowest consumption of alcohol and were most able to cook complex meals.
26 Students who reported greatest weight gain reported lower physical activity levels.
27 There were inter-correlations between cooking ability and lifestyle factors. In a
28 multivariate model, low physical activity and frequent consumption of ready meals
29 and convenience food independently predicted weight gain.

30 Conclusion: Weight gain was inversely associated with diet quality, cooking
31 ability and physical activity with reliance on ready meals & convenience food and
32 low physical activity particularly important. Prospective studies are needed to
33 confirm these cross-sectional associations and to explore how the university
34 setting may contribute to the effect.

35

36

37 **Introduction**

38 Approximately 25% of adults in England are obese (Health and Social Care
39 Information Centre, 2015). Obesity places a substantial burden on society, fuelling
40 hospital admissions and annual health care costs (Ellison, 2013). As the UK
41 attempts to reverse the rising trend of obesity among its adult population (Ellison,
42 2013), it is critical to identify population groups at particular risk and to elucidate
43 the factors underpinning risk in order to effect and target weight management
44 interventions.

45 The first year of university has been identified as an ‘at risk’ period for body
46 weight gain, and a ‘Freshman 15’ phenomenon has been proposed, which posits
47 that first-year university students gain 15lbs (6.8 kg) (Brown, 2008). Although
48 most studies record lesser average weight gain, weight gain is variable (0.7-3.1kg)
49 (Crombie et al., 2009). Furthermore, when only students who gain weight are
50 considered, observed weight gain is greater and the range narrower (3.1-3.4kg)
51 (Crombie et al., 2009). North American studies predominate this literature, but UK
52 studies have identified a similar phenomenon: an average weight change of +2.5kg
53 was noted among first year female undergraduate students in a single semester,
54 with 22% of students gaining in excess of 6.8kg (Cockman et al., 2013). A multi-
55 centre UK study recorded lesser average weight gain (0.83kg) during the first
56 three months of university, but body weight change was variable (-7.2kg to
57 +11.6kg) (Finlayson et al., 2012). Studies among British non-student populations
58 are not available, although US studies show lower levels of weight gain in the
59 general population (Levitsky et al., 2004).

60 Despite the wealth of literature describing body weight gain at university, the
61 factors underpinning these changes are less clear (Cockman et al., 2013). Several
62 studies have reported increased consumption of processed and take-away foods
63 and/or decreased consumption of fruit and vegetables among students who gain
64 weight (Levitsky et al., 2004; Pliner and Saunders, 2008; Pullman et al., 2009);
65 others report no association between eating patterns and weight change (Holm-
66 Denoma et al., 2008; Kasperek et al., 2008; Racette et al., 2005). Alcohol intake has
67 also been implicated (Adams and Rini, 2007; Butler et al., 2004; Economos et al.,
68 2008; Lloyd-Richardson and Lucero, 2008). Counter-intuitively, most North

American studies, which have employed a detailed assessment of diet have not observed increased energy intake among weight gainers (Butler et al., 2004; Jung et al., 2008; Pullman et al., 2009). Studies focusing on the psychological constructs of eating behaviour have reported a link between weight change and dietary restraint, disinhibition, history of dieting and stress (Economos et al., 2008; Finlayson et al., 2012; Girz et al., 2013; Levitsky et al., 2004; Lowe et al., 2006; Serlachius et al., 2007). The relationship between physical activity and weight change is also unclear (Butler et al., 2004; Edmonds et al., 2008; Finlayson et al., 2012; Racette et al., 2005) and lack of body composition measures often blurs interpretation. Further research is necessary to delineate the factors behind weight gain among university students.

The objective of the current study was to examine dietary habits, physical activity levels and perceived reasons for weight gain in relation to body weight gain among university students in the UK. Access to data from a national weight management programme (Slimming World, UK) afforded an opportunity to examine the issue in students who self-identified as needing to lose weight. Research to date has sampled from the general student population (Cockman et al., 2013; Finlayson et al., 2012; Nikolaou et al., 2014).

Methods

Members of Slimming World UK who were past or current university students were invited to complete an online survey during autumn 2013. The survey collected the following information: gender; age; student status (current vs. former student); number of years at university; weight gain at university; body weight prior to starting university (underweight – severely overweight); perceived reasons for weight gain; previous attempts at weight loss; perceived barriers to consuming a healthy diet at university; cooking ability; self-reported understanding of a healthy diet (non-existent to very good); consumption frequency of fruits and vegetables, fast food/takeaways, and convenience foods/ready meals; perceived healthfulness of food available on campus; alcohol consumption; effect of alcohol intake on food choices; ability to cook, shop and eat healthily on a student budget; factors influencing food choices at university; and physical activity levels at university. Participants answered all questions in

relation to their behaviours at university before joining Slimming World. Response options (e.g. frequency of consumptions; categories of weight gain; factors influencing food choices) were provided for each question.

The survey was designed and administrated by staff at Slimming World Headquarters. There were no incentives for participation. A total of 1060 Slimming World members who were either current or former university students responded to the survey. This data analysis used a subset of respondents from the original survey; students who were no longer at university (n=781) and male students (n=5) were excluded. The former exclusion was instigated to improve data quality, since current students would be expected to more accurately recall dietary and physical activity habits and weight gain at university than graduates. Male students were excluded because they were few in number.

