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Determinants of eating behaviours in Australian university students: A cross-sectional analysis

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Abstract

Aim

This study aimed to explore clustering among individual eating behaviours in a sample of Australian university students, and explore associations between clustered eating behaviours and demographic characteristics.

Methods

A cross-sectional analysis of data from the [removed for blind peer review] Student Healthy Lifestyle Survey 2017 was conducted. Measures included eating behaviours (e.g. vegetables, energy-dense nutrient poor (EDNP) food intakes) assessed using short diet

questions, and demographic characteristics (e.g. age, undergraduate/postgraduate student). Factor analysis was used to explore clustering of individual eating behaviours (i.e. identify factors). Linear regression models were used to explore associations between eating behaviour factors identified and demographic characteristics.

Results

3,062 students (70% female; 56% aged 17-24 years) were included in the analysis. The six eating behaviour factors identified (characterised by higher consumption of the named foods/drinks) were; EDNP snack foods, meat and takeaway foods, fruit and vegetables, sugary drinks, breakfast, and breads and cereals. A higher fruit and vegetable factor score was associated with being female ($p<0.001$), and a higher meat and takeaway foods factor score was associated with being male ($p<0.001$) and of younger age ($p<0.001$).

Conclusions

Nutrient-rich foods clustered together and EDNP foods clustered together, i.e. the identified factors represent either nutrient-rich or EDNP foods. Interventions in the university setting should target students with the poorest eating behaviours, including males and younger students.

Key words: university students; college students; eating behaviours; determinants; cross-sectional study

Introduction

43 Internationally, approximately 83% of university students consume less than five fruit
44 and vegetables serves per day.¹ Additionally, cross-sectional studies from the UK, the
45 USA and Europe show 22-37% of students consume confectionary or fast foods between
46 4 days per week and several times per day.²⁻⁴ Unhealthy eating behaviours in this group
47 are associated with poorer mental health, including higher stress⁵ and symptoms of
48 depression,⁶ lower academic achievement, including lower grades,⁷ and an increased risk
49 of chronic disease risk factors, predominantly obesity.⁸ Therefore, university students'
50 unhealthy eating behaviours are of interest as they are widespread and can have
51 detrimental effects on health and academic achievement.

52
53 In order to develop effective interventions to improve university students' eating
54 behaviours, an understanding of the determinants of eating behaviours are required.
55 University students are a unique population group due to elements of their personal and
56 social environment that are specifically relevant to the life-stage and the setting, and may
57 influence eating behaviours.⁹ For example, academic pressures and changing living
58 arrangements and social relationships. Living situation has been identified as a
59 determinant, with most studies showing that students living away from the parental home,
60 including at college, have lower consumption of nutrient-rich foods such as fruits,
61 vegetables and dairy,^{1, 2, 10} and higher consumption of energy-dense, nutrient-poor
62 (EDNP) foods, including confectionary and takeaway foods.^{10, 11} Additionally, limited

budget is a common constraint among university students and lower socio-economic status is a known determinant of poorer eating behaviours and diet quality.^{1, 12}

Observational studies from the USA, the UK and Europe confer that unhealthy eating behaviours are common in university students.^{2-6, 10} However, most studies have included a narrow exploration of diet, with most exploring only a select few eating behaviours or food groups, rather than a broad range, and few studies have explored the associations among eating behaviours. There is also a need to further explore determinants of a broader range of eating behaviours. This is necessary to identify sub-groups of students who are most at risk of poor eating behaviours, and therefore who should be targeted in interventions, as well as to inform the content of such interventions.¹³

Further, a limited body of evidence exists for prevalence of eating behaviours and their determinants in Australian university students, including only seven studies^{5, 14-19}. The scope of these is limited in terms of small samples, specific sub-groups of students (e.g. nutrition students), narrow explorations of diet, and only three which explore determinants of behaviour. Due to socio-cultural differences between countries, some international findings may not be generalisable to the Australian setting.⁹ For example, most students in the UK and the USA live in university accommodation and have food provided, whereas in Australia living situation and food acquisition are more varied.^{20, 21}

This study aimed to explore clustering of individual eating behaviours in a sample of Australian university students, and explore associations between clustered eating behaviours and demographic characteristics.

Methods

Study design

This study was a secondary analysis of cross-sectional data from the University of Newcastle (UON) Student Healthy Lifestyle Survey (SHLS) 2017. Full study methods and results have been previously published.²² The SHLS overall aim was to identify lifestyle-related health risk factors, mental health and wellbeing and overweight/obesity prevalence. The survey was conducted online using Survey Monkey and allowed access on one device to prevent multiple entries by the same individual. The survey was setup to require a response to each question before participants could progress to the next question, with the exception of sensitive questions (drug use, sexual health and mental health) which were optional to complete. The conduct and reporting of this work complies with STROBE-nut guidelines.²³

Participants

Participants were students from the UON, a large urban university with the main campus in Newcastle, NSW, Australia, and additional campuses across NSW (N=4) and Singapore (N=1). All students enrolled as of 4th September 2017 were invited to participate (N=33,783). Eligibility criteria included current enrolment as a student at the

University of Newcastle. To determine eligibility, a screening question asked individuals if they were a current student. The survey was open from 4th September-1st October 2017.

