

**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:

<http://shura.shu.ac.uk/15864/>

---

This document is the author deposited version. You are advised to consult the publisher's version if you wish to cite from it.

**Published version**

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.

---

**Copyright and re-use policy**

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



**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

1  
2  
3  
4  
5  
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

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  
7  
8  
9

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

Running head: Body weight gain in university students

British Food Journal

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

69 American studies, which have employed a detailed assessment of diet have not  
70 observed increased energy intake among weight gainers (Butler et al., 2004; Jung  
71 et al., 2008; Pullman et al., 2009). Studies focusing on the psychological constructs  
72 of eating behaviour have reported a link between weight change and dietary  
73 restraint, disinhibition, history of dieting and stress (Economos et al., 2008;  
74 Finlayson et al., 2012; Girz et al., 2013; Levitsky et al., 2004; Lowe et al., 2006;  
75 Serlachius et al., 2007). The relationship between physical activity and weight  
76 change is also unclear (Butler et al., 2004; Edmonds et al., 2008; Finlayson et al.,  
77 2012; Racette et al., 2005) and lack of body composition measures often blurs  
78 interpretation. Further research is necessary to delineate the factors behind  
79 weight gain among university students.

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

## 87 **Methods**

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

1 101 relation to their behaviours at university before joining Slimming World.  
2  
3 102 Response options (e.g. frequency of consumptions; categories of weight gain;  
4  
5 103 factors influencing food choices) were provided for each question.

6  
7 104 The survey was designed and administrated by staff at Slimming World  
8  
9 105 Headquarters. There were no incentives for participation. A total of 1060 Slimming  
10  
11 106 World members who were either current or former university students responded  
12  
13 107 to the survey. This data analysis used a subset of respondents from the original  
14  
15 108 survey; students who were no longer at university (n=781) and male students (n=  
16  
17 109 5) were excluded. The former exclusion was instigated to improve data quality,  
18  
19 110 since current students would be expected to more accurately recall dietary and  
20  
21 111 physical activity habits and weight gain at university than graduates. Male students  
22  
23 112 were excluded because they were few in number.

24  
25 113 Self-reported weight gain at university was categorised: 0 kg (weight-stable); <3.2  
26  
27 114 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  
28  
29 115 stones). No participant in the current study reported weight loss at university.  
30  
31 116 Category of weight gain was examined against perceived reasons for weight gain at  
32  
33 117 university using non-parametric tests (SPSS Statistics V23). An ordinal logistic  
34  
35 118 regression model was fitted to establish the independent effect of descriptively  
36  
37 119 significant variables (cooking ability, food frequency and physical activity) as  
38  
39 120 predictors of weight gain category. The statistical analysis was conducted using  
40  
41 121 SPSS (IBM SPSS 23.0, IBM Armonk, USA).

## 42 **Results**

43 122 Approximately half of the sample (47.6%) was between 18 and 21 years of age and  
44  
45 123 just under one quarter (22.3%) of respondents were between 22 and 30 years old.  
46  
47 124 The majority of responders had been members of Slimming World for less than a  
48  
49 125 month (46.0%) or between 3-6 months (29.9%) at the point of survey.

50  
51 126 Table 1 provides descriptive data for reported weight gain, food group  
52  
53 127 consumption and physical activity. An eighth of respondents (12.5%) were weight  
54  
55 128 stable during their time at university, while over half (55.4%) reported gaining in  
56  
57 129 excess of 6.4kg. Only 15.6% of students reported no weight gain during their first  
58  
59 130 year at university compared to 34.4% who reported gaining more than 6.4kg.  
60

1 132 58.1% of students reported the same level of weight gain in the two time periods  
2  
3 133 while 40.7% reported a higher level of weight gain overall than in first year  
4  
5 134 (Wilcoxon=193, n=270, p<0.001).

6  
7 135 Table 1 also shows descriptive data for physical activity and food consumption.  
8  
9 136 Self-reported physical activity levels at university varied from 'not at all active'  
10  
11 137 (14.3%) to 'active or very active' (14.3%). Less than one in four respondents  
12  
13 138 reported that they consumed fruit and vegetables every day when at university,  
14  
15 139 whilst one in three indicated that they consumed fruit and vegetables once a week  
16  
17 140 or less. Self-reported consumption of takeaways/fast food meals was high, with  
18  
19 141 just over half the sample (50.5%) reporting eating take-away & fast food several  
20  
21 142 times per week or more; just under a half (47.8%) of respondents reported  
22  
23 143 consuming ready meals & convenience food more than three times per week, with  
24  
25 144 fewer than one in five respondents (18.2%) reporting consumption of these foods  
26  
27 145 greater than 5 times per week. One third of respondents (33.7%) also reported  
28  
29 146 that they consumed alcohol on '3 or more nights per week'.