Self-reported weight gain at university was categorised: 0 kg (weight-stable); <3.2 kg (<0.5 stones); 3.2-6.4 kg (0.5-1 stone); 6.4-12.7 kg (1-2 stones); >12.7 kg (>2 stones). No participant in the current study reported weight loss at university. Category of weight gain was examined against perceived reasons for weight gain at university using non-parametric tests (SPSS Statistics V23). An ordinal logistic regression model was fitted to establish the independent effect of descriptively significant variables (cooking ability, food frequency and physical activity) as predictors of weight gain category. The statistical analysis was conducted using SPSS (IBM SPSS 23.0, IBM Armonk, USA).

Results

Approximately half of the sample (47.6%) was between 18 and 21 years of age and just under one quarter (22.3%) of respondents were between 22 and 30 years old. The majority of responders had been members of Slimming World for less than a month (46.0%) or between 3-6 months (29.9%) at the point of survey.

Table 1 provides descriptive data for reported weight gain, food group consumption and physical activity. An eighth of respondents (12.5%) were weight stable during their time at university, while over half (55.4%) reported gaining in excess of 6.4kg. Only 15.6% of students reported no weight gain during their first year at university compared to 34.4% who reported gaining more than 6.4kg.

58.1% of students reported the same level of weight gain in the two time periods while 40.7% reported a higher level of weight gain overall than in first year (Wilcoxon=193, n=270, $p<0.001$).

Table 1 also shows descriptive data for physical activity and food consumption. Self-reported physical activity levels at university varied from 'not at all active' (14.3%) to 'active or very active' (14.3%). Less than one in four respondents reported that they consumed fruit and vegetables every day when at university, whilst one in three indicated that they consumed fruit and vegetables once a week or less. Self-reported consumption of takeaways/fast food meals was high, with just over half the sample (50.5%) reporting eating take-away & fast food several times per week or more; just under a half (47.8%) of respondents reported consuming ready meals & convenience food more than three times per week, with fewer than one in five respondents (18.2%) reporting consumption of these foods greater than 5 times per week. One third of respondents (33.7%) also reported that they consumed alcohol on '3 or more nights per week'.

Table 2 provides information on students' self-assessment of their ability to cook various dishes. The dishes ranged from the simple, such as cheese on toast to the complex, such as a roast dinner. While 73 (26.6%) of the sample reported being able to cook all fourteen of the dishes, less than 5% reported being able to cook three or less dishes. Around 40% of students could not make dishes such as shepherd's pie, homemade soup and chilli con carne. Fewest students reported being able to cook a stew/casserole, with just over half of students claiming competency. A total of 82.7% of the sample agreed with the statement 'students need support to learn how to cook healthy food/meals' and 91.9% agreed with the statement 'students need support to learn how to eat healthily on a budget'.

There were several significant associations between cooking ability and category of weight gain (see Table 3). Specifically, a significantly higher proportion of students in the weight stable group reported that they were able to cook the following meals from scratch: stir-fry, homemade burger, soup, casserole/stew and shepherd's pie. Students who reporting greater difficulty in shopping, cooking and eating healthily on a student budget reported greater weight gain ($p = 0.237$; $df = 265$; $p < 0.001$).

164

165 Chi-square tests indicated statistically significant associations between level of

166 weight gain and several food consumption measures, as well as physical activity.

167 These cross-tabulations are shown in Table 4. Specifically, students reporting

168 greatest weight gain (>12.7 kg) were more likely have to be frequent consumers of

169 ready meals & convenience foods and takeaway & fast food and least likely to

170 consume fruit & vegetables on a daily basis. There was also a trend ($p=0.058$) for

171 alcohol consumption to be associated with weight gain; students in the top two

172 categories of weight gain (6.4-12.7kg and >12.7kg) had the highest proportion of

173 frequent drinkers. Weight gain at university was inversely associated with self-

174 reported physical activity: students reporting greatest weight gain at university

175 (>12.7 kg) were least likely to report that were 'fairly active' (60-90 minutes

176 activity per week) or 'active'/'very active'.

177

178 Cooking ability was correlated with alcohol consumption ($\rho_s=-0.226$, $n=273$,

179 $p<0.001$), consumption of takeaway & fast food ($\rho_s=-0.241$, $n=273$, $p<0.001$), fruit

180 & vegetables ($\rho_s=0.380$, $n=273$, $p<0.001$), consumption of ready-meals &

181 convenience food ($\rho_s=-0.320$, $n=274$, $p<0.001$) and physical activity levels at

182 university ($\rho_s=0.166$, $n=273$, $p<0.006$).

183

184 After multivariate adjustment (Table 5) only frequency of consumption of ready

185 meals & convenience food and physical activity were associated with weight gain.

186 Specifically, the ordinal logistic regression model showed that the odds of weight

187 gain increased at all lower levels of physical activity, while the odds of weight gain

188 decreased with less frequent consumption of ready meals. The model used had a

189 pseudo r-squared of 23.4%.