Recruitment

Students were recruited via email invitation from the administrators of their University email, including reminder emails one and three weeks later, via University social media, and posters and digital signage across campuses. The survey was also advertised via University teaching staff, who were emailed with the request to promote the recruitment materials in class or on the online learning management system. On completion participants could enter a prize draw to win one of five \$AU100 vouchers. All participants gave informed consent to participate. The study was approved by the UON Human Research Ethics Committee (H-2015-0459).

Measures

Eating behaviours

Eating behaviours were assessed using short diet questions from the NSW Adult Population Health Survey (Appendix I).²⁴ These questions have good relative validity and consistency compared with other dietary assessment methods.^{25, 26} The questions assessed the consumption frequency of various nutrient-rich and EDNP foods, defined according to the Australian Guide to Healthy Eating (AGHE).²⁷ This included: usual serves/day of fruit and vegetables (“Don’t eat” to “ ≥ 6 serves”), with one serve defined as 150 grams and 75 grams respectively, as per the AGHE;²⁷ consumption frequency of red meat (excluding pork and ham), bread, breakfast cereal, and pasta, rice, noodles or other

cooked cereals (all types i.e. white, wholemeal or wholegrain) (“Never/rarely” to “≥once/day”), water (“≤1 cup/week” to “≥2 cups/day”), and breakfast (“Never/rarely” to “Everyday”). EDNP foods assessed were processed meat products, hot chips, potato crisps/other salty snacks (e.g. corn chips), snack foods (e.g. sweet/savoury biscuits, cakes), confectionery (e.g. sweets, chocolate), ice-cream/ice-lollies (“Never/rarely” to “≥once/day”), and takeaway meals/snacks (“Never/rarely” to “Everyday”). EDNP beverages assessed were soft drink/soda, cordials or sports drinks, and fruit juice (“≤1 cup/week” to “≥2 cups/day”), with 1 cup defined as 250ml. Eating behaviours are reported as below recommendations for fruit (<2 serves/day) and vegetables (<5 or 5.5 serves/day based on age and gender). All other nutrient-rich foods are reported as lower intake (<once/day), with the exception of red meat (<3 times/week), as per the response options most in line with the AGHE.²⁷ EDNP items are reported as higher intake for foods (1-2 times/week or more) or beverages (2-6 cups/week or more), as per the AGHE lower end of the range for discretionary items.

Demographics

Demographic data collected included age, gender, country of birth, Aboriginal or Torres Strait Islander (ATSI) background, marital status, living situation, sources of financial support and hours of paid work/week, and were based on questions from the national census. Student-specific data collected included type of degree (undergraduate/postgraduate), faculty of study, number of years studying and whether they were a domestic or international student.

Statistical analysis

Data were analysed using STATA statistical software version 14.1 (StataCorp LLC, Texas, USA). In total 3,465 individuals consented and were eligible to participate, 3,077 completed all compulsory questions, and 3,062 were included in this analysis (Figure 1). Participants were excluded where gender was unspecified (n=15). Eating behaviours and demographic characteristics are described as percentages for categorical variables and means and standard deviations (SD) for continuous variables. Eating behaviour variables were dichotomised for the reporting of descriptive statistics, however were analysed in their raw form for all further analyses. Principal component analysis (PCA) was used to explore clustering of individual eating behaviours (n=18). PCA determines the minimum number of factors to explain the greatest amount of variance in the data. The number of components retained was based on eigenvalue >1.0 and visual interpretation of the screeplot. Components were obliquely rotated to aid interpretability of the resulting components. Labels were assigned to factors (representing a collection of eating behaviours with rotated component loadings >0.3), a higher loading relates to a greater contribution of a given eating behaviour to the component. Factor scores were calculated as the unweighted sum of the rotated loadings of each eating behaviour contributing to the factor. Unadjusted linear regression models were used to explore associations between each of the factor scores and individual demographic characteristics. Each linear regression model was then repeated (adjusted model) to include the other demographic characteristics of significance in the unadjusted models as potential confounders. All adjusted linear regression models controlled for age and gender. Adjusted models were tested for multi-collinearity, with variance inflation factor for each model between 1.3-1.5 (i.e. not showing multi-collinearity). Statistical significance was considered $p < 0.05$.

Results

Sample characteristics

Participants were mostly aged 17-24 years (56%) (Table 1). Most participants were female (70%) and Australian born (81%). Many were Faculty of Health and Medicine (31%) or Education and Arts (25%) students and living in rented accommodation (41%). Sample characteristics are consistent with the average Australian university student in terms of age groups and proportion of undergraduate students, with slightly higher proportions of female students.²⁸ The representation of domestic, ATSI, and Enabling course students was higher, however proportional to [removed for blind peer review] numbers.

