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A Western Australian Story: A Mixed Method Study Exploring Nutrition Knowledge, Food Intake, Influences on Food Choice, Body Image and Eating Attitudes of University Students

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A Western Australian Story:

A mixed method study exploring nutrition knowledge, food intake, influences on food choice, body image and eating attitudes of university students

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Declaration

I declare this thesis manuscript is my own work and contains no material that has been accepted for the award of any other degree or diploma at any other university or institution. I affirm that to the best of my knowledge, the thesis contains no material previously written or published by another person, except where due reference is made.

Statement of Contributors

Michelle Lambert is the Candidate and primary author of this thesis. This thesis is her own work and has been written to satisfy the criteria to attain a higher degree in research, Doctor of Philosophy (Health Sciences).

Associate Professor Fiona Farringdon is the Principal Supervisor of the Candidate. Fiona supervised the PhD Candidate in the design and development of all stages of this research. Her expertise and guidance helped to compile the key findings and direction of this thesis.

Dr Paola Chivers is a co-supervisor of the Candidate. Paola provided guidance for the design and development of this research, with specific supervision of the quantitative stage of research.

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Abstract

Emerging adults are fast gaining recognition as an important target group for health promotion as previous research indicates very few are meeting dietary guidelines, often consuming foods that have increased saturated fats, sugar and sodium. These eating patterns place this group at higher risk of developing chronic illnesses such as obesity, diabetes, cardiovascular disease and cancer. Understanding how and why these eating patterns develop is important to help establish healthy eating behaviours and greater compliance to Australian Dietary Guidelines – Recommended Daily Serves (ADG-RDS) for emerging adults. International research has focused on eating habits, weight gain patterns and possible influences on behaviour however, there is limited research that explores these issues in an Australian context.

Consequently, this sequential, mix-methods study aimed to:

1. investigate the level of nutrition knowledge and identify the sources of nutrition information used by emerging adults
2. identify the nutrition information emerging adults want and how best to deliver these messages so they are perceived as relevant for this group
3. explore associations between correct ADG-RDS knowledge, influences on nutrition knowledge, eating behaviour and actual food group intake
4. explore the association between level of body satisfaction, eating attitudes and actual food group intake

The first phase of research involved qualitative data collection, from gender separated focus groups comprising four female groups (*n*=31) and four male groups (*n*=18) (*Chapter Three)*. The focus groups interviews investigated the level of awareness of ADG-RDS, sources of nutrition knowledge, influences on eating behaviour and perception of current health promotion nutrition messages. The results indicated that participants identified a general awareness of ADG-RDS, however, confusion regarding serving sizes for different food groups was apparent. Social media was identified as both a source on nutrition knowledge and an influence on eating behaviour due to its impact on perceived body ideals. While there was acknowledgement that not all information was credible, there was also a strong tendency to follow the information regardless of the qualifications of the person providing the information, if they believed that it could provide the appearance related ideals they desired. Current health promotion messages were perceived as

irrelevant because they focused on long term health consequences of poor diet. Consequently, participants indicated not following the dietary guidelines was a deliberate choice as health risks were not a priority for them. The major motivator for changing eating behaviour was identified as weight gain or appearance concerns.

The findings of the focus group interviews informed the development of a survey tool to assess level of knowledge regarding ADG-RDS and influences on nutrition knowledge, eating behaviour and food purchases. Food intake was measured by a Food Frequency Questionnaire (FFQ) that indicated consumption of individual food items over the previous four weeks. Body satisfaction was measured using Body Part Satisfaction Scale (BPSS-R) and eating attitudes using EAT-16. The survey was pilot tested among the target population (n=18) and was found to be valid and reliable. Subsequently, the second phase of the research quantitatively examined level of knowledge of ADG-RDS and food intake (FFQ) among university students (n=287) (*Chapter Five)*. The influences on nutrition knowledge, eating behaviour and food purchase and their relationship to level of knowledge (ADG-RDS) and food intake (FFQ) were examined (*Chapter Six*). Body satisfaction (BPSS-R) and its relationship to food intake (FFQ), and influences on knowledge, eating behaviour and food purchases were also explored (*Chapter Seven)*. Finally, associations between eating attitudes (EAT-16), food intake (FFQ), influences on knowledge, eating behaviour, food purchases and level of body satisfaction (BPSS-R) were examined (*Chapter Eight)*.

Key findings indicated that knowledge of ADG-RDS for fruit and vegetables was consistent with the *Go for 2 & 5* campaign message however, the majority chose the 'don't know' option for RDS of all food groups confirming knowledge gaps. Correct knowledge was associated with fruit and vegetable consumption closer to ADG-RDS. Males were more likely to consume closer to ADG- RDS for meat, fish & eggs, dairy and grains than females (*Chapter Five)*. School nutrition programs were identified as the largest influence on nutrition knowledge, but this was not associated with actual food intake. Parents were identified as the largest influencer on eating behaviour, and this was associated with higher intakes of meat, fish and eggs as well as baked goods and snacks (discretionary food). Half of all participants identified Instagram and Facebook as an influence on both nutrition knowledge and eating behaviour, while food purchases were influenced by price, taste and convenience (*Chapter Six).* Correct nutrition knowledge was not associated with higher levels of body satisfaction. There was a negative association between weight and other appearance concerns and body satisfaction, and eating behaviour influenced by social

media was associated with lower levels of body satisfaction, particularly for females (*Chapter Seven).* Correct knowledge (ADG-RDS) was associated with higher EAT-16 scores indicating more risk of disordered eating. The influence of social media, weight and appearance concerns were all associated with higher EAT-16 scores, indicating a higher risk of disordered eating. Lower levels of body satisfaction were also associated with higher EAT-16 score for both males and females (*Chapter Eight).*

A novel finding that emerged from this Western Australian story was that emerging adults appear to make a deliberate choice not to follow ADG-RDS. While the findings confirm gaps in nutrition knowledge for this age group it also identified that correct knowledge was not translated to eating behaviours. An important finding was that the influences on nutrition knowledge were different from the influences on eating behaviour.

In conclusion, this research provides valuable insights for health promotion and health education in Western Australia. The study highlights the importance of understanding the influences on nutrition knowledge and eating behaviour of university students. The current focus on health consequence of poor diet is being ignored by this group as there is no sense of urgency. The outcomes from this research suggest that health promotion messages that focus on positive 'do' messages and more immediate benefits related to weight and appearance are more likely to resonant with Australian emerging adults.

Key words

Nutrition knowledge (ADG-RDS), eating behaviours, food intake, emerging adults, university students, mixed methods, body satisfaction, eating attitudes.

Conference Presentation and Publication

Conference Presentation

(See *Appendix A* for full presentation)

Lambert, M (2020, April) *A qualitative study exploring influences on the food choices of university students.* Paper presented at the World Public Health Nutrition Congress, Brisbane.

Publication

(See *Appendix B* for full paper)

Lambert, M., Chivers, P., & Farringdon, F. (2018). In their own words: A qualitative study exploring influences on the food choices of university students. *Health Promotion Journal of Australia, 30*(1), 66-75. doi:10.1002/hpja.180

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"At the end of the day people won't remember what you said or did, they will remember how you made them feel."

Maya Angelou

The quote above truly captures my experience during this epic journey. There were so many people along the way that helped me survive, both personally and professionally. I may not remember exactly all the things each of you said or did, but I do remember exactly how you made me feel during this experience. I would like to take this opportunity to thank those whose contributions need a special acknowledgement.

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Glossary

Australian Curriculum	The expectations for what all young Australians should be taught, regardless of where they live in Australia (Australian Curriculum Assessment and Reporting Authority [ACARA], 2016).
Australian Dietary Guidelines	Advice based on the latest scientific evidence on eating for health and wellbeing (National Health and Medical Research Council Australia, 2013).
Body image dissatisfaction	The negative evaluations of one's physical body, shape and weight (Fisher, 1986).
Body ideals	Body shape ideals which are communicated through media, family and peers. These ideals are used by individuals as a point of reference for judging attractiveness (Grogan, 2017).
Disordered eating	Habitual eating behaviours such as bingeing and food restriction in an attempt to lose or control weight. These behaviours occur less frequently and are often less severe than those required to meet the criteria for the diagnosed eating disorder (Pereira & Alvarenga, 2007).
Emerging adulthood	A developmental stage between the years of 18 and 25. This stage is defined as the period where individuals experience independence but often avoid commitment to long term adult responsibilities such as engaging in stable relationships and careers (Arnett, 2000).
Facebook	Facebook is a social networking website created in 2004. It is the dominant platform used by just over 90% of Australians crossing gender and all age groups (Sensis, 2018).
Feed	A feed is an updated list of all the new content posted by the accounts followed by a user on social media. This can also be referred to as a 'news feed', however this term is usually associated with Facebook (Cohen, Newton-John, & Slater, 2017).
Influencer	Individuals that have specific notoriety on social media, resulting in large followings. These individuals range from friends, personal trainers, actors and celebrities (Djafarova & Trofimenko, 2019)
Instagram	Instagram, a photo-based social networking site with 800 million global users who share an average of 95 million photos and videos per day, is most popular among 18- to 29-year-old women (Pew Research Centre, 2018).

Micro-celebrity	A new type of celebrity that would not achieve fame if social media did not exist. Their 'fame' is based on their followers being aware of these individuals and their identities. The amount of social influence they have is based on their recognition, level of admiration, association, and aspiration of their followers (Djafarova & Trofimenko, 2019).
Social media	Websites and applications that enable users to construct a profile, create and share content with other users with whom they connect (Sensis, 2018).

Abbreviations

α	Alpha coefficient
ABS	Australian Bureau of Statistics
ACARA	Australian Curriculum Assessment & Reporting Authority
AC	Australian Curriculum
ADG-RDS	Australia Dietary Guidelines– Recommended Daily Serves
AIHW	Australian Institute of Health and Welfare
BID	Body image dissatisfaction
BL-GLM	Binary logistic generalised linear model
BPSS-R	Body Parts Satisfaction Scale-Revised
β	Beta coefficient
CI	Confidence intervals
DEF	Daily Equivalent Frequency
DoH	Department of Health
EAT-16	Attitudes Towards Eating Questionnaire-16
FFQ	Food Frequency Questionnaire
GI	Glycemic Index
GLM	Generalised linear model
HBM	Health Belief Model
ICC	intraclass correlation coefficient
Ƙ	Cohen's kappa
M	Mean
Md	Median
OR	Odds ratio
p-value	Probability value
SD	Standard deviation
SE	Standard error of estimate
TCD	Theory of Cognitive Dissonance
TPB	Theory of Planned Behaviour
U	Mann-Whitney U test
WA	Western Australia(n)
χ^2	Chi square test

Chapter One

1

Introduction

1.1 Overview

The purpose of this study was to explore the nutrition knowledge, sources of knowledge, eating behaviour and influences that impact on the food choices of Western Australian (WA) university students between 18-25 years of age.

While there is emerging Australian evidence that confirms emerging adults (18-25 years) are consistently not following dietary guidelines, it is largely unknown where their nutrition knowledge comes from and what influences their food choices. International research exploring eating habits of university students provides some insights however, this study seeks to provide a WA context to this issue.

In this introductory chapter, the background to the study including the dietary related health risks associated with food choice is explored. Research findings regarding eating behaviours of emerging adults and theoretical frameworks that assist in understanding behaviour are examined. Finally, the aim, research objectives and significance of the study are addressed.

1.2 Background

Healthy nutrition is considered essential for health and wellbeing. It is widely accepted as a major factor in the prevention of chronic nutrition-related illnesses such as obesity, diabetes, cardiovascular disease, cancer, osteoporosis and dental disease (World Health Organization, 2003). A systematic analysis for the Global Burden of Disease (GBD) Study of the diet-related health effects in 195 countries, reported that in 2017 there were 11 million deaths attributable to dietary risk factors (GBD 2017 Diet Collaborators, 2019). The burden of disease in Australia from all dietary risks combined contributes to 62% of coronary heart disease burden, 41% of type 2 diabetes burden, 34% of stroke burden and 22% of bowel cancer burden (Australian Institute of Health and Welfare, 2015). Unhealthy dietary patterns have also been associated with poorer mental health in children and adolescents (O'Neil et al., 2014). This further contributes to the 1 in 7 (13.9%) of children and adolescents aged 4 to 17 years assessed as having mental health disorders (AIHW, 2015).

The development of the Australian Dietary Guidelines (ADG) was a health strategy to improve the nutrition of all Australians by providing advice about amounts and types of food required to maintain health and reduce the burden of preventable diet-related death, illness and disability (NHMRCA, 2003, 2013). However, the Australian Bureau of

Statistics (2018) reports that most Australians did not usually meet their minimum recommended daily serves (RDS) for any of the five core food groups. The current study focuses on the dietary patterns of the sub-group known as emerging adults and specifically university students from one WA University.

Many university students fall into the category of emerging adults (group aged 18-25 years) (Arnett, 2000), once considered to be the age of optimal health, are fast gaining recognition as an important target group for health promotion and disease prevention as they establish independence and adopt lasting health behaviour patterns (Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008). International research indicates that very few emerging adults are meeting dietary guidelines, often consuming snack and convenience foods that have increased saturated fats, sugar and sodium along with decreased vitamin, mineral and fibre intake, all of which are implicated factors for the development of obesity and chronic disease (Abraham, Noriega, & Shin, 2018; Alghamdi, Farrash, Bakarman, & Mukhtar, 2018; Alzahrani, Saeedi, Baamer, Shalabi, & Alzahrani, 2020; du Plessis, 2011; Lee & Yoon, 2014; Lytle et al., 2006). The ABS (2018) reports that emerging adults are less likely than any other age group to consume recommended amounts of fruit and vegetables, with over one-third (36%) of emerging adults total daily energy coming from discretionary foods (AIHW, 2018b). Emerging adults, including university students appear to place little importance on eating food they consider healthy because they believe nutrition-related ill health will not affect them until they are much older (Fisher, Erasmus, & Viljoen, 2016; Kim, Ahn, & No, 2012). Consequently, the consumption of healthy food is not considered a priority as they are not concerned about nutrition related ill health so there is no sense of urgency regarding the importance of food choices for health and wellbeing (Fisher et al., 2016; Neumark-Sztainer, Story, Perry, & Casey, 1999; Stewart & Tinsley, 1995).

A recent Australian study confirmed that university students eating behaviour is similar to other western countries (Whatnall, Patterson, Chiu, Oldmeadow, & Hutchesson, 2019) however, to understand how and why these patterns are occurring it is necessary to examine the nutrition knowledge of this group. Therefore, this study sought to identify knowledge gaps as well as sources of information that may contribute to their non-compliance with national dietary recommendations. Compared to international research there is very little Australian research that examines the evolving social influences affecting food intake of emerging adults which could assist in understanding their eating behaviour (Whatnall et al., 2019).

A recent Australian study identified that the strongest predictor of disordered eating was the body image flexibility measure (Pellizzer, Tiggemann, Waller, & Wade, 2017) which assesses broader aspects of positive body image. While this provides some insight into the importance of body image and attitudes towards food, these factors require further examination to determine their relationships with actual food intake of emerging adults. Identifying knowledge gaps, as understanding what influences impact knowledge and food intake is an important aspect of this study that may provide direction to encourage compliance to promoting healthy lifestyles to emerging adults.

1.3 Theoretical and Conceptual frameworks

The use of theoretical frameworks has been utilised to help explain, understand and modify behaviour. Previous research related to the eating behaviours of emerging adults has been guided by the Theory of Cognitive Dissonance (Festinger, 1957), Health Belief Model (Rosenstock, Strecher, & Becker, 1988) and Theory of Planned Behaviour (Ajzen, 1991).

1.3.1 Theory of Cognitive Dissonance

The Theory of Cognitive Dissonance (TCD) explains that individuals are motivated to maintain balance among pairs of cognitive beliefs, attitudes or behaviours and if inconsistency occurs, psychological discomfort follows and internal pressure is exerted to reduce the dissonance or avoid information that would increase the dissonance (Festinger, 1957). The TCD provided the theoretical framework for many studies focused on health-related behaviours in emerging adults, such as dissonance and alcohol use among American college students (Steele, Southwick, & Critchlow, 1981), dissonance and eating disorder prevention (Stice, Butryn, Rohde, Shaw, & Marti, 2013), dissonance and healthy weight (Stice, Shaw, Burton, & Wade, 2006) and intentions to change diet and physical activity (Stellefson, Wang, & Klein, 2006), all studies conducted in the USA. The TCD has also been used in a study testing a dissonance body image intervention among females in the United Kingdom (Halliwell & Diedrichs, 2014) and as a means to identify the prevalence of eating disorders in non-Western cultures (Witcomb, Arcelus, & Chen, 2013).

The TCD is relevant to the current study because emerging adults may show dissonance by believing there is no urgency to make changes to their diet as potential health consequences are too far into the future, therefore, considering the ‘health’ impacts of food

is not a priority (Fisher et al., 2016; Neumark-Sztainer et al., 1999; Stewart & Tinsley, 1995). Stellefson et al. (2006) proposed that causing emerging adults to feel cognitive dissonance between their attitudes about diet and their eating behaviour may cause them to reassess their behaviour and make changes to their diet. They discovered that emerging adults were more likely to question their eating behaviour when they were made to feel at risk of diminished physical appearance rather than at risk of diet-related health problems.

1.3.2 Health Belief Model

Research using the Health Belief Model (HBM) was first introduced by Hochbaum in 1952 and designed to describe a model of disease prevention, not a model of disease treatment. The model is based on an individual's perceived susceptibility to and severity of a disease and the perceived benefits of, and barriers to taking action to prevent a disease (Rosenstock et al., 1988). These perceptions can be adjusted and changed by the physical, social and cultural environment which the individual is exposed. The HBM was used as a theoretical framework for a study focusing on eating and physical activity behaviours of college students in America (Kim et al., 2012). This model was also used in a qualitative study conducted with 19 female university students in the United Kingdom to determine if participants resonate with health promotion messages regarding diet and exercise (Berry, Aucott, & Poobalan, 2018)

Perceived susceptibility to and severity of health problems as outlined in HBM are important to the current study as it appears emerging adults have a reduced sense of perceived susceptibility to and severity of diet-related health problems as these problems may or may not occur later in life. Kim et al. (2012) supports this stating that American college students involved in their study (n=251) did not perceive a threat, including susceptibility to and/or severity of four types of lifestyle related diseases (obesity, diabetes, cardiovascular disease and osteoporosis). They went on to explain that susceptibility to and severity of these diseases are not daily events for college students as these chronic conditions are uncommon among this age group. Therefore, emerging adults are more likely to modify behaviours that impact daily life and less likely if the behaviour may or may not affect long term health (Kim et al., 2012).

1.3.3 Theory of Planned Behaviour

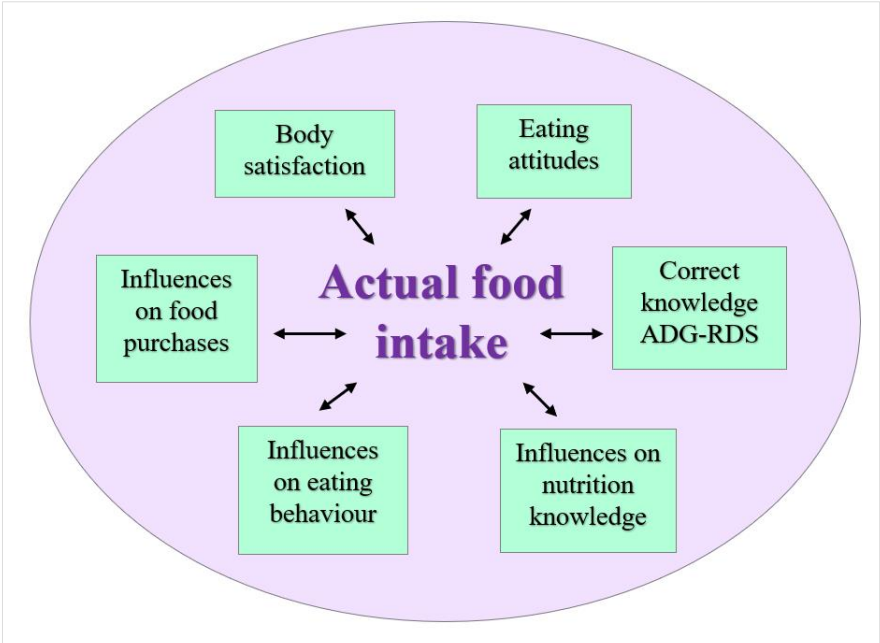
The Theory of Planned Behaviour (TPB) is based on three conceptual determinants of behaviour. Firstly, the individual's attitude towards the behaviour, social norms to

perform or not perform the behaviour, and finally, the perceptive ease or difficulty to perform the behaviour (Ajzen, 1991). Motivational factors also influence behaviour and individual's intention to perform a given behaviour. These influences can determine how much effort and planning an individual is willing to exert in order to perform a behaviour (Ajzen, 1991). The TPB has provided the theoretical framework for numerous studies on emerging adults health risk behaviours including understanding the relationship between stress and healthy/unhealthy eating intentions among 154 Australian university students (Louis, Chan, & Greenbaum, 2009), and student identity and group norms in healthy and unhealthy eating (Louis, Davies, Smith, & Terry, 2007). It was also used in determining factors influencing processed food consumption among 209 Korean adults (Seo, Kim, & Shim, 2014) and a study investigating beliefs about sugar restrictions among 981 university students in Tanzania (Masalu & Astrom, 2003).

Attitudes towards food, social norms regarding food choices and perceived behaviour controls as outlined in the TPB are important considerations for this study as they may influence eating behaviours of emerging adults. Seo et al. (2014) found that their Korean participants had a positive attitude towards processed foods and the perception that friends supported buying processed foods significantly influenced intention to consume processed foods. This was supported by Louis et al. (2007) who reported emerging adults who perceived eating unhealthily as normative were more likely to intend to eat unhealthily. Perceived control over diet can also be affected by stress (Louis et al., 2009). Australian university students who were under stress not only perceived more barriers to healthy eating but were also more deterred by these perceptions (Louis et al., 2009).

Therefore, the conceptual framework (Figure 1.1) that guided this study incorporated components of; the TCD to explore relationships between body satisfaction and attitudes to food; the TPB to examine influences on both nutrition knowledge and eating behaviour; and the HBM to explore associations between nutrition knowledge and food intake, and information emerging adults deemed relevant and how this can be best delivered to the target audience in order to influence their knowledge and eating behaviours.

Figure 1.1
Conceptual Framework for the current study



1.4 Aim

The aim of this study was to identify the level and source of nutrition knowledge among a university student group of WA emerging adults (18-25 years), their current food group intake, influences over food intake, what nutrition information they deemed useful and how best to receive this information. The inter-relationships between knowledge, sources of information, influences and eating behaviours were also explored. Furthermore, associations between body satisfaction and eating attitudes, influences on knowledge and eating behaviour and actual food intake were examined.

1.5 Research design

This study incorporated a sequential mixed methods design using focus group interviews and survey methodology.

1.6 Thesis structure

This research involved two phases of sequential design. In total, these phases incorporated five studies. Phase one (qualitative) comprised a focus group study which investigated awareness of ADG-RDS, sources of nutrition knowledge, influences on knowledge and eating behaviour and what information and modes of delivery university students deem relevant *(Study 1, Chapter Three)*. The results of phase one subsequently

informed the second phase (quantitative) of research which involved the development of a valid and reliable survey (*Chapter Four*) which measured knowledge and food group intake (*Study 2, Chapter Five*) and influences on knowledge and food group intake (*Study 3, Chapter Six*). This scale was then used to explore associations with body satisfaction (*Study 4, Chapter Seven*) and attitudes to eating (*Study 5, Chapter Eight*). Results and discussion related to these studies are reported within their relevant chapters.

Due to the structure of the thesis, each chapter describes a separate study for publication hence there is unavoidable repetition of content and references in some places, however an effort has been made to keep this to a minimum.

1.7 Research questions

The major research question for this study was "What nutrition knowledge do emerging adults have, where do they get their nutrition knowledge, what influences their knowledge and food intake including body image and eating attitudes?". In addressing the major research question, the following sub-questions were also considered:

Phase 1: Qualitative research questions

Study 1: Qualitative focus groups (Chapter Three)

- Are emerging adults aware of ADG and what is their level of understanding?
- How do emerging adults obtain their nutrition knowledge and what do they want to know regarding nutrition?
- How relevant are the ADG to emerging adults?
- How are emerging adults adhering to the dietary guidelines and what factors influence their food choice and eating behaviour?
- How do emerging adults want future health promotion nutrition messages communicated?

Phase 2: Quantitative research questions and alternate hypotheses

Study 2: Nutrition knowledge and behaviour (Chapter Five)

Research question	H_1 Hypothesis
– Are there gender differences in ADG-RDS knowledge and adherence?	There is a difference in nutrition knowledge and food group intake between males and females

Research question	H_1 Hypothesis
– Are there differences in ADG-RDS knowledge and adherence among those living with parent and those living independently?	There is a difference in food group intake between emerging adults living at home with parents and those living independently
– What is the relationship between emerging adults' nutrition knowledge of the ADG-RDS and their adherence to ADG-RDS?	There is an association between nutrition knowledge and food group intake

Study 3: Influences on nutrition knowledge and behaviour (Chapter Six)

Research question	H_1 Hypothesis
– Are there gender differences in what influences nutrition knowledge, eating behaviour and food purchases of emerging adults?	There is a difference between influences on nutrition knowledge, eating behaviour and food purchases between males and females
– Are there living situation differences in what influences on nutrition knowledge, eating behaviour and food purchases of emerging adults?	There is a difference between influences on nutrition knowledge, eating behaviour and food purchases of emerging adults living at home with parents compared to those living independently
– Is there any relationship between influences on nutrition knowledge and food group intake?	There is an association between influences on knowledge and food group intake
– Is there any relationship between influences on nutrition knowledge and correct ADG-RDS knowledge?	There is an association between influences on knowledge and correct ADG-RDS knowledge
– Is there any relationship between influences on eating behaviour and food group intake?	There is an association between influences on eating behaviour and food group intake
– Is there any relationship between influences on eating behaviour and correct ADG-RDS knowledge?	There is an association between influences on eating behaviour and correct ADG-RDS knowledge
– Is there any relationship between influences on food purchases and food group intake?	There is an association between influences on food purchases and food group intake

Study 4: The role of body satisfaction (Chapter Seven)

Research question	H_1 Hypothesis
– Are there gender differences in level of body satisfaction?	There is a difference in levels of body image satisfaction between males and females
– Are there living situation differences in level of body satisfaction?	There is a difference in levels of body image satisfaction between emerging adults living at home with parents and those living independently
– Is body satisfaction associated with ADG-RDS knowledge?	There is an association between correct nutrition knowledge (ADG-RDS) and body satisfaction
– Is body satisfaction associated with food group intake?	There is an association between food intake (DEF) and body satisfaction

Research question	H_1 Hypothesis
– Is body satisfaction associated with influences on the nutrition knowledge of emerging adults?	There is an association between influences on nutrition knowledge and body satisfaction
– Is body satisfaction associated with influences on the eating behaviours of emerging adults?	There is an association between influences on eating behaviours and body satisfaction
– Is body satisfaction associated with influences on food purchases of emerging adults?	There is an association between influences on food purchases and body satisfaction

Study 5: The role of eating attitudes (Chapter Eight)

Research question	H_1 Hypothesis
– Are there gender differences in eating attitudes of emerging adults?	There is a difference in eating attitudes between males and females
– Are there living situation differences in the eating attitudes of emerging adults?	There is a difference in levels of body image satisfaction between emerging adults living at home with parents and those living independently
– Are eating attitudes associated with correct ADG-RDS knowledge?	There is an association between correct nutrition knowledge (ADG-RDS) and eating attitudes
– Are eating attitudes associated with food group intake?	There is an association between food intake (DEF scores) and eating attitudes
– Are there any associations between eating attitudes and body satisfaction?	There is an association between body satisfaction and eating attitudes
– Are eating attitudes associated with influences on nutrition knowledge of emerging adults?	There is an association between influences on nutrition knowledge and eating attitudes
– Are eating attitudes associated with influences on the eating behaviours of emerging adults?	There is an association between influences on eating behaviours and eating attitudes
– Are eating attitudes associated with influences on the food purchases of emerging adults?	There is an association between influences on food purchases and eating attitudes.

1.8 Limitations

Specific limitations will be addressed within the corresponding chapters where relevant, however certain limitations exist for this study as a whole:

- A convenience sample was drawn from one university campus for this study thus, results and associations may not be representative of the whole emerging adult community.
- Participants self-selected mainly from health-related schools which may represent a bias.

- The cross-sectional design because if the study occurred at another point in time different results may have emerged.
- Changes to the food pyramid in Australia as of May 2015 (Nutrition Australia, nd), may have added to nutrition knowledge or further confused nutrition knowledge.
- The researcher had no control over any health promotion campaigns that may have impacted on knowledge and food group intake.
- The very poor nutrition knowledge found for some food groups resulted in some statistical analyses being underpowered for group comparisons.
- No adiposity measures such as BMI were taken for this study.

1.9 Scope and Limits

- The sample was limited to university students aged 18-25 years (emerging adults) from one WA University.
- This study did not measure other emerging adult behaviour.
- The Food Frequency Questionnaire used in this study involved self-reported approximations of food intake over a four-week period and did not assess serving sizes.
- The Food Frequency Questionnaire involved self-reported approximations of food intake over a four-week period not actual intake.
- Food Frequency Questionnaire limited participants' intake responses to a maximum of four times per day.

1.10 Significance

To the author's knowledge, when this research commenced in 2015, no Australian research had assessed associations between nutrition knowledge, food intake, influences on knowledge and eating behaviour, body image and eating attitudes of emerging adults. International research confirms that emerging adults are consistently not following dietary guidelines designed to maintain health and wellbeing, and protect against preventable diet-related illnesses (Abraham et al., 2018; Al-Khamees, 2009; Alghamdi et al., 2018; Alzahrani et al., 2020; Deshpande, Basil, & Basil, 2009; du Plessis, 2011; Lee & Yoon, 2014; Louis et al., 2007; Lytle et al., 2006). Recent data available from ABS (2018) suggests that this is also the case with emerging adults in Australia. The majority of international research conducted with emerging adults to date has focused on attitudes to food and eating, changes to dietary habits during university years and actual food intake (Al-Khamees, 2009; Deshpande et al., 2009; Devine, Lloyd, & Gray, 2006; du Plessis, 2011; Hendrie, Coveney,

& Cox, 2008; Kothe & Mullan, 2011; Nelson et al., 2008), however, there is limited Australian research regarding eating behaviours of emerging adults.

The qualitative aspect of this study provided important understanding in the words of WA university students regarding their perception of current health promotion messages and the sources of nutrition information they use, as well as what information they find relevant. The quantitative findings confirmed gaps in nutrition knowledge especially with regard to serving size and confirmed that these emerging adults are not meeting ADG-RDS for many of the core food groups. Factors influencing nutrition knowledge, eating behaviour and food purchases, body satisfaction, and eating attitudes which have not been comprehensively explored in previous Australian research were examined in this study.

The findings from the current study are important, given that the National Health Survey 2017-2018 reported 46% of 18-24 year-old Australian's are considered overweight or obese (ABS 2018) thereby increasing their risk of diet-related illness. While public health in Australia is focused on lifestyle disease, communicable and non-communicable diseases such as cancer, asthma, diabetes, cardiovascular disease (AIHW, 2018a) there appears to be limited attention placed on sociocultural influences including body image. While international research involving this age group is useful, it is important to gain a better understanding of eating behaviour within an Australian context to provide insight for Australian health promotion professionals and public health policy makers interested in improving eating behaviour of emerging adults within this cultural setting.

Chapter Two

2

Literature Review

2.1 Overview

In this chapter the literature that guided the research is explored. This includes the current understanding of the health benefits of a nutritious diet and the guidance provided by Australian Dietary Guidelines (ADG); followed by common eating patterns for emerging adults; knowledge of dietary guidelines in relation to food intake; and influences on their food intake including body image and eating attitudes that may contribute to food choice.

Many parts of the world experience a lack of availability of food resulting in malnutrition, stunted physical growth, disability and death. However, according to the World Health Organization (WHO) most of the world's population lives in countries where obesity kills more people than undernutrition (WHO 2015). WHO reported that worldwide obesity has more than doubled since 1980 with more than 600 million people considered to be obese (WHO 2015). According to the 2017-2018 National Health Survey, the prevalence of overweight and obesity in Australian adults aged 18 years has risen from 56.3% in 1995, 61.2% in 2007-08, 63.4% in 2011-12, to now more than two-thirds of the adult population (67%) considered overweight or obese (ABS 2018). A lack of good nutrition is not only contributing to the obesity epidemic but also an increase in nutrition-related chronic diseases such as cancer, diabetes, cardiovascular diseases, osteoporosis and dental disease (WHO 2003).

Dietary related risks are a major contributor to a high burden of non- communicable diseases with Australia ranking twelfth of 35 OECD countries examined in diet-related burden of disease trends (Melaku et al., 2019). A high proportion of this burden is associated with the more prevalent consumption of unhealthy diets, including processed foods high in saturated fats and sugar, among younger adults (below 45 years) and more specifically younger males (Melaku et al., 2019). In order to address the major health challenge of improving Australians' eating patterns and promoting the health benefits of a nutritious diet, the current Australian Dietary Guidelines (ADG) have been developed. These guidelines provide recommendations regarding daily serves of each food group and evidence that underpins those recommendations. The ADG is designed to help health professionals, policymakers and the Australian public by providing research and evidence-based dietary advice (NHMRCA 2013).

2.2 Australian Dietary Guidelines

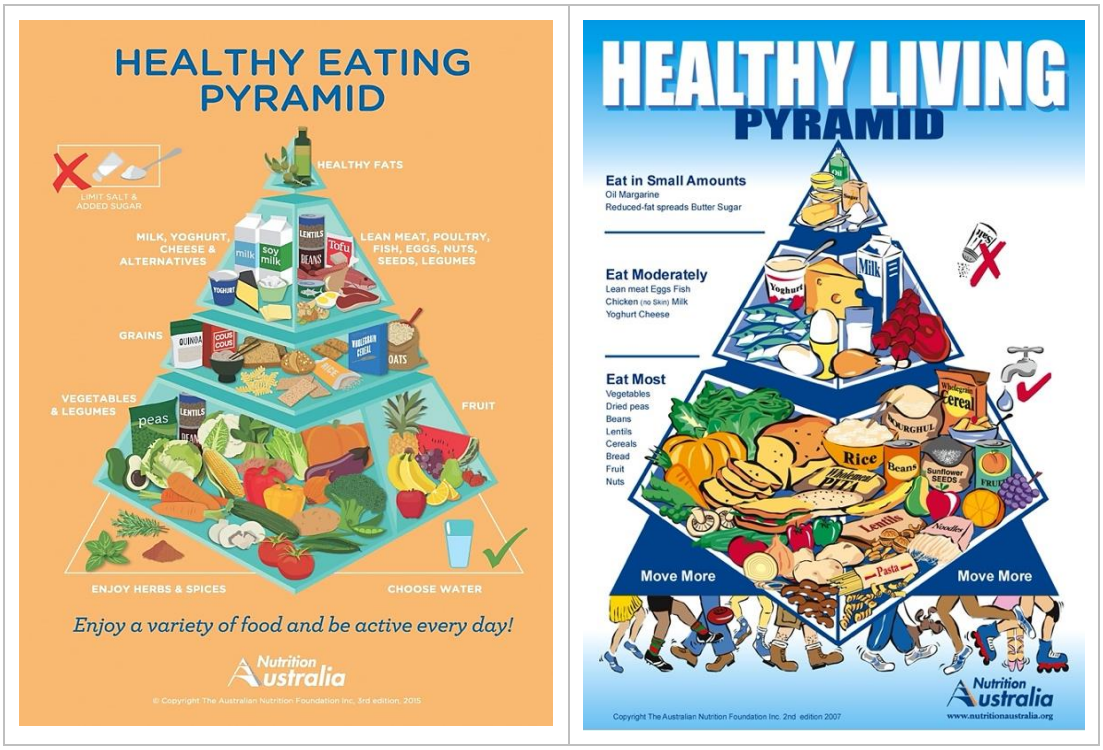
The ADG (2013) encourages all Australians to enjoy a wide range of nutritious foods from five food groups: vegetables and legumes, fruit, grains and cereals, lean meat, fish and eggs, and milk, yoghurt and cheese. The guidelines also recommend that people limit their intake of saturated fats, food high in salt and sugar, and alcohol. The ADG provides recommended daily serves (RDS) for each food group based on extensive scientific evidence (NHMRCA 2011). These recommendations vary between males and female and also differ according to age group (Table 2.1).