190

191 There were also significant associations between pre-university body weight and

192 weight gain at university ($\chi^2=33.75$ $df=12$; $p<0.001$). The most striking difference

193 was that students who were weight stable at university invariably reported being

194 overweight or severely overweight prior to starting university compared to

195 students who gained body weight at university. Between 23.8% and 43.5% of the

196 latter groups reported being of a healthy body weight prior to starting university.

197
198 When perceived reasons for weight gain at university were examined 'eating
199 unhealthily due to stress relating to studies' was significantly associated with level
200 of weight gain at university ($\chi^2 = 79.47$; $df=4$; $p<0.001$). A greater proportion
201 (90%) of students in the 6.4-12.7 kg group attributed their weight gain to stress
202 compared to approximately 70% of students in other weight gaining groups. There
203 was also only one significant association between weight gain and factors
204 influencing food choice at university: respondents in the weight stable group were
205 less likely to report cost as an important influence on their food choices at
206 university ($\chi^2 = 15.25$; $df = 4$; $p = 0.004$).
207

208 Discussion & Conclusion

209 The current study set out to examine eating habits associated with weight gain
210 among UK university students who were members of a slimming club. This focus
211 on a weight-gaining sub-group of the student population who have sought help
212 from a commercial slimming organisation, as opposed to the general student
213 population (Cockman et al., 2013; Finlayson et al., 2012) provides particular
214 perspective. We found considerable variation in weight gain during the first year
215 of university with about a third of students reporting a gain greater than 6.4kg
216 (equivalent to 1 stone). This level of weight gain would be considered clinically
217 significant for an average woman weighing 71kg (>7percent of body weight) and
218 may have important long-term health implications. Meta-analytic data record
219 average weight gain to be 1.36kg over the first year of student life for all students,
220 while the corresponding figure for students who gain weight (excluding weight
221 stable and weight losing students) was 3.38kg (Vadeboncoeur et al., 2015). Clearly
222 recruitment via a slimming club selects people who have a weight problem and
223 who have experienced substantial and greater than average weight gain. This
224 assertion is supported by data from a separate survey of Slimming World student
225 members, which documented that new members had on average a Body Mass
226 Index of 31.0 kg/m² upon entry to the programme (Smith et al., 2014).

227 Overall, reported weight gain over the entire university time period was greater
228 than that reported during first year, concurring with a meta-analysis of studies

that assessed weight gain in students beyond the first year (Fedewa et al., 2014). However, our data also showed that rates of weight gain slowed after the first year for nearly 60% of students, contrary to the meta-analytic study. Our data are in line with the expectation that membership of a slimming club may ameliorate weight gain, and Slimming World data on weight loss in student members, which recorded a weight loss of approximately 5kg for those who were overweight and obese and 3kg for those who were a healthy weight after 12 weeks membership (Smith et al., 2014).

We identified clear associations between weight gain and eating habits. As weight gain increased diet quality decreased, with students reporting greatest weight gain reporting least frequent consumption of fruits & vegetables and most frequent consumption of alcohol, take-away & fast food, and ready meals & convenience foods. Additionally, we identified an association between cooking ability and weight gain, and were able to discriminate students' level of weight gain according to their ability to cook more culinary complex meals.

Interestingly, cooking ability was negatively correlated with consumption frequencies of alcohol, takeaway & fast food and ready meals & convenience foods, and positively correlated with consumption of fruit & vegetables and physical activity. All these correlations were of moderate magnitude. It is evident that a constellation of lifestyle habits may be working together to increase risk of weight gain confirming the cluster analysis approach of Greene et al in a large cross-sectional study of both male and female North American students (Greene et al., 2011).

A multivariate model revealed that weight gain was most strongly associated with frequency of consumption of ready meals & convenience food and low physical activity. An axis between poor cooking skills, consumption of ready meals and risk of obesity has previously been documented in a non-student population (van der Horst et al., 2011), and ready meal consumption has been associated with the prevalence of obesity in Brazilian women (Lobato et al., 2009). Supermarket ready meals in the UK have been criticised for their high fat and salt content (Remnant and Adams, 2015), although limited data suggest that they are not consistently high in calories (Celnik et al., 2012). More generally, convenience food consumption has been implicated in the temporal rise in obesity rates in

Australia (Dixon et al., 2006). Notably, convenience food is heterogeneous in type and diverse in nutrient composition, for example it can range in type from highly processed foods such as canned ravioli to single foods such as frozen French fries and unprocessed salads (Brunner et al., 2010). The finding that low physical activity is associated with weight gain concurs with other weight gain studies of university students (Butler et al., 2004; Edmonds et al., 2008; Greene et al., 2011). Although the strongest connections between weight gain and lifestyle metrics are for low physical activity and consumption frequency of ready meals & convenience food, our internal correlations suggest that a multi-behavioural effect is influencing risk of weight gain.

Stress was identified by students as a factor leading to weight gain particularly for students gaining between 6.4 and 12.7kg of body weight, congruent with a previous UK study (Serlachius et al., 2007). The relationship between academic stress and calorie intake is inconsistent (Barker et al., 2015), but high stress has been reported to induce a hyperphagic response and tendency to consume high-fat, high-sugar foods particularly in restrained eaters (Habhab et al., 2009; Wardle et al., 2000). Moreover, a qualitative study exploring emotional eating behaviours among North American university students reported that female students identified stress as a primary trigger for abandonment of normal eating patterns and increased food consumption (Bennett et al., 2013). The fact that students reporting greatest weight gain were not so likely to report stress as a perceived reason for their weight gain is unclear, although one possible explanation may be that these students are less susceptible to emotional hunger cues. Psychometric measures of eating behaviour are needed to confirm this possibility.