30  
31 147 Table 2 provides information on students' self-assessment of their ability to cook  
32  
33 148 various dishes. The dishes ranged from the simple, such as cheese on toast to the  
34  
35 149 complex, such as a roast dinner. While 73 (26.6%) of the sample reported being  
36  
37 150 able to cook all fourteen of the dishes, less than 5% reported being able to cook  
38  
39 151 three or less dishes. Around 40% of students could not make dishes such as  
40  
41 152 shepherd's pie, homemade soup and chilli con carne. Fewest students reported  
42  
43 153 being able to cook a stew/casserole, with just over half of students claiming  
44  
45 154 competency. A total of 82.7% of the sample agreed with the statement 'students  
46  
47 155 need support to learn how to cook healthy food/meals' and 91.9% agreed with the  
48  
49 156 statement 'students need support to learn how to eat healthily on a budget'.

50  
51 157 There were several significant associations between cooking ability and category  
52  
53 158 of weight gain (see Table 3). Specifically, a significantly higher proportion of  
54  
55 159 students in the weight stable group reported that they were able to cook the  
56  
57 160 following meals from scratch: stir-fry, homemade burger, soup, casserole/stew and  
58  
59 161 shepherd's pie. Students who reporting greater difficulty in shopping, cooking and  
60  
162 eating healthily on a student budget reported greater weight gain ( $\rho = 0.237$ ;  $df =$   
163  $265$ ;  $p < 0.001$ ).



1 164  
2  
3  
4 165 Chi-square tests indicated statistically significant associations between level of  
5 166 weight gain and several food consumption measures, as well as physical activity.  
6  
7 167 These cross-tabulations are shown in Table 4. Specifically, students reporting  
8 168 greatest weight gain (>12.7 kg) were more likely have to be frequent consumers of  
9  
10 169 ready meals & convenience foods and takeaway & fast food and least likely to  
11  
12 170 consume fruit & vegetables on a daily basis. There was also a trend (p=0.058) for  
13  
14 171 alcohol consumption to be associated with weight gain; students in the top two  
15 172 categories of weight gain (6.4-12.7kg and >12.7kg) had the highest proportion of  
16  
17 173 frequent drinkers. Weight gain at university was inversely associated with self-  
18 174 reported physical activity: students reporting greatest weight gain at university  
19 175 (>12.7 kg) were least likely to report that were 'fairly active' (60-90 minutes  
20 176 activity per week) or 'active'/'very active'.  
21  
22  
23

24 177  
25 178 Cooking ability was correlated with alcohol consumption ( $\rho_s=-0.226$ , n=273,  
26 179 p<0.001), consumption of takeaway & fast food ( $\rho_s=-0.241$ , n=273, p<0.001), fruit  
27  
28 180 & vegetables ( $\rho_s=0.380$ , n=273, p<0.001), consumption of ready-meals &  
29 181 convenience food ( $\rho_s=-0.320$ , n=274, p<0.001) and physical activity levels at  
30 182 university ( $\rho_s=0.166$ , n=273, p<0.006).  
31  
32

33 183  
34  
35 184 After multivariate adjustment (Table 5) only frequency of consumption of ready  
36 185 meals & convenience food and physical activity were associated with weight gain.  
37  
38 186 Specifically, the ordinal logistic regression model showed that the odds of weight  
39 187 gain increased at all lower levels of physical activity, while the odds of weight gain  
40 188 decreased with less frequent consumption of ready meals. The model used had a  
41 189 pseudo r-squared of 23.4%.  
42  
43  
44

45 190  
46  
47 191 There were also significant associations between pre-university body weight and  
48 192 weight gain at university ( $\chi^2=33.75$  df=12; p<0.001). The most striking difference  
49  
50 193 was that students who were weight stable at university invariably reported being  
51 194 overweight or severely overweight prior to starting university compared to  
52  
53 195 students who gained body weight at university. Between 23.8% and 43.5% of the  
54 196 latter groups reported being of a healthy body weight prior to starting university.  
55  
56  
57  
58  
59  
60

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/m<sup>2</sup> 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

1 229 that assessed weight gain in students beyond the first year (Fedewa et al., 2014).  
2  
3 230 However, our data also showed that rates of weight gain slowed after the first year  
4  
5 231 for nearly 60% of students, contrary to the meta-analytic study. Our data are in  
6  
7 232 line with the expectation that membership of a slimming club may ameliorate  
8  
9 233 weight gain, and Slimming World data on weight loss in student members, which  
10  
11 234 recorded a weight loss of approximately 5kg for those who were overweight and  
12  
13 235 obese and 3kg for those who were a healthy weight after 12 weeks membership  
14  
15 236 (Smith et al., 2014).