Table 2.1
Australian Dietary Guidelines RDS for food group and various age groups

Age Group	Fruit	Vegetables	Grains & cereals	Meat, fish & eggs	Dairy
Age 2-3 years					
male	1	2.5	4	1	1.5
female	1	2.4	4	1	1.5
Age 4-8 years					
male	1.5	4.5	4	1.5	2
female	1.5	4.5	4	1.5	1.5
Age 9-11 years					
male	2	5	5	2.5	2.5
female	2	5	4	2.5	3
Age 12- 13 years					
male	2	5.5	6	2.5	3.5
female	2	5	5	2.5	3.5
Age 14-18 years					
male	2	5.5	7	2.5	3.5
female	2	5	7	2.5	3.5
Age 19-50 years					
male	2	6	6	3	2.5
female	2	5	6	2.5	2.5
Age 51-70 years					
male	2	5.5	6	2.5	2.5
female	2	5	4	2	4
Age 70+years					
male	2	5	4.5	2.5	3.5
female	2	5	3	2	4

The Australian Healthy Living Pyramid (2007) was designed to be an easily identifiable visual representation of the ADG. It has undergone a number of format and name changes over the years with Nutrition Australia (2016) most recently giving it a fresh look in 2015 to include targeted messages such as limit salt and added sugar, choose water and enjoy herbs and spices (Figure 2.1). Food groups are categorised on the pyramid as fruit, vegetables, and cereals are in the '*eat most'* section, lean meat, fish, eggs and dairy products are classified as '*eat moderately'* and foods that do not fit the major five food groups are referred to as discretionary foods. The ADG indicates that discretionary foods should only be consumed '*sometimes and only in small amounts*' (NHMRCA 2013).

Figure 2.1
Nutrition Australia's Healthy Living Pyramid (2007) and Healthy Eating Pyramid (2015)



Consuming a healthy balanced diet, as outlined in the ADG is critical in early life to establish healthy eating behaviours that prevent the onset of diet-related diseases later in life (NHMRC, 2013).

2.2.1 Health benefits of consuming vegetables

Adequate vegetable consumption is essential to reduce the risk of cardiovascular disease, obesity, cancer and other chronic disease (Godinho & Alves, 2017; NHMRCA 2011; 2013; Perikkou, Gavrieli, Kougioufa, Tzirkali, & Yannakoulia, 2013; WHO 2003; 2015). Vegetables contain protective elements such as potassium, folate, vitamins and fibre

which act to reduce antioxidant stress and lower blood pressure thereby reducing the risk of cardiovascular diseases (NHMRCA 2006; 2011). Increased vegetable consumption can protect against obesity, as vegetables are energy-dilute foods, and, therefore, contribute to a less energy dense diet assisting with weight control (Booth, Nowson, Worsley, Margerison, & Jorna, 2008; NHMRCA 2011). The consumption of vegetables has also been associated with significant risk reduction for cancers of the breast, oesophagus, lung, stomach, and colorectal cancer (NHMRCA 2011; Riboli & Norat, 2003).

The ADG recommended daily serves (RDS) for vegetable for adults is five serves per day, stating a single serve consists of 75 grams (NHMRCA 2013; Woolcott Research, 2007). Whilst the recommended daily intake helps protect the Australian population against chronic diseases, adults' reported consumption at the start of this study were low for vegetables (8.3%) (ABS 2012) and have continued to decline over the past five years with only one in thirteen (7.5%) adults meeting the guideline for (5-6 RDS depending on age) recommended for vegetables (ABS 2018). Australian adults identify time constraints, preparation difficulty, lack of knowledge regarding serving size and economic expense as barriers for meeting the recommended levels of vegetable consumption (Lee, 2016; Woolcott Research, 2007). When assessing motivational factors availability, affordability and knowledge of recommended vegetable serves have been identified as crucial contributors to vegetable consumption (Lee, 2016; Valmorbida & Vitolo, 2014). Vegetables also require preparation which may be a barrier for consumption as more than twice as many people choose fruit over vegetables as they are often eaten raw as a snack (Glasson, Chapman, & James, 2010).

2.2.2 Health benefits of consuming fruit

Fruit is considered highly nutritious and essential for a healthy diet for all ages (NHMRCA 2013). To benefit from fruit consumption, it is recommended that adults consume two serves of fruit per day with a single serve consisting of 150grams (NHMRCA 2013; Rodenburg, Oenema, Kremers, & van de Mheen, 2012; Woolcott Research, 2007). Nutrition obtained from two serves of fruit daily helps protect against obesity, reduces the risk of cancer, and lowers the incidence of children with unhealthy weight which in turn lowers the risk of obesity in adulthood (Godinho & Alves, 2017; Perikkou et al., 2013). Fruit consumption also decreases the risk of cardiovascular disease by 4% for each additional portion per day of fruit (Dauchet et al., 2006). There is additional evidence suggesting consumption of fruit decreases the risk of oesophageal cancer and lung cancer, and foods high in vitamin C such as citrus fruits can decrease the risk of stomach and lung

cancer (World Cancer Research Fund/ American Institute for Cancer Research, 2018). Also like vegetables, fruits are energy-dilute foods, and therefore, contribute to a less energy-dense diet, hence providing protection against obesity (Booth et al., 2008; NHMRCA 2011).

Despite the known benefits, the average fruit consumption among adults is low according to the ABS with just over half (51.3%) meeting the recommended daily two serves of fruit (ABS 2018). Woolcott Research (2007) revealed that while Australian adults acknowledge that consumption of fruit was necessary for a healthy diet, they were unaware of the recommended daily serves and were not able to identify reasons for increasing their personal fruit consumption. Inaccurate knowledge of what constitutes a single serve of fruit was identified by adults as a reason for consuming lower than the recommended amount (Woolcott Research, 2007). Inaccurate knowledge of recommended daily serves is also an issue for other food groups such as breads, cereals and grains.

2.2.3 Health benefits of consuming breads, cereal and grains

Whole-grain foods are a potent source of antioxidants and as such are recognised as an important food group that delivers significant health benefits (Anderson & Hanna, 1999). This food group is an excellent source of carbohydrate and dietary fibre as well as being an important source of protein, and B-group vitamins, vitamin E and many minerals such as iron, zinc, magnesium and phosphorus (NHMRCA 2003, 2013). The consumption of wholegrain foods has been associated with a greatly reduced risk of coronary heart disease as they are rich in soluble fibre which decreases total cholesterol concentrations (Anderson & Hanna, 1999; Liu et al., 1999; NHRMCA, 2011) and may protect against the onset of type 2 diabetes (Liu et al., 2000; NHMRCA, 2011). Whole-grain consumption increases dietary fibre and is associated with a reduced risk of colorectal cancer (Dagfinn et al., 2011). Furthermore, a diet high in whole grains has been associated with weight control and lower Body Mass Index (BMI) by assisting with energy control which is a significant factor in weight loss and weight management (Williams, Grafenauer, & O'Shea, 2008).

For adults, six serves of wholegrain foods including wholemeal breads and crispbreads, many high-fibre breakfast cereals, oats, wholemeal pasta, brown rice, quinoa, noodles, polenta, couscous and popcorn are recommended daily for a healthy diet (NHMRCA 2003, 2013). According to the ABS (2018) the majority of Australian adults consume insufficient grains with only around three in ten (30%) meeting the recommendations. Males were more likely than females to meet the recommended

number of serves (35% compared with 25%) (ABS 2018). A commonly held belief among emerging adults is that bread, cereals and grains are 'fattening' because they are high in carbohydrates which provide excess energy to the body and may be contributing to lower consumption (Williams et al., 2008), particularly among woman who are more weight conscious (Grogan, 2017). While refined carbohydrates intake may be contributing to the level of obesity, increased consumption of whole-grain foods, including legumes and cereals may protect against obesity as they are lower in Glycemic Index (GI) values and, therefore, contribute to the feeling of being full over a longer period of time (Williams et al., 2008). This reinforces the importance of clarifying guidelines and ensuring accurate information to increase the likelihood of meeting the recommended daily serves for bread, cereals and grains (Figueira, Curtain, Beck, & Grafenauer, 2019). This may also be important for other food groups including meat, fish and eggs, in order to address common misconceptions regarding these foods.

2.2.4 Health benefits of consuming meat, fish and eggs

Lean meat, poultry, fish, eggs and many plant-based alternatives including tofu, legumes, beans, nuts and seeds, all provide a good source of protein (NHMRCA 2013). These protein-rich foods also provide essential amino acids that promote and support growth and repair. Additionally, they are used to produce hormones, enzymes and haemoglobin (Hoffman & Falvo, 2004). While grass-fed meats, poultry and eggs provide the body with essential fatty acids, processed and cured meats are high in added salt and saturated fats and, therefore, intake of these should be limited (NHMRCA 2013). Fish also provides the body with essential fatty acids and is one of the few good dietary sources of omega-3 fatty acid which has been associated with a reduced risk of coronary heart disease and reduced risk of arthritis (Daviglus, Sheeshka, & Murkin, 2002). Eggs are a nutritious dietary inclusion and have shown to play a useful role in the diets of those with low-nutrient intakes such as the elderly and children (Miranda et al., 2015). There is growing evidence highlighting the benefits of plant-based protein such as legumes, as these alternatives have the added benefits of being high in dietary fibre making them a good alternative to meat or a healthy addition to a balanced diet (Figueira et al., 2019).

Three serves a day are recommended for adult men and two and half serves for adult women (NHMRCA 2013). ABS (2018) reports only around 14% of Australians meet the recommended serves for this food group on a regular basis. The data also suggests that overall males were more likely than females (18% compared to 10%) to meet the recommended daily serves. Understanding this behaviour is important because adequate

protein is not only essential for muscle growth and repair but along with dietary calcium assists bone mass and bone loss (Rizzoli, 2014).

2.2.5 Health benefits of consuming dairy products

Per calorie, dairy products provide more calcium, protein, potassium and phosphorus than any other food (Rizzoli, 2014). They are a major source of dietary calcium and contribute approximately 50% of daily calcium requirements. Foods high in calcium provide essential nutrients and have been associated with increased bone density particularly for those young people who may not yet be at peak bone mass (~20 years of age), and has probable links to reducing risks of coronary heart disease, stroke and cancer (NHMRCA 2013). There is evidence that individuals on a weight loss diet may be at risk of inadequate calcium intake (Booth et al., 2008). Choosing low fat dairy products can assist in maintaining adequate dietary calcium while lowering energy intakes for weight management (Booth et al., 2008). While it is more difficult to obtain the necessary calcium required in low-dairy or dairy-free (Rozenberg et al., 2016), calcium-enriched alternatives such as soy or rice drinks count towards the serves in this food group. Other foods high in calcium include almonds, tofu, and fish with bones which can be consumed as dairy alternatives (NHMRCA 2013).

To achieve health benefits the ADG suggest adults should consume two and a half serves of dairy per day (NHRMCA 2013). The first findings of the Australian Health Survey 2017/2018 indicate that nearly three-quarters of females (73%) and half of all males (51%) aged two years and over did not meet recommended daily intake for calcium from foods and beverages (ABS 2018). A study involving Australian adolescents and young adults conducted by Rouf, Sui, Rangan, Grech, and Allman-Farinelli (2018) reported that calcium intake of young people (19-25 years) was inadequate compared to the ADG. They also found that higher calcium intake was associated with healthier eating patterns and lower intake of all discretionary foods (Rouf et al., 2018).

2.2.6 The consumption of discretionary foods

The National Nutrition Survey conducted in Australia in 1995 indicated that adult consumption of discretionary food totalled 35% of their daily energy intake, almost twice the acceptable level according to the guidelines (ABS, 1997; Rangan, Hector, Louie, Flood, & Gill, 2009). While this data was collected in 1995 it does provide a snapshot. However, given influences such as increased availability and marketing of convenience

foods (Brownbill, Miller, & Braunack-Mayer, 2018) and the 'time poor' lifestyle (Bowman & Vinyard, 2013) suggested that this is likely to be an underestimate of the consumption today.

A study exploring the consumption of discretionary foods by Australian adults conducted by (Ragan, Schindeler, Hector, Gill, & Webb, 2009) indicated that younger adults (less than 45 years) consumed higher quantities of fried potatoes, margarine, cakes and muffins, beer, sugar-sweetened soft drinks, sweet biscuits, wine, ice cream, chocolate and pizza than older adults (45 years and older). Australia is ranked in the top ten countries for per-capita consumption of soft drink based on market share date with young adult males the highest consumers (French et al., 2013). A study conducted in Western Australia found that it was common for soft drink to be cheaper (per volume) than milk, fruit juice or water and that bulk purchasing of soft drink is encouraged through promotional offers (French et al., 2013).

A high intake of discretionary foods increases the risk of weight gain, obesity and nutrition-related chronic diseases (NHMRCA 2013; Ragan et al., 2009; Van den Bulck & Van Mierlo, 2004; WHO 2003). The high consumption of discretionary food may also reduce the intake of nutritious core food groups including vegetables, fruit, wholegrains, meat, fish and eggs and dairy products which are all important for a healthy balanced diet and reduced risk of chronic disease (NHRMCA 2013). A subpopulation of adults that may be at risk of not consuming a healthy balanced diet are emerging adults.

2.3 Emerging adults

The group aged between 18-25 years was classified by Arnett (2000) as emerging adults. Arnett (2000) argued that it was not sufficient to label this group as late adolescence because 18 years marks the legal age of adulthood where these young people are expected to vote and are able to sign legal documents. This state of transition includes changing environment from school to work or tertiary institutions, changes to peer group and friendships, changes in living situations, and financial responsibilities (Arnett, 2000). Additionally, social and economic changes have meant that many traditional key milestones of adulthood such as marriage, parenthood and homeownership are being attained much later in life due to increased housing costs, acceptance of extra-marital sex/cohabitation, and improvements in reproductive health (Ledford, 2018). There is also a trend toward higher rates of health risk behaviours as emerging adults strive to have a wide range of experiences before 'settling down' to the constraints of marriage and

children (Arnett, 2000, 2007). A literature review conducted by du Plessis (2011) exploring factors influencing food choices of Australian apprentices, describes this age group as 'vulnerable'. They are semi-autonomous, beginning to take responsibility for some aspects of their lives but leave other aspects to more mature adults (du Plessis, 2011). However, they are generally making autonomous decisions regarding what to do and what to eat (Bargordo, Grassi, Serio, Idolo, & De Donno, 2013).

International research involving emerging adults often uses university students as they provide a convenient and accessible sample. Exploration of the eating habits of university students in Saudi Arabia, Italy, America and Korea have all identified that healthy dietary habits appear to decline as emerging adults leave home and live independently with a higher risk of consuming fast food (Alghamdi et al., 2018; Bargordo et al., 2013; Harris, Gordon-Larsen, Chantala, & Udry, 2006). One pilot study on food habits of 141 female university students at Kuwait University (Al-Khamees, 2009) found that 86.5% ate more than the recommended limits of sweets and fatty foods and most consumed fewer vegetables and drank less water than recommended. Furthermore, most of these eating habits were as a result of fast food, snack foods and soft drink consumption. Studies involving university students in the United States of America (USA) have noted that the consumption of fast food is frequently used as an indicator of unhealthy eating and highlights the shift away from traditional cooking and towards the consumption of meals made outside of home (Larson, Perry, Story, & Neumark-Sztainer, 2006; Schmidt et al., 2005). In the USA the consumption of nutritious foods such as fruits and vegetables is inversely related to the frequency of visits to fast food outlets, which is prevalent among emerging adults (Bowman & Vinyard, 2013). One of the few international studies to include Australian emerging adults along with those from the USA and Brazil, found that young men aged 16-24 years are the highest consumers of sugar-sweetened soft drinks, consuming almost twice as much as females within this age group (Hector, Rangan, Louie, Flood, & Gill, 2009; Rangan et al., 2009; Rombaldi, Neutzling, Silva, Azevedo, & Hallal, 2011; Storey, Forshee, & Anderson, 2006).

2.3.1 Food intake of Australian emerging adults

While international research provides insight into the eating behaviour of emerging adults, research in the Australian context is scare by comparison. It mostly focuses on obesity rates and adherence to the adult ADG-RDS. The National Health Survey 2017-2018 (ABS 2018) estimates approximately 46% of 18-24 year old Australians are

overweight or obese. Food consumption in the National Health Survey is recorded in age groups (14-18 years) and (19-30 years) making it difficult to determine consumption for 18-25 years, however, there is evidence that suggests emerging adults are consistently not meeting the recommended amounts of many core food groups to maintain good health (ABS 2018; Daly, Parsons, Wood, Gill, & Taylor, 2011; Department of Health, 2006; Ha & Caine-Bish, 2009). While there are no specific dietary guidelines for emerging adults, the recommended daily serves (RDS) for adults aged 19-50 years for vegetables and legumes are six serves for males and five for females. In 2017-18, just over half (51.3%) of Australians aged 18 years and over met the RDS for fruit (2 or more serves), while one in thirteen (7.5%) met the RDS for vegetables (5-6 or more serves for men and 5 or more for women). Generally speaking, old adults were more likely to meet the guidelines than younger adults with only 3.6% of adults aged 18-24 years meeting the RDS for both fruit and vegetables (ABS 2018).

More relevant to emerging adults, the Food Frequency, Western Australia (FFWA) report (DoH 2006) found that WA adults aged 18-34 years reported only eating 2.2 serves of vegetables per day rather than the recommended six serves. The recommendation for fruit is two serves for both males and females, however the FFWA report indicated they consumed only 1.6 serves per day. While the guidelines promote whole fruit as the better option (NHMRC, 2013) fruit serves were often gained in the form of fruit juice (DoH 2006). The minimum recommendation for grains and cereals is six serves however, little is known about how much of this food group emerging adults are consuming. For lean meat, fish, poultry and eggs the recommendation is three serves for males and two and a half serves for females, with adults (18-34 years) in Western Australia reported to be consuming 2.2 serves per day of meat/fish/eggs. Red meat was mostly reported to be consumed, however, the guidelines encourage eating fish more often rather than red meat (DoH 2006). The recommendation for milk, yoghurt and cheese is two and a half serves for both males and females (NHMRC, 2013). WA adults reported consuming 3.5 serves of dairy per day with milk being the most frequently reported (DoH 2006; NHMRCA 2013).

While the age range for this study was 18-34 years, these results provide some insight into the food group consumption of WA emerging adults. Given dietary patterns continue to later adulthood resulting in higher risk of chronic disease, it is critical to gain understanding of what emerging adults are consuming to develop strategies to increase and/or decrease consumption of food groups to align with ADG-RDS. Developing targeted health promotion messages and strategies to improve emerging adults' food intake may

protect them against obesity and the development of chronic disease. Therefore, it is important to determine the level of their nutrition knowledge, what sources they use for nutrition knowledge, their actual food intake and the influences on their food choices.

2.4 Influences on food intake of emerging adults

Extensive research has examined the influences on children and adolescent eating habits. Some of the known influences include cultural background, family rules and parental modelling, increase in the number of working parents, foods availability, food used as a reward and the frequency of shared family meals and television viewing habits (Birch, 1999; Cusatis & Shannon, 1996; du Plessis, 2011; Haerens et al., 2008; Hastings et al., 2003; Neumark-Sztainer et al., 1999; Savage, Fisher, & Birch, 2007; Van den Bulck & Van Mierlo, 2004; Walsh & Nelson, 2010). Comparatively little research has examined the evolving social influences affecting the food intake of emerging adults especially in the Australian context (Nelson et al., 2008). A scoping review conducted on the barriers and enablers to healthy eating among young adults living in western countries reported minimal research with this population citing just 34 studies conducted in the past 10 years (Munt, Partridge, & Allman-Farinelli, 2017). This international research suggests there are some common barriers for emerging adults including balancing study, work and social interaction which make it difficult for them to achieve a healthy diet (Munt et al., 2017). King, Weber, Meiselman, and Lv (2004) suggested that meal context, as well as physical and social influences may be impacting their food choice. Given emerging adults are vulnerable to diet-related health risks and they are a difficult cohort to influence (Poobalan, Aucott, Clarke, & Smith, 2014), more research is needed to understand factors impacting on their food choices.

2.4.1 Social networks and peer influence

Social norms and the importance of fitting in influences adolescents' food choices (Neumark-Sztainer et al., 1999). In a systematic review of social network analyses and young people's eating behaviours and bodyweight, Fletcher, Bonnell, and Sorhaindo (2011) found that school friendships were critical in shaping eating behaviours, with fast food consumption found to cluster among boys, and body image and dieting to cluster among girls.

Social networks and peer influences appear to also influence emerging adults eating behaviour. Two systematic reviews of dietary interventions and social function of eating

of international college and university students both confirm that social networks are an important influence on the eating behaviours of emerging adults' with many reporting that they often feel that there is no peer support to eat healthy food (Kelly, Mazzeo, & Bean, 2013; Ruddock, Brunstrom, Vartanian, & Higgs, 2019). This finding is further supported by McArthur and Pawlak (2011) who indicated emerging adults perceived the important people in their lives do not enjoy consuming healthy food and this affects their own food choices. Devine et al. (2006) reported that university students who lived alone were more likely to eat fresh vegetables and salads regularly than students who lived with other students. This may suggest that while emerging adults may want to eat more healthily, the desire to 'fit in' with their social network influences their intentions. A qualitative study involving 35 university students in the USA reported that having the support of friends to eat healthily was an important stimulus (Sogari, Velez-Argumedo, Gomez, & Mora, 2018). Another small qualitative study involving 10 Australian university students also confirmed that social activities were a powerful influence on food selection however, more research with a larger sample is needed to confirm this for the Australian context (Hsieh, 2004). The same study also indicated other influences such as taste are important and that high-fat snacks were seen as desirable and pleasurable which may be a result of marketing and food advertising.

2.4.2 Marketing and advertising

Consumers of all ages are continually exposed to food advertising and images of people eating in shops, on billboards, and approximately a third to a half of television commercials are food-related which can motivate a desire to eat (Kemps, Tiggemann, & Hollitt, 2014). Over the last decade, food advertising has heavily targeted the 18-25 age group as they are a highly desirable market for securing a future consumer base by establishing brand loyalty (Brownbill et al., 2018; Nelson et al., 2008). Therefore, it is a reasonable assumption that food and beverage marketing may be a particularly potent influence for emerging adults and specifically university students. A study involving American college students (n=745) reported they dined out regularly with 43.1% eating out at least once a week with fast food chain restaurants the most frequently patronised (Mayfield, Tang, & Bosselman, 2014). Mayfield et al. (2014) also reported heavily advertised chain restaurants were the most frequently visited by USA college students.

A Californian based independent research company, Sandleman and Associates, confirmed that fast food industries best customers were males ages 18-34 years who purchased a full meal with side dishes after 10 pm ("Late night attracts fast food's best

customers," 2005). As a result of that information Taco Bell (USA) launched 'the fourth meal' concept - the meal between dinner and breakfast. In a press release they stated that nearly 50% of American young males aged (18-29) ate an additional meal after 7 pm. They also indicated that young men in this age group spent well above the market average in these visits (Bhasin, 2019; Nelson et al., 2008; Nudd, 2006). Furthermore, studies involving emerging adults in Saudi Arabia and Brazil have reported that regular consumption of fast food such as burgers, pizza and hot dogs correlates with frequency of consumption of soft drinks with young adult males being the highest consumers (Alghamdi et al., 2018; Rombaldi et al., 2011).

Food and beverage sponsorship is another form of marketing that has made an impact on emerging adults' food choice. The promotion of high energy, nutrient-poor food and drinks is clearly identifiable in the majority of televised sport and local sporting clubs are twice as more likely to be sponsored by an unhealthy product than a healthy one (Grunseit et al., 2012). An Australian study exploring the impact of food sponsorship among emerging adults found that branded sponsorship of elite sporting events is also important influences for emerging adults and that even brief exposure can impact on product preference and increase consumption of certain brands (Dixon et al., 2018). While sport is generally associated with physical health benefits and social connectedness, it has also been associated with health risk behaviours such as high levels of alcohol consumption (Burns, Evans, Jancey, Portsmouth, & Maycock, 2020) suggesting that high prevalence of unhealthy versus healthier food promotions and sponsorship may also impact eating behaviours. It is important therefore to establish if marketing and sponsorship of nutritionally poor foods influences food intake for Australian emerging adults. Other influences such as taste are important as emerging adults have identified high-fat snacks to be desirable and pleasurable (Hsieh, 2004).

2.4.3 Taste preference

Taste preference and food habits are established early in life and these influence food choices and eating behaviours later in life (Birch, 1999; Deshpande et al., 2009). Neumark-Sztainer et al. (1999) reported that adolescents are turned off by bruised, damaged or overcooked food as it does not look or taste good. This also appears to be important to emerging adults in an American study involving 18-24 years old working adults conducted by Stewart and Tinsley (1995) which reported, appearance and taste significantly correlated with consumption frequency of many food groups resulting in them choosing food they liked rather than food they thought was healthy.

International studies involving university students in the USA, Canada and Belgium all report that taste heavily influences food choice among this age group with many opting for quick tasty, heavily processed snack foods (Abraham et al., 2018; Deliens, Clarys, Bourdeauduij, & Beforche, 2014; House, Su, & Levy-Milne, 2006). A mixed methods study conducted in the United Kingdom involving 1029 university students and 284 emerging adults, found that taste was one of the major influences on food choice (Poobalan et al., 2014) with some participants reporting unhealthy food was more appetising, and they perceived these foods as cheaper and more convenient (Poobalan et al., 2014). Little research in the Australian emerging adults' context has examined if this is an influence on food group intake. Given emerging adults' live busy lives' (Lee & Yoon, 2014; Pendergast, Livingstone, Worsley, & McNaughton, 2019) convenience and time constraints may also influence good intake.

2.4.4 Convenience and time constraints

Studies involving adolescents found that the most commonly reported factors influencing food choices for adolescents include hunger and food cravings, time considerations for both themselves and their parents, as well as convenience (Bauer, Larson, Nelson, Story, & Neumark-Sztainer, 2008; Farringdon, Farringdon, & Chivers, 2019; Neumark-Sztainer et al., 1999). Adolescents also reported prioritising sleep and that when they were hungry they just wanted something quick that would fill them up (Neumark-Sztainer et al., 1999). Similarly, international research involving emerging adults indicate their busy lives and independent food choices are often based on convenience, price and taste rather than nutritional content (Alzahrani et al., 2020; Vereecken et al., 2015). The Food Attitudes and Behaviour Survey conducted with university students in Northern Ireland (n=3412) reported that lack of time was the most frequently identified influence, with many students reporting they usually eat pre-packaged or convenience meals (Devine et al., 2006). An Australian study involving 578 emerging adults identified that time scarcity was positively associated with skipping breakfast and lunch in young adults aged 18-30 years (Pendergast et al., 2019).

While many emerging adults are not meeting dietary guidelines, they also typically display erratic eating behaviours and tend to skip meals, consuming foods prepared away from home that are typically high in saturated fats, sugars and sodium (Ackard, Croll, & Kearney-Cooke, 2002; du Plessis, 2011; Lytle et al., 2006; Neumark-Sztainer et al., 1999; Pendergast et al., 2019). A study by Lee and Yoon (2014) involving 159 Korean college students also found students living independently were more likely to skip meals

identifying 'lack of time' as the most common reason. They also reported higher intakes of confectionery and instant noodles as snacks and ate out more often than students living with parents. In the Australian context, little research has considered if their living situation impacts the food choices of university students.

2.4.5 Living situation, food preparation skills and cooking skills

The living situations of emerging adults are not normative with some living independently for the first time while others remain at home with parents (Whatnall et al., 2019). What is known is that there is a general decline in healthy dietary habits among this age group (Mullan Harris, 2006). Internationally, the relationship between living situation and eating behaviour of university students has been explored. A study involving 2402 university students in four European countries conducted by El Ansari, Stock, and Mikolajczyk (2012) found a lower consumption of healthy foods such as fruit and vegetables among students who had moved away from their parental home suggesting students living at home do not have to pay for the food so financial constraints are not an issue. In addition, meals containing nutritious foods such as vegetables might be prepared for them and so the food available is healthier than the students living away from home. A Canadian study conducted by Jackson, Berry, and Kennedy (2009) reported that students living at home with parents were more likely to bring a packed lunch arguing this may act as a protective factor against the consumption of fast food during their day at university.

A study involving 730 Portuguese university students proposed that practical cooking skill and food preparation skills were also an issue for their participants (Kowalkowska, Poinhos, & Rodrigues, 2017) While those living at home have access to home-prepared meals they also report less involvement in food preparation and cooking which have been associated with better diet quality (Larson et al., 2006). Emerging adults perceive healthy foods to be more expensive and requiring food preparation skills consequently, they often choose food options that are cheaper and more filling but less healthy (Fisher et al., 2016; Poobalan et al., 2014). A study conducted in the USA found that emerging adults who were more involved in food preparation more often met the dietary guidelines (Larson et al., 2006). Given that these skills are learned generally at home, parental nutrition knowledge and cooking skills are important factors in the food security of children (Godrich, Davies, Darby, & Devine, 2017) who then become young adults. Parents in low socio-economic areas are less likely to have adequate nutrition knowledge and cooking skills resulting in more purchasing of take away foods (Godrich et al., 2017). Higher levels of education have shown to be a strong predictor of cooking skill in both male and

female university students according to a study conducted in Portugal (Kowalkowska et al., 2017). Consumer nutrition knowledge has also shown to influence university students' selection of fast food menu items according to a study conducted in the USA (Hwang & Cranage, 2015). This suggests that the level of nutrition knowledge is an important influence on eating behaviour.

2.5 Nutrition knowledge

Knowledge is assumed to underpin dietary habits and food preferences with previous research indicating that dietary habits and food preferences develop in childhood and are well established by age 15 years (Birch, 1999; du Plessis, 2011; Vereecken et al., 2015). These habits and preferences tend to transition into adulthood and can have long-term consequences for health and longevity (Deshpande et al., 2009). In spite of the ADG, school-based nutrition programs and public health campaigns such as *Go for 2 & 5*, it appears that Australian emerging adults have significant gaps in nutrition knowledge particularly regarding serving size and quantity of fruit and vegetables as per dietary guidelines (Kothe & Mullan, 2011). This is consistent with international research that indicates while emerging adults can recall some key messages such as eat more fruit and vegetables and less fatty foods, their interpretation and knowledge (or lack of) regarding serving size often results in diets that are not in line with dietary guidelines (Al-Khamees, 2009; Hendrie et al., 2008; Keenan, AbuSabha, & Robinson, 2002). International research with this target group also confirms that emerging adults have difficulty translating nutrition knowledge into their food choices (Al-Khamees, 2009; Berry et al., 2018). A pilot study involving 141 university students in Kuwait enrolled in nutrition and education courses noted that many of their participants were genuinely surprised how much their diet did not comply with dietary guidelines (Al-Khamees, 2009). Kothe and Mullan (2011) recommended further research to investigate these knowledge gaps among Australian emerging adults, what influences their knowledge and if there are any associations between nutrition knowledge and food choices in this group, gaps that remained at the commencement of this project in 2015.

2.6 Influences on nutrition knowledge

While it appears that emerging adults may not have sufficient nutrition knowledge, what influences their knowledge is an area that has attracted very little research. Participants in one study involving nursing students in South Africa reported that the most common sources of nutrition knowledge were media (47.8%) followed by school or

university-based teaching (35.4%) (van den Berg, Okeyo, Dannhauser, & Nel, 2012). Emerging adults are exposed to a large variety of media including mass media public health campaigns, internet and social media (Sensis, 2018) and it is a reasonable assumption that these may impact on their nutrition knowledge. Given that the majority of Australian adult nutrition messages have focused on the effects of poor nutrition such as diabetes, high blood pressure, cancer and heart problems, all most likely to occur in middle age or even later in life, it is possible that these are disregarded as irrelevant to emerging adults. Emerging adults may not be motivated to change eating behaviour because their behaviour is present-orientated so they do not have any sense of urgency regarding diseases that more than likely will occur much later in life (Al-Khamees, 2009; Kothe & Mullan, 2011; Neumark-Sztainer et al., 1999; Richards, Kattelmann, & Ren, 2006; Stewart & Tinsley, 1995). This was recently confirmed by a qualitative study conducted in the United Kingdom with 19 emerging adults that found nutrition messages targeting children and families to reduce obesity levels were often dismissed by emerging adults as irrelevant to their current lives (Berry et al., 2018). Given health promotion messages may be different in the Australian context, further investigation is needed to determine how Australian emerging adults perceive current health promotion messages.

2.6.1 Australian public health campaigns

With the steady rise in obesity over the last two decades (WHO, 2020) global concern regarding the obesity epidemic has resulted in many public health campaigns adopting a 'weight control' approach to nutrition messages. While there have been no public health campaigns that specifically target Australian emerging adults, they have been exposed to these messages and, as such, may have impacted on their nutrition knowledge. Australian public health campaigns such as *Measure up* in 2008 focused primarily on weight gain and targeted adults 25-50 years linking increased waist measurement with risk of chronic diseases such as heart disease, some cancers and type 2 diabetes (Heart Foundation WA, 2011). While the *Measure up* campaign was successful in raising awareness about the relevance of waist circumference as a personal indicator of chronic disease risk there was no objective measurement of weight, physical activity, nutrition or waist assessment (E. L. King, Grunseit, O'Hara, & Bauman, 2013). Recall of the campaign among Australian adults was high at 87% but intention to make improvements were significantly lower (12-14%) with most intending to increase fruit intake or physical activity and far less intending to increase vegetable intake. It appears that despite an increase in knowledge regarding recommended vegetable intake, achieving adequate vegetable intake seems to be a

difficult lifestyle change for Australian adults (Grunseit, O'Hara, Chau, Briggs, & Bauman, 2015).

Phase two of the campaign *Swap it Don't Stop it* in 2011, again targeting adults 25-50 years, was designed to build on the *Measure up* campaign and focused on how to make small lifestyle and diet changes to improve health. Evaluation of this campaign focused on prompted recall of the campaign. Results indicated that 65% of the target audience interviewed could, once prompted, recall the campaign. Results also indicated many participants visited the website, downloaded the iPhone app and recorded likes on Facebook (Australian National Preventive Health Agency, 2012; Heart Foundation WA, 2011, 2012). However, O'Hara et al. (2016) reported 85% of their 5,097 participants did not report any eating behaviour swapping as a result of the campaign. While this campaign achieved modest public awareness, it appears to have had little effect on eating behaviours.

This was followed in 2014 by the *LiveLighter* campaign that once again targeted adults aged 25-64 years, this time aiming to increase awareness of why lifestyle changes need to occur to avoid obesity and chronic diseases including type 2 diabetes, heart disease and several types of cancer (Heart Foundation WA, 2013). A study conducted on the awareness and impact of the *LiveLighter* campaign found there was no change in weight loss urgency or self-efficacy but a positive change in awareness of harms to health of being overweight (Morley, Niven, Coomber, Dixon, & Wakefield, 2013). While these campaigns all contained nutrition knowledge, they featured messages and images that were suited to their target audience, adults older than 25 years and, therefore, may not have been perceived as relevant by emerging adults.

One Australian campaign launched in WA in 2002 focused on increasing nutrition knowledge rather than obesity (Pollard et al., 2007). The *Go for 2 & 5* campaign aimed to promote a healthy diet through increased consumption of fruit and vegetables by imparting the knowledge of how many serves of each is required per day. While the primary target group was adults, these adults were parents with children aged up to 17 years and the secondary target group was youth aged 13-17 years (Woolcott Research, 2007). Knowledge of the recommended fruit and vegetable consumption levels increased as a result of the campaign, however, four out of ten parents indicated they attempted to increase family fruit consumption but less than three in ten indicated an attempt to increase vegetable consumption (Woolcott Research, 2007). Parents' nutrition knowledge, eating habits and cooking ability have all been identified as important factors regarding food security of children (Godrich et al., 2017). Given the growing trend of more emerging

adults finding themselves still living at home with parents, the influence of parents on nutrition-related knowledge and intake appears to be a gap in current research. Therefore, for most emerging adults in Australia, it is assumed that their nutrition knowledge would be influenced by parents and school-based nutrition programs.