Finally, the relationship found between bodyweight going to university and weight gain thereafter is likely to be an artefact of our sampling frame. Students whose pre-university body weight was in the normal range and who did not gain weight are unlikely to be included in our sample. The relationship between baseline body composition and weight change has been examined, but remains unclear (Kasperek et al., 2008; Mifsud et al., 2009; Mihaolopoulos et al., 2008; Provencher et al., 2009). It is possible that overweight students arriving at university are already engaging in practices to prevent further weight gain, whilst those who begin university at a healthy body weight are less aware of a need to engage in

1 295 behaviours that promote weight stability. Greater awareness among students
2
3 296 about the risk of body weight gain at university may therefore be necessary.
4
5 297 Despite the novel nature of our study focusing on a weight-gaining subgroup of the
6
7 298 general student population, it has a number of weaknesses. Specifically, our sample
8
9 299 was female, prohibiting extrapolation to the general student body. However, this
10
11 300 female predominance reflects the gender split of the national Slimming World
12
13 301 membership (Stubbs et al., 2015). Additionally, all data in the current study was
14
15 302 gathered using self-report and retrospective measures; lifestyle information may
16
17 303 have been particularly difficult to accurately recall given that lifestyle changes
18
19 304 would have been promoted – and likely implemented - upon joining Slimming
20
21 305 World. However, restriction of the dataset to current students who had recently
22
23 306 joined the programme reduced the likelihood of such error. Notably self-reported
24
25 307 and researcher-measured body weight among university students shows strong
26
27 308 correlation in student populations (Delinsky and Wilson, 2008; Economos et al.,
28
29 309 2008; Lloyd-Richardson et al., 2009). There is additionally no reason to believe any
30
31 310 form of recall bias according to weight gain group occurred, reinforcing the validity
32
33 311 of associations. As for many dietary studies, the collinearity observed between
34
35 312 food and lifestyle behaviours would suggest that a large sample size or complex
36
37 313 design is necessary to unpick the independent effects of single food behaviours.
38
39 314 Future research should now focus on this weight-gaining sub-group of the student
40
41 315 population to further delineate reasons for weight gain and identify students at
42
43 316 risk. Prospective studies are necessary to strengthen findings, and qualitative
44
45 317 methods would enhance understanding. Ultimately this research is important to
46
47 318 inform the development of interventions to reduce clinically significant weight
48
49 319 gain during early adulthood. Indeed while a mobile phone-based intervention
50
51 320 programme targeting dietary behaviour and physical activity has been shown to be
52
53 321 effective in preventing weight gain in a young Australian adults (Partridge et al.,
54
55 322 2016), there is limited study which addresses obesity prevention in student and
56
57 323 non-students (Allman-Farinelli, 2015). British research investigating weight gain
58
59 324 among a comparable non-student population is also pertinent to determine the
60 325 extent to which the university setting is responsible for weight gain.
326
327
328

329

330 **References**

- 331 Adams, T. and Rini, A. (2007), "Predicting 1-Year Change in Body Mass Index
332 Among College Students", *Journal of American College Health*, Vol. 55 No. 6, pp.
333 361–365.
- 334 Allman-Farinelli, M. (2015), "Nutrition Promotion to Prevent Obesity in Young
335 Adults", *Healthcare*, Vol. 3 No. 3, pp. 809–821.
- 336 Barker, M.E., Blain, R.J. and Russell, J.M. (2015), "The influence of academic
337 examinations on energy and nutrient intake in male university students",
338 *Nutrition Journal*, Vol. 14 No. 1, p. 98.
- 339 Bennett, J., Greene, G. and Schwartz-Barcott, D. (2013), "Perceptions of emotional
340 eating behavior. A qualitative study of college students", *Appetite*, Elsevier Ltd,
341 Vol. 60 No. 1, pp. 187–192.
- 342 Brown, C. (2008), "The information trail of the 'Freshman 15'--a systematic review
343 of a health myth within the research and popular literature.", *Health
344 Information and Libraries Journal*, Vol. 25 No. 1, pp. 1–12.
- 345 Brunner, T.A., van der Horst, K. and Siegrist, M. (2010), "Convenience food
346 products. Drivers for consumption.", *Appetite*, Elsevier Ltd, Vol. 55 No. 3, pp.
347 498–506.
- 348 Butler, S.M., Black, D.R., Blue, C.L. and Gretebeck, R.J. (2004), "Change in Diet,
349 Physical Activity, and Body Weight in Female College Freshman", *American
350 Journal of Health Behavior*, Vol. 28 No. 1, pp. 24–32.
- 351 Celnik, D., Gillespie, L. and Lean, M.E.J. (2012), "Time-scarcity, ready-meals, ill-
352 health and the obesity epidemic", *Trends in Food Science & Technology*,
353 Elsevier Ltd, Vol. 27 No. 1, pp. 4–11.
- 354 Cockman, C., O'Reilly, J. and Mellor, D.D. (2013), "Weight gain in British first year
355 university students: Is the 'Freshman 15' only an American phenomenon?",
356 *Proceedings of the Nutrition Society*, Vol. 72 No. OCE4, p. E208.