15 237 We identified clear associations between weight gain and eating habits. As weight  
16  
17 238 gain increased diet quality decreased, with students reporting greatest weight gain  
18  
19 239 reporting least frequent consumption of fruits & vegetables and most frequent  
20  
21 240 consumption of alcohol, take-away & fast food, and ready meals & convenience  
22  
23 241 foods. Additionally, we identified an association between cooking ability and  
24  
25 242 weight gain, and were able to discriminate students' level of weight gain according  
26  
27 243 to their ability to cook more culinary complex meals.

27 244 Interestingly, cooking ability was negatively correlated with consumption  
28  
29 245 frequencies of alcohol, takeaway & fast food and ready meals & convenience foods,  
30  
31 246 and positively correlated with consumption of fruit & vegetables and physical  
32  
33 247 activity. All these correlations were of moderate magnitude. It is evident that a  
34  
35 248 constellation of lifestyle habits may be working together to increase risk of weight  
36  
37 249 gain confirming the cluster analysis approach of Greene et al in a large cross-  
38  
39 250 sectional study of both male and female North American students (Greene et al.,  
40  
41 251 2011).

41 252 A multivariate model revealed that weight gain was most strongly associated with  
42  
43 253 frequency of consumption of ready meals & convenience food and low physical  
44  
45 254 activity. An axis between poor cooking skills, consumption of ready meals and  
46  
47 255 risk of obesity has previously been documented in a non-student population (van  
48  
49 256 der Horst et al., 2011), and ready meal consumption has been associated with the  
50  
51 257 prevalence of obesity in Brazilian women (Lobato et al., 2009). Supermarket  
52  
53 258 ready meals in the UK have been criticised for their high fat and salt content  
54  
55 259 (Remnant and Adams, 2015), although limited data suggest that they are not  
56  
57 260 consistently high in calories (Celnik et al., 2012). More generally, convenience  
58  
59 261 food consumption has been implicated in the temporal rise in obesity rates in  
60

1 262 Australia (Dixon et al., 2006). Notably, convenience food is heterogeneous in type  
2  
3 263 and diverse in nutrient composition, for example it can range in type from highly  
4  
5 264 processed foods such as canned ravioli to single foods such as frozen French fries  
6  
7 265 and unprocessed salads (Brunner et al., 2010). The finding that low physical  
8  
9 266 activity is associated with weight gain concurs with other weight gain studies of  
10  
11 267 university students (Butler et al., 2004; Edmonds et al., 2008; Greene et al., 2011).  
12  
13 268 Although the strongest connections between weight gain and lifestyle metrics are  
14  
15 269 for low physical activity and consumption frequency of ready meals & convenience  
16  
17 270 food, our internal correlations suggest that a multi-behavioural effect is influencing  
18  
19 271 risk of weight gain.

20  
21 272 Stress was identified by students as a factor leading to weight gain particularly for  
22  
23 273 students gaining between 6.4 and 12.7kg of body weight, congruent with a  
24  
25 274 previous UK study (Serlachius et al., 2007). The relationship between academic  
26  
27 275 stress and calorie intake is inconsistent (Barker et al., 2015), but high stress has  
28  
29 276 been reported to induce a hyperphagic response and tendency to consume high-  
30  
31 277 fat, high-sugar foods particularly in restrained eaters (Habhab et al., 2009; Wardle  
32  
33 278 et al., 2000). Moreover, a qualitative study exploring emotional eating behaviours  
34  
35 279 among North American university students reported that female students  
36  
37 280 identified stress as a primary trigger for abandonment of normal eating patterns  
38  
39 281 and increased food consumption (Bennett et al., 2013). The fact that students  
40  
41 282 reporting greatest weight gain were not so likely to report stress as a perceived  
42  
43 283 reason for their weight gain is unclear, although one possible explanation may be  
44  
45 284 that these students are less susceptible to emotional hunger cues. Psychometric  
46  
47 285 measures of eating behaviour are needed to confirm this possibility.