Eating behaviours

The majority of participants reported low consumption of nutrient-rich foods, including 88% consuming pasta, rice, noodles or other cooked cereals less than once per day, 89% consuming below recommendations for vegetables (<5 or 5.5 serves/day), and 42% consuming breakfast less than daily (Table 1). Most participants reported higher consumption (1-2 times/week or more) of EDNP foods including 73% for snack foods and 69% for confectionery.

Description of eating behaviour factors

PCA identified six factors, explaining 77% of the variability in eating behaviours in the sample (Table 2). Factors were labelled as; 1) EDNP snack foods, 2) meat and takeaway foods, 3) fruit and vegetables, 4) sugary drinks, 5) breakfast, and 6) breads and cereals.

Associations of eating behaviour factors with demographic characteristics

Results of the adjusted linear regression models are reported in Table 3 and Figure 2, and key findings described below. Higher factor scores relate to more frequent consumption of the included foods/drinks. Supplementary Table 1 contains all regression results.

Factor 1 – EDNP snack foods

Higher factor 1 score (i.e. higher intakes of confectionary, snack foods, ice-cream/ice- lollies and diet soft drink/soda) was associated with younger age ($p<0.001$), and living in their parent's home compared with their own home ($p=0.028$), on-campus ($p=0.004$), rented accommodation ($p<0.001$) or irregular accommodation ($p=0.030$).

Factor 2 – Meat and takeaway foods

Higher factor 2 score (i.e. higher intakes of red and processed meat, and takeaway foods) was associated with younger age ($p<0.001$), being male ($p<0.001$), ATSI ($p=0.032$), an undergraduate student ($p=0.002$), and with living in their parent's home compared with living in rented accommodation ($p<0.001$). Higher factor 2 score was also associated with being from the Faculty of Business and Law ($p=0.008$), Engineering/Built Environment ($p=0.027$) or English Language/Foundation Studies ($p=0.002$) compared with Health and Medicine.

219

220 *Factor 3 – Fruit and vegetables*

221 Higher factor 3 score (i.e. higher intakes of fruit and vegetables) was associated with
222 being female ($p<0.001$), a domestic student ($p=0.005$), not receiving financial support
223 ($p=0.040$), and being from the Faculty of Health and Medicine compared with the Faculty
224 of Education and Arts ($p=0.001$), Engineering/Built Environment ($p=0.024$) or English
225 Language/Foundation Studies ($p=0.009$).

226

227 *Factor 4 – Sugary drinks*

228 Higher factor 4 score (i.e. higher intakes of soft drink/soda and fruit juice, and lower water
229 intake) was associated with younger age ($p=0.034$), being male ($p<0.001$), ATSI
230 ($p=0.016$), an undergraduate student ($p=0.001$), and an international student ($p<0.001$).
231 Higher factor 4 score was also associated with living in their parent's home compared
232 with rented accommodation ($p<0.001$), and being from the Faculty of Business and Law
233 ($p=0.015$), Education and Arts ($p=0.003$) or English Language/Foundation Studies
234 ($p<0.001$) compared with Health and Medicine.

235

236 *Factor 5 – Breakfast*

237 Higher factor 5 score (i.e. higher intakes of breakfast cereal, breakfast and bread) was
238 associated with higher age ($p<0.001$), and being a postgraduate student ($p=0.015$). Higher
239 factor 5 score was also associated with being from the Faculty of Health and Medicine
240 compared with Business and Law ($p=0.001$), or Education and Arts ($p=0.002$).

241

242 *Factor 6 - Breads and cereals*

Higher factor 6 score (i.e. higher intakes of pasta, rice, noodles or other cooked cereals, and bread) was associated with being male ($p<0.001$), younger age ($p<0.001$), receiving financial support ($p=0.019$), and being an international student ($p<0.001$).

Discussion

This cross-sectional study explored clustering of eating behaviours in a sample of Australian university students and their associations with demographic characteristics. Nutrient-rich foods were found to cluster together, and EDNP foods clustered together. The associations between eating behaviour factors and demographic characteristics show consistent trends. Overall, females, older students, students living in rented accommodation, and students enrolled in postgraduate or health and medicine degrees had higher nutrient-rich foods consumption and lower EDNP foods consumption. Males, younger students, students living in their parent's home and students enrolled in undergraduate degrees or from non-health faculties had lower nutrient-rich foods consumption and/or higher EDNP foods consumption.

The eating behaviour factors identified in the current study, in particular the EDNP snack food and fruit and vegetable factors, are consistent with similar analyses among UK university students.^{10, 13} For example, Sprake et al. conducted a factor analysis among 1,500 UK university students and identified a snacking dietary pattern characterised by high consumption of biscuits, cakes and confectionary.¹³ These findings suggest that

students consuming more of one nutrient rich food also have higher consumption of other nutrient rich foods, and vice versa for EDNP foods. Dietary intake is more complex than this, in that diets are typically a mixture of healthy and unhealthy eating behaviours, however this provides some insight into overall diet among university students and highlights the importance of exploring a range of eating behaviours to contextualise individual behaviours. There are no similar studies among Australian university students for comparison, however the findings demonstrate that Australian students are similar in their eating behaviours to students in other western countries.