1 357 Crombie, A.P., Ilich, J.Z., Dutton, G.R., Panton, L.B. and Abood, D.A. (2009), "The
2 358 freshman weight gain phenomenon revisited", *Nutrition Reviews*, Vol. 67 No. 2,
3 359 pp. 83–94.

6 360 Delinsky, S.S. and Wilson, G.T. (2008), "Weight gain, dietary restraint, and
7 361 disordered eating in the freshman year of college.", *Eating Behaviors*, Vol. 9
8 362 No. 1, pp. 82–90.

12 363 Dixon, J.M., Hinde, S.J. and Banwell, C.L. (2006), "Obesity, convenience and 'phood'",
13 364 *British Food Journal*, Vol. 108 No. 8, pp. 634–645.

16 365 Economos, C.D., Hildebrandt, M.L. and Hyatt, R.R. (2008), "College freshman stress
17 366 and weight change: differences by gender.", *American Journal of Health
18 367 Behavior*, Vol. 32 No. 1, pp. 16–25.

22 368 Edmonds, M.J., Ferreira, K.J., Nikiforuk, E.A., Finnie, A.K., Leavey, S.H., Duncan, A.M.
23 369 and Randall Simpson, J.A. (2008), "Body Weight and Percent Body Fat Increase
24 370 during the Transition from High School to University in Females", *Journal of
25 371 the American Dietetic Association*, Vol. 108 No. 6, pp. 1033–1037.

29 372 Ellison, J. (2013), "Reducing obesity and improving diet", *Department of Health*,
30 373 available at: [https://www.gov.uk/government/policies/reducing-obesity-](https://www.gov.uk/government/policies/reducing-obesity-and-improving-diet)
31 374 [and-improving-diet](https://www.gov.uk/government/policies/reducing-obesity-and-improving-diet).

35 375 Fedewa, M. V., Das, B.M., Evans, E.M. and Dishman, R.K. (2014), "Change in weight
36 376 and adiposity in college students: A systematic review and meta-analysis",
37 377 *American Journal of Preventive Medicine*, Elsevier, Vol. 47 No. 5, pp. 641–652.

41 378 Finlayson, G., Cecil, J., Higgs, S., Hill, A. and Hetherington, M. (2012), "Susceptibility
42 379 to weight gain. Eating behaviour traits and physical activity as predictors of
43 380 weight gain during the first year of university.", *Appetite*, Elsevier Ltd, Vol. 58
44 381 No. 3, pp. 1091–8.

48 382 Girz, L., Polivy, J., Provencher, V., Gallander, M., Pratt, M.W., Pancer, S.M., Birnie-
49 383 lefcovitch, S., et al. (2013), "The four undergraduate years . Changes in weight ,
50 384 eating attitudes , and depression", *Appetite*, Elsevier Ltd, Vol. 69, pp. 145–150.

54 385 Greene, G.W., Schembre, S.M., White, A.A., Hoerr, S.L., Lohse, B., Shoff, S., Horacek,
55 386 T., et al. (2011), "Identifying clusters of college students at elevated health risk

- based on eating and exercise behaviors and psychosocial determinants of body weight.", *Journal of the American Dietetic Association*, Elsevier Inc., Vol. 111 No. 3, pp. 394–400.
- Habhab, S., Sheldon, J.P. and Loeb, R.C. (2009), "The relationship between stress, dietary restraint, and food preferences in women", *Appetite*, Vol. 52, pp. 437–444.
- Health and Social Care Information Centre. (2015), "Statistics on Obesity, Physical Activity and Diet: England 2015", *Health and Social Care Information Centre*, Health and Social Care Information Centre, No. March, p. 103.
- Holm-Denoma, J.M., Joiner, T.E., Vohs, K.D. and Heatherton, T.F. (2008), "The 'Freshman Fifteen' (the 'Freshman Five' actually): Predictors and Possible Explanations.", *Health Psychology*, Vol. 27 No. 1 (Suppl.), pp. S3-9.
- van der Horst, K., Brunner, T.A. and Siegrist, M. (2011), "Ready-meal consumption: associations with weight status and cooking skills.", *Public Health Nutrition*, Vol. 14 No. 2, pp. 239–45.
- Jung, M.E., Bray, S.R. and Martin Ginis, K.A. (2008), "Behavior Change and the Freshman 15: Tracking Physical Activity and Dietary Patterns in 1st-year University Women.", *Journal of American College Health*, Vol. 56 No. 5, pp. 523–30.
- Kasperek, D., Corwin, S., Valois, R., Sargent, R. and Morris, R. (2008), "Selected Health Behaviors That Influence College Freshman Weight Change", *Journal of American College Health*, Vol. 56 No. 4, pp. 437–444.
- Levitsky, D., Halbmaier, C. and Mrdjenovic, G. (2004), "The freshman weight gain: a model for the study of the epidemic of obesity.", *International Journal of Obesity*, Vol. 28 No. 11, pp. 1435–1442.
- Lloyd-Richardson, E. and Lucero, M. (2008), "The Relationship Between Alcohol Use, Eating Habits and Weight Change in College Freshmen", *Eating Behaviors*, Vol. 9 No. 4, pp. 504–508.
- Lloyd-Richardson, E.E., Bailey, S., Fava, J.L. and Wing, R. (2009), "A prospective study of weight gain during the college freshman and sophomore years.",

417 *Preventive Medicine*, Vol. 48 No. 3, pp. 256–61.