2.6.2 School-based nutrition programs

The topic of food and nutrition is embedded within the Health and Physical Education learning area of the Australian Curriculum (AC). The curriculum specifies that food groups, nutritional requirements, dietary needs and strategies for eating a healthy, balanced diet including contextual factors that influence food choice should be explored throughout primary and secondary school (Australian Curriculum Assessment and Reporting Authority [ACARA], 2016). Furthermore, school-based nutrition programs often act as enablers of increased fruit and vegetable consumption, such as *Crunch & Sip* where time is set aside in class to eat fruit and vegetables and drink water (Godrich, Davies, Darby, & Devine, 2018). Farringdon, Hands, and Chivers (2017) also suggests that school-based nutrition programs should also include practical skills such as food preparation and cooking skills as these are more likely to promote healthy eating than knowledge alone.

A review on Australian school-leavers' knowledge of nutrition identified that knowledge gaps exist for emerging adults (Sadegholvad, Yeatman, Parrish, & Worsley, 2017). The interviews conducted with food-related experts revealed that school-based program are generally inadequate as the content that students receive differs across schools, resulting in significant knowledge gaps (Sadegholvad et al., 2017). However, the impact of this is not fully understood as there is a lack of studies that compare the consistency and sufficiency of school-based nutrition programs (Sadegholvad et al., 2017). Insufficient nutrition knowledge is one aspect for consideration, however an American study involving university students also concluded that a high level of knowledge does not necessarily result in healthier eating, suggesting that many participants understood their eating behaviour was unhealthy but continued to do it anyway (Abraham et al., 2018). While this is unknown in the Australian context, there has been a push for health literacy to be embedded into school health curriculum as an important strategy to empower young people to take control over their health. However, a systematic review has reported the existence of different definitions and understanding around health literacy in Australia (Peralta & Rowling, 2018). Health literacy programs based on evidence informed practice are recommended as Australian experts believe that food choices of emerging adults may

be a result of the substantial influence media and technology has over nutrition awareness for this age group (Sadegholvad et al., 2017).

2.6.3 Internet and technology

A possible influence on both nutrition knowledge and eating behaviour is internet access. According to the most recent report (Sensis, 2018), virtually everyone in the Australian sample used the internet daily with more than half (60%) accessing it more than five times per day. A characteristic of emerging adults is their degree of familiarity with the internet because many have used it from childhood (Jones, 2002). Consequently, emerging adults are heavy users of the internet compared to older adults. Internet use is part of daily routines and is an important tool for education as well as communication (Jones, 2002). The internet is an increasingly powerful channel for health information that can be tailor-made to meet individuals' preferred methods of use and points of access (Eng et al., 1998). It provides volumes of health information for consumers which can be accessed conveniently via a variety of formats including text-based information, emails and online chat rooms (Eng et al., 1998; Escoffery et al., 2010). The accuracy of this content, however, is questionable given the unregulated nature of the internet (Pyburne & Jolly, 2015).

An American study regarding internet use for health information involved 743 college students and reported 72.9% of students accessed health information for themselves via the internet with diet and nutrition being the second most researched topic (47.2%) (Escoffery et al., 2010). This study also found that when assessing health information on the internet, of greatest importance among emerging adults was perceived accuracy, credibility, currency, clarity and ease of understanding the health content. Interestingly, 89% reported not always finding the desired health information which may indicate a need to train emerging adults to locate relevant information more efficiently (Escoffery et al., 2010). It is also possible that the information has not been made available in formats or URLs that emerging adults are likely to access. So, while it is known that emerging adults access the internet for nutrition information, it is yet to be confirmed in the Australian context.

The use of technology such as text messaging encouraging emerging adults to think about their fruit and vegetable consumption and consumption of energy dense foods has shown promising results (Shoneye et al., 2019). This Australian study involving 143 emerging adults found that providing emerging adults with dietary feedback via regular text messaging was integral to dietary change (Shoneye et al., 2019). With the increase of

mobile connection through smartphones providing opportunities for emerging adults to access information and download apps, the 18-29 year-old age group is more likely to download health apps than older smartphone uses (*AM:STARs Adolescent Medicine*, 2013). This creates opportunities for emerging adults to receive and share health information, however, the information may be inaccurate, misleading or misinterpreted and therefore lead to health risk behaviours (Wong, Merchant, & Moreno, 2014). Given the use of social media is popular among emerging adults, this could be an important vehicle to deliver accurate nutrition information (Korda & Itani, 2013). However, the role social media plays in influencing the food choices of Australian emerging adults requires further research.

2.6.4 Social media

Social media is a possible influence on both nutrition knowledge and eating behaviour of emerging adults. Emerging adults are the group most likely to access social media checking first thing in the morning (68%) and last thing at night (44%) with a higher percentage of females (41%) checking more than five times per day than males (26%) (Sensis, 2018). Social media is an increasingly popular way for emerging adults to be both creators and consumers of health information by providing a platform to share, discuss, create, modify and exchange information with the 'on-line' networks (Wong et al., 2014). Social networking sites such as Facebook, blogs and microblogs like Twitter, and photograph and video sharing including Instagram and YouTube all have become an integral part of adolescents' and emerging adults' lives (*AM:STARs Adolescent Medicine*, 2013; Wong et al., 2014). Social media has also provided an opportunity for people seeking fame to become 'micro-celebrities' by providing a platform that enables and encourages self-branding which elevates these individuals to the position of social media influencer (Khamis, Ang, & Willing, 2017). A qualitative study conducted in Russia involving 38 young women revealed that they believed that it was not necessary for these 'micro-celebrities' to be experts with qualifications, but it was important that they appear competent (Djafarova & Trofimenko, 2019). This may be of concern if emerging adults are using inappropriate diet advice from 'micro-celebrities' with no nutrition qualifications, as this could have a detrimental effect on their health. There is limited research, especially in the Australian context to confirm if emerging adults are in fact seeking dietary advice from these sources. What is known is that young women particularly use social media platforms to measure their own appearance against societal

'body ideals' which often results in body dissatisfaction (Choukas-Bradley, Nesi, Widman, & Higgins, 2019).

2.7 Body image

Body image is a complex concept considered to be a foundational element of physical and mental wellbeing; it consists of behavioural, perceptual, cognitive and affective components (Jong & Drummond, 2013; Tylka & Wood-Barcalow, 2015; Wood-Barcalow, Tylka, & Augustus-Horvath, 2010). Positive body image involves thoughts and believes such as self-appreciation, self-compassion, self-love and a broad definition of beauty and inner positivity (Wood-Barcalow et al., 2010) and is linked to greater emotional and social wellbeing (Swami, Weis, Barron, & Furnham, 2017). Negative body image can result in a relentless pursuit of thinness, as well as a 'perfectionist' attitude toward the body (Izydorczyk & Sitnik-Warchulska, 2018). The negative evaluation of one's physical body and shape has been labelled Body Image Dissatisfaction (BID) (Cohen & Blaszczynski, 2015) and is particularly prevalent among young women (Izydorczyk & Sitnik-Warchulska, 2018; Kenardy, Brown, & Vogt, 2001). Contributing to BID is the western world's increasing focus on body image promoting the general perception that 'thin female bodies' are attractive (Izydorczyk & Sitnik-Warchulska, 2018). Research conducted in both the USA and the UK confirms that females tend to internalise sociocultural attitudes to a higher degree than males, as appearance seems more commonly central to a females' identity and self-worth (DeBate, Lewis, Zhang, Blunt, & Thompson, 2008; Furnham, Badmin, & Sneade, 2002). In addition, Swami et al. (2017) found many facets of positive body image including body appreciation, body pride and body image flexibility were lower in UK women compared to men.

International research confirms that females generally have a more negative body image compared to males; they also have a skewed perception of the ideal body, with many reporting their ideal body size is smaller than their current body size which puts them at higher risk of disordered eating behaviour (Gitimu et al., 2016; Korn, Gonen, Shakes, & Golan, 2013; MacNeill & Best, 2015). An Australian study involving 328 female university students aged 17-25 years found that the strongest predictor of disordered eating and quality of life was body image inflexibility (Pellizzer et al., 2017). While body image has been traditionally stereotyped as a feminine matter, striving to obtain societal perceptions of masculinity which may be unrealistic has been identified as

an emerging concern among young men (Kling, Vangqvist, & Frisen, 2018). Internalisation of these societal 'body ideals' such as 'thin females are attractive' has been associated with weight / shape concern and eating restraint, while internalisation of an athletic-ideal is related to muscularity-oriented behaviours which involve higher intake of specific food groups that increase protein consumption and increased exercise (Hoffmann & Warschburger, 2019). BID occurs when these 'body ideals' become personal goals which go unmet (Cramblitt & Pritchard, 2013). It remains unknown if BID is associated with level of nutrition knowledge, food group consumption and eating attitudes of Australian university students.

2.8 Eating attitudes

Attitudes to food can change as emerging adults transition from schools to university because they often develop unhealthy eating habits, such as skipping meals, eating unhealthy snacks and consuming fast food (Alzahrani et al., 2020). Gender differences in attitudes towards eating have also been noted with females reporting higher frequency of dieting behaviours including fasting and skipping meals and they also generally have more negative eating attitudes than males (Hebden, Chan, Louie, Rangan, & Allman-Farinelli, 2015; Pettie, Jacobs, Page, & Porras, 2010). International research suggests females demonstrate higher disordered eating attitudes and behaviour such as higher dieting levels than males (Liao et al., 2012; Pettie et al., 2010). While dieting behaviour itself may not be necessarily negative, dieting for appearance-related reasons are most commonly associated with detrimental outcomes (Putterman & Linden, as cited in Aubrey, 2010). Attitudes towards eating can drive appearance related eating patterns which have shown to be problematic in both Western and non-Western cultures (Witcomb et al., 2013). An Australian study involving nutrition and dietetics students exploring the prevalence of exercise addiction and disordered eating found that exercise addiction risk was associated with disordered eating behaviours among female participants (Rocks, Pelly, Slater, & Martin, 2017). A study conducted in Portugal confirmed that diet and exercise behaviour that is motivated by appearance, weight and shape control put individuals at great risk of developing unhealthy eating patterns and engaging in excessive exercise (Goncalves & Rui Gomes, 2012). They suggested that this knowledge increases the importance of investigating motivations and attitudes as these directly affect health behaviours (Goncalves & Rui Gomes, 2012). If appearance is the primary motivator rather than health it is more likely a person will engage in more extreme weight-reduction efforts that can have a negative impact on emotional and physical health (Ackard et al., 2002).

Research suggests that an increased emphasis on outward appearance and the focus on thin 'body ideals' has been associated with severity of eating disorder symptoms and body dissatisfaction. Furthermore young women who internalise these messages are more likely to have problematic attitudes to eating (Ackard et al., 2002; Witcomb et al., 2013). One Australian study explored body image and its association with disordered eating among 328 female university students (Pellizzer et al., 2017). This study highlighted that many treatments for disordered eating behaviours focus on negative body image, however, they suggested it would be of interest to further investigate the predictive outcomes of early change to a focus on positive body image (Pellizzer et al., 2017). Further investigation is needed to understand the relationship between body image and eating attitudes and how these influence the nutrition-related knowledge and food intake of Australian university students. Understanding this relationship may uncover ways to improve emerging adults' adherence to the ADG and, hence, their overall health now and into adulthood.

2.9 Methodological issues

2.9.1 Assessment of dietary intake

Selecting an appropriate method for measuring food intake is an important consideration for research and, therefore, requires an understanding of the advantages and disadvantages of various dietary assessment methods (Thompson & Byers, 1994). The objectives of the study, characteristics of the target group, timeframe for the study, available resources and skill of the researcher also influence the choice of dietary assessment method (Biro, Hulshof, Ovesen, & Amorim Cruz, 2002). Some of the frequently used methods for measuring food intake with adolescents and emerging adults include dietary record 24-hour recall and food frequency questionnaires.

2.9.2 Dietary record

This method requires individuals to record food and beverages as they consume them. It is generally recorded for three days and ideally, the days are randomised to cover seasonal and weekday variations (Biro et al., 2002). Recording for more than seven days is usually unsatisfactory due to participant fatigue (Thompson & Byers, 1994).

The strength of this method is that it does not rely on the memory of the participant as food is recorded at the time of consumption (Biro et al., 2002). However, dietary records require the participants to be trained in the level of detail required to record types

of food, preparation methods and quantities or portion sizes (Thompson & Byers, 1994). This level of detail and the recording process can result in underreporting of usual dietary intake (Thompson & Byers, 1994).

Research involving emerging adults and the use of three day dietary records indicate that 'in class' training was required prior to dietary recording to ensure participants were familiar with the level of detail required regarding food types and quantities (Ha & Caine-Bish, 2009; McArthur & Pawlak, 2011). These studies also involved students enrolled in health-related disciplines and hence, they were more likely to have increased knowledge and interest in healthful eating. In spite of these measures there were still estimation errors that occurred during the self-recording process (Ha & Caine-Bish, 2009; McArthur & Pawlak, 2011). The labour-intensive nature of this method may also limit recruitment and adherence.

Recently the use of digital technology in the form of a mobile food record app has been trialled with participants aged 18-65 years (Halse et al., 2019) and adults 18-68 years in Western Australia (Kerr et al., 2017). It was noted that there was greater willingness to record among participants with higher BMI which may indicate they were able to recognise the potential benefits of self-monitoring in helping them lose weight (Kerr et al., 2017). A mobile food record app has also been used in a diet intervention with 247 young adults (18-30 years) in which image based diet was captured by participants and then tailored feedback messages were texted back to participants (Shoneye et al., 2019). These new technologies have shown potential to reach a large number of participants however, they were in development at the time of data collection for this study.

2.9.3 24-hour recall

A 24-hour recall is an interview method that relies on a well-trained interviewer who is familiar with a range of food types and food preparation methods in specific regions or ethnic groups (Biro et al., 2002). This is important so that the interviewer can gauge the reliability of the information provided by participants without altering patterns of food intake. The strength of this method is that participants do not have to rely on written instructions that are characteristic of other food intake records (Thompson & Byers, 1994).

This method has been used with adults (19 years and older) which include emerging adults but is not exclusive to this age group (Bowman & Vinyard, 2013; Ragan et al., 2009). In a study of the consumption of discretionary food by Australia adults, measurement errors, particularly regarding estimation of portion sizes, recall of precisely

what was consumed, and deliberate misreporting were associated with the 24hour recall method (Ragan et al., 2009). This method relies heavily on the participant's memory in recalling portion sizes and this may explain inconsistencies in findings (Thompson & Byers, 1994). Although a single 24hour recall method has some level of validity in estimating dietary intake it is limited in representing the usual food and beverage intake of an individual (Biro et al., 2002). This method is also time-consuming as all participants must be interviewed.

2.9.4 Food Frequency Questionnaires

Food frequency questionnaires (FFQ) provide participants with a limited checklist of food and beverages and asks them to indicate their consumption of these foods and beverages over a certain time to investigate usual frequency of consumption (Biro et al., 2002). FFQ are one of the most commonly used instruments because they can be easily administered in a short period of time, reducing the burden on respondents. Food items are pre-coded allowing for simple data handling, and they are relatively inexpensive (Biro et al., 2002). Being self-administered they are appropriate to use with a large group and can be a useful tool to assess an individual's usual food intake (Thompson & Byers, 1994).

The FFQ was used to explore the relationship between food consumption and living arrangements of college students in four European countries (El Ansari et al., 2012); food consumption and weight gain among first-year American university students (Crombie, Illich, Dutton, Panton, & Abood, 2009); stress and dietary behaviour among first-year Australian university students (Papier, Ahmed, Lee, & Wiseman, 2015); socio-demographics and eating patterns among Australian nursing students (Williams et al., 2020); and fruit and vegetable consumption of 18-24 year old participants in America (Richards et al., 2006). Other studies with adults (including emerging adults) have used the FFQ method including food frequency of WA (DoH, 2006), and food consumption habits of the states of South Australia and Western Australia (Daly et al., 2011).

The limitation associated with using FFQ is that actual quantities are not recorded (Thompson & Byers, 1994). While FFQ do not provide information on the amounts of food being consumed they can provide information regarding the types of food consumed and individual item food intake response can be converted to a daily equivalent frequency (DoH 2006) which can be compared with ADG-RDS. Based on the literature and target group, the FFQ is the most appropriate method to collect dietary intake for this study. The use of the FFQ reduces the burden on participants as information can be gathered in a

relatively short period of time and would suit a university lecture class environment for surveying. Furthermore, the FFQ food groups allow for associations between knowledge of dietary guidelines and food intake to be examined. Finally, this method is not time-consuming or expensive and is therefore ideal for use in a university class setting involving emerging adults.

2.10 Conclusion

The international research conducted in the last decade has explored emerging adults' nutrition knowledge, compliance with dietary guidelines and definitions of healthy eating. It has also examined eating habits, living situations and cooking skills of emerging adults. Influences on eating behaviour including weight and appearance concern have been examined. Most of this research has occurred with university students because they provide a convenience sample. While this provides important insights into the eating behaviour of emerging adults and in particular university students, little of this research has been conducted in an Australian context.

Research that focuses on eating behaviours of 18-25 years is beginning to emerge in Australian but is still relatively limited. While integrated into this review of literature, a summary of the relevant research conducted in Australia over the last decade is documented in *Appendix D*. Consequently, at the commencement of this project in 2015, several gaps in the literature were identified which the present study aimed to address:

1. No known Australian studies have used qualitative methods to understand why emerging adults are not complying with dietary guidelines
2. No known Australian studies have explored sources of nutrition knowledge for emerging adults and how these may influence their eating behaviour
3. Several quantitative studies have explored various influences on emerging adults eating behaviour, however, none have included a qualitative or mixed method approach in order to gain a deeper understanding of the influences on eating behaviour
4. No known Australian studies have explored associations between nutrition knowledge (ADG and HLP), sources of knowledge and actual food group intake of emerging adults
5. No known Australian studies have explored associations between nutrition knowledge (ADG and HLP), influences on eating behaviours and actual food group intake of emerging adults

6. No known Australian studies have explored the influence on nutrition knowledge (ADG and HLP), eating behaviour and food purchases and their associations with body satisfaction and eating attitudes of emerging adults
7. No known Australian studies have used qualitative methods to determine what nutrition information emerging adults need and how they would like the information communicated.

Australian emerging adults are less likely than older adults to meet the ADG-RDS and are over consuming discretionary foods that are high in saturated fats and sugar. This eating behaviour may be contributing to the 46% of Australian emerging adults being considered overweight or obese (ABS 2018) which will increase their risk of chronic illness adding to the burden of disease in Australia. Therefore, understanding level of nutrition knowledge, food intake and influences on food choices of Australian emerging adults will be useful for Australian health promotion professionals and public health policymakers interested in improving eating behaviour of emerging adults.

Chapter Three

3

Phase 1: Qualitative focus groups

In their own words: A qualitative study exploring influences on the food choices of university students.

PAPER – IN THEIR OWN WORDS: A QUALITATIVE STUDY EXPLORING INFLUENCES ON THE FOOD CHOICES OF UNIVERSITY STUDENTS.

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In their own words: A qualitative study exploring influences on the food choices of university students

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Keywords:	university students, food choices, body ideals, social media
Notes:	See *Appendix B* for a reproduction of the published edition of this article.

Study 1

In this chapter, Phase 1 (qualitative) of the study is described and the following study research questions are addressed:

- Are emerging adults aware of Australian Dietary Guidelines and what it their level of understanding?
- How do emerging adults obtain their nutrition knowledge and what do they want to know regarding nutrition?
- How relevant are the Australian Dietary Guidelines to emerging adults?
- How are emerging adults adhering to the dietary guidelines and what factors influence their food choice and eating behaviour?
- How do emerging adults want future health promotion nutrition messages communicated?

Abstract for study 1

Issue addressed: University students generally make independent decisions regarding food choices. Current research about knowledge of Australian Dietary Guidelines (ADG), sources of nutrition information and influences on food choices for this group is scarce.

Methods: Qualitative data was collected from gender separated focus groups comprising four female (*n*=31) and four male (*n*=18) to identify: knowledge of ADG, sources of nutrition information; factors that influence food choices; perceived relevant nutrition messages and how best to deliver them.

Results: Gaps in knowledge were identified particularly regarding number of serves and serving size for food groups. Social media was the most commonly reported source of knowledge. Social media was also a major influence on food choice due to its impact on body ideals.

Conclusion: Current health promotion nutrition messages were perceived irrelevant given the focus on long-term health risks. Health and adhering to the ADG were not identified as important. The desire to look a particular way was the major influence on food choices.

So What? While there is an awareness of ADG, our participants made a deliberate decision not to follow them. This provides a challenge for developing relevant preventive health messages for this target audience.

Summary: Focus groups were conducted with university students (18-25year) to explore knowledge of ADG, sources of nutrition information; factors that influence food choices; perceived relevant nutrition messages and how best to deliver them. Current health promotion nutrition messages were perceived as irrelevant. The major source of nutrition information was social media, which was also reported as the major influence on food choice due to its impact on body ideals.

Key words: university students, food choices, body ideals, social media.

3.1 Introduction

Emerging adulthood describes 18-25-year-olds (Arnett, 2000), when individuals are establishing independence and taking responsibility for life choices, including health behaviours (Nelson et al., 2008). As such this group is an important target population for health promotion and disease prevention. Previous research indicates that very few emerging adults meet current dietary guidelines, often consuming diets high in saturated fats, sugar and sodium along with decreased vitamin, mineral and fibre intake, all of which are associated with later life obesity and chronic disease (du Plessis, 2011; Lytle et al., 2006). The ABS (2012) reports that emerging adults are less likely than any other age group to consume recommended amounts of fruit and vegetables. They also typically display erratic eating behaviours and tend to skip meals (du Plessis, 2011; Lytle et al., 2006; Neumark-Sztainer et al., 1999).

While some research has occurred with emerging adults internationally, little research has explored the evolving social influences affecting food choices of Australian emerging adults (Nelson et al., 2008), and in particular Australian university students. Emerging adulthood is a time when living situation may change, and this can influence food intake. Harris et al. (2006) found that as emerging adults leave home and live independently, there is a decline in healthy dietary habits. Specific to university students a study of four European countries reported participants who had moved away from their parental home identified a lower consumption of healthy foods, specifically fruit and vegetables (El Ansari et al., 2012). The authors speculated that students living at home did not have to pay for their food so financial constraints may not restrict the purchase of healthy food. In addition, meals containing nutritious foods such as vegetables were more likely to be prepared for them when living with parents. Therefore, healthier food was more freely available compared to the food options available to the students living away from home. Furthermore, Jackson et al. (2009) reported that those living at home with parents were more likely to bring a packed lunch, which may act as a protective factor against the consumption of fast food during their day at university. Kelly et al. (2013) identified that living with other university students can negatively influence eating behaviours because of a lack of peer support to eat healthily. Devine et al. (2006) found that university students in Northern Ireland who lived alone were more likely to eat fresh vegetables and salads regularly compared to students who lived with other students. This peer influence is further reinforced by McArthur and Pawlak (2011) who reported that American university

students perceived their peers did not enjoy consuming healthy food and this influenced their own food choices.

While nutrition knowledge is assumed to influence dietary habits and food preferences, Al-Khamees (2009) study involving university students from Kuwait enrolled in nutrition and education courses noted that many were genuinely surprised that their diet did not comply with dietary guidelines. Even for this knowledgeable, unique, target group, translating dietary guidelines into their food choices was difficult. While not specific to university students, an Australian study by Kothe and Mullan (2011) identified that emerging adults also had significant knowledge gaps regarding serving size and quantity of fruit and vegetables recommended by dietary guidelines and appeared to have insufficient knowledge of food preparation and cooking skills. The authors suggested more research is needed to investigate these knowledge gaps and how these gaps might influence food choice in emerging adults (Kothe & Mullan, 2011).

Australian public health campaigns have attempted to increase nutrition knowledge. The *Go for 2 and 5* campaign primarily targeted parents of children aged up to 17 years with the secondary target group youth aged 13-17 years and aimed to increase fruit and vegetable consumption by increasing knowledge of the importance of consuming these foods (Woolcott Research, 2007). Several follow-on campaigns such as *Measure Up* in 2008, *Swap It Don't Stop It* in 2011, and the *LiveLighter* campaign in 2014, linking increased waist measurement with risk of chronic diseases targeted 25-50-year-olds and focused on weight reduction messages (Heart Foundation WA, 2013). Working emerging adults, however, appear to place little importance on the prevention of chronic disease because they believe this will not affect them until they are much older (Stewart & Tinsley, 1995). Consequently, the consumption of healthy food is not considered a priority, as there is no sense of urgency regarding the importance of food choices for health and wellbeing (Fisher et al., 2016; Neumark-Sztainer et al., 1999; Stewart & Tinsley, 1995). Further investigation is needed to explore if university students also have this perception.

To date, in Australia, there have been no public health campaigns that target emerging adults and specifically university students' nutrition knowledge. Furthermore, it is unknown if health promotion campaigns delivered via the traditional media (television and radio) would resonate with this population. It is possible, however, that they have been exposed to these campaigns along with a variety of other nutrition messages from media including the internet and social media. These sources of nutrition information may impact nutrition knowledge and possibly influence food choices. From our review of the

literature further investigation of this assumption is required regarding its impact on university students.

Social media is an increasingly popular way for users to be both creators and consumers of health information by providing a platform to share, discuss, create, modify and exchange information with the on-line networks (Wong et al., 2014). As 18-29-year-old are regular social media users and are more likely to repost images and video (Duggan, 2013; Sensis, 2017) it is potentially an important vehicle to disseminate nutrition information. However, Wong et al. (2014) cautions that the information they engage with may be inaccurate, misleading or misinterpreted and therefore lead to health risk behaviours (Wong et al., 2014). Another challenge facing health professionals is the rapid pace of evolution of these platforms. Further research needs to explore if social media would be effective in delivering nutrition messages to university students (Vaterlaus, Patten, Roche, & Young, 2015; Yonker, Zan, Scirica, Jethwani, & Kinane, 2015).

Given the lack of evidence regarding Australian emerging adults' knowledge of dietary guidelines and their sources of nutrition information, it is important to explore this as a potential influence on eating behaviour. This information can be used to inform the development and best delivery of relevant and targeted nutrition messages as a key element of chronic disease prevention.

Hence the aims of our study were to identify:

1. Knowledge of Australian Dietary Guidelines (ADG) and sources of nutrition information preferred among university students
2. Factors that influence food choices and eating behaviours of students at one Australian university
3. Nutrition knowledge deemed relevant to university students and how they would like nutrition messages to be communicated.

3.2 Methods

This study evolved from food-related research specifically focusing on adolescents conducted by members of the research team (Farringdon et al., 2017). A qualitative approach using focus group was chosen to provide participants the opportunity to describe their experiences in their own words thus providing the researcher a clearer understanding of the experiences as seen from the individual's point of view (Fade, 2004). University students aged 18-25 years currently studying at a private university in Australia were

invited to participate in focus group discussions. This invitation was offered during oral presentation (5 minutes) across various lectures. Students were provided with a summary of the purpose of the study *(Appendix H)* and were offered the opportunity to participate via a signup sheet. Students who indicated their interest via the signup sheet, were contacted on the email address they provided the researchers. Once consent was provided *(Appendix I)* students were allocated to focus groups.

Ethics approval was obtained through the university's Human Research Ethics Committee prior to conducting this research (Ref: 015126F) *(Appendix E)*. A total of 49 students aged 18-25 years self-selected to participate from a variety of learning areas including Schools of Medicine, Arts and Sciences, Health Science, Business, and Philosophy and Theology. Gender-separated focus groups were conducted consistent with focus group methodology that advised homogeneous groups assist participants to feel equal and to get to know each other more quickly, so they feel comfortable to share ideas and information (Acocella, 2012). Focus groups were conducted until the research team determined that data saturation had been met. A total of eight focus groups, four female groups (n=31) and four male groups (n=18) were conducted.

The research team used combined expertise in qualitative research and nutrition to develop the interview schedule outlined in Table 3.1. This was piloted with a small group of university students to ensure the questions elicited appropriate responses. The same interview schedule was used for all focus groups. Each focus group session was allocated 90 minutes. The primary author, experienced in conducting focus groups conducted all focus groups (Peterson-Sweeney, 2005). An independent note taker recorded additional notes and non-verbal interactions of participants to augment the audio-recording (Liamputtong, 2013).

Table 3.1
Interview schedule

Focus group questions	Additional prompts
What do you know about the Australian Dietary Guidelines?	How relevant do you think they are for people your age? Why / why not?
	Do you think people your age, follow the guidelines? Why / Why not?
Does it make a difference to food choices for people your age if they are living at home or living independently?	What else influences what you choose to eat?

Focus group questions	Additional prompts
What other things influence what you eat?	Do you use anything specifically to get nutrition information? (e.g. Internet? How do you use it?) Are any of these sources of information more important than others? What are your "go to sources" of information?
What messages or information have you seen in the media lately regarding food / nutrition? (where did you see or hear messages - Radio, TV, Internet, Social Media) (need to explore the prompts for each media source identified)	Do you think this information is accurate? How do you know if it's accurate or not? Do you go looking for nutrition information or does it just come to you via your news feed?
Does any of the nutrition information or messages influence your eating behaviour?	What is it about the message or the information that influences your eating behaviour?
Traditionally health promotion messages about nutrition happen via TV. Is that relevant to people your age?	What would be the optimal way for people your age to get nutrition messages? What do you think people your age, want to know about nutrition?
Is eating healthy important to you? Why / why not?	

3.3 Analysis

With consent from participants, the focus groups were taped by the lead author, then transcribed verbatim by an independent contractor, with these transcripts checked by the lead author to ensure accuracy (Liamputtong, 2013; Neumark-Sztainer et al., 1999). Content was inductively analysed by the lead author and codes were assigned based on themes to establish categories and identify the frequency by which they occurred (Elo et al., 2014). These categories were identified across the focus groups, and any new themes were categorised as they emerged *(Appendix F)*. Verification checks occurred by co-authors to ensure agreement in identification of categories (Liamputtong, 2013). The data was then re-analysed using NVivo data analysis software v11 (QSR International, 1999-2013), validating the categories and subcategories established by the initial content analysis.

3.4 Results

Common factors influencing food choices, including those that related to nutrition knowledge were grouped into two major categories: internal and external influences on food choices. Two additional categories emerged: nutrition knowledge deemed relevant by emerging adults; and preferred delivery method of nutrition knowledge.

3.4.1 Internal influences on food choice

Internal influences on food choices included: level of nutrition knowledge based on the Australian Dietary Guidelines; knowledge of serving size for different food groups; perceived relevance of dietary guidelines; compliance to dietary guidelines; body image, appearance and weight control; and cooking skill and confidence.

Knowledge of Australian Dietary Guidelines

The majority of the participants were aware of ADG (NHMRCA 2013) with the most popular recollection being the visual format of the healthy food pyramid:

> Is that the food pyramid stuff? [Female Group 2 (FG2)]

There was consensus that fruit and vegetables comprised the bottom *'eat most'* section of the pyramid hence were healthy. Also, there was consensus that sugar was at the top of the pyramid indicating, '*eat least'*. All other details regarding the structure of the pyramid varied. There was some confusion over the positioning of carbohydrates such as bread, pasta and rice some participants indicated these were '*eat sometimes'* and should not be eaten as frequently as fruit and vegetables, but the majority believed that they were on the same level as fruit and vegetables. The greatest confusion was regarding the correct positioning of meat and dairy products.

Knowledge of serving sizes

When prompted about serving sizes for different food groups there was a high level of disagreement and confusion. The majority agreed that it varied from food to food, but they were unsure regarding what constituted a serving size:

> In terms of actual (serving size) recommendations, I couldn't visualise one. [Male Group 2 (MG2)]

> A serving size is about the palm of your hand. [FG4]

> I thought it was the size of a deck of cards. [FG2]

> A cup. [MG1]

> It depends who you talk to. [FG4]

While there was a general awareness of the ADG (NHMRCA 2013), the majority indicated that they did not adhere to the guidelines. Of particular concern, not following the dietary guidelines was identified as a choice rather than lack of awareness:

> I think the guidelines are good, and I have a fair idea of what they are, but nine times out of ten, I won't follow them. [MG1]

> We know we're not following them. It's a deliberate choice. [FG2]

The most common reason for not adhering to the guidelines was they lacked importance or relevance due to no sense of urgency. The majority stated that healthy eating and following the guidelines only became relevant as a person grew older or started experiencing ill health or significant weight gain:

> I don't care enough! … because of my build, I've never really had any weight problems. But it may be something that occurs in the future. But at the moment, I don't have any reason to really change how I'm eating. [FG3]

> We kind of have the impression that we're young, we don't need to worry about it at this point, and we'll cross that bridge when we're 35 and have high cholesterol. [MG2]

Body image, appearance and weight control

The majority of participants expressed that food choices, eating and eating behaviours were heavily influenced by body ideals:

> Looking good is the biggest motivator for people our age. [FG3]

> It's much more about looks rather than general health. [MG3].

While the desire to 'look good' was expressed in all focus groups, the female groups consistently mentioned weight control and being skinny as the desired appearance. Some added they felt pressure from society to conform to the thin ideal:

> Yes. It's about appearance more than anything else…in advertising they use very slim attractive people, and you think, 'Oh if I want to look like that then I should eat this' or ' I shouldn't eat this... [FG1]

> Society pressure, perception that women should look skinny, amazing…and eat nothing. [FG4]

Of particular concern was the general perception among females that being skinny was associated with being healthy:

> People perceive skinny as being healthy. [FG1]

Weight control was mentioned less by male participants and their desire to 'look good' had a different focus. Muscle gain and how to best achieve it was mentioned most by the males:

> Guys focus on eating the right sort of portions so that they can gain the most weight, or muscle mass or fitness… but are those diets really healthy? [MG2]

> It tends to be more muscle gain for the blokes and weight loss for the girls. It's the pressure of every guy wanting to be huge and every girl wanting to be stick thin. [MG3]

Cooking skills and confidence

Cooking skills were identified as important for eating a healthy diet. Cooking skill and confidence were also linked to cost. While these factors strongly influenced food choices for males, they were also a consideration for females. However, females generally expressed more confidence in cooking skills than males:

> Cooking skills are also a very big factor – I have very limited cooking skills. If it's going to take too long to prepare, or it seems a bit too complex, then I'm more likely to just go out and buy something. [MG2]

> Whether or not you can cook influences your food choices – if you can't cook then you go and get take away. [FG1]

Cooking skills and confidence were also linked to cost with many participants concerned about spoiling food and therefore wasting money:

> You might have spent a lot of money on an expensive meal to prepare, and you burn it or stuff it up or something. [MG2]

3.4.2 External influences on food choices

External influence of food choices included: sources of nutrition knowledge; current living situation and peer influence; cost, convenience, time and effort required.