Students' living situation was found to be a significant determinant of EDNP food intakes but not nutrient-rich foods. Specifically, students living in their parent's home more frequently consumed EDNP snack foods, meat and takeaway foods and sugary drinks than students living in rental accommodation, their own home and/or on-campus, while living situation was not significantly associated with nutrient-rich eating behaviour factors. Comparatively, a study among 309 Australian university students found no significant differences in students' diet quality score between those living with parents, flatmates, a partner or on their own.¹⁷ These findings are interesting as they differ from previous studies in the USA, the UK and Europe, where students living with their parents were found to consume less EDNP foods and more healthy foods.^{1, 2, 10, 11} However, students in the USA, the UK and Europe commonly move out of their parents' home and

live in university accommodation,^{29, 30} whereas most Australian students enrol in local universities,²⁸ with greater variation in living situation. Students living with their parents in the Australian context possibly have more disposable income to spend on socialising outside of the home environment and therefore greater access to EDNP foods.

In this sample, older and female students less frequently consumed EDNP foods than younger and male students. While females and domestic students consumed fruit and vegetables more frequently than males, and international students consumed breads and cereals more frequently than domestic students. In terms of age, the poorer eating behaviours among younger students is supported by national and international study findings where 18-24 year olds have been found to consume lower fruit and vegetables and have worse dietary pattern scores compared with adults 25 years and above.^{31, 32} This demonstrates the importance of targeting eating behaviours in emerging adults.³² The findings around gender are consistent with studies of university students from the UK and Australia where female students have also been found to consume more fruit and vegetables and less highly processed foods than males,^{2, 5} while studies from the USA reported no significant gender differences in fruit and vegetable intake.^{8, 33} It is widely recognised that gender differences exist in the perceived importance of, and motivation towards, healthy eating, with males generally found to place less importance on healthy eating.⁹ This could provide some explanation for the gender differences in the current

study. The differences between domestic and international students could reflect different cultural food preferences and dietary guidelines between countries.

In a university sample, students' field of study could also provide some explanation for their perceived importance of health and health awareness, and subsequently their eating behaviours i.e. students enrolled in health degrees may be more health conscious.³⁴ Consistent with this idea, Faculty of Health and Medicine students in the current study more frequently consumed fruit and vegetables and breakfast, and less frequently consume meat and takeaway foods and sugary drinks than students from non-health faculties. Although, even these students were performing poorly compared with dietary guidelines.²⁷ Interestingly, in a study comparing health science and non-health science university students across 17 low and middle income countries, health science students were found to have greater awareness of dietary risk behaviours, however they also had poorer dietary behaviours than non-health science students.³⁴ Therefore students' field of study may have some impact on eating behaviours, however it may not necessarily be positive and other factors may have greater impact.

In this study, the number of hours students worked and whether they received financial support, both indicators of financial status, had limited associations with eating behaviours. This differs from previous studies, for example, poorer family background and coming from a lower income country were significantly associated with lower fruit and vegetable intakes among a sample of 17,789 university students from 26 countries.¹ Our lack of findings around financial status, and the finding of lower fruit and vegetable

intake being associated with receiving financial support, could indicate that a more specific measure, such as income or money available to spend on food, is needed to better explore this association.

The main strengths of this study include the broad range of eating behaviours and characteristics explored, and the large sample size. In terms of limitations, not all EDNP foods were considered, such as alcohol, energy drinks, and some fried foods, intake of dairy foods was not assessed, and the diet questions do not consider non-Anglo-Saxon cultural eating patterns. Further, the large sample size may have contributed to some statistically significant findings where effect sizes are small. However, definite trends can be identified and findings are largely supported by previous research. Other limitations include self-report data and the cross-sectional design. However, the use of tools/methods with good validity^{25, 26} reduces the potential bias from self-reporting. The study sample was a small proportion of the total student body (9.1%), however this is similar to other online surveys in university students using convenience sampling.³⁵

In terms of future observational research, more studies are needed which explore a broad range of eating behaviours and determinants to further understand eating behaviours in this group, and studies which track how these change over time, for example cohort studies. Tracking eating behaviours over time could help to identify when and potentially why eating behaviours change, e.g. in relation to moving away from parents, or in the transitions from first to final years of study. Such research would be useful to inform and enhance future interventions, in terms of both key time points for intervention, i.e. before changes in eating behaviours may occur, and intervention content

i.e. how to manage healthy eating in circumstances associated with unhealthy eating behaviours. The study findings reinforce that targeted nutrition interventions for university students are needed, as these are lacking. Interventions should target all students, but in particular students identified as higher-risk of unhealthy eating behaviours, including male, younger, and undergraduate students, and students living in their parent's home. Further, healthy eating advice should consider the factors that have been shown to influence students eating behaviours, such as living situation and gender, so that it is relevant and may be more effective in changing behaviour. For example, providing advice to students living in their parent's home for selecting healthier alternatives to EDNP foods when purchasing their own foods or eating out. There is a vital role for dietitians and other health professionals in designing these interventions.