418 Lobato, J.C.P., Costa, A.J.L. and Sichieri, R. (2009), “Food intake and prevalence of

419 obesity in Brazil: an ecological analysis.”, *Public Health Nutrition*, Vol. 12 No.

420 11, pp. 2209–2215.

421 Lowe, M.R., Annunziato, R. a, Markowitz, J.T., Didie, E., Bellace, D.L., Riddell, L.,

422 Maille, C., et al. (2006), “Multiple types of dieting prospectively predict weight

423 gain during the freshman year of college.”, *Appetite*, Vol. 47 No. 1, pp. 83–90.

424 Mifsud, G., Duval, K. and Doucet, E. (2009), “Low body fat and high

425 cardiorespiratory fitness at the onset of the freshmen year may not protect

426 against weight gain.”, *The British Journal of Nutrition*, Vol. 101 No. 9, pp. 1406–

427 12.

428 Mihaolopoulos, N., Auinger, P. and Klein, J. (2008), “The Freshman 15: Is it Real?”,

429 *Journal of American College Health*, Vol. 56 No. 5, pp. 531–533.

430 Nikolaou, C.K., Hankey, C.R. and Lean, M.E.J. (2014), “Weight changes in young

431 adults : a mixed-methods study”, *International Journal of Obesity*, Nature

432 Publishing Group, Vol. 39 No. 3, pp. 508–513.

433 Partridge, S.R., McGeechan, K., Bauman, A., Phongsavan, P. and Allman-Farinelli, M.

434 (2016), “Improved eating behaviours mediate weight gain prevention of

435 young adults: moderation and mediation results of a randomised controlled

436 trial of TXT2BFiT, mHealth program.”, *The International Journal of Behavioral*

437 *Nutrition and Physical Activity*, International Journal of Behavioral Nutrition

438 and Physical Activity, Vol. 13, p. 44.

439 Pliner, P. and Saunders, T. (2008), “Vulnerability to freshman weight gain as a

440 function of dietary restraint and residence.”, *Physiology & Behavior*, Vol. 93 No.

441 1–2, pp. 76–82.

442 Provencher, V., Polivy, J., Wintre, M.G., Pratt, M.W., Pancer, S.M., Birnie-Lefcovitch,

443 S. and Adams, G.R. (2009), “Who gains or who loses weight? Psychosocial

444 factors among first-year university students”, *Physiology and Behavior*, Vol. 96

445 No. 1, pp. 135–141.

446 Pullman, A.W., Masters, R.C., Zalot, L.C., Carde, L.E., Saraiva, M.M., Dam, Y.Y., Randall

- 1 447 Simpson, J. a, et al. (2009), "Effect of the transition from high school to
2 448 university on anthropometric and lifestyle variables in males.", *Applied*
3 449 *Physiology, Nutrition, and Metabolism = Physiologie Appliquee, Nutrition et*
4 450 *Metabolisme*, Vol. 34, pp. 162–171.
- 5
6
7
8 451 Racette, S.B., Deusinger, S.S., Strube, M.J., Highstein, G.R. and Deusinger, R.H.
9 452 (2005), "Weight Changes, Exercise, and Dietary Patterns During Freshman
10 453 and Sophomore Years of College.", *Journal of American College Health*, Vol. 53
11 454 No. 6, pp. 245–51.
- 12
13
14
15 455 Remnant, J. and Adams, J. (2015), "The nutritional content and cost of supermarket
16 456 ready-meals. Cross-sectional analysis", *Appetite*, The Authors, Vol. 92, pp. 36–
17 457 42.
- 18
19
20
21 458 Serlachius, A., Hamer, M. and Wardle, J. (2007), "Stress and weight change in
22 459 university students in the United Kingdom.", *Physiology & Behavior*, Vol. 92 No.
23 460 4, pp. 548–53.
- 24
25
26
27 461 Smith, S., Barber, J., Avery, A., Cryan, C. and Lavin, J. (2014), "Weight management
28 462 in university students", *Public Health England Annual Conference*, Warwick,
29 463 available at: [https://images.slimmingworld.com/health/evidence/weight-](https://images.slimmingworld.com/health/evidence/weight-management-in-univ-students.pdf)
30 464 [management-in-univ-students.pdf](https://images.slimmingworld.com/health/evidence/weight-management-in-univ-students.pdf).
- 31
32
33
34 465 Stubbs, R.J., Morris, L., Pallister, C., Horgan, G. and Lavin, J.H. (2015), "Weight
35 466 outcomes audit in 1.3 million adults during their first 3 months' attendance in
36 467 a commercial weight management programme", *BMC Public Health*, BMC
37 468 Public Health, Vol. 15 No. 882, pp. 1–13.
- 38
39
40
41 469 Vadeboncoeur, C., Townsend, N. and Foster, C. (2015), "A meta-analysis of weight
42 470 gain in first year university students: is freshman 15 a myth?", *BMC Obesity*,
43 471 Vol. 2:22, available at:<https://doi.org/10.1186/s40608-015-0051-7>.
- 44
45
46
47 472 Wardle, J., Steptoe, A., Oliver, G. and Lipsey, Z. (2000), "Stress , dietary restraint and
48 473 food intake", *Journal of Psychosomatic Research*, Vol. 48, pp. 195–202.
- 49
50
51 474
52
53
54 475
55
56
57
58
59
60