Sources of nutrition knowledge

Social media was the most common source of nutrition knowledge with the majority indicating that they do not search for nutrition information, but they are exposed to it constantly:

> I don't think people really search for it [nutrition information]; if it comes up in social media then maybe people read about it. [FG2]

Both males and females commented that the majority of nutrition information on social media was accompanied by images of thin females and muscular males 'looking fit, healthy and happy'. These images were associated with participants' knowledge about what contributed to being healthy:

> Slim fit girls are presented on social media as being in their active wear, drinking a smoothie. Fit muscular guys are all about the supplements, how to get large. [MG4]

> Instagram promotes this ideal that "healthiness equals happiness" and that's what everyone is striving for. [FG2]

While social media, in general, was mentioned, there was a notable difference between males and females in the social media platforms used. While Facebook was identified evenly across the male and female groups, Instagram was frequently mentioned by females but rarely by males as a source of nutrition information. The volume of nutrition information on social media were accompanied by images that created the desire to look 'fit and healthy' and contributed to body dissatisfaction. Some participants indicated they were aware that the images were unrealistic but were still envious and strived to look like the bodies portrayed in the images:

> On Instagram, in particular, there are a lot of unrealistic portrayals of, particularly girls…the pictures are very colourful, and the girls look very happy and skinny, which brings out envy. [FG2]

Participants all spoke of the high number of celebrities and 'micro-celebrities' (those who have become famous via social media) who promoted diets, supplements and exercise programs:

> You see a lot of links on social media to things like "super diets" or 'my friend did this and had these results in 12 weeks. [MG3]

> Perfect bodies on the paleo diet. Stuff like that is all over social media. [FG4]

> The sheer amount of pages on Instagram – all of them are just of girls in their bikini, or of their meal. You can't go through your (news) feed without seeing them. [FG4]

Accuracy of the nutrition information on social media was generally not a concern with the majority indicating that the most popular measure of 'accuracy' was to ask friendship group if they had tried the diets or supplements and check if any had positive results. When asked to clarify what was meant by 'a positive result' the common theme again was appearance:

> I want to look fit and lean. [MG4]

> Losing weight and looking good. [FG3]

Participants were asked if they could recall any health promotion campaigns as these may have contributed to nutrition knowledge. Recognition of the *LiveLighter* campaign and the *Go for 2 &* 5 campaign were high with all female groups and the majority of male groups. While recognition was high, participants agreed that they were not the target audience with many questioning the relevance of these campaigns to their age group:

> I don't think they target us. [MG3]

> They use middle age people in those commercials…it doesn't feel relevant to us. [FG1]

While most identified a key message of the *LiveLighter* campaign was to reduce intake of sugary drinks, they indicated this message did not motivate behaviour change:

> I probably drink a lot more, soft drink than I should, but then I'm still skinny. So you wonder if anything is really going to happen. It makes me think about it, but it doesn't change my behaviour. [MG3]

Furthermore, the health consequences outlined in the campaign felt irrelevant to the participants because health consequences were 'future concerns:

> I can't image my visceral fat being that bad compared to that man. It doesn't feel relevant. [FG4]

> People (our age) don't think the consequences of those ads will happen to them. [MG3]

Both male and female participants were adamant that focusing on negative consequences associated with food choice had no impact on their eating behaviour:

> Health promotion messages are so negative – like this is what happens to your gut when you drink coke. I know it's supposed to have an impact, but I don't feel like it has a significant impact. [FG3]
>
> There is as sense that it's not urgent and that it doesn't apply to us. [MG4]

Living situation and peer influence

There was consensus that living at home with parents had a positive influence on food intake because parents stocked the fridge and pantry, which to some extent dictated food choice. Participants also noted the quality and variety of food improved when living at home with parents mainly due to the associated high cost of healthy food:

> When you're living at home, you can't really control what your Mum and Dad buy and put in the cupboard, as opposed to when you live independently… you can. [FG2]
>
> If you're by yourself your main consideration is finances rather than your health. Healthy food is more expensive. [MG2]

Consequently, the majority indicated that living at home made it easier to eat healthy food. Mothers were identified as a positive source of information and influence on food choice:

> My Mum always served veggies or salad with meals, and now it's just become a habit rather than a knowledge of the guidelines. [MG1]
>
> It comes back to cost. Last year I was out of home and not eating well at all – I was just eating whatever was on special. Now I'm back home, mainly to save money, Mum and Dad provide much more variety and better food. It makes a big difference. [MG3]

The majority indicated that being with friends, socially and also living with peers increased the likelihood of choosing unhealthy food:

> It depends on who you're with – if I'm hanging out with friends that are eating junk food, then I'll eat it with them. [FG3]
>
> If you're sharing a house with friends, you're generally influenced by what your friends cook. So, if there's someone cooking, then you might be inclined to cook more, but if someone's always going out to get crap food, then you're more inclined to do that as well. [MG3]

Cost, convenience, time and effort required

Regardless of living situation cost, convenience, time and effort required were recurring themes across all focus groups having significant impact on their food choices. There was a very strong perception among participants that university students consumed fast foods because they were cheaper and more convenient even though they acknowledged it was unhealthy:

> You're normally going for the cheap stuff, which ends up being the bad stuff. [FG3]

While cost and convenience made fast food an attractive option, another influencing factor was effort. Many participants identified that healthy eating required more time, effort and preparation than they were prepared to give:

> It's a lot easier to just go and get take away then it is to actually make something, especially if you're home late. Because you have to go to the effort of buying it, making it, and cleaning up afterwards. [MG4]

3.4.3 Nutrition knowledge emerging adults want and how to deliver it

Weight loss and appearance was again the predominant focus of the type of information participants wanted. Related to weight loss, many identified a need for accurate information particularly regarding serving sizes:

> It's important to know how big a serving size is because frequently you think it's bigger than it actually is. [FG2]

> A lot of people don't realise it's not just eating healthier; it's lowering your portion size as well that helps lose weight. [MG2]

Accurate information regarding healthy ways to lose weight quickly was considered important particularly by female participants:

> The quickest way to lose the weight and being healthy as possible. [FG1]

The majority identified that correct information regarding fad diets would also be relevant to ensure more of a balance of food consumed:

> People go on extreme diets where they just focus far too much on eating one type of food when there needs to be more of a balance. [MG3]

> People our age need information about skipping meals and meal replacements shakes; how they are not effective in actually helping people lose weight. [FG2]

Participants highlighted that nutrition information focusing on body image and appearance rather than health risks would be more relevant:

> The approach needs to be image based - not 'it's going to make you 'feel better' but 'it's going to make you look better'…results that appeal to us might make a difference. [MG1]

Many participants, especially females, indicated they would like to see more of a positive body image focus:

> Promoting what is a realistic amount of weight loss for different body types. [FG4]

> Not using unattainable, un-realistic bodies or celebrities, just use normal people. [FG3]

Participants also identified that nutrition messages need to be more positive and focus on immediate benefits rather than long-term health risks*:*

> It comes down to promoting fun - not "don't eat this, don't do this". Finding a way to say "hey look what you can do if you're actually get out there and do stuff and you eat good food – it's fun." [FG3]

> Might be more effective if they focus on something that we can see or feel almost immediately. [MG4]

Another important aspect mentioned by participants related to cost of food. It was strongly suggested that healthy food be more cost-effective:

> If you made the healthier, more nutritious food cheaper than the less healthy foods that could make some difference. [MG1]

> Cheap places to pick up vegies and maybe healthy cheap meal ideas. [FG2]

Regarding how best to deliver nutrition Information there was consensus it should be online incorporating social media:

> People our age don't watch TV…it's got to be online. [MG3]

> Social media because that's what we're exposed to the most – but the dietary guidelines aren't on social media. [FG3]

3.5 Discussion

This study provides an Australian context to international evidence regarding influences on dietary behaviour among university students aged 18-25 years (Al-Khamees, 2009; Deshpande et al., 2009; Devine et al., 2006; El Ansari et al., 2012; Kelly et al., 2013; McArthur & Pawlak, 2011; Nelson et al., 2008). Findings confirm that the cost of food when living independently influences food choice with a strong perception among participants that healthy food costs significantly more than unhealthy food (El Ansari et al., 2012; Harris et al., 2006; Jackson et al., 2009). Also consistent with international studies the participants in this study acknowledged that peers influenced their decision to consume unhealthy foods while living with parents positively affected this food choice (Devine et al., 2006; Kelly et al., 2013; McArthur & Pawlak, 2011). This study also identified that cooking skills and confidence, as well as time and effort required in the preparation of food, were considerations with participants reporting that convenience, confidence and cooking skill often influences food choices. More research needs to be conducted to further explore how significant these influences are on food choices.

Our findings support previous research concerning Australian emerging adults' diets not adhering to recommended dietary guidelines (Driskell, Kim, & Goebel, 2005; du Plessis, 2011). A novel finding of this study is that while emerging adults have some knowledge about ADG (NHMRCA 2013) they deliberately choose not to follow them because they do not consider healthy eating a priority or relevant to their age group, and ADG information is not promoted on social media. While previous health promotion campaigns in Australia have attempted to promote the importance of healthy eating, (Heart Foundation WA, 2011, 2012; Woolcott Research, 2007), they have not specifically targeted emerging adults. Although our study supports previous findings that suggest some key messages such as eat more fruit and vegetables and less sugar seem to reach emerging adults (Al-Khamees, 2009; Hendrie et al., 2008; Keenan et al., 2002; Kothe & Mullan, 2011), however, these messages do not translate to the eating behaviour of our cohort. For example, participants identified difficulty in translating messages such as *Go for 2 & 5* in 'real life' food choices due to confusion over what constitutes a serving size. Further, many Australian campaigns have focused on the effects of poor nutrition, such as obesity, visceral fat on vital organs, diabetes, high blood pressure, cancer and heart problems. While participants could recall messages from campaigns such as *LiveLighter* they perceived these messages as irrelevant and reported they had no influence on food choices because the health consequences highlighted generally occur in middle age or even later.

Consequently, our study participants were not motivated to change their food choices because there is no sense of urgency (Al-Khamees, 2009; Kothe & Mullan, 2011; Neumark-Sztainer et al., 1999; Richards et al., 2006; Stewart & Tinsley, 1995).

Regarding sources of nutrition knowledge, participants indicated that they do not watch commercial television, which has traditionally been the major medium for communicating public health messages. Participant identified social media as the most commonly used source of nutrition information. A novel finding was these social media users do not specifically search for nutrition knowledge rather they have constant access to this information via their social media 'newsfeed'. The majority of participants stated their interest was 'sparked' based on the physical appearance of the person in the 'post' shared on social media. Once engaged by the 'post' they reported following the 'fad diets' promoted by this individual regardless of nutritional value or accuracy of the information. This is concerning given the majority of the participants were studying health-related degrees at the university. Future research should consider if this finding is similar across other emerging adult populations including those with less access to education. Participants reported a strong desire to look fit and lean and this was associated with being healthy. As most of these fad diets focus on 'body ideals', this could explain why appearance and body dissatisfaction, generally in the form of weight control emerged as the largest influence on food choices for the participants in our study. Given that approximately 89% of online 18-29 year-olds are regularly using social media (Sensis, 2017) the consumption of weight appearance focused nutrition information is clearly contributing to the participants' perception that being skinny (for females) and muscular (for males) is healthy. This supports the findings of Tiggemann and Miller (2010) in their study of adolescent girls which found girls who spent more time on social media had higher levels of drive for thinness.

Our study highlighted that female participants specifically identified Instagram as the primary social media platform utilised. Given that Instagram is an image-based platform this may be further contributing to the emphasis on weight control and appearance, which may be reinforcing the perception that being thin is ideal and also healthy. Further reinforcing these 'thin ideals' may be the 'weight control' approach to nutrition currently used in Australian health promotion campaigns such as *LiveLighter* (Heart Foundation WA, 2011, 2012, 2013). It is recommended that nutrition messages focus on general health rather than weight loss for this target group (Berry et al., 2018). This would seem to be important as females in our study acknowledged there was societal pressure to conform to

the thin ideal and there was also a general agreement that being thin meant being healthy. Regardless of gender, this belief that appearance is the main marker of health is concerning as it may further contribute to body dissatisfaction and influence food choices among emerging adults as a way of achieving this thin or buff body. More research focusing with this target group is needed to further understand these associations.

The findings of this study must be considered in light of some limitations. The participants were a convenience sample drawn from one university campus. However, replication of some results, suggest this group is similar to others university and college-based studies reported in the literature. As a select sample of university students, their education level may mean that their nutrition knowledge is higher than other groups of emerging adults, therefore, results and associations cannot be generalised to the whole emerging adult community. While the sample may not be fully representative of the emerging adult population, the participants were keen to have their voices heard and provided in-depth insights into the influences on their food choices and implications for communicating nutrition information. A strength of the study was the design that adhered to focus group methodology hence saturation of categories was achieved, and the initial content analysis was validated by the content analysis performed through NVivo v11 (QSR International, 1999-2013) adding to the rigour of the results.

3.6 Conclusion and implications

Given that emerging adults attending university do not consider dietary guidelines or health promotion campaigns relevant, the findings of this investigation have implications for preventive health strategies targeting this age group. Future campaigns could deliver positive nutrition messages and present benefits of healthy eating rather than focus on weight loss and future health risks (Berry et al., 2018). In addition, accurate information regarding serving sizes was identified as important because participants found it difficult to translate current nutrition messages into actions they could utilise in their daily lives. There was also a desire for accurate information regarding current fad-diets as well as healthful strategies for weight loss. This presents a challenge for health promotion to counteract current appearance related perceptions regarding health in a rapidly changing, social media-saturated environment that heavily promotes thin or muscular ‘body ideals.’ There were calls for more realistic body shapes on social media, especially by the female participants. Perhaps this is where health promoters should direct their attention because

the insidious nature of the constant appearance comparison ever present on social media makes it unrealistic for many to achieve the current ideal body in a healthful way.

Another consideration for future health promotion campaigns is the mode of delivery. Given the participants in this study do not watch television and identified social media as the preferred source of nutrition information, health professionals need to rethink how to best communicate future public health nutrition messages to this audience. While social media appears to negatively influence perceptions of health and eating behaviour it may also provide the potential solution. However, more research is needed regarding potential barriers and challenges associated with social media and emerging adults health behaviours (Vaterlaus et al., 2015). Many platforms exist in the social media space, and little is known about which platform would be the most effective for this target group. The results of this study indicate that Instagram could be an avenue for further investigation as female participants identified it as their most commonly utilised social media platform. Clearly, more research in this area is required to confirm the findings of our study so that emerging adults' transition into adulthood with accurate, useful nutrition knowledge that will potentially result in a healthy diet and the accompanying health benefits (Deshpande et al., 2009; Kothe & Mullan, 2011; Nelson et al., 2008).

This study highlights the challenges and importance of developing relevant messages and considering new modes of communicating with this target group. (Berry et al., 2018) suggests it may be beneficial to present some of these messages in practical forms such as recipes for emerging adults. While the authors acknowledge the importance of developing relevant nutrition messages for this cohort, simply increasing knowledge does not appear to influence their food choices. Therefore, it is recommended that alongside developing relevant messages future public health interventions need to consider additional strategies to create an environment that supports healthy eating. Our participants reinforced the findings of El Ansari et al. (2012) indicating the need for healthy food choices to be made more affordable particularly for those living away from home to encourage healthy eating. Other strategies such as limiting advertising of energy dense foods (Sainsbury, Colagiuri, & Magnusson, 2017), limiting access to unhealthy convenience foods, introducing a sugar tax and improving cooking skills (Kowalkowska et al., 2017) may also support healthy eating. Further research focused on emerging adults is needed to assist in developing a comprehensive approach to address the issues identified by this cohort in order to positively influence their food choices.

Chapter Four

4

Phase 2: Survey development and validation

4.1 Overview

In this chapter the methodology used in Phase two of this study is outlined. Phase one of this study provided information regarding level of awareness of ADG and influences on eating behaviour such as body image and attitudes to eating. This information was used to develop the survey tool designed to evaluate the research questions by quantifying level of ADG-RDS knowledge, actual food intake among emerging adults, influences on knowledge, eating behaviour and food purchases, level of body satisfaction and eating attitudes. As such, this chapter explains the methodological procedure employed within the development, validation, implementation and analysis of the survey tool used in Phase two of this study.

4.2 Study Design

This study used a comparative, correlational, cross-sectional design. It describes the differences in eating behaviour between gender and living situation and investigates relationships between influences on food choices and actual food intake among a sample of WA university students.

4.3 Sample Size

A power calculation (*a priori)* based on the McArthur and Pawlak (2011) study, using four groups, power 0.8, alpha 0.05 determined a total sample of 256 was required for this study to be powered to detect a difference.

4.4 Participants and setting

Data was collected over a five-month period (February - July 2017). University students aged between 18 and 25 years studying at one WA University, self-selected to complete an anonymous paper- based survey *(Appendix J)*. An information sheet regarding the study *(Appendix G)* was provided prior to completing the survey during class time under the supervision of the researcher following a standardised protocol. Mean age of participants was 20.5 years (SD 2.30). Participants self-selected from a variety of areas of study including Health Science, Physiotherapy, Arts and Science and Nursing. The sample included females (*n*= 199), males (*n*= 88), students living at home with parents at time of data collection (*n*=219) and students living independently (*n*=68). Ethics approval was obtained through the university's Human Research Ethics committee prior to conducting this research (Ref: 015126F) *(Appendix E)*.

4.5 Measures

The survey comprised a knowledge section, food intake section, influences on nutrition knowledge and food intake section, body satisfaction section and eating attitudes section.

4.5.1 Knowledge questionnaire

The questionnaire comprised knowledge of the 2007 Healthy Living Pyramid (HLP) and the Australian Dietary Guidelines Recommended Daily Serves (ADG-RDS) of the core food groups. Even though the HLP was revised in 2015 (Nutrition Australia, 2015) Phase one of this study revealed that emerging adults identified the HLP (2007) as the most common recollection of the ADG (Lambert, Chivers, & Farringdon, 2018). Participants were asked to indicate where each core food group was placed in the pyramid layers according to the categories '*eat most', 'eat moderately'* and '*eat least'*. They were instructed to tick the 'don't know' option rather than guessing. 'Don't know' responses were categorised as incorrect *(Appendix J)*.

4.5.2 Australian Dietary Guidelines - Recommended Daily Serves

As there are no specific guidelines for males and females aged 18-25, responses were recorded correct/incorrect based on the ADG-RDS for adults 19-50 years (Table 4.1).

Table 4.1
Australian Dietary Guidelines RDS for adults aged 19-50

	Fruit	Vegetables	Grains & cereals	Meat, fish & eggs	Dairy
Age 19-50					
Female	2	5	6	2.5	2.5
Male	2	6	6	3	2.5

Participant's indicated how many serves they believe were recommended daily for each food group or if they were unsure by ticking the 'don't know' option rather than guessing *(Appendix J)*.

4.5.3 Food intake

Food intake was measured using a food frequency questionnaire (FFQ) based on questionnaires used in previous Australian studies (Daly et al., 2011; Department of

Health, 2006). FFQ are one of the most commonly used instruments because they can be easily administered in a short period of time, reducing burden on respondents and have been used in other studies involving university students (Crombie et al., 2009; El Ansari et al., 2012). The FFQ used in this study was very similar to those previously validated (Osler & Heitmann, 1996) and this FFQ was previously used in a study involving WA adolescents (Farringdon et al., 2019). The FFQ listed food from the following core food groups: dairy; grains; meat, fish and eggs; vegetables; fruit; and discretionary foods (baked goods and snacks; sugar, spreads and dressing; and non-milk drinks). Participants recorded how many times they had consumed a particular food item over the past month. Response was recorded in line with the frequencies described: never, once a month, once per fortnight, once per week, 2-4 times per week, 5-6 times per week, once per day, 2-3 times per day and 4+ times per day. Food intake was calculated using the FFQ data to determine Daily Equivalent Frequency (DEF) utilising the following conversions: never = 0; <1 month = 0.02; 1 per fortnight = 0.07; 1per week = 0.14; 2-4 week = 0.43; 5-6 week = 0.78; 1 day = 1; 2-3 day = 2.5; 4+ = 4 and summed DEF totals were then calculated for each food group (Department of Health, 2006) *(Appendix J)*.

4.5.4 Influences on knowledge, eating behaviour and food purchases

The influences on nutrition knowledge, eating behaviour and food purchases were identified during focus group interviews in response to the prompts '*What influences what you choose to eat?*' and '*Do you use anything specifically to get nutrition information (for example internet?)*' (Lambert et al., 2018). Table 4.2 provides an overview of quotes from focus groups conducted in the previous study (*Chapter 3)* which informed the development of the list of influences used in the survey.

Influences on knowledge examined in this study included: school-based programs; peers; parent/family; television; food advertisements; healthy food promotion; internet; Instagram/Facebook; YouTube. Influences on eating behaviour examined in this study included: school-based programs; peers; parent/family; television; food advertisements; healthy food promotion; nutrition knowledge; weight concerns; other appearance concerns; health concerns; internet; Instagram/Facebook. Influences on food purchases included: price of food; quality & freshness; cooking skill; taste; how much money available to spend; convenience; family habit/routine; availability of food where I shop; someone else decides. Participants were asked to select which items they perceived influenced their knowledge, eating behaviour and food purchases *(Appendix J)*.

Table 4.2

Example quotes from focus groups which informed the development of influences used in survey

Participant quotes related to influences on food choice
'Money has a major impact' [FG 1]
'Cost, it comes down to price. Especially while you're at uni. And convenience' [MG1]
'Accessibility, food trends and fad diets' [FG2]
'If we don't have much time, we'll eat a quick Maccas or something to save money' [MG2]
'Depends on who you're with too – if I'm hanging out with friends that are eating junk food, then I'll eat it with them' [FG3]
'Social group definitely has an impact. Generally, you get similar meals' [MG4]
'It's about losing weight and how you look rather than actually eating properly' [FG1]
'Taste is the most important' [MG1]
'Whether or not you can cook – if you can't cook then you go and get take away'. [FG1]
'Now I'm living at home, Mum & Dad provide much more variety of better food. So, where you live makes a big difference to what you eat.' [MG3]
Participant quotes related to influences on nutrition knowledge
'My mum forces it upon me and it got drilled into me in one term at high school, but after that it's kind of up to the individual' [FG1]
'Most of the stuff I know about food is what they teach in primary school' [MG3]
'Media, particularly social media and who you follow on Instagram. Heaps of girls at the moment are follow Kayla Itsine and her bikini body guide and diet guide' [FG2]
'Social media is a huge influence, there is a lot of information and you tend to get bombarded with it' [MG4]
'I follow dieticians or nutritionists on social media' [FG4]
'*The internet'* [FG3]
'Marketing and advertising is normally where information about food comes from' [MG3]
'2 fruit and 5 vegetables'. [MG2]

4.5.5 Validity and reliability

A pilot study involving university students (*n*=18), all aged between 18-25 years and drawn from the same university as the main study was conducted to assess the validity and reliability of the knowledge, food intake and influences sections of the questionnaire. The knowledge and influences components of the questionnaire were informed by the focus groups and experts in quantitative research and nutrition provided content validity. Participants completed the survey on two occasions, one week apart and given the opportunity to make comments on the survey and indicate their understanding. Results indicated participants understood the instructions and completed the survey correctly indicating good face validity.

The reliability of each item on the knowledge questionnaires was assessed using Cohen's kappa (K). Kappa was interpreted using <0.20 poor agreement; 0.21-0.40 fair;

0.41-0.60 moderate; 0.61 or higher as very good agreement (Viera & Garrett, 2005). Kappa chi-square analysis for HLP (correct/incorrect) identified 100% agreement for vegetables, very good agreement for meat, fish and eggs (0.65) and for fruit (0.56), moderate for grains (0.53) and for dairy (0.51), and fair agreement for extra food items (0.22). Kappa chi-square analysis for ADG-RDS (correct/incorrect) reported 100% agreement for fruit, vegetables, meat, fish & eggs and dairy, and fair agreement for grains (0.33) and for extra foods (0.27).

The FFQ results revealed that all participants understood the instruction of having only one frequency consumption response for each food item with no crossover responses, such as having two or more crosses for one food item, suggesting good face validity.

Reliability of the daily equivalent frequency (DEF) was assessed using intra-class correlation coefficient (ICC) 2-way mixed-effects model with absolute-agreement. ICCs were reported as moderate (0.5-0.75), good (0.75-0.90) and excellent (>0.9) (Koo & Li, 2016; Shieh, 2016). The DEF ICCs indicated moderate reliability for dairy (0.58); grains (0.66); and baked goods and snacks (0.72); good reliability for sugar, spreads & dressings (0.87) and vegetables (0.90); and excellent reliability for meat, fish and eggs (0.91), fruit (0.92) and non-milk beverages (0.96).

The reliability of each item on the influences on nutrition knowledge, eating behaviour and food purchases listed in the questionnaire was assessed using Cohen's kappa (K). Kappa was interpreted using <0.20 poor agreement; 0.21-0.40 fair; 0.41-0.60 moderate; 0.61 or higher as very good agreement (Viera & Garrett, 2005).

Kappa Chi-square analysis for influences on nutrition knowledge identified very good agreement for school-based nutrition programs (K=0.86), parents (0.82), and television (0.68), moderate agreement for peers (0.54), internet (0.60), and Instagram / Facebook (0.47) and fair agreement for healthy food promotion (0.31) and food advertisements (0.33). Kappa Chi-square analysis for influences on eating behaviour identified very good agreements for peers (0.84), television (0.76), food advertisements (0.66), appearance concerns (0.76) and Instagram / Facebook (0.72) and moderate agreement for school-based programs (0.50), parents (0.45), healthy food promotion (0.44), nutrition knowledge (0.43), weight concerns (0.42) and internet (0.42), and fair agreement for health concerns (0.29). Kappa Chi-square analysis for influences on food purchases identified 100% agreement on convenience (K = 1.00), quality and freshness (all individuals responded 'yes' on both occasions), very good agreement for price (0.82), amount of money available

to spend (0.82), availability of food (0.64) and someone else decides (0.71) and fair agreement for taste (0.30) and habit / routine (0.29).

4.5.6 Body Satisfaction Scale

Phase one revealed that food choices for emerging adults were '*more appearance than anything else*' [FG1]. The importance of body image and appearance was expressed by both males and females however, there was a difference in the way they want to appear, as explained by a participant, '*every guy wants to be huge and every girl wants to be stick thin'* [MG3]. Emerging adults reported not actively seeking nutrition knowledge but were constantly exposed to food and diet messages via social media which may explain why they are more focused on appearance concerns such as body image and a desire to look a certain way. In order to measure the impact of body satisfaction on food choice this study included the Body Parts Satisfaction Scale- Revised (BPSS-R) 14 body parts (Petrie, Tripp, & Harvey, 2002) adapted from the Body Part Satisfaction Scale 24 body parts (Berscheid, Walster, & Bohrnstedt, 1973). Participants ranked each body part (i.e. shoulders, arms, stomach etc.) on a 6-point Likert scale from one 'extremely dissatisfied' to six 'extremely satisfied' based on how they are feeling at the present moment (Berscheid et al., 1973). Individuals rated their satisfaction for each item, with overall size and shape as a separate item. Internal consistency for this scale is high as Cronbach's alpha level ranges between 0.81 to 0.94 and test-retest reliability scored highly at 0.90 (Catikkas, 2011; Stice et al., 2006). The BPSS-R included two factors: factor one, body and factor two, face. Petrie et al. (2002) strongly supports the factorial, construct and concurrent validity of the revised scale against a number of extensively used measures, and across a range of population samples. This study used the following factor scores for the BPSS-R. Factor 1: Body was calculated using six items (weight, arms, stomach, buttock, upper thighs and general muscle tone). Factor 2: Face was calculated using four items (hair, complexion, overall face and chest) (Petrie et al., 2002) *(Appendix J)*.

4.5.7 Eating Attitudes Test

Phase one revealed that health was not a significant influence on food choices as it was seen by participants as a 'future' concern. The attitude '*that won't happen to me'* [FG3] and '*health only moves higher up the priority list if there's a reason*' [MG3] lead to the decision to further explore the eating attitudes of this group and identify potential risk of disordered eating behaviour. The main measure for this component of the study was the Eating Attitudes Test (EAT-16) a revised version of an objective, self-report

measure of disordered eating symptoms (McLaughlin, 2014). The original scale (EAT-26) has been useful in identifying individuals with abnormal concerns about eating and weight gain (Garner, Olmsted, Bohr, & Garfinkel, 1982). The EAT-16 total score has been found useful in screening for eating disorders in non-clinical setting particularly with undergraduate students (McLaughlin, 2014). This abbreviated measure has been identified as a better-fitting measure in young women than the commonly used EAT-26 (Wade, 2017). A limitation of the EAT-16 is the overall accuracy associated with the cut off score is lower than the accuracy achieved by the EAT-26, however, there are 10 less items making is less arduous for participants (McLaughlin, 2014).

The EAT-16 has been found to have acceptable configural and metric invariance as well as internal consistency reliability (Ocker, Lam, Jensen, & Zhang, 2007), and alpha coefficients for the current sample were Factor 1: Self-perception of body shape ($\alpha = 0.90$), Factor 2 Dieting ($\alpha = 0.82$), Factor 3: Awareness of food contents ($\alpha = 0.74$), and Factor 4: Food preoccupation ($\alpha = 0.87$). These four subscales of the (EAT-16) accurately measure behaviours and attitudes relevant to the proposed study and have previously been used with emerging adult populations (Lundahl, Wahlstrom, Christ, & Stoltenberg, 2015; Ocker et al., 2007). Participants indicated the frequency of particular thoughts and behaviours on a 6-point Likert scale ranging from 1 (never) to 6 (always) (McLaughlin, 2014). The EAT-16 items were summed to a total score (as per scoring instructions) (McLaughlin, 2014) with the higher the score the more potential for disordered eating. Total subscale scores were determined (as per scoring instructions) (McLaughlin, 2014) by summing respective items for each subscale: Factor 1 self-perception of body shape (three items range 3-18); Factor 2 dieting (five items range 5-30); Factor 3 awareness of food content (four items range 4-24); and Factor 4 food preoccupation (four items range 4-24). Higher scores reflected more disordered eating attitudes (McLaughlin, 2014). An EAT-16 cut-off score of 41 was considered as disordered eating (McLaughlin, 2014) *(Appendix J)*.

Chapter Five

5

Phase 2: Knowledge and food intake

Mind the gap: Exploring knowledge and food intake of Western Australian university students.

Study 2 abstract

Issue: Evidence suggests emerging adults consistently do not adhere to Australian Guide to Healthy Eating (ADG)-recommended daily serves (RDS). Current Australian research regarding knowledge of ADG-RDS and associations with food intake for this group is scarce.

Methods: This study comprised 287 university students aged 18-25 years. Survey methodology was used to measure knowledge of the Healthy Living Pyramid (HLP) and the ADG-RDS. Food group intakes was measured using a modified Food Frequency Questionnaire. Associations between the HLP, RDS knowledge and daily equivalent frequencies (DEF) scores for each food group were investigated using a generalised linear model (GLM).

Results: Knowledge of HLP for vegetables and extra foods was higher than other food groups. RDS were correctly identified for fruit and vegetable. According to DEF scores, participants did not meet RDS for any food group. There was a positive association between DEF's and correct HLP breads and grains (p= 0.004), vegetables (p=0.008) and fruit (p=0.008). Only correct knowledge of RDS for baked goods and snacks was associated with DEF closer to ADG-RDS (p=0.026). Participants living at home with parents were more likely to adhere to ADG-RDS.

Conclusion: Knowledge of the HLP was more accurate than the ADG-RDS. Correct knowledge of HLP was positively associated with intake for some food groups suggesting knowledge can influence food choice.

So what? This study identified some important findings regarding the effectiveness of the HLP, the sustainability of *Go for 2 & 5* message and the need to develop similar positive messages for other food groups to assist emerging adults adopt lasting healthy eating patterns.

5.1 Introduction

Good nutrition is considered essential for health and wellbeing and is widely accepted as a major factor in the prevention of chronic nutrition-related illnesses (Dagfinn et al., 2011; NHMRCA, 2013; WHO, 2003). The ADG were developed to improve the health of all Australians by providing advice about amounts and types of food required to maintain health (NHMRCA 2013). The Healthy Living Pyramid is a commonly recognised visual representation of the ADG (Lambert et al., 2018; Nutrition Australia, 2016).

Emerging adults, are consistently not following dietary guidelines designed to maintain health and wellbeing (Al-Khamees, 2009; ABS 2018; DOH 2006; Deshpande et al., 2009) and have displayed a general decline in healthy dietary habits as they make more independent food choices (Abraham et al., 2018; Alghamdi et al., 2018; Sogari et al., 2018). Over one-third (36%) of emerging adults total daily energy comes from discretionary foods (AIHW 2018b). For these reasons emerging adults are gaining recognition as an important target group for health promotion (Berry et al., 2018).

The majority of international research conducted with this population has focused on university students, changes to living situation, changes to dietary habits and eating behaviours during these transition years (Alghamdi et al., 2018; El Ansari et al., 2012; Heron, Scott, Sliwinski, & Smyth, 2014; Lee & Yoon, 2014). International students often move from home to university accommodation, while Australian university students have a greater variety of living situations, and those living at home with parents appear to have more disposable income and, therefore, greater access to fast and convenient food options (Whatnall et al., 2019). Nutrition knowledge is assumed to influence food choice, however, emerging adults report finding it difficult to translate dietary guidelines into their food choices (Al-Khamees, 2009; Berry et al., 2018). Australian research involving the nutrition knowledge and eating behaviours of emerging adults is limited (Whatnall et al., 2019).

To date, in Australia, there have been no public health campaigns that target emerging adults' nutrition. The *Go for 2&5* campaign launched in WA in 2002 (Pollard et al., 2007) attempted to increase knowledge of specific number of serves required per day for fruit and vegetables based on ADG-RDS. While it appears that emerging adults have retained the eat 2 fruits and 5 vegetables message they appear to have significant knowledge gaps regarding RDS for other food group (Kothe & Mullan, 2011; Lambert et al., 2018) suggesting that more research is required to investigate the knowledge gaps of emerging adults.

Social media platforms such as Instagram, have been identified by female emerging adults as a source of nutrition knowledge and given these platforms are image based they may contribute to an emphasis on weight control and appearance rather than health (Korda & Itani, 2013; Lambert et al., 2018). Liimakka (2014) identified that female university students were especially aware of the intertwining ideals of physical appearance and health and suggested this group might have more knowledge for attaining these ideals. Current health promotion nutrition messages often focus on long-term health consequences associated with poor diet and, are therefore are considered irrelevant by emerging adults as their focus is on physical appearance (Berry et al., 2018; Lambert et al., 2018). To assist in developing relevant health promotion messages for this population, it is important to explore the current knowledge of ADG-RDS and associations between level of knowledge and food intake of Australian emerging adults. The research questions and hypotheses explored in this study were:

Research question	H_1 Hypothesis
– Are there gender differences in ADG-RDS knowledge and adherence?	There is a difference in nutrition knowledge and food group intake between males and females
– Are there differences in ADG-RDS knowledge and adherence among those living with parent and those living independently?	There is a difference in food group intake between emerging adults living at home with parents and those living independently
– What is the relationship between emerging adults' nutrition knowledge of the ADG-RDS and their adherence to ADG-RDS?	There is an association between nutrition knowledge and food group intake

5.2 Methods

The overarching methodology for the quantitative studies has been described in *Chapter Four*, including participants, procedures, measures and treatment of data. The measures used in this study were the knowledge and the FFQ components of the larger survey.

Data analysis was conducted using SPSS v25 (IBM Corp, Released 2017). Significance was set at $p < 0.05$. Knowledge was determined by responses regarding food group location, correct/incorrect based on HLP and ADG-RDS. '*Don't know*' responses were categorised as incorrect. HLP responses (correct/incorrect) were described using frequency and count. HLP and ADG-RDS (correct/incorrect) and gender differences and living situation differences were examined using Chi square.

Food intake was calculated using the FFQ data to determine Daily Equivalent Frequency (DEF). Food group DEF's were described using mean (M), standard deviation (SD), median (Md) minimum to maximum range. Shapiro-Wilk test identified DEF's were normally distributed for food groups dairy, meat, fish and eggs, vegetables, baked goods and snacks, therefore group differences between gender and living situation were examined using Independent *t* tests. Food group DEF's not normally distributed (grains, fruit, sugar, spreads & dressing and non-milk beverages) were examined using Mann-Whitney *U* test (nonparametric independent *t* test). DEF scores were also categorised as compliant or not compliant based on ADG-RDS (NHMRCA 2013). Gender differences and living situation differences were examined using Chi square.

Associations between food intake and knowledge were investigated using a General Linear Model (GLM) to exploring DEF, HLP and ADG-RDS knowledge (correct/incorrect). A separate GLM was used with DEF for each food group as the dependent outcome, and corresponding food group HLP and ADG-RDS as independent variables, whilst controlling for gender. Assumptions for the GLM were evaluated (residual plots) and there was a large violation at the tails. DEF values were log transformed (natural log) and the resulting GLMs did not violate this assumption on inspection.