48  
49 286 Finally, the relationship found between bodyweight going to university and weight  
50  
51 287 gain thereafter is likely to be an artefact of our sampling frame. Students whose  
52  
53 288 pre-university body weight was in the normal range and who did not gain weight  
54  
55 289 are unlikely to be included in our sample. The relationship between baseline body  
56  
57 290 composition and weight change has been examined, but remains unclear  
58  
59 291 (Kasperek et al., 2008; Mifsud et al., 2009; Mihaolopoulos et al., 2008; Provencher  
60  
292 et al., 2009). It is possible that overweight students arriving at university are  
293 already engaging in practices to prevent further weight gain, whilst those who  
294 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-  
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

- 1 387 based on eating and exercise behaviors and psychosocial determinants of  
2 388 body weight.”, *Journal of the American Dietetic Association*, Elsevier Inc., Vol.  
3 389 111 No. 3, pp. 394–400.
- 6 390 Habhab, S., Sheldon, J.P. and Loeb, R.C. (2009), “The relationship between stress,  
7 391 dietary restraint, and food preferences in women”, *Appetite*, Vol. 52, pp. 437–  
8 392 444.
- 12 393 Health and Social Care Information Centre. (2015), “Statistics on Obesity, Physical  
13 394 Activity and Diet: England 2015”, *Health and Social Care Information Centre*,  
14 395 Health and Social Care Information Centre, No. March, p. 103.
- 18 396 Holm-Denoma, J.M., Joiner, T.E., Vohs, K.D. and Heatherton, T.F. (2008), “The  
19 397 ‘Freshman Fifteen’ (the ‘Freshman Five’ actually): Predictors and Possible  
20 398 Explanations.”, *Health Psychology*, Vol. 27 No. 1 (Suppl.), pp. S3-9.
- 24 399 van der Horst, K., Brunner, T.A. and Siegrist, M. (2011), “Ready-meal consumption:  
25 400 associations with weight status and cooking skills.”, *Public Health Nutrition*,  
26 401 Vol. 14 No. 2, pp. 239–45.
- 30 402 Jung, M.E., Bray, S.R. and Martin Ginis, K.A. (2008), “Behavior Change and the  
31 403 Freshman 15: Tracking Physical Activity and Dietary Patterns in 1st-year  
32 404 University Women.”, *Journal of American College Health*, Vol. 56 No. 5, pp.  
33 405 523–30.
- 37 406 Kasperek, D., Corwin, S., Valois, R., Sargent, R. and Morris, R. (2008), “Selected  
38 407 Health Behaviors That Influence College Freshman Weight Change”, *Journal of*  
39 408 *American College Health*, Vol. 56 No. 4, pp. 437–444.
- 43 409 Levitsky, D., Halbmaier, C. and Mrdjenovic, G. (2004), “The freshman weight gain: a  
44 410 model for the study of the epidemic of obesity.”, *International Journal of*  
45 411 *Obesity*, Vol. 28 No. 11, pp. 1435–1442.
- 48 412 Lloyd-Richardson, E. and Lucero, M. (2008), “The Relationship Between Alcohol  
49 413 Use, Eating Habits and Weight Change in College Freshmen”, *Eating Behaviors*,  
50 414 Vol. 9 No. 4, pp. 504–508.
- 54 415 Lloyd-Richardson, E.E., Bailey, S., Fava, J.L. and Wing, R. (2009), “A prospective  
55 416 study of weight gain during the college freshman and sophomore years.”,