1	476
2	
3	477
4	
5	478
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	
57	
58	
59	
60	

British Food Journal

Table 1: Self-reported weight gain, eating behaviours and physical activity levels at university prior to joining Slimming World

		Number	Percentage (%)
Self-reported body weight gain throughout university	0 kg	34	12.5
	<3.2 kg	24	8.9
	3.2-6.4 kg	63	23.6
	6.4-12.7 kg	95	35.1
	>12.7 kg	55	20.3
Self-reported body weight gain during the first year	0 kg	42	15.6
	<3.2 kg	58	21.5
	3.2-6.4 kg	77	28.5
	6.4-12.7 kg	74	27.4
	>12.7 kg	19	7.0
Consumption of alcohol	Never	34	12.5
	Less than once per week	49	17.9
	1-2 nights per week	98	35.9
	3 or more nights per week	92	33.7
Consumption of takeaways & fast food at university	None	23	8.4
	Once a week	112	41.0
	A few a week	127	46.5
	>5 a week	11	4.0
Consumption of ready meals & convenience foods	Never	20	7.3
	Once a week	39	14.2
	1-3 per week	84	30.7
	3-5 per week	81	29.6
	>5 per week	50	18.2
Consumption of fruits & vegetables	Never	3	1.1
	Once or less week	87	31.9
	2-3 times per week	78	28.6
	4-5 times per week	38	13.9
	Every day	67	24.5
Physical activity levels	Not at all active	39	14.3
	Rarely active (<30 minutes/week)	82	30.0
	Sometimes active (30-60 minutes/week)	71	26.0
	Fairly active (60-90 minutes/week)	42	15.3
	Active (>90- minutes/week)	39	14.3

Table 2 Proportion of students reporting that they are able to cook specific meals

Meal	Number	%
Cheese on toast	260	95.2%
Tinned spaghetti hoops on toast	255	93.4%
Baked beans on a jacket potato	250	91.6%
Scrambled eggs on toast	236	86.4%
Full English breakfast	231	84.6%
Stir-fry	214	78.4%
Spaghetti Bolognese	193	70.7%
Shepherds Pie	174	63.7%
Roast dinner	168	61.5%
Homemade soup	166	60.8%
Chilli con carne	152	55.7%
Homemade burger	149	54.6%
Curry	143	52.4%
Casserole/stew	141	51.6%

Table 3 Weight gain at University tabulated against self-reported ability to cook specific meals; number and percentage of column totals in parentheses.

Weight Gain	None	<3.2 kg	3.2-6.4 kg	6.4-12.7 kg	>12.7 kg	Chi-squared Test
Cheese on toast	31 (91.2%)	22 91.7%	61 96.8%	89 93.7%	54 98.2%	3.44 P=0.497
Tinned spaghetti hoops on toast	31 91.2%	23 95.8%	59 93.7%	85 89.5%	54 98.2%	4.59 P=0.327
Baked beans on a jacket potato	29 85.3%	22 91.7%	58 92.1%	84 88.4%	54 98.2%	5.76 P=0.218
Scrambled eggs on toast	31 91.2%	23 95.8%	58 92.1%	77 81.1%	45 81.8%	7.47 P=0.113
Full English breakfast	32 94.1%	18 75.0%	58 92.1%	77 81.1%	43 78.2%	9.14 P=0.058
Stir-fry	31 91.2%	20 83.3%	55 87.3%	65 68.4%	40 72.7%	12.92 P=0.120
Spaghetti Bolognese	26 76.5%	16 66.7%	52 82.5%	64 67.4%	33 60.0%	8.50 P=0.075
Shepherds pie	27 79.4%	13 54.2%	46 73.0%	52 54.7%	35 63.6%	10.25 P=0.036
Roast dinner	26 76.5%	16 66.7%	43 68.3%	50 52.6%	31 56.4%	8.44 P=0.077
Homemade soup	27 79.4%	15 62.5%	45 71.4%	52 54.7%	26 47.3%	13.66 P=0.008
Chilli con carne	21 61.8%	15 62.5%	39 61.9%	51 53.7%	24 43.6%	5.32 P=0.056
Homemade burger	25 73.5%	12 50.0%	40 63.5%	44 46.3%	26 47.3%	10.92 P=0.027
Curry	23 67.6%	13 54.2%	38 60.3%	42 44.2%	25 45.5%	8.38 P=0.079
Casserole/stew	25 73.5%	13 54.2%	38 60.3%	37 38.9%	26 47.3%	15.01 P=0.005

Table 4: Weight gain while at University tabulated against dietary consumption measures and physical activity; number and percentages of consumption categories in parentheses