5.3 Results

A total of 287 university students aged between 18-25 years completed the survey (*n*=287) for the main study.

The majority of participants correctly identified vegetables (87.5%) as '*eat most'*, discretionary foods (82.2%) as '*eat least'* and dairy (64.8%) as '*eat moderately*.' A little over half correctly identified fruit (58.8%) as '*eat most'* and meat, fish and eggs (53.7%) as '*eat moderately'*. Less than half correctly identified grains (42.9%) as '*eat most*.' As reported in Table 5.1, females consistently had a higher proportion of correct responses compared to males, but the only statistically significantly different results were for meat, fish and eggs (p =.040) and discretionary foods (p = .008).

Table 5.1

Gender differences in Healthy Living Pyramid knowledge for emerging adults

Item	Total N	Percent Correct	Males percent correct	Females percent correct	Gender Difference	
					X^2	p
Fruit	287	58.5%	51.1%	61.8%	2.86	.093
Vegetables	287	87.8%	81.8%	90.5%	4.25	.050
Grains	287	43.2%	39.8%	44.7%	0.61	.442
Meat, fish, eggs	286	52.8%	43.2%	57.1%	4.72	**.040**
Dairy	287	63.1%	56.8%	65.8%	2.13	.185
Discretionary Foods	287	81.2%	71.6%	85.4%	7.65	**.008**

Bold type indicates statistically significant gender difference $p<.05$

Responses for the number of serves recommended by ADG-RDS for each food group are shown in Table 5.2. Fruit and vegetables had the highest percentage of correct responses (79.1% and 81.5% respectively). Apart from fruit and vegetables, the majority of participants indicated they 'don't know' the RDS for grains (69.9%), meat fish and eggs (60.3%), dairy (64.1%) and discretionary foods (59.6%). Only 3.1% of participants identified the correct number of serves for grains.

Table 5.2

Recommended Daily Servings knowledge (frequency and percentage) for adults 19-50 years

Serves N	Fruit 287(%)	Vegetable 287(%)	Grains 286(%)[1]	Meat, fish & eggs 287(%)	Dairy 287(%)	Discretion-ary Foods 287(%)
0	0	0	0	0	1 (0.3)	**62 (21.6)**[b]
1	6 (2.1)	2 (0.7)	28 (9.8)	40 (13.9)	56 (19.5)	**44 (15.3)**[b]
2	**227 (79)**	6 (2.1)	18 (6.3)	46 (16.0)	22 (7.7)	4 (1.4)
2.5	0	1 (0.3)	0	**8 (2.8)**[a]	**3 (1.0)**	0
3	17 (6)	12 (4.2)	11 (3.8)	**13 (4.5)**[a]	14 (4.9)	0
3.5	0	0	0	2 (0.7)	2 (0.7)	0
4	1 (0.3)	1 (0.3)	9 (3.1)	2 (0.7)	1 (0.3)	0
4.5	0	0	2 (0.7)	0	0	0
5	2 (2.1)	**234 (81.5)**	10 (3.5)	1 (0.3)	1 (0.3)	1 (0.3)
6	0	0	**9 (3.1)**	0	0	0
6+	1 (0.3)	2 (0.7)	7 (2.4)	2 (0.7)	3 (1.0)	5 (1.7)
Don't know	29 (10.1)	29 (10.1)	192 (69.9)	173 (60.3)	184 (64.1)	171 (59.6)

Notes: Correct response is **in bold**; % = percentage

[1] One response was missing (0.3%)

[a] 2.5 serves is RDS for females and 3 serves is RDS for males, so 2.5–3 serves was considered correct for this analysis.

[b] Recommended Daily Serves is small amounts, so 0–1 serve was considered correct for this analysis

Table 5.3 summarises food group DEF scores according to gender and living situation. Overall the majority of our participants did not meet the RDS for any food group. Gender differences were statistically significant for dairy (p <.001), grains (p <.001) as well as meat, fish and eggs (p = .032), while mean and median scores did not meet the RDS for these food groups, males were more likely than females to have DEF's closer to the RDS. Living situation group differences were identified for vegetables (p = .024) and grains (p = .001).

Table 5.3

Gender and living situation differences for Food Group daily equivalent frequencies summary

	Parameter	Dairy	Grains	Meat Fish Eggs	Veg	Fruit	Baked Goods snacks	Sugar spreads dressing	Non milk beverages	Discretion-ary Foods[1]
Gender										
Male	N	86	86	87	81	84	81	82	82	79
	Mean	2.82	2.84	2.00	6.81	2.73	1.41	1.81	1.83	5.04
	Md	2.62	2.53	1.88	5.29	2.20	1.15	1.46	1.72	4.62
	SD	1.72	1.79	1.27	7.09	2.37	0.94	1.46	1.25	2.56
	RDS	**2.50**	**6.00**	**3.00**	**6.00**	**2.00**	**<1.00**	**<1.00**	**<1.00**	**<1.00**
Female	N	197	196	198	186	193	189	194	192	187
	Mean	1.92	2.04	1.42	6.84	3.26	1.17	1.66	1.65	4.47
	Md	1.57	1.73	1.28	5.93	2.55	0.92	1.48	1.21	4.16
	SD	1.31	1.49	0.82	4.11	2.58	0.87	1.11	1.33	2.25
	RDS	**2.50**	**6.00**	**2.50**	**5.00**	**2.00**	**<1.00**	**<1.00**	**<1.00**	**<1.00**
Total	N	283	282	285	267	277	270	276	274	266
	Mean	2.19	2.27	1.59	6.83	3.10	1.24	1.70	1.71	4.64
	Md	1.75	1.94	1.44	5.71	2.43	0.98	1.47	1.29	4.33
	SD	1.51	1.63	1.01	5.18	2.53	0.88	1.23	1.31	2.36
Group Difference	Statistic	4.35[a]	-4.32[b]	3.94[a]	-.051[a]	-1.92[b]	1.99[a]	-.156[b]	-1.53	-1.69[b]
	p-value	<.001	<.001	.032	.342	.054	.238	.876	.126	0.92

	Parameter	Dairy	Grains	Meat Fish Eggs	Veg	Fruit	Baked Goods snacks	Sugar spreads dressing	Non milk beverages	Discretion-ary Foods[1]
Living Situation										
Living with Parents	N	216	214	217	204	211	206	209	206	203
	Mean	2.27	2.41	1.59	6.56	3.15	1.31	1.76	1.70	4.76
	Md	1.92	2.09	1.44	5.70	2.50	1.06	1.47	1.33	4.45
	SD	1.52	1.60	0.92	5.08	2.47	0.91	1.29	1.27	2.45
Living Independently	N	67	68	68	63	66	64	67	68	63
	Mean	1.96	1.89	1.61	7.71	2.95	1.01	1.53	1.72	4.24
	Md	1.47	1.57	1.44	5.92	2.13	0.74	1.49	1.22	4.17
	SD	1.31	1.65	1.28	5.45	2.72	0.82	1.00	1.42	1.99
Group Difference	Statistic	1.43[a]	-3.23[b]	-.101[a]	-1.484[a]	-1.40[b]	2.349[a]	-.759[b]	-.258[b]	-.980[b]
	p-value	.725	.001	.429	.024	.160	.172	.448	.797	.327

Note: RDS for male and females are **in bold**
Grey shading indicates food items combined to form the category - Discretionary foods.
% Adherent was determined based on a 1DEF range above recommended daily intake.
[1] BGS, SSD & NMB were combined to create extra foods DEF
[a] Independent t-test statistic
[b] Mann-Whitney U standardised statistic

General linear models explored for each food group and any associations between RDS and HLP knowledge and DEF (log transformed), controlling for gender are reported in Table 5.4. A positive association with correct HLP knowledge was reported for DEF vegetables (p = .008), DEF fruit (p .008) and DEF grains (p = .004). This indicates that, in this sample, participants with the correct HLP knowledge also reported DEF scores closer to that recommended. For DEF baked goods and snacks, there was a negative association with correct RDS (p = .026), indicating that participants with correct knowledge of RDS also reported consuming lower servings, aligning with the recommended RDS.

Table 5.4

Generalised linear model models: Log transformed daily equivalent frequencies with RDS serves and Healthy Food Pyramid (HFP) (correct/incorrect), controlling for gender

				95% confidence Interval (β)		
Model Food Group	**Parameter**	**β Estimate**	**SE**	**Lower bound**	**Upper bound**	***p-value***
Dairy	Intercept	bb	0.09	0.31	0.65	**.003**
	RDS[a]	-0.15	0.36	-0.85	-0.55	.673
	HLP[a]	-0.12	0.10	-0.31	-0.07	.217
	Gender[b]	0.39	0.10	0.19	0.59	**<.001**
Grains	Intercept	0.36	0.07	0.21	0.50	**<.001**
	RDS[a]	-0.33	0.26	-0.83	0.18	.203
	HLP[a]	0.27	0.09	-0.09	0.46	**.004**
	Gender[b]	0.34	0.10	0.13	0.54	**.001**
Meat, Fish & eggs	Intercept	0.17	0.09	-0.01	0.36	.173
	RDS[a]	-0.29	0.25	-0.78	0.21	.254
	HLP[a]	-0.15	0.13	-0.37	0.07	.180
	Gender[b]	0.44	0.12	0.20	0.68	**<.001**
Vegetables	Intercept	1.36	0.14	1.08	1.65	**<.001**
	RDS[a]	0.09	0.12	-.015	0.33	.474
	HLP[a]	0.33	0.12	0.09	0.57	**.008**
	Gender[b]	0.04	0.13	-0.21	0.29	.758
Fruits	Intercept	0.68	0.13	0.42	0.95	**<.001**
	RDS[a]	0.03	0.13	-0.22	0.28	.810
	HLP[a]	0.28	0.10	0.08	0.49	**.008**
	Gender[b]	-0.16	0.11	-0.38	0.06	.156

Model Food Group	Parameter	β Estimate	SE	95% confidence Interval (β)		*p-value*
				Lower bound	Upper bound	
Baked goods & snacks	Intercept	0.09	0.13	-0.16	0.35	.848
	RDS[a]	-0.23	0.10	-0.43	-0.03	**.026**
	HLP[a]	-0.14	0.13	-0.40	0.11	.262
	Gender[b]	0.21	0.11	-0.00	0.42	.055
Discretionary Food	Intercept	1.39	0.09	1.22	1.57	**<.001**
	RDS[a]	0.05	0.07	-0.09	0.19	.488
	HLP[a]	-0.06	0.09	-0.24	0.12	.515
	Gender[b]	0.11	0.08	-0.04	0.26	.147

[a]Reported group is response *correct*, with comparison group response *incorrect* set to zero
[b]Reported group is *male*, with comparison group *female* set to zero
β – beta; SE – standard error of the β estimate
Bold type indicates statistical significance *p*<.05

5.4 Discussion

A novel aspect of this study was exploring associations between knowledge of the HLP and ADG- RDS and food intake among Australian university students. Findings suggest that while HLP knowledge was generally high, ADG-RDS knowledge was poor for most food groups. The high percentage of correct responses for RDS fruit and vegetables suggests that the *Go for 2 & 5* message, which ran in Western Australia from 2002 – 2012, contributed to the RDS knowledge for fruit and vegetables and seems to have been sustained over time (Pollard, Miller, Woodman, Meng, & Binns, 2009; Pollard et al., 2007; Woolcott Research, 2007). For all other food groups the majority of participants chose *'don't know'*, confirming previous findings regarding knowledge gaps among this group (Abraham et al., 2018; Kothe & Mullan, 2011; Lambert et al., 2018). This may be in part because the RDS for the core food groups vary according to age and gender and there are no clear health promotion messages about food groups other than fruit and vegetables. This may be causing some confusion regarding which ones are appropriate for our participants. Clear messages regarding all core food group may be beneficial.

Participants who reported correct HLP knowledge for vegetables and fruit were more likely to consume close to the RDS. An unexpected finding was the positive association between knowledge of grains and likelihood of consuming closer to RDS, given the majority (96.9%) incorrectly identified the RDS for grains and had DEF's of less than half the RDS. It is likely therefore, that the very small number of participants who knew the

RDS for grains also consumed closer to the recommend intake, supporting the need to improve knowledge for this group (Berry et al., 2018; Farringdon et al., 2019). Developing positive 'do' messages like *Go for 2 & 5* for all the food groups has been suggested for adolescents (Farringdon et al., 2019). These findings indicate that this may also be useful for emerging adults.

DEF scores were used as a point of comparison with ADG-RDS and results support the ABS (2018) that emerging adults are less likely to comply with ADG-RDS than older adults. Interestingly our participants recorded DEF's for vegetables and fruits above the ADG-RDS, which is contrary to findings of ABS (2018). This further suggests that the *Go for 2 & 5* message may be having an ongoing influence on intake of those foods. Perhaps given their knowledge, they may have been providing socially desirable responses that do not accurately reflect what they are actually eating. Of concern, our participants reported higher than recommended intake of fruit which may be due to the HLP as fruit is located on the bottom layer '*eat most'* section (Nutrition Australia, 2016). Higher than recommended fruit intake could be problematic due to its high-sugar content, hence these results support the recommendation by Farringdon et al. (2019) to move fruit higher on the pyramid to an '*eat moderately'* position to alleviate potential confusion.

No participants complied with ADG-RDS for grains, and there was very low compliance in all other food groups supporting the needs for clearer messages focused on increasing understanding of RDS to assist in improving adherence for all food groups (Carter, Pollard, Atkins, Marie Milliner, & Pratt, 2011). While not meeting the RDS, males in this study were more likely to consume close to the RDS for dairy; grains; and meat, fish and eggs, possibly because male emerging adults have reported a desire to look 'fit, lean and muscular' (Lambert et al., 2018; Morgan et al., 2012) and may associate these food groups with achieving this body ideal. In contrast, females reported a desire to look 'slim' (Lambert et al., 2018; Morgan et al., 2012), therefore, they may be avoiding these food groups due to lack of knowledge regarding the weight management benefits of these food groups (NHMRCA, 2013; Williams et al., 2008). Study participants identified social media as their main source of nutrition knowledge (Korda & Itani, 2013; Lambert et al., 2018), and these platforms often promote gender specific body ideals, that could be contributing to body image concerns and may be affecting food choices as a way of achieving this ideal. More research should explore how these social media platforms can be used to promote healthy weight as the ideal and that compliance with ADG-RDS of all food groups may be an effective strategy to achieve a healthy body ideal (Farringdon et al., 2019).

Discretionary foods were the second highest DEF's for both males and females which is consistent with the ABS (2018). This is of concern given approximately one third of 18-24 year old Australians are considered overweight or obese (AIHW 2018b). This finding is interesting as weight concerns have been identified as a predictor of dieting and disordered eating in adolescence and emerging adults (Loth, MacLehose, Bucchianeri, Crow, & Neumark-Sztainer, 2014). It is possible that like adolescents, emerging adults restrict food group intake of foods considered fattening (grains and dairy) to compensate for their high consumption of energy dense discretionary foods (Farringdon et al., 2019). Therefore, accurate information related to increase consumption of some foods, such as wholegrains being associated with weight management (Williams et al., 2008), may be considered more relevant to this target group. Given the importance of a slim body type for adolescents and emerging adults, females in particular (Lambert et al., 2018; Liimakka, 2008; Tiggemann & Miller, 2010), further investigation of the associations between DEF's and influences on eating behaviour including body satisfaction is recommended.

Interestingly, living independently was associated with higher intake of vegetables and higher percentage of compliance for food groups; baked goods and snacks; sugar, spreads and dressing and non-milk beverages than those living at home with parents. While the explanation of this result is complex, it may be related to the availability of these foods for those living at home, and budget constraints when living independently (El Ansari et al., 2012; Sogari et al., 2018). As parents are often responsible for purchasing groceries and as such, they determine the food available for consumption which may explain why more snack foods being consumed by those living at home with parents.

The findings of this study must be considered in light of some limitations as results may differ if the study occurred at a different time with different participants due to the cross- sectional design. While the study was adequately powered, the fact that all participants were university students and therefore, have a higher level of education, makes it difficult to generalise findings to the broader emerging adult population. The FFQ was piloted with emerging adults to ensure face and content validity and test-retest showed no significant differences in response between tests suggesting it was a reliable tool. However, it was not compared against actual dietary intake or any other measure (e.g. 24-hour recall) to test its concurrent validity. While self-reported FFQ have limitations, it is still regarded as a robust measure which is widely used due to its low cost, being easy to administer, and permitting comparison across studies (Daly et al., 2011; DoH 2006). As serving size was not measured, it is not possible to make direct comparisons to

ADG-RDS. The DEF's did, however, provide an estimated comparison and the estimated food group consumption was similar to the recent ABS (2018) results over the same study period. Due to the majority of participants studying in the health-related areas, it is possible that they may have been providing socially desirable responses especially regarding vegetable and fruits intake, given the ongoing emphasis of the health importance of eating plenty of these foods.

5.5 Implications for research and practice

This study confirms that the *Go for 2 & 5* fruit and vegetable campaign message has been sustained over time and appears to have influenced our participants RDS knowledge for these food groups. This is important as the majority of participants choose the *'don't know'* option when identifying the ADG-RDS for all other core food groups. Poor knowledge of RDS (other than fruit and vegetables) no compliance with RDS for grains, and very low compliance in all other food groups suggests the need for messages similar to *Go for 2 & 5* for all food groups. The current study findings echo Farringdon et al. (2019) call for the promotion of clear, targeted, clear positive messages about the recommended daily serves for all food groups. Low consumption of grains may be a consequence of weight concerns fueled by societal attitudes to 'body ideals' promoted particularly on social media however, further research is recommended to explore these associations. If food choices of emerging adults are in fact, driven by weight and appearance concerns this creates a challenge for health promoters in encouraging compliance with ADG-RDS for all food groups. Refocusing nutrition health promotion messages to a positive 'do' approach and establishing foods such as wholegrains for aiding in weight management may encourage more emerging adults to adhere to ADG-RDS as they are establishing independence and adopting lasting health behaviour pattern.

Chapter Six

6

Phase 2: Influences on food intake

Power of influence: Exploring what influences food choices of Western Australian university students.

Study 3 abstract:

Issue addressed: In the previous studies knowledge gaps and inadequate nutrition in 18-25year old Australian university students have been established. Australian research regarding potential influences on university student's nutrition knowledge and intake is scarce. Therefore, this study adds to previous work providing a comprehensive picture of influences on eating related behaviours among WA university students.

Methods: This cross-sectional study identified influences on knowledge, eating behaviour and food purchases using survey methodology. Students 18-25 years (n=287) from one WA university self-selected to participate. Influences on nutrition knowledge and food intake were identified. Associations between influences on knowledge, food intake and food purchases with correct knowledge of the Australian Dietary Guidelines (ADG) and food intake daily equivalent frequencies (DEF summed score) for each food group were investigated using a generalised linear model.

Results: Significantly more females than males indicated Instagram/Facebook influenced knowledge (p <.001). Gender differences in influences on eating behaviour were significant with more females than males reporting weight concerns (p <.001), appearance concerns (p = .035) and Instagram/Facebook (p <.001) influencing what they ate. Food purchases were primarily influenced by price of food and convenience. When controlling for gender, participants who reported knowledge influenced eating behaviour had higher intakes of fruit (p = .005) and those who reported weight concerns influenced eating behaviour had lower intake of grains (p =.047).

Conclusion: Influences on knowledge and eating behaviours differ. Weight and appearance concerns both significantly influence eating behaviours particularly for females. Price of food and convenience influences food purchase.

So what? Social media, weight and appearance concerns are significant influences on eating behaviour which seems to result in lower consumption of some core food groups including grains. This suggests the need for further research to identify how influences can be modified to include RDS for all core food groups.

6.1 Introduction

The influences on children and adolescent eating habits have been studied extensively, identifying influences such as cultural background, family rules and parental modelling, increase in the number of working parents, food availability, food used as a reward, the frequency of shared family meals, television viewing habits and marketing (Birch, 1999; Cusatis & Shannon, 1996; du Plessis, 2011; Haerens et al., 2008; Hastings et al., 2003; Nelson Laska, Larson, Neumark-Sztainer, & Story, 2009; Neumark-Sztainer et al., 1999; Savage et al., 2007; Van den Bulck & Van Mierlo, 2004; Walsh & Nelson, 2010). Little research however, has examined the evolving social influences affecting the food intake of emerging adults (Nelson et al., 2008; Pelletier, Graham, & Laska, 2014; Ruddock et al., 2019), particularly Australian university students. What has been established is that healthy dietary habits decline as emerging adults leave home and there is a higher risk of consuming fast food (Alghamdi et al., 2018; Bargordo et al., 2013; Harris et al., 2006).

Emerging adults live busy social lives, and appear to make dietary decisions based on convenience, time constraints, price and taste, rather than nutritional content (Deliens et al., 2014; Devine et al., 2006; Fisher et al., 2016; Vereecken et al., 2015). A study by Lee and Yoon (2014) involving Korean college students found that those living independently were more likely to skip breakfast, replace meals with snacks and convenient foods including confectionary and instant noodles. They also reported that convenience was a significant factor in Korean college students' food choice (Lee & Yoon, 2014). Convenience food are heavily marketed and aimed to motivate the viewer's desire to eat more, with approximately a third to a half of television commercials being food-related (Kemps et al., 2014). Research involving Australian adults found that this cumulative exposure was associated with higher levels of fast food consumption (Scully, Dixon, & Wakefield, 2008). Over the past decade food advertising has heavily targeted young people with the aim of securing a future consumer base by establishing brand loyalty (Brownbill et al., 2018; Nelson et al., 2008). Australian research has focussed on advertising influence on children and adolescents and parents (Chapman, Nicholas, & Supramaniam, 2006) and adults (Sainsbury et al., 2017; Scully et al., 2008) but there is little involving emerging adults. Traditionally, television has been the preferred medium for health promotion however, with internet and social media widely used among this target group it may be an important medium to use for future health promotion messages.

According to Australian data, emerging adults are the group most likely to access social media first thing in the morning (79%) and last thing at night (29%) (Sensis, 2017). Social media platforms are increasingly utilised by manufacturers of convenience foods, soft drinks, and sports and energy drinks. Regular consumption of soft drinks correlates with frequency of consumption of snack foods, burgers, pizza and hot dogs, with young adult males being the highest consumers (Alghamdi et al., 2018; Rombaldi et al., 2011). Brownbill et al. (2018) reported that companies align their marketing with activities that are likely to be regarded as important by adolescents and emerging adults. Mayfield et al. (2014) found that American college students reported dining out regularly with 43.1% reporting eating out at least once a week and heavily advertised chain restaurants were the most frequently visited. Reinforcing these marketing messages is the influence of peers and the importance of social networks for emerging adults. Evidence continues to show that social networks are an important influence on eating behaviour with individuals reporting they often feel that they do not have any peer support to eat healthy food (Kelly et al., 2013; Ruddock et al., 2019). McArthur and Pawlak (2011) also argued that emerging adults perceived the important people in their lives do not enjoy consuming healthy food and this affects their own food choices.

Understanding the role of these influences will inform future health promotion campaigns that target emerging adults. Therefore, identifying what influences eating behaviours and food purchases and exploring the impact of transitioning from living with parents to living independently has on food intake is recommended (Kothe & Mullan, 2011; Nelson et al., 2008; Richards et al., 2006). While international research provides important insights there is a need to explore these factors in an Australian context. Hence, the research questions and hypotheses examined in this study were:

Research question	H_1 Hypothesis
– Are there gender differences in what influences nutrition knowledge, eating behaviour and food purchases of emerging adults?	There is a difference between influences on nutrition knowledge, eating behaviour and food purchases between males and females
– Are there living situation differences in what influences on nutrition knowledge, eating behaviour and food purchases of emerging adults?	There is a difference between influences on nutrition knowledge, eating behaviour and food purchases of emerging adults living at home with parents compared to those living independently
– Is there any relationship between influences on nutrition knowledge and food group intake?	There is an association between influences on knowledge and food group intake
– Is there any relationship between influences on nutrition knowledge and correct ADG-RDS knowledge?	There is an association between influences on knowledge and correct ADG-RDS knowledge
– Is there any relationship between influences on eating behaviour and food group intake?	There is an association between influences on eating behaviour and food group intake
– Is there any relationship between influences on eating behaviour and correct ADG-RDS knowledge?	There is an association between influences on eating behaviour and correct ADG-RDS knowledge
– Is there any relationship between influences on food purchases and food group intake?	There is an association between influences on food purchases and food group intake

6.2 Methods

The overarching methodology for the quantitative studies has been described in *Chapter Four*, including participants, procedures, measures and treatment of data. The specific measures used in this study were the knowledge, the FFQ and the influences on knowledge and food intake components of the larger survey to investigate the influences on nutrition knowledge, eating behaviour and food purchases and examined the association between these influences and previously reported HLP, ADG-RDS, and food intake (DEF) (*Chapter Five*).

The influences on nutrition knowledge, eating behaviour and food purchases were identified during the qualitative Phase 1 focus group interviews in response to the prompts '*What influences what you choose to eat?*' and '*Do you use anything specifically to get nutrition information (for example internet)?*' (Lambert et al., 2018). Hence, influences on knowledge examined in this study included: school-based programs; peers; parent/family; television; food advertisements; healthy food promotion; internet; Instagram/Facebook; YouTube. Influences on eating behaviour examined in this study included; school-based programs; peers; parent/family; television; food advertisements; healthy food promotion; nutrition knowledge; weight concerns; other appearance concerns; health concerns; internet; Instagram/Facebook. Influences on food purchases

included: price of food; quality and freshness; cooking skill; taste; how much money available to spend; convenience; family habit/routine; availability of food where I shop; someone else decides. Participants were asked to select all items they perceived influenced their knowledge, eating behaviour and food purchases.

Data was analysed using SPSS version 26 (IBM Corp, Released 2018). Alpha was set for significance $p < .05$. Each influence on nutrition knowledge, eating behaviour and food purchases (yes/no) was described by frequency and percentage. Differences between influences on knowledge, eating behaviour and food purchases with demographic variables gender (male/female) and living situation (home with parents/independent) were examined using Fisher's Exact Chi-square Test statistic for cell counts less than five with exact *p*-value 2-sided reported. The Fisher's Exact Chi-square was also used to determine whether there were significant differences on the same influence between knowledge (yes/no) and eating behaviour (yes/no).

Exploration of the association between each influence (yes/no) on actual knowledge of each ADG-RDS (correct/incorrect) was examined using univariate binary logistic generalised linear models (BL-GLM), controlling for gender. Univariate generalised linear models (GLM) were used to explore associations between each influence on knowledge, eating behaviour, and food purchases with previously reported DEF summed scores [logged transformed] for each food group, controlling for gender. As previously described (*Chapter Four*) inspection of the residual plots for the GLM found a large violation at the tails which was overcome by log transforming the outcome DEF summed score.

Final multivariable GLMs were used to explore the combined associations between statistically significant influences on knowledge, eating behaviour and food purchases on food intake (DEF) controlling for gender. Living situation was previously identified as having a statistically significant association with vegetables and grains intake (*Chapter Five*) hence, living situation was included as a factor for those respective GLMs.

6.3 Results

The study sample of 287 university students (female *n*=199 69%) reported influences on their nutrition knowledge as described in Table 6.1. The majority of participants indicated that school-based programs (82.2%) and parents / family (82.2%) influenced their nutrition knowledge. More females (78.9%) compared to males (57%) identified healthy food promotion (p =.013) and Instagram/Facebook (71.2% compared to males 38.6% p <.001) influenced their nutrition knowledge. More participants who reported living at home with parents identified parents / family (85.4% compared to 72.1% living independently p = .018), healthy food promotion (77.6% compared to 64.7% living independently p = .039) and internet / google (73.5% compared to 66.2% living independently p = .028) influenced their nutrition knowledge.

Table 6.1

Influences on knowledge (yes/no) including gender and living situation group differences

Influence on knowledge	Yes (%)	No (%)	Gender difference		Living situation difference	
			χ^2	*p*-value	χ^2	*p*-value
School Education	236 (82.2)	50 (17.4)	1.00	.867	0.00	1.000
Peers	191 (66.6)	94 (32.8)	0.82	.412	0.58	.462
Parents/family	236 (82.2)	51 (17.8)	3.22	.093	6.31	**.018**
Television	151 (52.6)	134 (46.7)	0.01	1.000	0.71	.407
Food ads	149 (51.9)	137 (47.7)	1.54	.249	3.19	.095
Healthy food promotion	214 (74.6)	73 (25.4)	6.42	**.013**	4.57	**.039**
Internet / google	206 (71.8)	81(28.2)	3.07	.089	1.38	**.028**
Instagram /Facebook	175 (61.0)	111 (38.7)	27.22	**<.001**	0.16	.776
YouTube	76 (26.5)	209 (72.8)	0.00	1.000	0.07	.875

% - percentage χ^2 = Fisher's Exact Chi Square Test.
Bold type indicates statistical significance p<.05
Note. Where total percentage yes/no do not add to 100%, the unaccounted percentage represents missing responses. No more than three missing responses per item were present

Influences on eating behaviour are described in Table 6.2. The majority of participants indicated that parents / family (88.2%) and nutrition knowledge (86.1%) influenced their eating behaviour. Gender differences were identified for healthy food promotion (p = .049), weight concerns (p <.001), other appearance concerns (p = .035) and Instagram/Facebook (p <.001). In all instances more females (64.8%, 83.8%, 75%, 60.9%) identified these as influences on eating behaviour than males (52.3%, 63.6%, 62.5%, 31.8%) respectively. Living situation differences were identified with more participants who reported living at home with parents (92.2%) identifying parents / family as an influence on eating behaviour compared to those living independently (76.5%, p <.001).

Table 6.2

Influences on eating behaviour (yes/no) including gender and living situation group differences

Influence on eating behaviour	Yes (%)	No (%)	Gender difference		Living situation difference	
			χ^2	*p*-value	χ^2	*p*-value
School Education	172 (59.9)	113 (39.4)	0.00	1.000	0.31	.670
Peers	214 (74.6)	70 (24.4)	1.13	.299	0.01	1.000
Parents/family	253 (88.2)	33 (11.5)	0.11	.814	12.57	**<.001**
Television	105 (36.6)	180 (62.7)	2.08	.184	0.09	.886
Food advertisements	134 (46.7)	151 (52.6)	0.37	.608	0.07	.889
Healthy food promotion	173 (60.3)	111 (38.7)	4.00	**.049**	0.95	.393
Nutrition knowledge	247 (86.1)	39 (13.6)	0.14	.712	1.75	.227
Weight concerns	221 (77.0)	64 (22.3)	14.14	**<.001**	2.02	.184
Appearance concerns	202 (70.4)	82 (28.6)	4.62	**.035**	0.04	.879
Health concerns	229 (79.8)	57 919.9)	0.24	.749	0.02	.863
Internet / google	115 (40.1)	170 (59.2)	0.43	.601	0.95	.396
Instagram /Facebook	148 (51.6)	137 (47.7)	20.62	**<.001**	0.13	.781

% - percentage χ^2 = Fisher's Exact Chi Square Test.

Bold type indicates statistical significance p<.05

Note. Where total percentage yes/no do not add to 100%, the unaccounted percentage represents missing responses. No more than three missing responses per item were present

Table 6.3 describes influences on food purchases with price of food (92%), quality and freshness (91.6%) and taste (91.3%) being the most common influences. Few significant group differences were found. More females (93.9%) reported purchasing food for taste (p = .039) compared to males (86.4%). Living situation was significant for 'someone else decides for me' (p <.001) with the majority of participants living independently (91.2%) indicating this does not influence their food purchase compared to living at home with parents (69.7%).

Table 6.3

Influences on food purchases (yes/no) including gender and living situation group differences

Influence on food purchases	Yes (%)	No (%)	Gender difference		Living situation difference	
			χ^2	*p*-value	χ^2	*p*-value
Price of food	264 (92.0)	23 (8.0)	0.00	1.000	0.63	.446
Quality and freshness	263 (91.6)	24 (8.4)	0.58	.490	0.71	.464
Cooking skill	175 (61.0)	111 (38.7)	1.02	.358	0.01	1.000
Taste	262 (91.3)	24 (8.4)	4.55	**.039**	2.72	.130
How much money I have	252 (87.8)	35 (12.2)	1.14	.333	2.47	.130
Convenience	229 (79.8)	57 (19.9)	0.22	.634	0.72	.390
Habit, routine (family, habits)	217 (75.6)	69 (24.0)	0.28	.654	3.30	.076
Availability of food	197 (68.6)	90 (31.4)	0.03	.891	0.25	.654
Someone else decides for me	72 (25.1)	214 (74.6)	0.71	.461	12.66	**<.001**

% - percentage χ2 = Fisher's Exact Chi Square Test.
Bold type indicates statistical significance p<.05
Note. Where total percentage yes/no do not add to 100%, the unaccounted percentage represents missing responses. No more than one missing response per item was present

Of the eight common influences, all reported a significant difference between influences on knowledge (yes/no) and influences on eating behaviour (yes/no) combinations (Table 6.4). The most frequently reported influence on both knowledge and eating behaviour was parents / family (78.7%) followed by school nutrition education programs (59.3%), peers (57.4%) and healthy food promotion (55.6%). Of interest, almost one quarter (23.2%) of participants reported school education influenced their knowledge but not eating behaviour, and one third (33.7%) identified internet/google influenced knowledge but not eating behaviour.

This study examined the associations between influences on nutrition knowledge with previously reported RDS *(Chapter Five)* using binary logistic GLM. Participants were more likely to correctly identify RDS for fruit if they reported the following influences on their nutrition knowledge: peers (OR = 1.87, CI = 1.04 – 3.39, p =.038), television (OR = 2.16, CI = 1.20 – 3.92, p = .011), food advertisements (OR = 2.96, CI 1.58 – 5.48, p = .001) and healthy food promotion (OR =2.06, CI = 1.11 – 3.58, p = .023). While not statistically significant, it is worth noting that where family and parents were reported as an influence, participants were 1.8 times more likely to have correct RDS for fruit (OR = 1.8, CI = 0.91 – 3.62, p = .093), and where Instagram and Facebook was identified as an influence participants were 1.41 time more likely to have correct RDS for fruit (OR = 1.41, CI = 0.76 – 2.50, p = .274). No statistically significant findings were found for vegetables and extra foods RDS. Only a small number of participants correctly reported the RDS for meat, fish and eggs (n=15), grains (n=10) and dairy (n=5), but this was not sufficiently powered for statistical modelling.

Table 6.4

Items reporting a significant difference between Influences on knowledge and influences on eating behaviour

Influences	Yes knowledge & Yes eating behaviour	Yes knowledge & No eating behaviour	No knowledge & Yes eating behaviour	No knowledge & No eating behaviour	X^2	*p-value*
School education (n=284)	169 (59.3%)	66 (23.2%)	3 (1.1%)	47 (16.5%)	74.86	**<.001**
Peers (n=286)	163 (57.4%)	27 (9.5%)	51 (18.0%)	43 (15.1%)	33.71	**<.001**
Parents / family (n=284)	225 (78.7%)	10 (3.5%)	28 (9.8%)	23 (8.0%)	68.47	**<.001**
Television (n=285)	80 (28.2%)	70 (24.6%)	24 (8.5%)	110 (38.7%)	38.26	**<.001**
Food ads (n=284)	93 (32.6%)	55 (19.3%)	41 (14.4%)	96 (33.7%)	30.93	**<.001**
Healthy food promotion(n=284)	158 (55.6%)	53 (18.7%)	15 (5.3%)	58 (20.4%)	67.25	**<.001**
Internet / google (n=285)	108 (37.9%)	96 (33.7%)	7 (2.5%)	74 (26.0%)	47.27	**<.001**
Instagram / Facebook (n=285)	130 (45.6%)	44 (15.4%)	18 (6.3%)	93 (32.6%)	92.90	**<.001**

% = percentage χ^2 = Fisher's Exact Chi Square Test**.**
Bold type indicates statistical significance p <.05

Associations between influences on knowledge, eating behaviour and food purchases with previously reported food group intake (DEF) *(Chapter Five)* were explored using a univariate GLM with statistically significant findings reported in Table 6.5. No significant influences were associated with dairy intake. Food advertisements, healthy food promotion and YouTube were the only significant influences on knowledge found across DEF food groups. Higher vegetable intake was recorded for participants that identified food advertisements influenced their nutrition knowledge (p = .045). Lower intake of breads, cereals and grains was recorded for participants who indicated food advertisements (p = .040) and although not reaching statistical significance health food promotion influenced their knowledge (β = *-0.22 SE=0.11* p = .050). Participants had higher intake of meat, fish and eggs (p =.001) when YouTube was identified as an influence on knowledge. No statistically significant influences on knowledge were identified in the multivariable GLM when controlling for gender and living situation.