- 1 417 *Preventive Medicine*, Vol. 48 No. 3, pp. 256–61.
- 2
- 3
- 4 418 Lobato, J.C.P., Costa, A.J.L. and Sichieri, R. (2009), “Food intake and prevalence of
- 5 419 obesity in Brazil: an ecological analysis.”, *Public Health Nutrition*, Vol. 12 No.
- 6 420 11, pp. 2209–2215.
- 7
- 8
- 9 421 Lowe, M.R., Annunziato, R. a, Markowitz, J.T., Didie, E., Bellace, D.L., Riddell, L.,
- 10 422 Maille, C., et al. (2006), “Multiple types of dieting prospectively predict weight
- 11 423 gain during the freshman year of college.”, *Appetite*, Vol. 47 No. 1, pp. 83–90.
- 12
- 13
- 14
- 15 424 Mifsud, G., Duval, K. and Doucet, E. (2009), “Low body fat and high
- 16 425 cardiorespiratory fitness at the onset of the freshmen year may not protect
- 17 426 against weight gain.”, *The British Journal of Nutrition*, Vol. 101 No. 9, pp. 1406–
- 18 427 12.
- 19
- 20
- 21
- 22 428 Mihaolopoulos, N., Auinger, P. and Klein, J. (2008), “The Freshman 15: Is it Real?”,
- 23 429 *Journal of American College Health*, Vol. 56 No. 5, pp. 531–533.
- 24
- 25
- 26 430 Nikolaou, C.K., Hankey, C.R. and Lean, M.E.J. (2014), “Weight changes in young
- 27 431 adults : a mixed-methods study”, *International Journal of Obesity*, Nature
- 28 432 Publishing Group, Vol. 39 No. 3, pp. 508–513.
- 29
- 30
- 31
- 32 433 Partridge, S.R., McGeechan, K., Bauman, A., Phongsavan, P. and Allman-Farinelli, M.
- 33 434 (2016), “Improved eating behaviours mediate weight gain prevention of
- 34 435 young adults: moderation and mediation results of a randomised controlled
- 35 436 trial of TXT2BFiT, mHealth program.”, *The International Journal of Behavioral*
- 36 437 *Nutrition and Physical Activity*, International Journal of Behavioral Nutrition
- 37 438 and Physical Activity, Vol. 13, p. 44.
- 38
- 39
- 40
- 41
- 42
- 43 439 Pliner, P. and Saunders, T. (2008), “Vulnerability to freshman weight gain as a
- 44 440 function of dietary restraint and residence.”, *Physiology & Behavior*, Vol. 93 No.
- 45 441 1–2, pp. 76–82.
- 46
- 47
- 48
- 49 442 Provencher, V., Polivy, J., Wintre, M.G., Pratt, M.W., Pancer, S.M., Birnie-Lefcovitch,
- 50 443 S. and Adams, G.R. (2009), “Who gains or who loses weight? Psychosocial
- 51 444 factors among first-year university students”, *Physiology and Behavior*, Vol. 96
- 52 445 No. 1, pp. 135–141.
- 53
- 54
- 55
- 56 446 Pullman, A.W., Masters, R.C., Zalot, L.C., Carde, L.E., Saraiva, M.M., Dam, Y.Y., Randall
- 57
- 58
- 59
- 60

- 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  
52 474  
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 (%)
<b>Self-reported body weight gain throughout university</b>	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
<b>Self-reported body weight gain during the first year</b>	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
<b>Consumption of alcohol</b>	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
<b>Consumption of takeaways &amp; fast food at university</b>	None	23	8.4
	Once a week	112	41.0
	A few a week	127	46.5
	>5 a week	11	4.0
<b>Consumption of ready meals &amp; convenience foods</b>	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
<b>Consumption of fruits &amp; vegetables</b>	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
<b>Physical activity levels</b>	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
<b>Cheese on toast</b>	31 (91.2%)	22 91.7%	61 96.8%	89 93.7%	54 98.2%	3.44 P=0.497
<b>Tinned spaghetti hoops on toast</b>	31 91.2%	23 95.8%	59 93.7%	85 89.5%	54 98.2%	4.59 P=0.327
<b>Baked beans on a jacket potato</b>	29 85.3%	22 91.7%	58 92.1%	84 88.4%	54 98.2%	5.76 P=0.218
<b>Scrambled eggs on toast</b>	31 91.2%	23 95.8%	58 92.1%	77 81.1%	45 81.8%	7.47 P=0.113
<b>Full English breakfast</b>	32 94.1%	18 75.0%	58 92.1%	77 81.1%	43 78.2%	9.14 P=0.058
<b>Stir-fry</b>	31 91.2%	20 83.3%	55 87.3%	65 68.4%	40 72.7%	12.92 P=0.120
<b>Spaghetti Bolognese</b>	26 76.5%	16 66.7%	52 82.5%	64 67.4%	33 60.0%	8.50 P=0.075
<b>Shepherds pie</b>	27 79.4%	13 54.2%	46 73.0%	52 54.7%	35 63.6%	10.25 P=0.036
<b>Roast dinner</b>	26 76.5%	16 66.7%	43 68.3%	50 52.6%	31 56.4%	8.44 P=0.077
<b>Homemade soup</b>	27 79.4%	15 62.5%	45 71.4%	52 54.7%	26 47.3%	13.66 P=0.008
<b>Chilli con carne</b>	21 61.8%	15 62.5%	39 61.9%	51 53.7%	24 43.6%	5.32 P=0.056
<b>Homemade burger</b>	25 73.5%	12 50.0%	40 63.5%	44 46.3%	26 47.3%	10.92 P=0.027
<b>Curry</b>	23 67.6%	13 54.2%	38 60.3%	42 44.2%	25 45.5%	8.38 P=0.079
<b>Casserole/stew</b>	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
<b>Frequency of consumption of alcohol</b>						
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%)	
<b>Frequency of consumption of take-aways &amp; fast food</b>						
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%)	
<b>Frequency of consumption of fruit &amp; vegetables</b>						
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%)	
<b>Frequency of consumption of ready meals &amp; convenience foods</b>						
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%)	
<b>Level of physical activity</b>						
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%)	

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

British Food Journal

1  
2  
3  
4  
5  
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



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)