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464 **Appendix I** Short diet questions included in the [removed for blind peer review] Student

465 Healthy Lifestyle Survey 2017

What is a serve of vegetables*?

A standard serve is about 75g (100–350kJ) or:

- ½ cup cooked green or orange vegetables (for example, broccoli, spinach, carrots or pumpkin)
- ½ cup cooked dried or canned beans, peas or lentils
- 1 cup green leafy or raw salad vegetables
- ½ cup sweet corn
- ½ medium potato or other starchy vegetables (sweet potato, taro or cassava)
- 1 medium tomato



*With canned varieties, choose those with no added salt

How many serves of vegetables do you normally eat each day?

- ☐ I don't eat vegetables
- ☐ Less than 1 serve
- ☐ 1 serve
- ☐ 2 serves
- ☐ 3 serves
- ☐ 4 serves
- ☐ 5 serves
- ☐ 6 or more serves

466

What is a serve of fruit?

A standard serve is about 150g (350kJ) or:

1 medium apple, banana, orange or pear

2 small apricots, kiwi fruits or plums

1 cup diced or canned fruit (no added sugar)

Or only occasionally:

125ml (½ cup) fruit juice (no added sugar)

30g dried fruit (for example, 4 dried apricot halves,
1½ tablespoons of sultanas)



How many serves of fruit do you usually eat each day?

- ☐ I don't eat fruit
- ☐ Less than 1 serve
- ☐ 1 serve
- ☐ 2 serves
- ☐ 3 serves
- ☐ 4 serves
- ☐ 5 serves
- ☐ 6 or more serves

How often do you usually eat the following foods:

	Never or rarely	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day
Processed meat products such as sausages, frankfurts, devon, salami, hamburgers, chicken nuggets, meat pies, bacon or ham	☐	☐	☐	☐	☐	☐
Red meat, such as beef, lamb, liver and kidney (but not pork or ham)	☐	☐	☐	☐	☐	☐
Bread, including bread rolls, flat breads, crumpets, bagels, English or bread type muffins.	☐	☐	☐	☐	☐	☐
Breakfast cereal	☐	☐	☐	☐	☐	☐
Pasta, rice, noodles, or other cooked cereals	☐	☐	☐	☐	☐	☐
Hot chips, French fries, wedges or fried potatoes	☐	☐	☐	☐	☐	☐
Potato crisps or other salty snacks such as Twisties or corn chips	☐	☐	☐	☐	☐	☐
Snack foods, such as sweet and savoury biscuits, cakes, donuts or muesli bars	☐	☐	☐	☐	☐	☐
Confectionary such as lollies and chocolate	☐	☐	☐	☐	☐	☐
Ice cream or ice-blocks	☐	☐	☐	☐	☐	☐

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Please indicate how many cups of each of the drinks you usually drink
1 cup is equal to 250mL

	1 cup or less per week	2-4 cups per week	5-6 cups per week	1 cup per day	2-4 cups per day	5-6 cups per day	6 or more cups per day
Soft drink, cordials or sport drink, such as lemonade or Gatorade	☐	☐	☐	☐	☐	☐	☐
Fruit juice	☐	☐	☐	☐	☐	☐	☐
Diet soft drink, cordials or sport drink, such as Diet Coke or Sprite Zero	☐	☐	☐	☐	☐	☐	☐
Water	☐	☐	☐	☐	☐	☐	☐

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How often do you have meals or snacks such as burgers, pizza, chicken or chips from places like McDonalds, Hungry Jacks, Pizza Hut, KFC, Red Rooster, or local take-away places?

- ☐ Never or rarely
- ☐ Less than once a week
- ☐ About 1 to 2 times a week
- ☐ About 3 to 4 times a week
- ☐ About 5 to 6 times a week
- ☐ Everyday

How often do you usually have something for breakfast?

- ☐ Never or rarely
- ☐ Less than once a week
- ☐ About 1 to 2 times a week
- ☐ About 3 to 4 times a week
- ☐ About 5 to 6 times a week
- ☐ Everyday

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Table 1 Demographic characteristics and eating behaviours of a sample of Australian university students (n=3,062)

<i>Demographics</i>	
Variable	% (n) or mean±SD
Age (years) (mean±SD)	27.1±9.8
Age groups (years) % (n)	
17-20	25 (772)
21-24	31 (940)
25-29	17 (528)
30-39	15 (459)
≥40	12 (363)
Female % (n)	70 (2134)
Australian born % (n) ^(a)	81 (2475)
Aboriginal or Torres Strait Islander % (n)	3 (92)
Living situation % (n)	
Own home	15 (465)
Parents home	33 (1010)
On-campus	8 (247)
Renting	41 (1254)
Boarding/homestay	2 (59)
Irregular	1 (27)
Paid work (hours/week) (mean±SD)	13.4±13.2