Table 6.5

Summary of Generalised Linear Model statistically significant associations between influences on knowledge, eating behaviour, food purchases and food intake (log-transformed DEF)

	DEF Food Group	Intake	β Estimate	SE	*p*-value
Influence on knowledge					
Food advertisements	Vegetables	↑	0.16	0.08	.045
	Grains	↓	-0.20	0.10	.040
Youtube	Meat, Fish & Eggs	↑	0.40	0.12	.001
Influence on eating behaviour					
Nutrition Knowledge	Fruit	↑	0.41	0.15	.005
	Vegetables	↑	0.50	0.12	<.001
Health concerns	Fruit	↑	0.30	0.13	.019
	Vegetables	↑	0.29	0.10	.003
Food Advertisements	Fruit	↓	-0.20	0.10	.045
	Meat, Fish & Eggs	↑	0.23	0.11	.039
Weight concern	Fruit	↓	-0.26	0.13	.040
	Grains	↓	-0.23	0.12	.047
Healthy food promotion	Vegetables	↑	0.21	0.08	.011
Parent / family	Meat, Fish & Eggs	↑	0.44	0.17	.010

	DEF Food Group	Intake	β Estimate	SE	*p*-value
Influence on food purchase					
Quality and freshness	Fruit	↓	-0.44	0.18	.018
	Vegetables	↓	-0.32	0.15	.029
Cooking Skills	Fruit	↑	0.28	0.10	.007
Convenience	Fruit	↑	0.34	0.12	.008
	Vegetables	↓	-0.40	0.10	<.001
How much money I have	Vegetables	↑	0.32	0.12	.010
Someone else decides	Grains	↓	-0.29	0.11	.007
Family routine	Meat, Fish & Eggs	↓	-0.31	0.13	.019

β = beta; SE = standard error of the estimate

When examining eating behaviour, the most commonly identified influences were nutrition knowledge, health concerns, food advertisements, weight concerns, healthy food promotion, and parent/family. Participants who reported nutrition knowledge and health concerns as an influence on eating behaviour had higher intakes of fruit (p = .005 and p = .019 respectively), while those who reported food advertisements and weight concerns as an influence on eating behaviour had lower intakes of fruit (p = .045 and p =.040 respectively). Higher intake of vegetables was reported for those who indicated healthy food promotion (p =.011), nutrition knowledge (p <.001) and health concerns (p =.003) influenced eating behaviour. Participants who reported weight concerns as an influence on eating behaviour had lower intake of grains (p =.047). Higher meat, fish and eggs intake was found when parents / family (p =.010) and food advertisements (p =.039) were identified as an influence on eating behaviour. Although not reaching statistical significance, it was of interest to note that higher intakes of baked goods and snacks were found when parents /family ($\beta = 0.30$ $SE=0.16$ p = .052) were reported as an influence on eating behaviour.

Differences for influences on food purchases were found across the DEF food groups. Participants had lower intake of fruit when quality and freshness (p =.018) were reported as an influence and higher intake when cooking skill (p =.007) and convenience (p =.008) was reported as an influence on food purchase. Lower intake of vegetables was associated with quality and freshness being an influence of food purchase (p =.029) with higher intake of vegetables reported when amount of money available (p =.010) and convenience (p <.001) were reported as an influence on food purchase. Participants had lower intake of grains when they reported someone else decides what they eat (p =.007). Meat, fish and

eggs was associated with lower intake when habit and family routine were identified as an influence on food purchase (p =.019).

A multivariable GLM examining all statistically significant influences identified that not all items remained statistically significant. Neither food advertisements nor healthy food promotion remained significant influences on knowledge when controlling for gender and living situation. For fruit weight concerns (p = .007), health concerns (p =.049) and nutrition knowledge (p =.017) all remained significant influences on fruit intake. Interestingly, a participant who is only concerned with weight ate 0.3 DEF less fruit (β=0.3, CI -0.6 to -0.1), while a participant who indicated that they were concerned about their health (β-=0.3, CI 0 to 0.5) and were influenced by level of nutrition knowledge (β=0.4, CI 0.1 to 0.7) ate 0.7 DEF more fruit. Nutrition knowledge remained a significant influence for vegetable intake when controlling for gender and living situation indicating participants who were influenced by level of nutrition knowledge (β=0.4 - CI = 0.2 to 0.7) ate 0.4 DEF more vegetables.

For influences on food purchase the multivariable GLMs showed for fruit intake (DEF), quality and freshness (p =.010) and cooking skill (p =.014) remained significant. For example, model estimates indicated a participant who is only influenced by quality and freshness will eat 0.5 DEF less fruit (β=-0.5, CI -0.1 to -0.8), while a participant who indicated that they were influenced by cooking skill (β= 0.3, CI 0.5 to 0.01) will eat 0.3 DEF more fruit. For vegetables, convenience remained the only significant influence on food intake, controlling for gender and living situation indicating that a participant who was influenced by convenience (β = -0.4, CI -0.5 to -0.02) ate 0.4 DEF less vegetables.

6.4 Discussion

To the authors knowledge this is the first Australian study to report on emerging adults' perceived influences on knowledge, eating behaviour and food purchases. This study builds on previous work (*Chapter Five)* to explore how these influences are associated with knowledge of the ADG-RDS and food intake (DEF).

The results of this study indicate that school programs and parents were the largest influence on emerging adults' nutrition knowledge. However, while school programs influence knowledge (82%) it seems they have much less influence on eating behaviour (59%), as this does not seem to translate into actual eating behaviour (DEF). These Australian results concur with Fisher et al. (2016) who concluded their South African emerging adults' food choices were not necessarily due to lack of information, suggesting

that emerging adults may find it difficult to translate nutrition knowledge into food choices. It also suggests they may not be aware of what is really influencing their nutrition knowledge as the influences most identified had no significant impact on their DEF summed scores.

Findings indicate that parents have the largest influence on both knowledge and eating behaviour (78%) which is likely due to the fact that the majority of the participants reported still living at home with parents (76%). While living at home with parents has been associated with increased access to fruit and vegetables in a European study (El Ansari et al., 2012), this study's participants *(Chapter Five)* reported higher consumption of vegetables when living independently than those living at home with parents. Given the high proportion of emerging adults continuing to live at home with parents, research is required to examine how parents influence nutrition knowledge and eating behaviour post-high school (Nelson Laska et al., 2009). As parents are responsible for the majority of the grocery shopping the influence of access of food at home provided by parents requires further examination (Wansink, 2006).

Almost two-thirds of participants reported peers influence their nutrition knowledge with almost three quarters indicating that peers influenced eating behaviour. This peer influence may be contextual given the finding of focus group interviews where participants identified that what they eat often depends on who they are with (Lambert et al., 2018). This is important given that emerging adults do not feel they have peer support and the important people in their lives do not enjoy eating healthy food (Kelly et al., 2013; McArthur & Pawlak, 2011). Therefore future investigation is needed to develop techniques to strengthen social norms for healthy eating amongst peers (Kelly et al., 2013; Ruddock et al., 2019).

An important finding for future health promotion campaigns is that one-third of participants indicated that television was not an influence on knowledge or eating behaviour. Given the majority of Australian health promotion campaigns utilise television this finding suggests that ongoing and future health promotion campaigns targeted at emerging adults should deliver health promotion messages via other platforms such as social media. Almost half of our participants indicated that Instagram/Facebook influenced both their knowledge and eating behaviour. This is consistent with findings from an American study (Vaterlaus et al., 2015) that identified social media as an important influence on food choice of emerging adults. A novel finding of our study was that over half of our participants identified healthy food promotion as an influence on

knowledge and eating behaviour which supports the sustainability of the *Go for 2 & 5* campaign. Further research is recommended to identify where emerging adults are seeing 'healthy food promotion' messages, how these messages are influencing their food-related knowledge and behaviours and what emerging adults classify as a 'health promotion' messages as this classification was not established in the current study. Given the abundance of unhealthy messages and fewer healthy messages (Berry et al., 2018) and the fact that food advertisements affect one's desire to eat (Kemps et al., 2014), the role of social media as an advertising platform needs further examination to ascertain whether emerging adults classify food and diet messages on social media as 'health promotion' messages, because these may not necessarily be promoting nutritionally sound advice.

Instagram and Facebook were identified by almost half of this study's participants as an influence on both knowledge and behaviour with more females indicating that healthy food promotion and Instagram/Facebook influence their nutrition knowledge, than males. Given that Instagram is an image-based platform this may be further contributing to the emphasis on weight control and appearance (Lambert et al., 2018) and could explain why more female participants identified that their eating behaviour was significantly influenced by weight concerns, other appearance concerns and Instagram/Facebook. However, higher weight people are not often seen in media and when they are, they are often stigmatised as unhealthy, unhappy and lazy (Logel, Stinson, & Brochu, 2015). Fear of stigmatisation has been shown as a potential barrier for engaging in healthy behaviours (Berry et al., 2018), particularly around weight loss. For this reason, it is recommended that future nutrition messages focus on general health, positive body image, rather than weight loss for this target group.

For most participants, influences on food purchases include price of food, quality and freshness, taste and convenience. While there were no statistically significant differences between living situations, it is important to note that living independently had a negative impact on food purchases which may contribute to poor dietary patterns as emerging adults. This age group typically adopt busier schedules and begin to turn to convenience and fast foods as a replacement for home meal preparation (Fisher et al., 2016; Nelson Laska et al., 2009) and those living independently do not come home to meals prepared by parents. Jackson et al. (2009) identified that university students often spent money on fast food lunches. Considering food purchases are also heavily influenced by price of food (92%), previous recommendations that more affordable healthy food options be made available to university students in order to assist them to choose more healthy options

(Sogari et al., 2018) appears to be relevant to our study cohort. Another consideration is that quality and freshness negatively affected the intake of fruit and vegetables in emerging adults in our study. This finding is consistent with Neumark-Sztainer et al. (1999) and Stewart and Tinsley (1995) who reported adolescents and emerging adults are turned off by bruised, damaged or overcooked food as it does not look good. Therefore, consideration of appearance, quality and freshness must also be considered with convenience and price of food.

This study further explored influences on knowledge and eating behaviour with previously reported RDS and DEF results *(Chapter Five)* and found a novel association. When food advertisements and healthy food promotion were identified as an influence on nutrition knowledge, participants consumed less grains. Given previously reported findings that identify males were eating almost half the RDS for grains and females were consuming only one third of the RDS for grains *(Chapter Five),* this is nutritionally concerning. This may be the result of a general perception that the consumption of grains is associated with weight gain and corresponds with our finding that weight is a significant influence on eating behaviour. While refined and processed grains have been associated with weight gain, the opposite is true for a diet rich in whole grains and legumes, which have been linked to a lower BMI (Williams et al., 2008). As the focus of many Australian health promotion campaigns, such as *Measure Up* and *LiveLighter* (Heart Foundation WA, 2011, 2013), has been on weight control, it is possible that emerging adults equate being thin with being healthy, however, more investigation is required to examine this.

This finding does however, support Farringdon et al. (2019) recommendation for clear 'do' messages about eating the recommended servings of all food groups. Clear and positive 'do' messages such as the *Go for 2 & 5* campaign seem to be effective in increasing knowledge of RDS as this campaign is widely recognized by emerging adults (Lambert et al., 2018). These results suggest that clear positive 'do' messages may also influence eating behaviour because when nutrition knowledge and health concerns were identified as an influence on eating behaviour, fruit and vegetable intake increased, suggesting that accurate nutrition knowledge may be a positive influence on eating behaviour. Interestingly, according to the 2013 ADG-RDS, males aged 19-50 years should be consuming six serves of vegetables per day (NHMRCA 2013), therefore the *Go for 2 & 5* campaign is no longer accurate for males. This likely explains our findings which indicated that if participants reported healthy food promotion as an influence on knowledge, they were 1.7 times more likely to be incorrect with knowledge of RDS for

vegetables. This highlights the importance of accuracy and simplicity for health promotion messages.

Specific limitations to be considered for this sub-study include the qualitative approach used to inform the influences that were examined. Different influences might have been identified if the study occurred at a different time and with different participants. Limitations specific to nutrition knowledge and food intake were discussed in *Chapter Five*, with an overarching review of limitations provided at *Chapter Nine*.

6.5 Conclusion

Our findings provide some important insights into the influences on emerging adults' nutrition knowledge, eating behaviour and food purchases within the Australian context. Of particular interest was that participants identified that the influences on knowledge were different from the influences on eating behaviour. However, parents remained a strong influence for both knowledge and eating behaviour. Another key finding of this study is that weight concerns were identified as a significant influence on eating behaviour, particularly for females. Combined with emerging adults consuming below recommended serves for grains, and the influence of healthy food promotion, suggests a targeted opportunity for promoting clear positive messages around healthy eating relevant to emerging adults. Regarding food purchases, price of food and convenience are key influences. In order to assist emerging adults' to make healthy food choices it is recommended that healthy food options be made more convenient and affordable in order to encourage recommended consumption of these foods. Together these findings provide important evidence for shaping future health promotion and policy directions in promoting healthy food intake in emerging adults, particularly within the Australian context.

Chapter Seven

7

Phase 2: Body satisfaction and food intake

Appearance matters: Body image, eating influences and food intake of Western Australian university students.

Study 4 abstract

Issue addressed: Emerging adults are particularly vulnerable to diet-related health issues as they consistently do not adhere to Australian Guideline for Healthy Eating (ADG-RDS) with diets typically high in saturated fats and sugar. Research exploring relationships between nutrition knowledge, food intake and influences on eating behaviour and body satisfaction of Australian university students is scarce.

Methods: This cross-sectional study involved university students aged 18-25 years (n = 287). Survey methodology determined knowledge, influences on knowledge, eating behaviour, food purchases, actual food intake (daily equivalent frequencies for each food group) and body image satisfaction. Associations were investigated using a generalised linear model.

Results: Females reported lower body satisfaction than males (BPSS-R) summed total (p =.002). Correct knowledge of ADG-RDS did not result in higher levels of body satisfaction. When school programs were an influence on nutrition knowledge higher levels of body satisfaction for overall size and shape (p =.001) were reported. When weight concerns were not an influence on eating behaviour participants reported higher levels of body satisfaction BPSS-R summed total (p <.001). Similarly, when not influenced by Instagram / Facebook higher levels of body satisfaction BPSS-R summed total (p =.005) were reported.

Conclusion: Influences on nutrition knowledge and eating behaviour appear to have a more significant impact on body satisfaction than correct ADG-RDS knowledge.

So what?: Social media, and weight concerns negatively impact body satisfaction. School programs could have an important 'early intervention' role but need to reframe nutrition message to focus on 'feeling good' rather than 'looking good.'

7.1 Introduction

International research involving emerging adults' report increased body image concerns which have been associated with disordered eating in females (MacNeill & Best, 2015; Pellizzer et al., 2017; Voelker, Reel, & Greenleaf, 2015). A Polish study conducted by Izydorczyk and Sitnik-Warchulska (2018) found that adolescent females and employed women had the general perception that 'thin female bodies' were attractive, hence they experienced BID with younger females displaying higher levels of effort to become thin including bulimic tendencies. In recent times, research has explored the impact of social media use on BID and body comparison among adolescents and emerging adults (Bourgeois, Bower, & Carroll, 2014; Choukas-Bradley et al., 2019; Cohen et al., 2017). Image based social media platforms such as Facebook and Instagram have been associated with 'thin ideal' internalisation and the behaviour of body surveillance or self-objectification of young females (Cohen et al., 2017). Australian university students have identified these platforms as providing information on how to achieve societal 'body ideals' by providing diet and exercise advice (Lambert et al., 2018). A qualitative study with young women in Russia reported participants were highly influenced by information posted on Instagram and it was not necessary for the 'micro-celebrities' they follow to be experts with relevant qualifications, but rather it was more important they be competent when communicating information (Djafarova & Trofimenko, 2019). Once an individual in this age group is engaged by a 'post' on social media, they report following the post's advice (e.g. fad diets) regardless of nutritional value or accuracy of the information (Lambert et al., 2018).

Nutrition knowledge is assumed to influence dietary habits and food preference, however it has been established that this age group have significant gaps in this area (Al-Khamees, 2009; Kolodinsky, Harvey-Berino, Berlin, Johnson, & Reynolds, 2007; Kothe & Mullan, 2011; van den Berg et al., 2012). While there is international research investigating BID of emerging adults (Anton, Perri, & Riley, 2000; Cramblitt & Pritchard, 2013; DeBate et al., 2008; Furnham et al., 2002; Gitimu et al., 2016; Izydorczyk & Sitnik-Warchulska, 2018; Korn et al., 2013; Swami et al., 2017) there is limited Australian research that investigates BID. There is even less research that explores associations with nutrition knowledge, food choices and actual eating behaviour of male and female emerging adults. Understanding the level of BID and its associations with influences on eating behaviour and actual food intake could provide insights for the development of health promotion campaigns specifically for this age group in the Australian context. Hence, the research questions and hypotheses explored in this study were:

Research question	H_1 Hypothesis
– Are there gender differences in level of body satisfaction?	There is a difference in levels of body image satisfaction between males and females
– Are there living situation differences in level of body satisfaction?	There is a difference in levels of body image satisfaction between emerging adults living at home with parents and those living independently
– Is body satisfaction associated with ADG-RDS knowledge?	There is an association between correct nutrition knowledge (ADG-RDS) and body satisfaction
– Is body satisfaction associated with food group intake?	There is an association between food intake (DEF) and body satisfaction
– Is body satisfaction associated with influences on the nutrition knowledge of emerging adults?	There is an association between influences on nutrition knowledge and body satisfaction
– Is body satisfaction associated with influences on the eating behaviours of emerging adults?	There is an association between influences on eating behaviours and body satisfaction
– Is body satisfaction associated with influences on food purchases of emerging adults?	There is an association between influences on food purchases and body satisfaction

7.2 Methods

The overarching methodology for the quantitative studies has been described in *Chapter Four*, including participants, procedures, measures and treatment of data. This study reports on body satisfaction in WA university students and examines the association between body satisfaction and previously reported nutrition knowledge and food intake (DEF) (*Chapter Five*), and influences on nutrition knowledge and behaviour (*Chapter Six*).

The main measure for this study was the Body Parts Satisfaction Scale- Revised (BPSS-R) 14 body parts (Petrie et al., 2002) adapted from the Body Part Satisfaction Scale 24 body parts (Berscheid et al., 1973).

Data was analysed using SPSS version 26 (IBM Corp, Released 2018). Alpha was set for significance $p < .05$. Scores for total BPSS-R and factor scores were described using mean, median, standard deviation and normality assessed using Shapiro-Wilks test which reported non-normal distribution. The Mann-Whitney *U* Test was used to test for differences between BPSS-R scores for males and females, living situation (at home with parents, or living independently), nutrition knowledge ADG -RDS (correct/incorrect) as well as differences in response to influences (yes/no) on knowledge, eating behaviour and

food purchases. No multiple comparison correction was applied as each total and factor scores on the BPSS-R could be assessed individually (Perneger, 1998).

The association between BPSS-R factor scores and BPSS-R total score, each influence on knowledge, eating behaviour and food purchases (yes/no) on, nutrition knowledge ADG-RDS (correct/incorrect) and eating behaviour (DEF summed scores [logged transformed] for each food group were examined using univariate generalised linear models (GLM), controlling for gender. Note the log transformed outcome DEF summed score was used as it overcame the large violation at the tails found from inspection of the residual plots for the DEF summed scores GLMs. A final multivariable GLM examined BPSS-R and influences on eating behaviour, controlling for living situation and gender associations with each food group intake (log-transformed DEF). No violations were noted on visual inspection of the final models' residuals.

7.3 Results

Results for BPSS-R total, Factor 1 body, Factor 2 face and overall size and shape are described in Table 7.1 along with gender and living situation between group differences. Females were less satisfied than males for Factor 1: body (p <.001) overall size and shape (p <.001), and for BPSS-R summed total (p =.002). No statistically significant gender differences were identified for Factor 2: face. No statistically significant living situation group differences were reported for total and factor BPSS-R scores.

No general trend was noted in the exploration of nutrition knowledge ADG-RDS (correct/incorrect) for each food group with body satisfaction. However, findings indicated that participants who had incorrect knowledge of RDS for vegetables reported higher levels of body satisfaction for overall size and shape of their body than those with correct knowledge of RDS for vegetables (p=.012). Factor 2: face was significant only for dairy (p=.037) indicating those who had correct knowledge of RDS for dairy reported higher levels of body satisfaction for Factor 2: face than those who had incorrect knowledge of RDS for dairy. No significant differences were reported for BPSS-R Total summed score or Factor 1: body for any food group.

A GLM explored the associations between body satisfaction (BPSS-R) total and factor scores and food intake (log-transformed DEF). The only statistically significant finding was for Factor 2: Face where higher levels of satisfaction with Factor 2: Face was associated with increase DEF for Meat, Fish and Eggs (β=0.041, SE=0.016, p= .011).

Table 7.1

Gender and living situation differences BPSS-R

	Total			Male			Female			Gender differences		Living situation differences	
SS item	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***p*-value**	**U[1]**	***p*-value**
Factor 1: Body	21.50	22.00	6.56	23.90	23.00	5.57	20.41	21.00	6.70	-3.91	**<.001**	1.11	.265
Factor 2: Face	16.26	16.00	3.53	16.69	17.00	3.55	16.05	16.00	3.51	-1.11	.268	1.57	.116
Overall size & shape (n=285)	3.73	4.00	1.29	4.18	4.00	1.06	3.54	4.00	1.33	-3.91	**<.001**	1.42	.154
BSS summed total (n=282)	57.96	59.00	13.41	61.67	62.00	12.63	56.31	57.00	13.45	-3.03	**.002**	1.79	.073

[1] Standardised test Statistic reported

Bold type indicates statistical significance *p* <.05

Mann Whitney *U* group differences for influences on nutrition knowledge with BPSS-R are described in Table 7.2. When school programs were reported as an influence on nutrition knowledge participants reported higher levels of body satisfaction for Factor 1: Body (p=.014), overall size and shape (p=.001) and BPSS-R summed total (p=.015).

For influence on eating behaviours (Table 7.3), when school programs were reported as an influence, participants reported higher levels of body satisfaction for overall size and shape (p=.031). When health concerns were reported as an influence on eating behaviour participants reported higher levels of body satisfaction for each Factor 1: Body (p=.006), Factor 2: Face (p=.024), overall size and shape (p=.016) and BPSS-R summed total (p=.006). When weight concerns were reported to not be an influence on eating behaviour, participants had higher levels of body satisfaction Factor 1: Body (p<.001) overall size and shape (p<.001), and BPSS-R summed total (p<.001). Similarly, those that reported appearance concerns did not influence eating behaviour reported higher levels of body satisfaction for Factor 1: Body (p=.001) overall size and shape (p<.001), and BPSS-R summed total (p=.006). When participants reported Instagram / Facebook was not an influence on their eating behaviour they reported higher levels of body satisfaction for Factor 1: Body (p=.001) overall size and shape (p=.001), and BPSS-R summed total (p=.005).

For influences on food purchases (Table 7.4), when quality and freshness was an influence, participants recorded higher levels of body satisfaction for Factor 1: Body (p=.049). When price of food was not an influence on food purchase participants reported higher levels of satisfaction for overall size and shape (p=.044). Similarly, those that reported convenience was not an influence on food purchase indicated higher levels of satisfaction for Factor 1: Body (p=.045), Factor 2: Face (p=.037) and BPSS-R summed total (p=.037).

Table 7.2

Influences on Knowledge (yes/no), on Body Satisfaction (BPSS-R)

		Yes			No				
Influence on Knowledge	**BPSS –R**	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
School-based programs	Factor 1: Body	21.90	22.00	6.15	19.58	19.00	6.58	-2.45	**.014**
	Factor 2: Face	16.42	16.00	3.45	15.56	16.00	3.76	-1.37	.072
	Overall size & shape	3.86	4.00	1.23	3.16	3.00	1.42	-3.26	**.001**
	BPSS-R total score	58.82	59.00	13.17	54.12	50.50	14.08	-2.43	**.015**
Peers	Factor 1: Body	21.30	22.00	6.29	21.81	23.00	7.16	0.65	.514
	Factor 2: Face	16.35	16.50	3.37	16.12	16.00	3.82	-0.88	.375
	Overall size & shape	3.70	4.00	1.29	3.80	4.00	1.30	0.94	.349
	BPSS-R total score	57.76	58.50	12.99	58.38	59.00	14.42	0.37	.714
Parents	Factor 1: Body	21.38	22.00	6.49	22.96	22.50	6.96	0.52	.604
	Factor 2: Face	16.28	16.00	3.41	16.10	16.50	4.07	-0.32	.750
	Overall size & shape	3.72	4.00	1.29	3.80	4.00	1.31	0.38	.702
	BPSS-R total score	57.79	59.00	13.15	58.76	58.50	14.70	0.47	.641
Television	Factor 1: Body	22.00	22.00	6.13	20.92	21.00	7.04	-1.27	.203
	Factor 2: Face	16.24	16.00	3.47	16.30	16.00	3.60	1.53	.879
	Overall size & shape	3.78	4.00	1.24	3.68	4.00	1.38	-0.58	.563
	BPSS-R total score	58.74	59.00	12.57	57.13	57.00	14.38	-1.10	.273

		Yes			No				
Influence on Knowledge	**BPSS –R**	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
Food Ads	Factor 1: Body	21.96	22.00	6.36	20.98	20.00	6.78	-1.34	.181
	Factor 2: Face	16.54	16.00	3.27	15.98	16.00	3.74	-1.34	.181
	Overall size & shape	3.81	4.00	1.23	3.65	4.00	1.36	-0.82	.411
	BPSS-R total score	59.10	60.00	12.61	56.80	57.00	14.21	-1.59	.111
Healthy food promotion	Factor 1: Body	21.49	22.00	6.36	21.44	22.00	7.17	-0.13	.899
	Factor 2: Face	16.34	16.00	3.34	15.99	16.00	4.04	-0.98	.326
	Overall size & shape	3.77	4.00	1.27	3.65	4.00	1.34	-0.80	.424
	BPSS-R total score	58.14	59.00	12.73	57.44	58.00	15.32	-0.52	.605
Internet / google	Factor 1: Body	21.25	22.00	6.47	22.06	22.00	6.82	0.62	.534
	Factor 2: Face	16.19	16.00	3.61	16.40	16.00	3.33	0.17	.862
	Overall size & shape	3.68	4.00	1.29	3.87	4.00	1.30	1.09	.276
	BPSS-R total score	57.45	58.00	13.28	59.28	59.00	13.75	0.75	.455
Instagram / Facebook	Factor 1: Body	20.98	21.00	6.21	22.28	23.00	7.05	1.35	.176
	Factor 2: Face	16.17	16.00	3.45	16.42	16.00	3.62	0.04	.968
	Overall size & shape	3.62	4.00	1.29	3.91	4.00	1.28	1.81	.070
	BPSS-R total score	57.00	59.00	12.55	59.49	59.00	14.62	1.12	.262
YouTube	Factor 1: Body	21.32	22.00	6.32	21.50	22.00	6.65	0.17	.865
	Factor 2: Face	16.23	16.00	3.54	16.24	16.00	3.38	-0.01	.989
	Overall size & shape	3.78	4.00	1.22	3.71	4.00	1.32	-0.12	.900
	BPSS-R total score	57.96	58.00	12.74	57.87	59.00	13.61	-0.21	.830

Bold type indicates statistical significance $p < .05$
Grey shading indicates higher mean score = higher level of body satisfaction

Table 7.3

Influences on Eating Behaviour (yes/no), on Body Satisfaction (BPSS-R)

Influence on Eating Behaviour	BPSS –R	Yes			No				
		M	Md	SD	M	Md	SD	U[1]	*P* value
School based programs	Factor 1: Body	21.94	22.00	6.33	20.83	21.00	6.98	-1.47	.141
	Factor 2: Face	16.43	16.00	3.37	16.06	16.00	3.78	-0.72	.471
	Overall size & shape	3.88	4.00	1.17	3.51	4.00	1.43	-2.16	**.031**
	BPSS-R total score	58.92	60.00	12.73	56.57	57.00	14.38	-1.61	.108
Peers	Factor 1: Body	21.14	22.00	6.34	22.58	23.00	7.31	1.76	.078
	Factor 2: Face	16.27	16.00	3.31	16.32	16.00	4.18	0.22	.822
	Overall size & shape	3.68	4.00	1.28	3.90	4.00	1.34	1.65	.100
	BPSS-R total score	57.44	58.00	12.75	59.59	59.00	15.39	1.21	.228
Parents	Factor 1: Body	21.38	22.00	6.23	22.36	24.00	9.02	0.97	.333
	Factor 2: Face	16.16	16.00	3.33	17.18	18.00	4.82	1.42	.155
	Overall size & shape	3.73	4.00	1.23	3.79	4.00	1.69	0.42	.673
	BPSS-R total score	57.58	58.00	12.48	60.85	64.00	19.08	1.16	.246
Television	Factor 1: Body	21.08	23.00	6.15	21.32	21.00	6.87	-0.48	.631
	Factor 2: Face	16.15	16.00	3.30	16.36	16.00	3.68	0.75	.455
	Overall size & shape	3.75	4.00	1.22	3.72	4.00	1.33	0.15	.881
	BPSS-R total score	57.99	59.00	12.11	57.98	59.00	14.18	-0.11	.913

Influence on Eating Behaviour	BPSS –R	Yes			No				
		M	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
Food Ads	Factor 1: Body	21.56	22.00	6.32	21.44	22.00	6.87	0.07	.947
	Factor 2: Face	16.15	16.00	3.21	16.40	17.00	3.81	0.82	.414
	Overall size & shape	3.73	4.00	1.25	3.74	4.00	1.33	0.32	.750
	BPSS-R total score	57.80	59.00	12.22	58.15	59.00	14.45	0.22	.829
Healthy food promotion	Factor 1: Body	21.66	22.00	6.25	21.25	22.00	7.16	-0.46	.645
	Factor 2: Face	16.44	16.00	3.40	16.04	16.00	3.75	-0.77	.438
	Overall size & shape	3.78	4.00	1.20	3.66	4.00	1.42	-0.24	.810
	BPSS-R total score	58.33	59.00	12.66	57.44	59.00	14.67	-0.52	.606
Nutrition knowledge	Factor 1: Body	21.76	22.00	6.62	19.72	18.40	6.31	-1.87	.061
	Factor 2: Face	16.40	16.00	3.54	15.47	16.00	3.47	-1.21	.228
	Overall size & shape	3.78	4.00	1.27	3.46	4.00	1.43	-1.25	.212
	BPSS-R total score	58.50	59.00	13.48	54.43	54.00	12.58	-1.65	.099
Weight concerns	Factor 1: Body	20.35	21.00	6.37	25.50	25.00	5.87	5.27	**<.001**
	Factor 2: Face	16.07	16.00	3.53	17.03	17.00	3.52	1.75	.079
	Overall size & shape	3.51	400	1.28	4.49	5.00	1.03	5.56	**<.001**
	BPSS-R total score	56.02	57.00	12.90	64.79	64.00	13.12	4.34	**<.001**

Influence on Eating Behaviour	BPSS –R	Yes			No				
		M	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
Appearance concerns	Factor 1: Body	20.63	21.00	6.53	23.68	24.00	6.34	3.47	**.001**
	Factor 2: Face	15.99	16.00	3.49	17.00	17.00	3.59	1.86	.065
	Overall size & shape	3.56	4.00	1.32	4.18	4.00	1.12	3.59	**<.001**
	BPSS-R total score	56.45	57.50	13.15	61.80	61.00	13.53	2.77	**.006**
Health concerns	Factor 1: Body	22.03	23.00	6.63	19.35	19.00	6.11	-2.75	**.006**
	Factor 2: Face	16.57	16.00	3.53	15.11	16.00	3.39	-2.26	**.024**
	Overall size & shape	3.84	4.00	1.25	3.33	3.00	1.37	-2.40	**.016**
	BPSS-R total score	59.10	60.00	13.45	53.47	53.00	12.41	-2.74	**.006**
Internet / google	Factor 1: Body	21.43	22.00	6.45	21.54	22.00	6.74	-0.03	.977
	Factor 2: Face	16.32	16.00	3.77	16.26	16.00	3.39	-0.25	.801
	Overall size & shape	3.68	4.00	1.30	3.77	4.00	1.29	0.72	.470
	BPSS-R total score	57.81	59.00	13.64	58.10	58.00	13.33	-0.06	.952
Instagram / Facebook	Factor 1: Body	22.24	20.00	5.96	22.84	23.00	7.02	3.29	**.001**
	Factor 2: Face	15.95	16.00	3.37	16.64	17.00	3.70	1.46	.144
	Overall size & shape	3.50	4.00	1.24	3.99	4.00	1.30	3.36	**.001**
School based programs	BPSS-R total score	55.64	56.50	12.10	60.52	60.00	14.36	2.79	**.005**

Bold type indicates statistical significance $p < .05$
Grey shading indicates higher mean score = higher level of body satisfaction

Table 7.4

Influences on Food Purchases (yes/no), on Body Satisfaction (BPSS-R)

Influence on Food Purchases	BPSS –R	Yes			No				
		M	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
Price of food	Factor 1: Body	21.30	22.00	6.54	24.00	24.50	6.58	1.89	.059
	Factor 2: Face	16.20	16.00	3.48	17.23	17.00	3.88	1.12	.264
	Overall size & shape	3.70	4.00	1.29	4.18	4.00	1.22	2.01	**.044**
	BPSS-R total score	57.56	58.00	13.25	62.68	62.00	14.70	1.63	.103
Quality & Freshness	Factor 1: Body	21.73	22.00	6.63	19.16	19.00	5.53	-1.97	**.049**
	Factor 2: Face	16.36	16.00	3.55	15.42	15.50	3.06	-1.27	.204
	Overall size & shape	3.79	4.00	1.27	3.17	3.00	1.43	-1.95	.051
	BPSS-R total score	58.38	59.00	13.55	53.54	53.00	11.16	-1.67	.095
Cooking skill	Factor 1: Body	21.59	22.00	6.47	21.39	21.00	6.76	-0.40	.689
	Factor 2: Face	16.25	16.00	3.38	16.33	16.00	3.74	0.56	.578
	Overall size & shape	3.74	4.00	1.30	3.72	4.00	1.28	0.08	.933
	BPSS-R total score	58.02	59.00	13.24	57.93	59.00	13.79	-0.05	.957
Taste	Factor 1: Body	21.59	22.00	6.70	20.67	21.00	5.05	-0.77	.441
	Factor 2: Face	16.36	16.00	3.50	15.42	15.00	3.63	-1.29	.196
	Overall size & shape	3.75	4.00	1.30	3.54	4.00	1.25	-0.69	.493
	BPSS-R total score	58.25	59.00	13.52	55.17	56.50	12.39	-1.07	.285

Influence on Food Purchases	BPSS –R	Yes			No				
		M	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
How much money I have	Factor 1: Body	21.46	22.00	6.52	21.91	21.00	7.02	0.13	.895
	Factor 2: Face	16.16	16.00	3.45	17.12	17.00	3.91	1.18	.236
	Overall size & shape	3.73	4.00	1.29	3.76	4.00	1.35	0.28	.776
	BPSS-R total score	57.76	59.00	13.17	59.44	58.00	15.20	0.32	.748
Convenience	Factor 1: Body	21.08	22.00	6.41	23.27	23.00	6.97	2.01	**.045**
	Factor 2: Face	16.07	16.00	3.39	17.14	17.50	3.89	2.09	**.037**
	Overall size & shape	3.68	4.00	1.23	3.96	4.00	1.49	1.92	.055
	BPSS-R total score	57.02	58.00	12.84	61.86	61.50	15.11	2.08	**.037**
Family habits	Factor 1: Body	21.55	22.00	6.47	21.40	22.00	6.93	-0.04	.967
	Factor 2: Face	16.30	16.00	3.39	16.20	17.00	3.90	0.20	.840
	Overall size & shape	3.72	4.00	1.27	3.78	4.00	1.35	0.41	.681
	BPSS-R total score	57.91	59.00	13.05	58.20	59.00	14.65	0.21	.836
Availability	Factor 1: Body	21.39	22.00	6.61	21.79	22.00	6.51	0.67	.505
	Factor 2: Face	16.40	16.00	3.51	16.02	17.00	3.54	-0.47	.640
	Overall size & shape	3.72	4.00	1.29	3.78	4.00	1.29	0.68	.496
	BPSS-R total score	57.82	58.00	13.44	58.27	60.00	13.44	0.47	.637
Someone else decides	Factor 1: Body	21.58	22.00	6.86	21.49	22.00	6.49	-0.15	.883
	Factor 2: Face	16.21	16.00	3.50	16.30	16.00	3.53	0.45	.654
	Overall size & shape	3.73	4.00	1.32	3.73	4.00	1.28	-0.13	.897
Price of food	BPSS-R total score	57.70	57.00	13.95	58.08	59.00	13.29	0.32	.751

Bold type indicates statistical significance $p < .05$
Grey shading indicates higher mean score = higher level of body satisfaction

Multivariable GLM considered BPSS-R and influences on eating behaviour, controlling for living situation and gender and their association with each food group intake (log-transformed DEF). The only BPSS-R item that remained statistically significant was Factor 2: Face indicating increased DEF for Meat, Fish and Eggs (β= 0.045, SE= 0.016, *p* =.004) were associated with higher levels of satisfaction for Factor 2: Face.