Weight gain	None	<3.2 kg	3.2-6.4 kg	6.4-12.7 kg	>12.7 kg	Chi-squared Test
Frequency of consumption of alcohol						
Never	7 (20.6%)	3 (8.8%)	4 (11.8%)	13 (38.2%)	7 (20.6%)	20.54 P=0.058
< 1 night per week	9 (18.8%)	7 (14.6%)	11 (22.9%)	14 (29.2%)	7 (14.6%)	
1-2 nights per week	12 (12.5%)	9 (9.4%)	30 (31.3%)	27 (28.1%)	18 (18.8%)	
3 + nights per week	6 (6.5%)	5 (5.4%)	17 (18.5%)	41 (44.6%)	23 (25%)	
Frequency of consumption of take-aways & fast food						
Never	5 (22.7%)	6 (27.3%)	4 (18.2%)	5 (22.7%)	2 (9.1%)	41.65 P<0.001
Once a week	20 (18%)	11 (9.9%)	29 (26.1%)	34 (30.6%)	17 (15.3%)	
A few a week	8 (6.3%)	4 (3.2%)	28 (22.2%)	55 (43.7%)	31 (24.6%)	
5 plus a week	0 (0%)	3 (27.3%)	2 (18.2%)	1 (9.1%)	5 (45.5%)	
Frequency of consumption of fruit & vegetables						
Never	0 (0%)	1 (33.3%)	2 (66.7%)	0 (0%)	0 (0%)	34.08 P=0.005
Once or less a week	6 (7.1%)	5 (5.9%)	18 (21.2%)	30 (35.3%)	26 (30.6%)	
2-3 a week	8 (10.4%)	5 (6.5%)	15 (19.5%)	35 (45.5%)	14 (18.2%)	
3-5 a week	4 (10.5%)	3 (7.9%)	10 (26.3%)	15 (39.5%)	6 (15.8%)	
Everyday	16 (23.9%)	10 (14.9%)	18 (26.9%)	15 (22.4%)	8 (11.9%)	
Frequency of consumption of ready meals & convenience foods						
Never	7 (35%)	3 (15%)	5 (25%)	4 (20%)	1 (5%)	44.14 P<0.001
Once a week	5 (12.8%)	6 (15.4%)	13 (33.3%)	11 (28.2%)	4 (10.3%)	
1-3 times a week	11 (13.4%)	8 (9.8%)	24 (29.3%)	29 (35.4%)	10 (12.2%)	
3-5 times a week	8 (9.9%)	4 (4.9%)	15 (18.5%)	35 (43.2%)	19 (23.5%)	
More than five times a week	3 (6.1%)	3 (6.1%)	6 (12.2%)	16 (32.7%)	21 (42.9%)	
Level of physical activity						
Not active at all	3 (7.9%)	5 (13.2%)	7 (18.4%)	11 (28.9%)	12 (31.6%)	40.16 P=0.001
Rarely active	6 (7.3%)	4 (4.9%)	17 (20.7%)	32 (39%)	23 (28%)	
Sometimes active	9 (13%)	4 (5.8%)	12 (17.4%)	29 (42%)	15 (21.7%)	

Fairly active	4 (9.5%)	4 (9.5%)	16 (38.1%)	15 (35.7%)	3 (7.1%)	
Active or very active	11 (28.2%)	7 (17.9%)	11 (28.2%)	8 (20.5%)	2 (5.1%)	

British Food Journal

Table 5 Results of ordinal logistic regression predicting odds of moving to a greater weight gain classification according to lifestyle categories (odds ratios with 95% confidence intervals (CI); highest frequency/category as referent)

	Odds Ratio	Lower CI	Upper CI
Cooking Score	0.956	0.891	1.026
Alcohol never	1.214	0.554	2.659
Alcohol <1night per week	0.585	0.297	1.153
Alcohol 1-2 nights per week	0.733	0.421	1.278
Alcohol 3+nights per week	1		
Take-aways & Fast food never	1.076	0.234	4.953
Take-aways & fast food once a week	1.240	0.339	4.531
Take-aways & fast food few times per week	1.925	0.553	6.706
Take-aways & Fast food 5+ times per week	1		
Fruit & vegetables never	0.133	0.015	1.201
Fruit &vegetables once or less per week	1.430	0.697	2.939
Fruit & vegetables 2-3 times per week	1.029	0.513	2.063
Fruit & vegetables 3-5 times per week	1.432	0.666	3.080
Fruit & vegetables every day	1		
Ready meal never	0.162	0.051	0.509
Ready meal & convenience food once per week	0.349	0.141	0.865
Ready meal & convenience food 1-3 per week	0.349	0.163	0.751
Ready meal & convenience food 3-5 times per week	0.474	0.227	0.989
Ready meal & convenience food >5 times per week	1		
Physical activity not active	3.391	1.363	8.432
Rarely active	3.508	1.597	7.706
Sometimes active	2.798	1.305	6.001
Fairly active	1.879	0.827	4.272
Physical activity active or very active	1		

Note - The ordered weight gain classifications are (1) None, (2) <3.2kg, 3) 3.2-6.4kg, 4) 6.4-12.7kg, 5) >12.7kg. The overall model was significant (p=0.011)