Receiving financial support % (n)	63 (1914)
Student type % (n)	
Undergraduate	71 (2167)
Postgraduate	22 (668)
Other ^(b)	7 (227)
Domestic/International % (n)	
Domestic	89 (2710)
International	11 (352)
Number of years studying % (n)	
1st	39 (1189)
2nd	20 (616)
3rd	20 (608)
4th	11 (336)
5th year or later	10 (313)
Faculty of study % (n)	
Business and Law	14 (416)
Education and Arts	25 (759)
Engineering and Built Environment	12 (362)
Health and Medicine	31 (944)
Science	14 (417)
English Language and Foundation Studies	5 (164)

Eating behaviours

% (n)	% (n)	% (n)
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		<i>0-1 serves/day</i>	<i>2-4 serves/day</i>	<i>≥5 serves/day</i>	
Fruits		49 (1509)	48 (1477)	3 (76)	
Vegetables		24 (748)	64 (1955)	12 (359)	
		<i>Never/rarely</i>	<i>1-2 times/week</i>	<i>3-6 times/week</i>	<i>≥once/day</i>
Processed meat products		40 (1226)	38 (1174)	19 (575)	3 (87)
Red meat		24 (735)	43 (1317)	30 (905)	3 (105)
Bread or similar products		11 (333)	21 (635)	39 (1184)	30 (910)
Breakfast cereal		45 (1381)	18 (544)	20 (608)	17 (529)
Pasta, rice, noodles or other cooked cereals		8 (252)	33 (1021)	46 (1416)	12 (373)
Hot chips, wedges or fried potatoes		45 (1391)	42 (1295)	11 (346)	1 (30)
Potato crisps or salty snacks		55 (1674)	34 (1040)	10 (320)	1 (28)
Snack foods e.g. biscuits/ cookies, cakes		27 (821)	38 (1150)	29 (891)	7 (200)

Confectionary	31 (940)	39 (1196)	24 (739)	6 (187)	
Ice-cream/ice-lollies	60 (1828)	31 (941)	8 (251)	1 (42)	
	<i>≤once/week</i>	<i>1-2</i>	<i>3-4</i>	<i>5-6</i>	<i>Everyday</i>
		<i>times/week</i>	<i>times/week</i>	<i>times/week</i>	
Takeaway food	69 (2107)	25 (777)	5 (150)	1 (24)	<1 (4)
Breakfast	10 (319)	9 (271)	11 (341)	12 (365)	58 (1766)
	<i>≤1 cup/week</i>	<i>2-6 cups/week</i>	<i>1 cup/day</i>	<i>≥2 cups/day</i>	
Soft drink/soda, cordial or sports drink	74 (2258)	19 (584)	4 (115)	3 (105)	
Fruit juice	69 (2107)	25 (757)	5 (149)	2 (49)	
Diet soft drink/soda, cordial or sports drink	80 (2442)	14 (439)	3 (79)	3 (102)	
Water	1 (19)	4 (133)	4 (116)	91 (2794)	

^(a)n=3,051 (n=11 unspecified). ^(b)Includes students enrolled in enabling (i.e. transition to university) courses and English language courses for international students.

486 **Table 2** Rotated component (Factor) loadings and explained variances for the eating
 487 behaviour factors (n=6) identified in a sample of Australian university students (n=3,062)

Eating variables	behaviour	Factor 1 (EDNP snack foods)	Factor2 (Meat & takeaway foods)	Factor 3 (Fruit & veg)	Factor4 (Sugary drinks)	Factor 5 (Break fast)	Factor6 (Breads & cereals)
Fruits				0.79			
Vegetables				0.77			
Processed meat products			0.69				
Red meat			0.93				
Breakfast						0.65	
Bread or similar products						0.34	0.54
Breakfast cereal						0.81	
Pasta, rice, noodles or other cooked cereals							0.83
Hot chips, wedges or fried potatoes						-0.31	
Potato crisps or salty snacks		0.42					
Snack foods e.g. biscuits/ cookies, cakes		0.80					
Confectionery		0.89					

Ice-cream/ice-lollies 0.66

Takeaway foods 0.41

Soft drink/soda, cordial or 0.58
sports drink

Fruit juice 0.87

Diet soft drink/soda, 0.36 -0.38
cordial or sports drink

Water 0.63 -0.39

Proportion of variance 16.8% 13.9% 13.2% 12.4% 10.9% 9.7%
explained (76.8%)

488 Loadings for all eating behaviour variables were used in calculating factor scores. Eating

489 behaviours with loadings >0.3 are displayed and were used to interpret factors.