7.4 Discussion

To the authors knowledge this is the first Australian study to explore body dissatisfaction with nutrition knowledge, eating behaviour and influences on food intake of university students aged 18-25 years. A novel aspect of this study was to explore ADG-RDS knowledge (correct/incorrect) and level of body satisfaction (BPSS-R). An unexpected finding of our study was that those participants who had incorrect knowledge of RDS for vegetables reported significantly higher levels of body satisfaction for overall size and shape of their body than those with correct knowledge of RDS for vegetables. A possible explanation may be that the majority of this age group are indifferent to nutritional guidelines and potential health consequences, demonstrated by their deliberate choice not to follow recommendations (Lambert et al., 2018). It could be that this indifference may correlate with their own body satisfaction. Conversely, correct nutrition knowledge did not correspond to higher levels of body satisfaction, the knowledge that lifestyle factors (such as diet or physical activity) play an important role in weight control can consequently lead to a preoccupation with weight and therefore food intake, which may lead to disordered eating and excessive exercise (Izydorczyk & Sitnik-Warchulska, 2018). Potentially, the weight-focused health promotion campaigns in Australia, while not targeted at emerging adults may be reinforcing body dissatisfaction as Aubrey (2010) suggests that health messages that focus on appearance may cause people feel shame and increase BID, which may be counter-productive in changing eating behaviour.

When school-based programs were reported as an influence on nutrition knowledge participants had higher body satisfaction scores, this suggests that these nutrition programs could have an important 'early intervention' role to play in reframing nutrition messages to focus on 'feeling good' rather than 'looking good' which may increase body satisfaction. Coupled with Korn et al's (2013) finding that physical activity has a greater impact on body satisfaction than good nutrition, suggests the body satisfaction benefits from the influence of school programs may be achieved through non-nutrition aspects. While these conflicting results highlight another gap in our understanding, our findings

more generally support reframing Australian school-based nutrition education, to focus on positive body image through healthy lifestyle, including nutrition and physical activity.

The association between influences on eating behaviour and body satisfaction was also a novel aspect of this study. Results indicate that those who's eating behaviour was not influenced by weight and appearance concerns had consistently higher levels of body satisfaction. The mechanism by which this occurs may be explained by Hoffmann and Warschburger (2019) where weight and shape concerns were associated with eating restraint driven by a body image ideal to be thin and attractive. Further, Gitimu et al. (2016) found that the majority of female college students perceived the ideal body shape to be smaller than their current body shapes and were therefore, significantly more at risk of acquiring an eating disorder. Discrepancies between current body shape and ideal body shape have been associated with disordered eating in adolescents and emerging adults (Anton et al., 2000; MacNeill & Best, 2015; Pellizzer et al., 2017; Voelker et al., 2015). Evidence suggests this thin 'body ideal' seems to be driven further by social media platforms such as Facebook and Instagram (Cohen et al., 2017) and concurs with our findings that participants who reported social media as an influence on eating behaviour also reported significantly lower body satisfaction. While limiting social media exposure may be an unrealistic option for promoting healthy eating behaviours and positive body satisfaction, Cohen (2019) has shown the benefits of body positive social media posts for women and this may provide a promising health promotion avenue to target for emerging adults.

While our findings support other studies confirming females were generally less satisfied with their body than males (DeBate et al., 2008; Furnham et al., 2002; Izydorczyk & Sitnik-Warchulska, 2018; Kenardy et al., 2001; Korn et al., 2013; Swami et al., 2017) it is imperative that this issue not be stereotyped as a gendered issue. Given the increased media representation of the 'ideal' male body, twenty- first century men are becoming more interested in their appearance (Grogan, 2017; Kling et al., 2018) and research suggests that males aged 18-25 years are concerned with being thin, lean and toned (Lambert et al., 2018; Tylka, 2011). While men may wish to lose body fat the rationale is not to be thin but rather to highlight their muscle definition, therefore their drive for leanness is similar to females, but the construct is different (Tylka, 2011). For these reasons more research is recommended to understand how BID impacts attitudes to food and eating behaviour.

An interesting finding of this study was that when food purchases were influenced by convenience participants reported significantly lower levels of satisfaction for overall size

and shape, Factor 1: Body. Factor 2: Face and BPSS-R summed total score. This highlights an area of concern, given consumption of convenience foods is very high among emerging adults (Alghamdi et al., 2018; Bargordo et al., 2013; Harris et al., 2006; Pelletier et al., 2014) and 46% of 18-24 year old Australian's are considered overweight or obese (ABS 2018). Given that many convenience foods tend to be discretionary foods (high in fat and sugar), and our study participants were consuming on average 4.5 to 5.0 serves per day which is well above ADG-RDS (*Chapter Five)*. It is possible that participants influenced by convenience may have more issues with weight management which could explain why they reported higher level of body dissatisfaction, however, weight was not measured in this study.

These findings need to be considered in light of some study specific limitations. Sample representation of the broader emerging adult population has been identified previously, however, our novel findings are likely to be similar to what we might expect in similar populations, given that our results are similar to those previously reported such as females being more generally dissatisfied with their bodies than males (DeBate et al., 2008; Furnham et al., 2002; Izydorczyk & Sitnik-Warchulska, 2018; Kenardy et al., 2001; Korn et al., 2013; Swami et al., 2017). Furthermore, factor scores for the BPSS-R previously validated by Petrie et al. (2002) were used. However, the Factor 1: Body in this study was calculated using only six items (weight, arms, stomach, buttock, upper thighs and general muscle tone) rather than seven, as information on hips was not collected. The upper thighs/buttocks terms are however considered representative of the body mid-section, and hence upper thighs provides a good indicator for hips (Frederick, Hatfield, Bohnstedt, & Berscheid, 2014). It should also be noted that the item hips is also more pertinent to females compared to males (Frederick et al., 2014) and therefore Factor 1 Body scores are likely less gender biased. Limitations specific to nutrition knowledge and food intake were discussed in *Chapter Five*, influences in *Chapter Six*, with an overarching review of limitations provided at *Chapter Nine*.

7.5 Conclusion and implication

Our findings provide some new insights on the associations between nutrition knowledge, influences on knowledge, eating behaviour and food purchases with levels of body satisfaction in emerging adults, particularly within the WA context. Key findings include the continuing influence of school-based nutrition programs, negative impact of social media and purchasing influence of convenience on body satisfaction. Due to the

ongoing influence of school-based nutrition programs, there is an opportunity to refine early intervention nutrition messages to focus on 'feeling good' rather than 'looking good' as a potential strategy to reduce BID. For this reason, it is recommended that the focus of school-based nutrition programs be on positive body image through healthy lifestyle choices that include nutrition and physical activity. Furthermore, health promotion professionals should be utilising social media platforms to communicate nutrition messages that are body positive. Given convenience food purchases were associated with higher levels of body dissatisfaction, and these are typically of poor nutritional value, it is recommended that policy makers consider strategies to increase the availability of healthy convenience foods to encourage emerging adults to make healthier food choices which in term could have a positive impact on body satisfaction.

Chapter Eight

8

Phase 2: Eating attitudes and food intake

Eating attitudes, influences on eating, body satisfaction and food intake of Western Australian university students.

Study 5 abstract

Issue addressed: Research exploring relationships between nutrition knowledge, food intake and influences on eating and eating attitudes of WA university students is scarce.

Methods: Survey methodology was used in this cross-sectional study involving university students aged 18-25 years (n = 287). Generalised linear models examined relationships between knowledge, influences on knowledge, eating behaviour, food purchases, actual food intake (daily equivalent frequencies for each food group), body satisfaction and eating attitudes (EAT-16).

Results: While females recorded significantly higher EAT-16 scores factor and total scores than males, the EAT-16 total mean scores for both genders were above the 'cut-off' for disordered eating (Males, M = 41.02 and Females, M = 48.72). Correct knowledge of recommended daily serves was associated with higher EAT-16 total scores for vegetables (p = .008), grains (p = .035), meat, fish and eggs (p =.026) and discretionary foods (p = .027), indicating higher disordered eating attitudes. When social media, weight and appearance concerns were reported to influence eating behaviour higher EAT-16 scores were the result. Lower body satisfaction scores were associated with higher EAT-16 scores for both male and females.

Conclusion: Correct nutrition knowledge does not appear to be a protective factor regarding eating attitudes. Weight and appearance concerns, along with social media have a significant negative impact on disordered eating behaviours for both males and females.

So what?: This provides a challenge for health promotion and suggests that social media may be an important avenue for nutrition messages including realistic appearance ideals and health weight management.

8.1 Introduction

Eating attitudes are most widely assessed in terms of eating disorders, with disordered eating risk often being determined by self-report scores using an Eating Attitude Test (EAT) (McLaughlin, 2014). While eating attitudes have been studied extensively in adolescents and adults, and in university students, the focus has been on females and eating disorders. For the general emerging adult population without a diagnosed eating disorder, the role of eating attitudes on eating behaviour is unclear.

The role of appearance and weight concerns have been associated with eating attitudes driving eating patterns that are problematic for young woman in both Western and non-Western cultures (Witcomb et al., 2013), and concur with findings of the previous study (*Chapter Seven*). International research confirms females reported higher frequency of dieting behaviour's including restricting intake of certain food groups and generally had more negative eating attitudes than males (Furnham et al., 2002; Loth et al., 2014; Pettie et al., 2010). Females in the current study reported restricting intake of grains, meat, fish and eggs, and dairy potentially as a weight management strategy (*Chapters Three and Five)*. While dieting behaviour itself may not be necessarily negative, dieting for appearance-related reasons is most commonly associated with the use of drastic dieting strategies and higher body dissatisfaction (Aubrey, 2010). A Portuguese study involving university students reported that diet and exercise motivated by body dissatisfaction, appearance, weight and shape control put individuals at greater risk of developing unhealthy eating patterns and engaging in excessive exercise (Goncalves & Rui Gomes, 2012). When appearance is the primary motivator rather than health (*Chapters Three and Six*) it is more likely a person will engage in more extreme weight-reduction efforts that can have a negative impact on emotional and physical health (Ackard et al., 2002). Frequent exposure to 'thin ideals' promoted on social media platforms where physical appearance is central focus is prevalent among 18 to 25 year-olds with the majority having smartphones hence constant access (Choukas-Bradley et al., 2019). This persistent focus on appearance has been associated with severe eating disorder symptoms and body dissatisfaction, with young women who internalize these messages being more likely to have problematic attitudes to eating (Ackard et al., 2002; Witcomb et al., 2013).

Emerging adults have been described as 'vulnerable' due to the many transitional changes they face such as changing environment from school to work or tertiary institutions, changes to peer group and friendships, changes in living situations and financial responsibilities (Arnett, 2000, 2007; du Plessis, 2011). The transition out of the

school environment highlights the importance of nutrition knowledge and attitude to eating as access to new food options and different dietary challenges such as food preparation become more prevalent (Abraham et al., 2018). This combined with international findings increases the importance of investigating motivations and attitudes as these may directly affect eating behaviours of emerging adults (Goncalves & Rui Gomes, 2012). Therefore, the purpose of this research was to investigate the attitudes to eating and associations between these attitudes and food related knowledge, intake, body satisfaction and other influences on knowledge and intake among WA students at one university. Hence, the research questions associated with this study were:

Research question	H_1 Hypothesis
– Are there gender differences in eating attitudes of emerging adults?	There is a difference in eating attitudes between males and females
– Are there living situation differences in the eating attitudes of emerging adults?	There is a difference in levels of body image satisfaction between emerging adults living at home with parents and those living independently
– Are eating attitudes associated with correct ADG-RDS knowledge?	There is an association between correct nutrition knowledge (ADG-RDS) and eating attitudes
– Are eating attitudes associated with food group intake?	There is an association between food intake (DEF scores) and eating attitudes
– Are there any associations between eating attitudes and body satisfaction?	There is an association between body satisfaction and eating attitudes
– Are eating attitudes associated with influences on nutrition knowledge of emerging adults?	There is an association between influences on nutrition knowledge and eating attitudes
– Are eating attitudes associated with influences on the eating behaviours of emerging adults?	There is an association between influences on eating behaviours and eating attitudes
– Are eating attitudes associated with influences on the food purchases of emerging adults?	There is an association between influences on food purchases and eating attitudes.

8.2 Methods

The overarching methodology for the quantitative studies has been described in *Chapter Four*, including participants, procedures, measures and treatment of data. This study reports on eating attitudes in WA university students and examines the association between eating attitudes and previously reported nutrition knowledge and food intake (DEF) *(Chapter Five)*, influences on nutrition knowledge and behaviour *(Chapter Six)*, and body satisfaction *(Chapter Seven)*.

The main measure for this study was the Eating Attitudes Test (EAT-16) a revised version of an objective, self-report measure of disordered eating symptoms (McLaughlin, 2014). Higher scores reflected more disordered eating attitudes (McLaughlin, 2014). An EAT-16 cut-off score of 41 was considered as evidence of disordered eating (McLaughlin, 2014).

Data was analysed using SPSS version 26 (IBM Corp, Released 2018). Alpha was set for significance $p < .05$. Eat-16 total and Factor scores were described using mean, median and standard deviation with normality assessed using the Shapiro-Wilk test, indicating a non-normal distribution. The Mann-Whitney *U* Test was used with standardized test statistic reported for EAT-16 group differences between males and females, living situation, ADG-RDS (correct/incorrect), influences (yes/no) on knowledge, eating behaviour and food purchases. No multiple comparison correction was applied as each Factor score of the EAT-16 could be assessed in its own right (Perneger, 1998).

Association between each EAT 16 factor scores and total score and eating behaviour (DEF summed scores [logged transformed] for each food group) were examined using generalised linear models (GLM), controlling for gender. Association between BPSS-R summed total score and EAT-16 Total score was explored using a GLM controlling for sex. For all GLMs a visual inspection was conducted on model residuals and no violations were noted.

8.3 Results

Eating attitudes (EAT-16) factor and total scores for the sample (n=287) are described in Table 8.1, including a comparison of gender and living situation differences. The mean EAT-16 total scores were above the cut-off of 41, indicating risk of disordered eating, for both males (M = 41.04) and females (M = 48.72). Gender differences were identified for Factor 1 self-perception of body shape ($p < .001$), Factor 2 dieting ($p = .001$), Factor 4 food preoccupation ($p = .009$), and EAT total score ($p < .001$), with females recording significantly higher risk of disordered eating scores than males. No statistically significant differences were identified for living situation. Although not statistically significant ($U = -1.75$ $p = .080$), it was worth noting that those living at home with parents reported higher Factor 3 Awareness of food content scores (M =11.57, Md =11.00, SD = 4.32) than those living independently (M =10.43, Md = 10.00, SD =3.27).

Table 8.1

Total, male and female EAT-16 total and factor scores, with Gender & Living situation differences

	Total			Male			Female			Gender differences		Living situation differences	
Eat 16 (n=287)	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***p*-value**	**U[1]**	***p*-value**
Factor 1: Self-perception of body shape	10.41	10.00	4.31	7.96	8.00	3.71	11.47	12.00	4.19	6.35	**<.001**	-0.61	.543
Factor 2: Dieting	13.98	13.00	5.41	12.47	11.00	4.93	14.69	14.00	5.52	3.43	**.001**	-1.10	.271
Factor 3: Awareness of food contents	11.29	11.00	4.14	10.99	11.00	4.22	11.43	11.00	4.07	1.18	.238	-1.75	.080
Factor 4: Food preoccupation	10.66	10.00	4.74	9.61	9.00	4.06	11.12	10.00	4.93	2.60	**.009**	-1.36	.175
EAT 16 total score	46.37	44.00	15.62	41.04	37.00	14.14	48.72	48.00	15.70	4.19	**<.001**	-1.35	.177

[1] Standardised test Statistic reported

Bold type indicates statistical significance *p* <.05

Findings for nutrition knowledge ADG-RDS (correct/incorrect) for each food group with EAT-16 factor and total scores are described in Table 8.2. Overall, correct RDS knowledge was associated with higher EAT-16 factor and total scores, although not all were statistically significant. Participants who had correct knowledge of RDS for vegetables reported significantly higher disordered EAT-16 Factor 1 self-perception of body shape (p <.001), Factor 2 dieting (p = .031) and EAT 16 total score (p =.008). Those with correct RDS knowledge for grains reported higher scores for Factor 4 food preoccupation (p =.008) and EAT-16 total score (p = .035). Those reporting correct RDS for Meat, fish & eggs they reported higher scores for Factor 3 awareness of food content (p = .001) and EAT-16 total score (p =.026). Participants with correct RDS for discretionary foods reported higher scores for Factor 4 food preoccupation (p = .032) and EAT-16 total score (p = .027).

Table 8.3 provides a summary of the significant results for the GLMs used to explore associations between EAT-16 factor scores and total score with food intake (DEF summed scores [logged transformed]) for each food group, controlling for gender. Those participants with higher EAT-16 Factor 3 awareness of food content scores also had higher intake of vegetables (p =.015). While those with higher EAT-16 scores for Factor 1 self-perception of body shape (p =.012), Factor 2 dieting (p =.033), Factor 3 awareness of food content (p <.001) and EAT-16 total score (p =.010) all had lower intake of grains. Also, those with higher EAT-16 Factor 1 self-perception of body shape (p <.001), Factor 2 dieting (p =.003), Factor 3 awareness of food content (p <.001) and EAT-16 total score (p =.002) had lower discretionary foods (baked goods and snacks) intake.

EAT-16 total and factors scores were examined with influences on nutrition knowledge. Only school programs and social media were found to be statistically significant (Table 8.4). When social media was identified as an influence on nutrition knowledge participants scored higher disordered eating attitudes for all factors and total EAT-16 score. Conversely, when school programs were identified as an influence on nutrition knowledge, participants scored lower disordered eating attitudes for Factor 1 self-perception of body shape, Factor 2 dieting, Factor 3 awareness of food contents and EAT-16 total score, however Factor 4 food preoccupation did not reach statistical significance (p=.055).

Table 8.5 describes influences on eating behaviour and EAT-16 factor and total scores. Participants who identified peers, weight concerns, appearance concerns and

social media as an influence on eating behaviour, scored higher disordered eating attitudes on all factor scores and EAT-16 total score. Other significant findings include, those who identified internet / google as an influence on eating behaviour scored higher in Factor 2 dieting (p =.047), Factor 3 awareness of food content (p =.001), Factor 4 food preoccupation (p =.036), and Eat-16 total score (p =.013). Those who identified food advertisement as an influence on eating behaviour scored higher in Factor 4 food preoccupation (p =.028). Those who identified both health food promotion and nutrition knowledge as an influence on eating behaviour scored higher in Factor 3 awareness of food content (p =.033 and p =.003 respectively).

There were no statistically significant findings for influences on food purchase with eating attitudes (Table 8.6).

Table 8.2

Knowledge of recommended daily serves for food groups (ADGE-RDS correct/incorrect) on eating attitudes (EAT-16)

		Correct RDS			Incorrect RDS				
Food Group	**EAT-16**	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
Vege	Factor 1	11.32	12.00	4.19	9.06	9.00	4.27	-4.31	**<.001**
	Factor 2	14.50	14.00	5.45	13.29	12.00	5.35	-2.16	**.031**
	Factor 3	11.43	11.00	4.06	11.10	11.00	4.20	-0.65	.513
	Factor 4	10.87	10.00	4.83	10.35	9.00	4.57	-1.16	.246
	EAT Total	48.12	47.00	15.41	43.81	41.00	15.64	-2.66	**.008**
Fruit	Factor 1	10.42	10.00	4.25	10.32	9.00	4.78	-0.20	.843
	Factor 2	13.96	13.00	5.29	14.20	13.00	6.01	0.05	.956
	Factor 3	11.30	11.00	4.14	11.27	11.00	4.05	0.32	.747
	Factor 4	10.68	10.00	4.63	10.61	9.00	5.11	-0.31	.754
	EAT Total	43.36	44.00	15.22	46.39	45.00	17.25	-0.05	.963
Grains	Factor 1	12.60	14.00	4.93	10.32	10.00	4.32	-1.66	.096
	Factor 2	16.20	17.50	7.22	13.93	13.00	5.36	-1.28	.201
	Factor 3	13.80	14.50	6.01	11.20	11.00	4.01	-1.66	.096
	Factor 4	15.60	17.00	6.10	10.48	10.00	4.58	-2.64	**.008**
	EAT Total	58.20	60.50	21.25	45.93	44.00	15.25	-2.11	.035*
Meat, Fish & Eggs	Factor 1	12.53	15.00	4.69	10.28	10.00	4.31	-1.94	.053
	Factor 2	17.20	17.00	8.19	13.83	13.00	5.20	-1.57	.116
	Factor 3	15.20	14.00	4.66	11.07	11.00	3.98	-3.39	**.001**
	Factor 4	12.27	10.00	6.15	10.57	10.00	4.63	-0.84	.399
	EAT Total	57.20	58.00	21.24	45.75	44.00	15.06	-2.23	**.026**

		Correct RDS			Incorrect RDS				
Food Group	**EAT-16**	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
Dairy	Factor 1	9.20	10.00	5.63	10.42	10.00	4.34	0.50	.619
	Factor 2	12.60	15.00	5.77	14.04	13.00	5.44	0.33	.742
	Factor 3	8.60	10.00	4.34	11.34	11.00	4.10	1.11	.265
	Factor 4	13.80	16.00	3.77	10.60	10.00	4.72	-1.67	.094
	EAT Total	44.20	51.00	17.08	46.41	44.00	15.62	0.09	.924
Discretionary Food	Factor 1	10.94	11.00	4.52	10.04	9.00	4.21	-1.74	.082
	Factor 2	14.86	14.00	6.22	13.44	13.00	4.77	-1.50	.134
	Factor 3	11.88	12.00	4.46	10.90	11.00	3.83	-1.72	.085
	Factor 4	11.38	10.50	4.86	10.17	9.00	4.58	-2.14	**.032**
	EAT Total	49.05	49.00	17.01	44.55	42.00	14.38	-2.21	**.027**

[1]Standardised test Statistic reported
Bold type indicates $p < .05$
Grey shading indicates statistically significant higher score
Factor 1 self-perception of body shape
Factor 2 dieting
Factor 3 awareness of food contents
Factor 4 food preoccupation

Table 8.3

Summary of statistically significant Generalised Linear Model associations between eating attitudes (EAT-16) and food intake (log-transformed DEF)

Food group	EAT-16	Intake	β Estimate	SE	*p*-value
Vegetable	Factor 3	↑	.023	.010	.015
Grain	Factor 1	↓	-.030	.012	.012
	Factor 2	↓	-.019	.009	.033
	Factor 3	↓	-.047	.011	<.001
	EAT-16 Total score	↓	-.008	.003	.010
Discretionary Food (Baked goods and snacks)	Factor 1	↓	-.045	.012	<.001
	Factor 2	↓	-.026	.009	.003
	Factor 3	↓	-.045	.012	<.001
	EAT-16 Total score	↓	-.010	.003	.002

β = beta; SE = standard error of the estimate
Factor 1 self-perception of body shape
Factor 2 dieting
Factor 3 awareness of food contents
Factor 4 food preoccupation

Table 8.4

Influences on knowledge and EAT-16 total and factor scores

		Yes influence knowledge			No influence on knowledge				
	EAT-16	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
School	Factor 1	10.13	10.00	4.22	11.61	12.00	4.80	2.05	**.040**
	Factor 2	13.59	13.00	5.18	16.02	15.00	6.23	2.40	**.016**
	Factor 3	11.00	11.00	3.99	12.73	12.00	4.42	2.15	**.032**
	Factor 4	10.34	9.50	4.60	12.00	11.00	5.04	1.92	.055
	EAT Total	45.06	42.50	15.00	52.37	49.00	17.29	2.73	**.006**
Peers	Factor 1	10.64	10.00	4.35	9.89	10.00	4.36	-1.22	.221
	Factor 2	14.21	13.00	5.34	13.63	13.00	5.67	-1.11	.266
	Factor 3	11.56	11.00	4.10	10.80	11.00	4.11	-1.50	.134
	Factor 4	10.89	10.00	4.65	10.13	9.00	4.82	-1.51	.130
	EAT Total	47.30	44.00	15.42	44.46	41.50	16.01	-1.43	.151
Parents	Factor 1	10.54	10.00	4.32	9.73	10.00	4.51	-1.14	.254
	Factor 2	14.06	13.00	5.41	13.80	13.00	5.62	-0.56	.576
	Factor 3	11.28	11.00	4.11	11.39	11.00	4.18	-0.22	.826
	Factor 4	10.78	10.00	4.79	10.10	10.00	4.39	-0.82	.410
	EAT Total	46.66	44.00	15.63	45.02	42.00	15.65	-0.60	.548
Television	Factor 1	10.20	10.00	4.18	10.61	10.00	4.58	0.70	.483
	Factor 2	14.00	13.00	5.41	14.09	13.00	5.49	0.16	.876
	Factor 3	11.17	11.00	4.30	11.50	11.00	3.91	1.18	.236
	Factor 4	10.40	10.00	4.69	10.93	10.00	4.80	0.99	.324
	EAT Total	45.76	43.50	15.95	47.13	45.00	15.38	1.01	.312

		Yes influence knowledge			No influence on knowledge				
	EAT-16	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
Food Ads	Factor 1	10.24	10.00	4.47	10.56	10.00	4.25	0.55	.580
	Factor 2	13.78	13.00	5.05	14.27	13.00	5.85	0.41	.684
	Factor 3	10.95	11.00	3.89	11.70	11.00	4.34	1.39	.163
	Factor 4	10.49	10.00	4.46	10.80	10.00	4.93	0.39	.697
	EAT Total	45.46	42.50	14.88	47.32	45.00	16.44	0.98	.328
Healthy food Promotion	Factor 1	10.49	10.00	4.25	10.14	9.00	4.68	-0.65	.515
	Factor 2	14.01	13.00	5.36	14.01	13.00	5.70	-0.34	.734
	Factor 3	11.37	11.00	4.06	11.08	10.00	4.28	-0.98	.326
	Factor 4	10.83	10.00	4.76	10.17	9.00	4.60	1.13	.257
	EAT Total	46.70	45.00	15.43	45.41	42.00	16.24	-0.73	.463
Internet	Factor 1	10.65	10.00	4.24	9.77	9.00	4.60	-1.70	.090
	Factor 2	14.17	13.00	5.62	13.61	13.00	4.95	-0.55	.579
	Factor 3	11.55	11.00	4.19	10.66	10.00	3.88	-1.76	.079
	Factor 4	10.94	10.00	4.81	9.95	9.00	4.46	-1.63	.103
	EAT Total	47.31	46.00	15.68	43.99	42.00	15.31	-1.59	.112
Social media	Factor 1	11.91	11.00	4.30	9.14	8.50	4.17	-3.96	**<.001**
	Factor 2	14.66	14.00	5.45	13.02	12.00	5.30	-2.92	**.003**
	Factor 3	11.85	12.00	4.15	10.46	9.50	3.92	-3.09	**.002**
	Factor 4	11.23	11.00	4.94	9.70	9.00	4.18	-2.63	**.009**
	EAT Total	48.93	49.00	15.81	42.32	39.00	14.57	-3.80	**<.001**

		Yes influence knowledge			No influence on knowledge				
	EAT-16	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
YouTube	Factor 1	10.46	10.00	4.36	10.34	10.00	4.37	-0.33	.743
	Factor 2	14.21	13.50	5.44	13.99	13.00	5.45	-0.61	.544
	Factor 3	11.75	11.00	4.00	11.15	11.00	4.16	-1.05	.292
	Factor 4	10.81	10.00	4.97	10.59	10.00	4.63	-0.05	.961
	EAT Total	47.22	46.50	15.56	46.07	43.50	15.74	-0.73	.466

[1]Standardised test Statistic reported
Bold type indicates $p < .05$
Grey shading indicates statistically significant higher score
Factor 1 self-perception of body shape
Factor 2 dieting
Factor 3 awareness of food contents
Factor 4 food preoccupation

Table 8.5

Influences on Eating Behaviour and EAT-16 total and factor scores

		Yes influence knowledge			No influence on knowledge				
	EAT-16	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
Peers	Factor 1	10.78	10.00	4.39	9.22	9.00	4.07	-2.43	**.015**
	Factor 2	14.45	14.00	5.52	12.78	12.00	4.98	-2.52	**.012**
	Factor 3	11.60	11.00	4.09	10.49	10.00	4.07	-2.43	**.015**
	Factor 4	10.98	10.00	4.64	9.67	8.00	4.81	-2.43	**.015**
	EAT Total	47.81	46.00	15.62	42.16	39.00	14.90	-2.94	**.003***
Food Ads	Factor 1	10.47	10.00	4.29	10.34	10.00	4.44	-0.36	.720
	Factor 2	14.44	13.50	5.64	13.70	13.00	5.24	-1.15	.251
	Factor 3	11.79	11.50	4.45	10.92	11.00	3.75	-1.47	.140
	Factor 4	11.35	10.00	5.01	10.04	9.00	4.33	-2.19	**.028**
	EAT Total	48.05	47.00	16.62	45.00	42.00	14.56	-1.50	.133
Healthy food Promotion	Factor 1	10.63	10.00	4.32	10.06	9.00	4.44	-1.19	.234
	Factor 2	14.42	14.00	5.39	13.54	12.00	5.46	-1.57	.117
	Factor 3	11.73	11.00	4.07	10.74	10.00	4.12	-2.14	**.033**
	Factor 4	10.67	10.00	4.72	10.66	10.00	4.72	-0.14	.886
	EAT Total	47.46	47.00	15.68	45.00	42.00	15.48	-1.37	.169

		Yes influence knowledge			No influence on knowledge				
	EAT-16	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
Nutrition knowledge	Factor 1	10.39	10.00	4.27	10.56	10.00	4.95	0.30	.765
	Factor 2	14.15	13.00	5.50	13.28	13.50	4.88	-1.09	.276
	Factor 3	11.56	11.00	4.12	9.69	9.50	3.66	-2.92	**.003**
	Factor 4	10.68	10.00	4.74	10.75	10.00	4.62	0.11	.912
	EAT Total	46.78	44.00	15.61	44.28	43.50	15.47	-0.64	.520
Weight concerns	Factor 1	11.42	11.00	4.12	6.66	6.00	2.97	-7.54	**<.001**
	Factor 2	15.01	15.00	5.50	10.49	11.00	3.31	-6.15	**<.001**
	Factor 3	11.89	12.00	4.12	9.25	9.00	3.37	-4.32	**<.001**
	Factor 4	11.08	10.00	4.77	9.10	8.00	4.11	-3.07	**.002**
	EAT Total	49.41	48.00	15.54	35.51	35.00	10.06	-6.38	**<.001**
Appearance concerns	Factor 1	11.37	11.00	4.26	8.10	8.00	3.72	-5.76	**<.001**
	Factor 2	14.98	14.00	5.52	11.78	11.00	4.52	-4.73	**<.001**
	Factor 3	11.93	11.00	4.04	9.90	10.00	3.96	-3.22	**.001**
	Factor 4	11.15	10.00	4.81	9.54	8.50	4.23	-2.79	**.005**
	EAT Total	49.44	48.00	15.56	39.31	36.50	13.31	-5.10	**<.001**

		Yes influence knowledge			No influence on knowledge				
	EAT-16	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
Internet	Factor 1	10.94	11.00	4.24	10.05	9.00	4.42	-1.72	.086
	Factor 2	14.96	14.00	6.08	13.44	13.00	4.89	-1.99	**.047**
	Factor 3	12.25	12.00	4.42	10.72	10.00	3.78	-3.23	**.001**
	Factor 4	11.34	11.00	4.72	10.21	9.00	4.65	-2.10	**.036**
	EAT Total	49.49	49.00	16.35	44.42	42.00	14.81	-2.47	**.013**
Social media	Factor 1	11.49	12.00	4.17	9.23	9.00	4.27	-4.46	**<.001**
	Factor 2	15.03	14.00	5.64	12.98	12.00	5.01	-3.19	**.001**
	Factor 3	12.01	12.00	4.17	10.59	10.00	3.92	-2.76	**.006**
	Factor 4	11.47	11.00	4.79	9.79	9.00	4.46	-3.00	**.003**
	EAT Total	50.01	49.00	15.53	42.60	40.00	14.82	-4.22	**<.001**

[1]Standardised test Statistic reported
Bold type indicates p <.05
Grey shading indicates statistically significant higher score
Factor 1 self-perception of body shape
Factor 2 dieting
Factor 3 awareness of food contents
Factor 4 food preoccupation

Table 8.6

Influences on food purchases and EAT-16 scores

		Yes influence knowledge			No influence on knowledge				
	EAT-16	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
Price of food	Factor 1	10.43	10.00	4.33	10.09	9.50	4.75	-0.41	.681
	Factor 2	14.00	13.00	5.43	14.14	13.00	5.63	-0.22	.824
	Factor 3	11.24	11.00	4.09	11.91	11.50	4.42	0.58	.562
	Factor 4	10.56	10.00	4.71	11.82	10.50	4.87	1.25	.211
	EAT Total	46.23	44.00	15.68	47.95	45.00	15.15	0.69	.487
Quality/Freshness	Factor 1	10.38	10.00	4.35	10.68	10.50	4.49	0.44	.658
	Factor 2	14.07	13.00	5.45	13.27	12.00	5.33	-0.93	.351
	Factor 3	11.35	11.00	4.12	10.68	10.50	4.13	-0.92	.360
	Factor 4	10.68	10.00	4.71	10.41	9.00	5.02	-0.58	.562
	EAT Total	46.48	44.50	15.55	45.05	43.00	16.74	-0.52	.599
Cooking skills	Factor 1	10.30	10.00	4.32	10.54	10.50	4.43	0.63	.529
	Factor 2	13.74	13.00	5.26	14.47	13.00	5.73	0.61	.542
	Factor 3	10.94	11.00	4.07	11.91	11.00	4.12	1.61	.108
	Factor 4	10.59	10.00	4.72	10.71	9.50	4.71	0.02	.985
	EAT Total	45.57	42.00	15.37	47.62	45.50	16.07	0.97	.333
Taste	Factor 1	10.31	10.00	4.43	11.36	11.00	3.29	1.36	.175
	Factor 2	13.87	13.00	5.37	15.77	15.00	6.11	1.11	.266
	Factor 3	11.21	11.00	4.10	12.45	12.00	4.18	0.97	.333
	Factor 4	10.51	10.00	4.73	12.09	12.00	4.25	1.51	.130
	EAT Total	45.89	44.00	15.64	51.68	47.50	15.01	1.69	.090

		Yes influence knowledge			No influence on knowledge				
	EAT-16	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
Money I have	Factor 1	10.38	10.00	4.32	10.56	10.00	4.68	0.15	.878
	Factor 2	13.88	13.00	5.33	14.97	14.00	6.12	0.71	.476
	Factor 3	11.16	11.00	4.04	12.29	12.00	4.54	1.21	.224
	Factor 4	10.52	10.00	4.64	11.71	10.50	5.24	1.24	.213
	EAT Total	45.93	44.00	15.39	49.53	49.00	17.10	1.26	.208
Convenience	Factor 1	10.56	10.00	4.25	9.69	9.00	4.76	-1.22	.221
	Factor 2	14.16	13.00	5.40	13.434	12.00	5.62	-1.09	.275
	Factor 3	11.34	11.00	4.12	11.20	11.00	4.10	0.05	.962
	Factor 4	10.70	10.00	4.63	10.37	9.50	5.06	-0.44	.659
	EAT Total	46.76	45.00	15.44	44.69	42.00	16.53	-0.85	.394
Family routine	Factor 1	10.40	10.00	4.37	10.36	10.00	4.34	-0.00	.997
	Factor 2	13.95	13.00	5.43	14.24	14.00	5.54	0.35	.724
	Factor 3	11.27	11.00	3.93	11.45	11.00	4.69	0.52	.606
	Factor 4	10.49	10.00	4.65	11.09	10.00	4.91	1.17	.241
	EAT Total	46.10	44.00	15.20	47.15	46.00	17.09	0.52	.605
Availability	Factor 1	10.36	10.00	4.46	10.48	10.00	4.12	0.31	.756
	Factor 2	14.03	13.00	5.60	13.98	14.00	5.09	0.03	.975
	Factor 3	11.23	11.00	4.03	11.43	11.00	4.33	0.63	.528
	Factor 4	10.50	10.00	4.65	11.02	10.50	4.90	0.91	.363
	EAT Total	46.13	43.50	15.69	46.91	46.00	15.54	0.78	.433

		Yes influence knowledge			No influence on knowledge				
	EAT-16	**M**	**Md**	**SD**	**M**	**Md**	**SD**	**U[1]**	***P* value**
Another decides	Factor 1	10.39	10.00	4.11	10.39	10.00	4.45	-0.06	.948
	Factor 2	14.03	13.00	5.20	14.01	13.00	5.54	0.09	.926
	Factor 3	10.93	10.00	4.10	11.44	11.00	4.12	1.45	.146
	Factor 4	10.30	10.00	4.68	10.75	10.00	4.73	0.74	.459
	EAT Total	45.65	43.00	14.92	46.60	45.00	15.92	0.52	.604

[1]Standardised test Statistic reported
Bold type indicates $p < .05$
Grey shading indicates statistically significant higher score
Factor 1 self-perception of body shape
Factor 2 dieting
Factor 3 awareness of food contents
Factor 4 food preoccupation

When the association between EAT-16 total score and BPSS-R summed total score were examined, those with higher disordered eating EAT-16 score were more likely to have lower level of body satisfaction (for BPSS-R summed total score) (β= -0.46, SE= 0.05, $p <$ .001). This was irrespective of gender (β= 2.27, SE= 1.51, p =.133). For example, using the model estimates (with reported intercept β= 78.23, SE= 2.34), an individual with a mean EAT-16 score of 46 would have a predicted BPSS-R summed total score of 58, while an individual reporting a higher disordered EAT-16 total score of 96 would have a predicted BPSS-R summed total score of 33, indicating very low body satisfaction.