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Table 3 Adjusted linear regression results of eating behaviour factors with socio-demographic characteristics in a sample of Australian university students (n=3,062)

Variable	β -coefficient ^(a)					
	Factor1 (EDNP snack foods)	Factor2 (Meat & takeaway foods)	Factor3 (Fruit & veg)	Factor4 (Sugary drinks)	Factor5 (Break fast)	Factor 6 (Breads & cereals)
Age	-0.009***	-0.009***	-0.003	-0.005*	0.011***	-0.013***
Female	-0.063	-0.559***	0.292***	-0.415***	-0.009	-0.221***
Non-ATSI		-0.217*		-0.248*		
Living situation						
Reference category=Parent's home						
Own home	-0.152*	-0.073		-0.091	-0.022	-0.156
On-campus	-0.207**	-0.089		-0.132	0.005	0.050
Renting	-0.187***	-0.153***		-0.158***	-0.104	-0.030
Boarding/homestay	0.081	0.055		-0.146	-0.119	-0.008
Irregular	-0.420*	-0.357		-0.100	-0.119	-0.358
Paid work (hours/week)			0.002	-0.0002		-0.0003

Receive financial support	-0.088*	-0.061	0.099*
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Student type

Reference category=Undergraduate

Postgraduate	0.030	-0.145**	0.106	-0.177**	0.121*
Other ^(b)	-0.120	-0.058	-0.004	-0.063	-0.300**
International	-0.106		-0.177**	0.231***	0.381***

Number of years

studying

Reference category=1st year

2nd year			0.035	-0.006	0.124	-0.002
3rd year			0.059	-0.145**	0.051	0.018
4th year			0.151	-0.204**	0.166**	0.018
5th year/later			0.079	-0.053	0.143*	-0.174*

Faculty of study

Reference category=Health and Medicine

Business and Law	-0.023	0.151**	-0.100	0.141*	-0.190**	-0.081
Education and Arts	0.085	0.053	-0.111**	0.141**	-0.149**	0.028
Engineering and	-0.001	0.139*	-0.156*	0.011	-0.031	0.048

Built Environment

Science	0.024	-0.057	-0.147	0.055	-0.081	0.058
English Language /	0.341	0.405**	-0.093**	0.578***	-0.120	0.010
Foundation Studies						

ATSI, Aboriginal or Torres Strait Islander. ^(a) β -Coefficient indicates the increase in factor score per unit increase in the independent variable. ^(b)Includes students enrolled in enabling (i.e. transition to university) courses and English language courses for international students. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

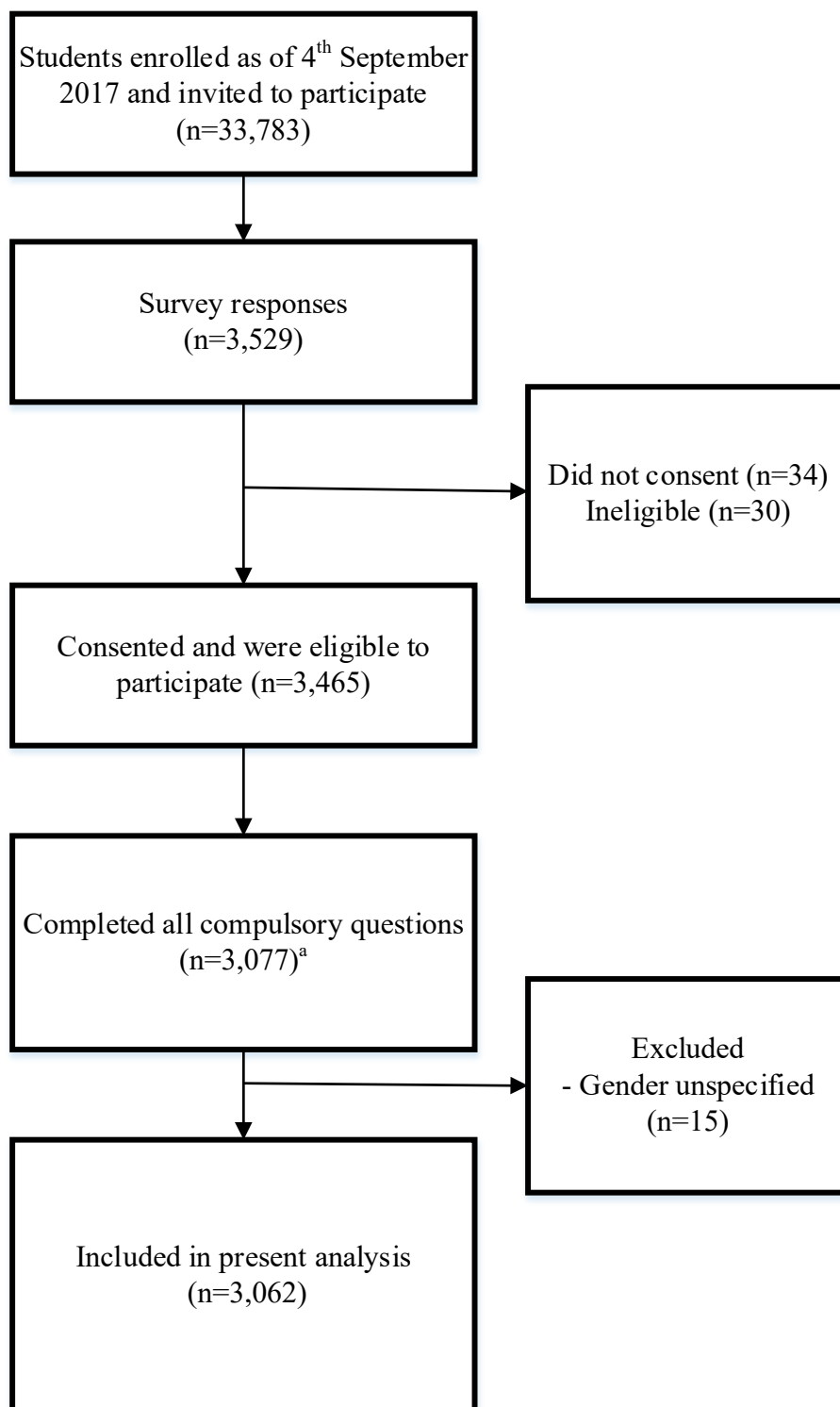
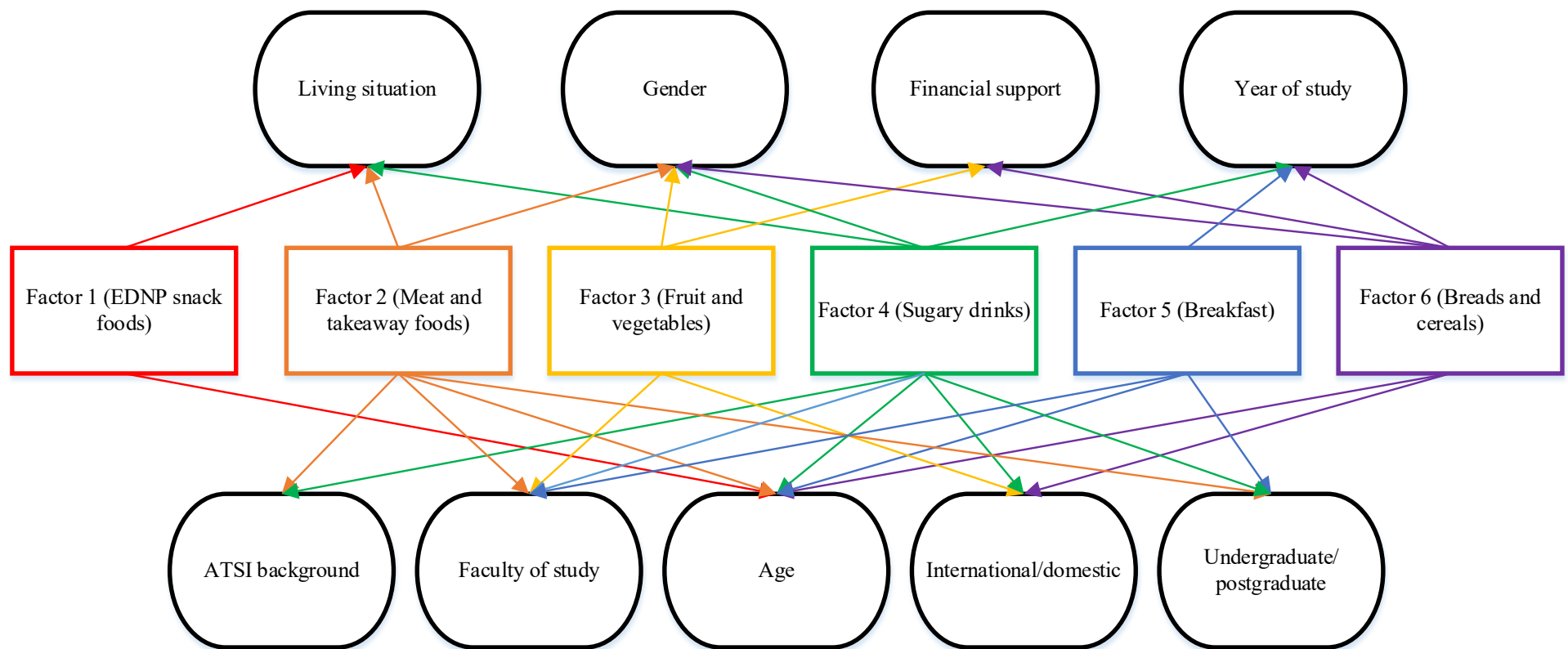


Figure 1 Flow diagram of individuals included in a subset analysis of the University of Newcastle Student Healthy Lifestyle Survey 2017

^a Compulsory survey questions included demographics, eating behaviours, physical activity, sitting time, sleep and alcohol intake. Questions of a sensitive nature were optional to complete (drug use, sexual health and mental health).



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524 **Figure 2** Diagram of associations between eating behaviour factors and demographic characteristics in a sample of Australian university

525 students (n=3,062)