8.4 Discussion

A novel aspect of this study was the combined exploration of nutrition knowledge, food intake, influences' on knowledge, eating behaviours, and food purchases, body satisfaction and eating attitudes within a WA university context. Females students reported significantly higher disordered eating attitude scores than males, supporting international research (Furnham et al., 2002; Loth et al., 2014; Pettie et al., 2010), yet mean scores for both females and males were above the cut-point indicated for risk of disordered eating attitudes (McLaughlin, 2014). This supports Lundahl et al. (2015) who reported healthy American undergraduate male students in their study demonstrated eating attitudes and behaviours that suggested disordered eating do not affect only women. The current study appears to be the first Australian study of undergraduate students to identify this finding. This is important because males are often over-looked in the disordered eating discourse with our findings suggesting more research is needed to examine eating attitudes and behaviours of males within this age range.

We further examined the potential underlying mechanisms for higher disordered eating attitude scores. Given that good nutrition knowledge has shown to increase consumption of healthy foods such as fruit and vegetables (Dissen, Policastro, Quick, & Byrd-Bredbenner, 2011) it was surprising that participants in this study who had correct knowledge of ADG-RDS for vegetables, grains, meat, fish & eggs and discretionary foods reported higher disordered eating attitude. It appears that correct RDS knowledge does not transition into healthier eating attitudes and may be an indicator of preoccupation with food. Abraham et al. (2018) explained that even though university students may be aware of the importance of a healthy diet, their attitudes to eating can deter them from changing their eating behaviour as there are many influences on their food choice. Our findings suggest that for many study participants, health is not important because appearance is

their main concern, rather than health. Therefore, if foods are perceived to lead to weight gain the knowledge that they are healthy may be overridden by the desire to attain a certain 'body ideal'. Hence, the need for investigating influences on nutrition knowledge.

When the influences on nutrition knowledge were examined in relation to eating attitudes, school-based nutrition programs were associated with lower disordered eating attitudes for all factors and EAT-16 total score. Farringdon et al. (2017) identified that school-based nutrition programs are commonly reported by adolescents as an influence on knowledge but were significantly less likely to influence food intake. School-based nutrition programs may be an important early intervention for positive eating attitudes however, evidence strongly suggests that school-based nutrition programs are more effective and achieve best results through interactive, skills-based programs rather than content-driven programs (Nation et al., 2003). Given we did not collect data about the type of school-based programs participants experienced it is difficult to comment about the quality of programs, however, school-based nutrition programs had a positive influence on body satisfaction *(Chapter Seven)*, it appears important for future research to explore which types of school-based nutrition programs translate to body satisfaction and healthy eating attitudes in emerging adults.

Irrespective of how schools-based nutrition programs are delivered, there are other influences on nutrition knowledge including social media which were associated with significantly higher EAT-16 scores suggesting increased risk of disordered eating behaviour. Given that the most popular social media platforms such as Facebook, Instagram and snapchat (Sensis, 2018) are all photo-based, with physical appearance a central focus (Choukas-Bradley et al., 2019), this may be contributing to BID *(Chapter Seven)* and hence disordered eating attitudes. When examining influences on eating behaviour it was not surprising that weight and appearance concerns were associated with statistically significant higher disordered eating attitudes for the majority of participants. Extreme weight control behaviours such as fasting and skipping meals following binges and unhealthy snacking has been reported, with many healthy weight university students using unhealthy methods in an attempt to control weight (Abiodun, Ogunkoya, & Rabor, 2018). This behaviour may be further explained using the questions from the EAT-16 tool. For example, a participant with correct nutrition knowledge would be more likely to indicate '*I feel guilty after eating'* if they visit a fast food outlet (such as burger outlet) as they would be aware that fast food is not recommended. They may also score highly for *'I think about burning calories when I exercise'.* This may further explain why having

correct knowledge does not translate into safer eating attitudes because other influences such as appearance and weight concerns are more powerful in affecting our participants' attitudes to eating (Abraham et al., 2018).

The previous studies *(Chapters Three and Six)* identified social media platforms such as Instagram and Facebook are not only a significant influence on nutrition knowledge but also on eating behaviour which were shown to be a key driver of 'body ideals.' These image based social media platforms have been associated with the internalisation of thin 'body ideals', body surveillance and body comparisons among young woman (Cohen et al., 2017; Prichard, McLachlan, Lavis, & Tiggemann, 2018; Tiggemann & Zaccardo, 2018). While there is a considerable amount of research regarding body image and eating attitudes of females, our findings suggest there is a need for more research exploring these factors for young men. Our male participants indicated that their eating attitudes were also associated with the influence of social media and therefore, are potentially also at risk of disordered eating behaviour in their attempt to achieve 'body ideals' promoted on these platforms. Internalising 'body ideals' portrayed on social media could manifest into personal goals that go unmet (Cramblitt & Pritchard, 2013) and hence result in lower body satisfaction *(Chapter Seven)*. There appears to be a growing interest among twenty- first century men regarding their appearance possibly due to the increased media representation of the 'ideal' male body (Grogan, 2017; Kling et al., 2018) and it has been established that males aged 18-25 years are concerned with being thin, lean and toned (Lambert et al., 2018; Tylka, 2011). Research suggests that when females are determined to meet societal 'body ideals' they can become preoccupied with food intake, which may lead to disordered eating behaviours and excessive exercise (Izydorczyk & Sitnik-Warchulska, 2018). More research is recommended as our findings indicate this may also be true of young men.

These findings should to be considered in light of study specific limitations. While the EAT-16 total score 'cut-off' for disordered eating is 41, a reported false positive rate of 35.4% has been identified (McLaughlin, 2014), however a false diagnosis is perceived as less costly than missing a diagnosis for a true case. Limitations specific to nutrition knowledge and food intake were discussed in *Chapter Five*, influences in *Chapter Six*, and body dissatisfaction in *Chapter Seven*, with an overarching review of limitations provided in *Chapter Nine*.

8.5 Conclusion and implications

The findings provide a WA context and new insights on associations between nutrition knowledge, food intake, influences' on eating behaviour, body satisfaction and attitudes to eating in emerging adults. Key findings include correct nutrition knowledge did not seem to be a protective factor regarding eating attitudes with accurate knowledge being associated with higher disordered eating scores. It appears that weight and appearance concerns, along with social media have a significant negative impact on disordered eating attitudes for both males and females. This provides a challenge for health promotion action that has traditionally followed an awareness raising strategy focused on health risks associated with poor diet. It appears this does not resonate with our participants because the eating attitudes are far more complex and involve the interplay of multiple environmental and social influences which may be further complicated by the lack of clarity for emerging adults about health, appearance and body ideals. Clearly more research is required to explore how the interrelationship of these influences can be addressed in a targeted and relevant way. Social media is an important source of nutrition information for emerging adults but appears to have negative consequences regarding eating attitudes. While these platforms may be contributing to the current issues regarding body image and disordered eating, they also present an opportunity for positive health behaviours messaging, including realistic appearance ideals, healthy dietary guidance, and healthy weight management information.

Chapter Nine

9

Thesis discussion and conclusion

9.1 Overview

Within this thesis, the results of each phase of the mixed method study were interpreted and discussed in their relevant chapters. In this chapter the findings from both phases of the study with WA University students aged 18-25 years are integrated, providing an overarching thesis discussion. Firstly, the key outcomes for each study and, where relevant, the hypotheses with reference to the conceptual framework outlined in *Chapter One* are discussed. The findings from both phases are then examined in relation to current evidence reviewed in *Chapter Two* and the emerging themes from each sub-study are used to add further explain the interrelated findings. Finally, the limitations and strengths of the study are summarised.

9.2 Outcomes summary

9.2.1 Research Objective: Phase 1 (qualitative) – Study 1: *Chapter Three*

To explore awareness of ADG, where emerging adults get their nutrition knowledge and what influences their knowledge and food intake.

Key findings

- WA university students aged 18-25 years have a general awareness of ADG but report a deliberate choice not to follow the guidelines as health and healthy eating is not seen as a priority by this cohort.
- Some key messages regarding healthy eating were memorable such as *Go for 2 & 5,* however, participants identified that these were difficult to translate into food choice because of the confusion over what constitutes a serving size.
- A majority of participants felt that current health promotion messages were not targeted at them as they were focused on long term health consequences which they felt were irrelevant.
- Living at home with parents provided more access to a variety of food such as more fruit and vegetables and home cooked and prepared meals.
- Cost of food influenced food choice for those living independently as there was a strong perception that healthy food costs significantly more than less healthy food.
- Peers influenced food choice which usually translated to less healthy food due to convenience.

- Cooking skill, lack of time and effort for food preparation all influenced food choices resulting in selection of convenience foods rather than healthier options.
- Weight and appearance were identified as the biggest motivator for changing eating behaviour. Females expressed a strong desire to look 'thin' and males made food choices to help them look 'fit and lean'
- Social media was identified as the biggest source of nutrition information.
- Majority of participants reported not searching for the information however it regularly appeared on their 'newsfeed 'and further exploration occurred if they desired to look like that person in the post and, hence, were more inclined to follow their 'diet and / or exercise' program.
- Participants expressed an interest in accurate serving size information, weight management information, and positive messages not focused on long term health risks.

9.2.2 Research Objective: Phase 2 (quantitative) – Study 2: *Chapter Five*

To investigate knowledge of ADG-RDS and HLP and examine association between knowledge and food intake (DEF scores).

H_1: Alternative Hypothesis	**Outcome**
There is a difference in nutrition knowledge and food group intake between males and females	Accepted
There is a difference in food group intake between emerging adults living at home with parents and those living independently	Accepted
There is an association between nutrition knowledge and food group intake	Accepted

Key outcomes

- Females consistently had a higher percentage of correct HLP knowledge than males. Both males and females demonstrated higher percentage of correct responses for RDS fruit and vegetables, but majority of participants had significant knowledge gaps regarding RDS of all other core food groups.
- Females ate significantly less dairy, grains and meat, fish and eggs than males.
- Those living independently ate more vegetables than those living at home with parents. Those living at home with parents ate more grains than those living independently.
- Correct HLP knowledge was associated with DEF scores for vegetables and fruit that were closer to those recommended by ADG-RDS.

– Correct knowledge of ADG-RDS for discretionary foods was associated with consuming lower DEF's for baked goods and snacks, aligning with the recommendations of ADG-RDS.

9.2.3 Research Objective: Phase 2 – Study 3: *Chapter Six*

To investigate influences on nutrition knowledge, eating behaviour and food purchases and examine association between knowledge and food intake (DEF's) and influences on knowledge and eating behaviour.

H_1: Alternative Hypothesis	**Outcome**
There is a difference between influences on nutrition knowledge for:	
Males and females	Accepted
Emerging adults living at home with parents compared to those living independently	Accepted
There is a difference between influences on eating behaviour for:	
Males and females	Accepted
Emerging adults living at home with parents compared to those living independently	Accepted
There is a difference between influences on food purchases for:	
Males and females	Accepted
Emerging adults living at home with parents compared to those living independently	Accepted
There is an association between influences on knowledge and:	
Correct ADG-RDS knowledge	Accepted
Food group intake	Accepted
There is an association between influences on eating behaviour and:	
Correct ADG-RDS knowledge	Rejected
Food group intake	Accepted
There is an association between influences on food purchases and:	
Correct ADG-RDS knowledge	Rejected
Food group intake	Accept

Key influences on nutrition knowledge

- The nutrition knowledge of females was influenced significantly more by healthy food promotions and social media (Instagram and Facebook) than males.
- The nutrition knowledge of emerging adults living at home with parents was significantly more influenced by parents, healthy food promotion and internet than those living independently.
- Correct RDS for fruit was associated with the following influences on knowledge: peers, television, food advertisements and healthy food promotion. No statistically significant associations were found for any other food group.
- The influence of food advertisements on nutrition knowledge was associated with higher intake of vegetables and lower intake of grains.
- The influence of healthy food promotion on nutrition knowledge was associated with lower intake of grains.
- The influence of YouTube on nutrition knowledge was associated with higher intake of meat, fish and eggs.

Key influences on eating behaviour

- Eating behaviour of females was significantly more influenced by healthy food promotion, weight and other appearance concerns, and social media (Instagram and Facebook) than males.
- Eating behaviour of emerging adults living at home with parents was significantly more influenced by parents than those living independently.
- The influence of health concerns and nutrition knowledge on eating behaviour was associated with eating more fruit and more vegetables.
- The influence of food advertisements on eating behaviour was associated with lower intake of fruit and higher intake of meat, fish and eggs
- The influence of weight concerns was associated with lower intake of fruit and grains
- The influence of healthy food promotion was associated with higher intake of vegetables.
- The influence of parents and family was associated with higher intake of meat, fish and eggs and baked goods and snacks.

Key influences on food purchases

- Food purchases for females were significantly more influenced by taste than for males.
- Food purchases for emerging adults living at home with parents were significantly more influenced by other people deciding what they eat than those living independently.
- The influence of quality and freshness on food purchases was associated with lower intake of fruit and vegetables
- The influence of cooking skills on food purchases was associated with higher intake of fruit.
- The influence of convenience was associated with lower vegetable intake and higher intake of fruit.
- The influence of 'how much money I have' was associated with higher intakes of vegetables
- The influences of 'someone else decides' was associated with lower intake of grains.
- The influence of parents and family was associated with lower intake of meat, fish and eggs.

9.2.4 Research Objective: Phase 2 – Study 4: *Chapter Seven*

To investigate body satisfaction and association with nutrition knowledge, food intake, influences on knowledge, eating behaviour and food purchases.

H_1: Alternative Hypothesis	**Outcome**
There is a difference in level of body image satisfaction between:	
Males and females	Accepted
Emerging adults living at home with parents compared to those living independently	Rejected
There is an association between body image satisfaction and:	
Correct ADG-RDS knowledge	Accepted
Food group intake	Accepted
Influences on nutrition knowledge	Accepted
Influences on eating behaviours	Accepted
Influences on food purchases	Accepted

Key findings regarding body satisfaction:

- Females were less satisfied than males for Factor 1: Body, overall size and shape and total body satisfaction BPSS-R summed total but not significantly different for Factor 2: Face.
- There was no difference in Factor scores of Total body satisfaction for those living with parents and those living independently
- Incorrect knowledge of ADG-RDS for vegetables was associated with higher levels of body satisfaction for Factor 1: Body, overall size and shape.
- Correct knowledge of ADG-RDS for dairy was associated with higher levels of body satisfaction for Factor 2: Face
- Food intake (DEF scores) for meat, fish and eggs were positively associated with body satisfaction Factor 2: Face.

Key influences on knowledge and body satisfaction

- School-based nutrition programs were associated with higher levels of body satisfaction Factor 1: Body, overall size and shape and BPSS-R total.

Key influences on eating behaviour and body satisfaction

- School-based nutrition programs were associated with higher body satisfaction scores for overall size and shape
- Health concerns were associated with higher body satisfaction scores for Factor 1: Body, Factor 2: Face, overall size and shape and Total body satisfaction.
- Weight concerns were associated with lower body satisfaction scores for Factor 1: Body, overall size and shape and BPSS-R summed total.
- Appearance concerns were associated with lower body satisfaction scores for Factor 1: Body, overall size and shape and BPSS-R summed total.
- Social media was associated with lower body satisfaction scores for Factor 1: Body, overall size and shape and BPSS-R summed total.

Key influences on food purchases and body satisfaction

- Quality and freshness were associated with higher body satisfaction scores for Factor 1: Body.
- Price of food was associated with lower body satisfaction scores for overall size and shape.
- Convenience was associated with lower body satisfaction scores for Factor1: Body, Factor 2: Face and BPSS-R summed total.

9.2.5 Research Objective: Phase 2 – Study 5: *Chapter Eight*

To investigate eating attitudes and association with nutrition knowledge, food intake, influences on knowledge, eating behaviour and food purchases and body satisfaction.

H_1: Alternative Hypothesis	**Outcome**
There is a difference in eating attitudes between:	
Males and females	Accepted
Emerging adults living at home with parents compared to those living independently	Rejected
There is an association between eating attitudes and:	
Correct ADG-RDS knowledge	Accepted
Food group intake	Accepted
Influences on nutrition knowledge	Accepted
Influences on eating behaviours	Accepted
Influences on food purchases	Rejected
Level of body satisfaction	Accepted

Key findings regarding eating attitudes

- Females showed significantly higher scores indicating more risk of disordered eating behaviours than males.
- The mean Total eating attitude score for both female and males were above the 'cut-off' score (41) for disordered eating behaviours indicating both genders were at risk.
- There was no significant difference in eating attitude scores for those living with parents and those living independently.

- Correct knowledge of ADG-RDS for vegetables, grains and meat, fish and eggs and discretionary foods was associated with significantly higher eating attitudes scores indicating higher risk of disordered eating behaviour.
- Higher Factor 3: Awareness of food contents scores (more risk of disordered eating behaviour) was associated with higher intake of vegetables.
- Higher Factor 1: Self-perception of body shape, Factor 2: Dieting, Factor 3 Awareness of food intake and Total eating attitudes score (more risk of disordered eating behaviour) was associated with lower grain intake (DEF scores).
- Higher Total eating attitude scores (more risk of disordered eating behaviour) were associated with lower baked goods and snacks intake (DEF scores).

Key influences on nutrition knowledge and eating attitudes

- Social media (Instagram / Facebook) were association with higher Factor and Total eating attitude scores suggesting higher risk of disordered eating.
- School-based nutrition programs were associated with lower Factor and Total eating attitude scores suggesting they may be a potential protective factor.

Key influences on eating behaviour and eating attitudes

- Peers were associated with higher Factor and Total eating attitude scores suggesting higher risk of disordered eating behaviour.
- Weight concerns were associated with higher Factor and Total eating attitude scores suggesting higher risk of disordered eating behaviour.
- Appearance concerns were associated with higher Factor and Total eating attitude scores suggesting higher risk of disordered eating behaviour.
- Social media (Instagram/Facebook) were associated with higher Factor and Total eating attitude scores suggesting higher risk of disordered eating behaviour.
- Internet was associated with higher Factor 2: Dieting, Factor 3: Awareness of food content, Factor 4: Food preoccupation and Total eating scores suggesting higher risk of disordered eating behaviour.
- Nutrition knowledge was associated with higher Factor 3: Awareness of food content scores.
- Healthy food promotions were associated with higher Factor 3: Awareness of food content scores.
- Food advertisements were associated with higher Factor 4: Food preoccupation scores.

Key influences on eating behaviour and eating attitudes

– There were no statistically significant findings for influences on food purchase with eating attitudes.

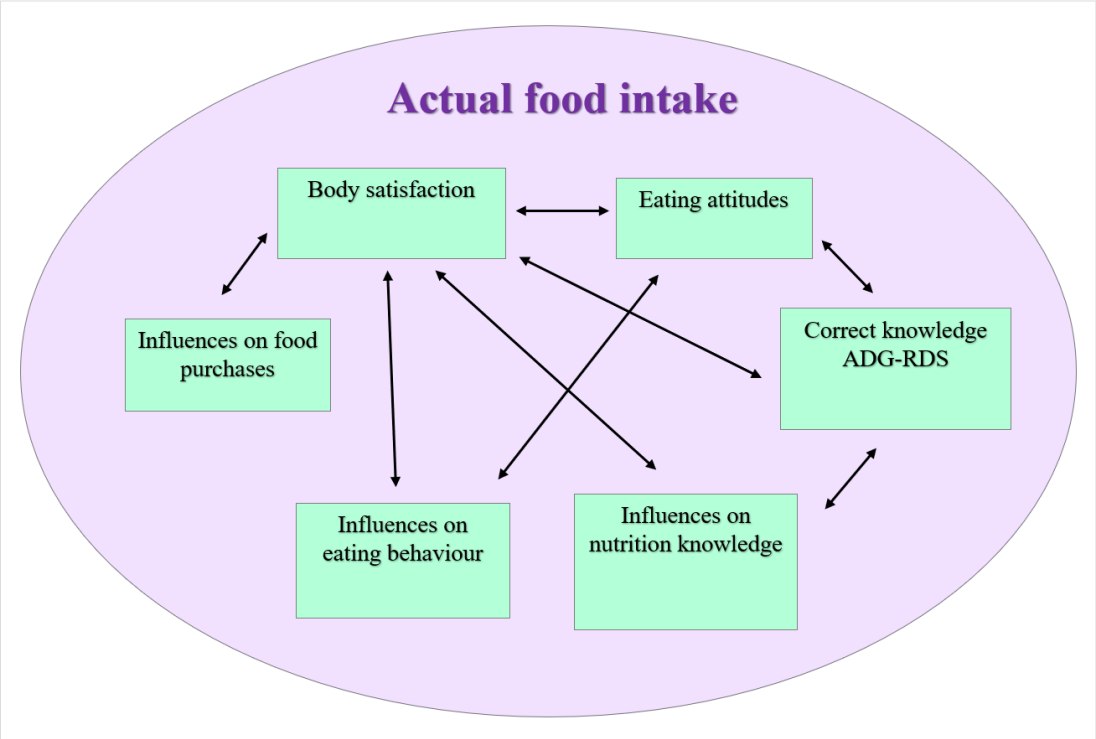
Key findings for body satisfaction and eating attitudes

– Higher Total eating scores (more risk of disordered eating behaviour) were associated with lower body satisfaction scores for both males and females.

9.3 Conceptual framework

The key findings of this study indicate that each of the elements examined, correct ADG knowledge, influences on knowledge, influences on eating behaviour, influences on food purchases, level of body satisfaction and eating attitudes were all associated with actual food intake (Figure 9.1). Other associations between the elements examined, established through statistical models are also depicted in this adapted conceptual framework:

Figure 9.1
Conceptual framework showing associations between elements affecting actual food intake based on this thesis findings



9.4 General Discussion

The study described in this thesis explored food-related behaviours of 18-25 year old university students within the WA context, examining the complex, interwoven factors such as nutrition knowledge, influences and attitudes that drive food intake, body satisfaction and eating attitudes. While similarities with international college-based studies were found, key differences were also noted.

University students in this study reported poor knowledge of ADG-RDS. This concurs with previously reported findings regarding Australian emerging adults who are consistently not meeting ADG recommendations for core food groups (ABS, 2018; Daly et al., 2011; DoH, 2006). This is concerning given their increased risk of diet-related illness due to only 3.6% of 18-24-year-olds meeting the RDS for both fruit and vegetables and almost half (46%) being considered overweight or obese (ABS 2018). While the ADG-RDS were developed to help improve Australians' eating patterns and promote the health benefits of a nutrition diet (NHMRCA 2013), adherence remains poor.

An important finding of this study was the *Go for 2 & 5* campaign message has been retained with the majority of participants correctly identifying RDS of fruit and vegetable which was also reflected in their food intake (DEF summed scores). Those with correct HLP knowledge for fruit and vegetables consumed closer to the ADG-RDS for those food groups. This supports Pollard et al. (2007) who reported the *Go for 2 & 5* campaign, which was launched in WA in 2002, was successful in raising awareness and increasing the consumption of vegetables among WA adults. However, the findings of the current study also confirmed significant knowledge gaps for ADG-RDS with the majority of participants selecting the '*don't know'* option for RDS of all other core food groups. This suggests the need for positive 'do' messages similar to *Go for 2 & 5* for other food groups as suggested for adolescents by Farringdon et al. (2019). Furthermore, these types of campaigns should be conducted over an extended period to ensure incremental growth in knowledge, intentions and behaviour can occur and be maintained (Pollard et al., 2007).

Poor nutrition knowledge is concerning from a health maintenance perspective, however, the findings regarding influences on eating behaviour suggest the health perspective was not important to participants. An important finding of this study was that participants indicated their non-adherence to the ADG-RDS was a deliberate choice. The focus groups confirmed international trends that emerging adults were not motivated to change eating behaviour as there is no sense of urgency (Al-Khamees, 2009; Kothe &

Mullan, 2011; Neumark-Sztainer et al., 1999; Richards et al., 2006; Stewart & Tinsley, 1995). This was unexpected given many of the cohort were studying in a health-related area. However, given the age of the participants, the HBM helps to explain this behaviour as there is no *perceived susceptibility* among emerging adults as they believe diet-related illness is something experienced later in life, furthermore, this belief also indicates a lack of *perceived severity* by participants.

> At the moment it's not a priority because I can shovel in whatever I want and not put on a lot of weight. But I think in the future it will become an issue [MG3]

> I think that within the 18-25 age bracket, there's more of an attitude that 'I'll do what I want.' It may be something that I think about in the future but at the moment I don't have any reason to really change how I'm eating [FG3]

> Scare tactics tend to work for older people but are easier to dismiss by young people. [MG4]

Given that health was not a priority for participants, an interesting finding was the majority of participants in this study recorded DEF's for vegetable and fruit that were above the ADG-RDS. This finding was inconsistent with the ABS (2018) that reported less than 7.5% of all Australian adults met the ADG-RDS for vegetables and just over half met the recommended intake for fruit. The fact the WA has had the *Go for 2 & 5* campaign since 2002 may again explain this finding as there may be an increased awareness due to the campaign (Pollard et al., 2007). Further, correct ADG-RDS for fruit was also associated with the following influences on knowledge: peers, television, food advertisements and healthy food promotion, consistent with the extremely high recall of the *Go for 2 &* 5 campaign among this cohort. However, the high recall may have biased results as it increases the potential for socially desirable responses, especially given the majority of the study cohort were studying in a health-related discipline and, therefore, would have a greater awareness of the food they should be consuming even if health was not a major driver for their food choices.

The influences on nutrition knowledge most commonly identified were school-based nutrition programs (82%) and parents/family (82%). These influences were also mentioned in the focus groups. However, these influences on knowledge were not associated with actual food intake. The influences on nutrition knowledge that were significantly associated with actual food intake (DEF scores) were food advertisements, associated with higher vegetable intake and lower grain intake and YouTube, associated

with higher intake of meat, fish and eggs. Therefore, their belief that school-based nutrition programs and parents influenced their nutrition knowledge was not consistent with the reality that those influences had significantly less impact on their food choices. This finding is consistent with the 'mindless eating' concept proposed by Wansink (2006) that highlights that many factors including environmental cues and marketing influence food choices however, the majority of people are either unaware or deny these influences affect them. Yet the influence of school-based nutrition programs on knowledge was associated with better levels of body satisfaction and eating attitudes therefore schools do provide a useful space for enhancing nutrition knowledge. However, which aspects of these programs provide the best potential for positive outcomes is yet to be researched.

Participants reported the influences on eating behaviour were parent (88%) and nutrition knowledge (86%). Interestingly, the influence of parents on knowledge was not associated with actual food intake although parents as an influence on eating behaviour was associated with increased intake of meat, fish and egg and discretionary foods (specifically, baked goods and snacks). Further, both males and females involved in this study on average consumed less than recommended meat, fish and eggs and more than recommended baked goods and snacks. Home availability and home accessibility of discretionary foods has been associated with increased consumption among adolescents (Pearson, Griffiths, Biddle, Johnston, & Haycraft, 2017). Given that two thirds of the emerging adults involved in this study were living at home with parents, access and availability of food supplied by parents may be driving increased consumption of discretionary foods. The impact of social networks, in this case parents, on eating behaviour can be explained using the TPB. For example, if energy-dense snack foods are available, and emerging adults have a positive attitude towards consuming them and they have 'social' approval from parents due to the availability of these foods at home, this may influence their intention to consume these snacks (Seo et al., 2014). Previous research has confirmed that social networks (such as parents and family) are an important influence on eating behaviour (Kelly et al., 2013; Ruddock et al., 2019). Role modelling by influential people, such as parents, has been identified as a key determinant for influencing health eating in children and adolescents (Godrich et al., 2018). While parental modelling has been associated with healthier diets, the strongest predictors of consumption among adolescents and children has been identified as access and availability (Pearson et al., 2017). Comments from the focus groups conducted in this study confirm this view further explaining how parents are influential in food choice and eating behaviours of emerging adults.

> It makes a difference because your parents cook your dinner for you and you don't have the option to choose the food yourself. [FG1]

> I know that my family had a lot of junk food at home, while my cousin's family were stricter on the healthy eating. So now my cousins have probably got healthier eating habits than I do – despite the fact that we had the same messages at school. [MG2]

The majority of participants living at home with parents reported that their parents did the grocery shopping. According to Wansink (2006) the person responsible for the majority of the grocery shopping is the '*nutritional gate keeper'* and thus largely determines the menu and food available for consumption. The findings of this study suggest further research is required to investigate how parents' influence eating behaviours beyond adolescence. For example Godrich et al. (2018) suggests that factors such as nutrition knowledge and poor food literacy and cooking skill may be contributing to grocery choices of parents with children and adolescents. It is currently unknown if these factors result in an increase of access and availability of convenience and snack foods for emerging adults living at home.

A concerning finding was that no participants in this study recorded adequate DEF scores for grains. Males consumed less than half the ADG-RDS and females consumed less than one third the ADG-RDS for grains. Insufficient consumption of grains appears to be due in part to lack of accurate information regarding this food group.

> Bread are kind of near the top of the food pyramid which means we should be having smaller amounts [MG2]

However, it also appears to be driven by appearance, particularly for females.

> For girls, the message is 'bread is bad for you and will make you fat' – so you tend to eat more fruit and veggies rather than more substantial foods. [FG3]

This is consistent with international research that found 'appearance' was the main motivator for fruit and vegetable consumption for the 18-25-year-olds (Poobalan et al., 2014). Appearance and 'body ideals' in this study were a primary influence for both males and females. However, the focus of these 'body ideals' were gender specific. Females were focused on weight loss with a 'thin' body ideal, while males were focused on muscle development and fitness goals. Appearance and weight control were themes that consistently emerged throughout the current study with both males and female participants indicating that weight gain was the biggest motivator for dietary change. This suggests

that WA university students appear to be pursuing unrealistic 'body ideals' which in turn could be driving the consumption of some foods and the restriction of others. There were significant gender differences in food intake, with males more likely to consume closer to RDS for meat, fish and eggs, dairy and grains than females. The qualitative data suggests that males may be consuming higher amounts of these food as they have been associated with muscle development which is the 'body ideal' identified by males. While males may wish to lose body fat the rationale is not to be 'thin' as it is for females. Males' drive for leanness is to highlight their muscle definition so the construct of their behaviour is different to that of females (Tylka, 2011). The focus group discussions confirmed that males were as driven as females to strive for societal 'body ideals' and their desire to achieve these muscular 'body ideals' affected their food choices and impacted on their level of body satisfaction.

> We're more focused on eating the right sort of portions, to gain the most weight, or muscle mass, and fitness [MG2]
>
> For me, it's just about looking healthy and somewhat fit. I don't mind having a little bit of body fat – it's healthy – but I don't want to go above having 15% body fat. That would concern me. [MG4]
>
> It's the pressure of every guy wanting to be huge [muscular] and every girl wanting to be stick thin. [MG3]
>
> How I look, and what I do… it about performance both physical and mental, whether I can lift the weight I want [MG4]
>
> I've got an app on my phone that tracks my intake of proteins, carbohydrates and liquids. And you can scan the barcode of products and it comes up with how it matches your daily intake. [MG1]

Furthermore, the mean eating attitudes scores for the male participants were above the 'cut off' for disordered eating. Given social media was identified as an influence on eating behaviours and it reinforces 'body ideals', it appears to be also influencing eating attitudes as a way of attaining these ideals.

Females' food intake (DEF's) of dairy, grains and meat, fish and eggs were all significantly less than males. The qualitative data suggests that females may be avoiding these foods as they have been associated with weight gain and the 'body ideal' for women is thin.

> Girls are less concerned with the healthy food pyramid and more concerned with current trend as dictated by social media – so 'clean' and 'raw' foods, stay away from carbs and so on. It's the same for guys but the trend for them is focusing more on protein rather than carbs so they can bulk up. [FG3]

Societal 'body ideals' that become unmet personal goals and body image inflexibility are predictors of disordered eating behaviours (Cramblitt & Pritchard, 2013; Pellizzer et al., 2017). Eating attitudes for emerging adults in this study appear to be focused on achieving particular 'body ideals' which suggests a need for accurate information regarding healthier ways to maintain body size and shape. Female participants had significantly higher disordered eating attitude scores than males which supports findings of international research involving this target group (Furnham et al., 2002; Loth et al., 2014; Pettie et al., 2010). However, both males and females mean scores were above the disordered eating cut-off score of 41 (McLaughlin, 2014), suggesting both groups were at a higher risk of disordered eating behaviour. Attempts to meet unrealistic 'body ideals' may lead to BID which is associated with disordered eating behaviours such as fasting, skipping meals, and restricting intake of certain foods has been reported as prevalent among female emerging adults (Ackard et al., 2002) and higher intake of snack food (Abiodun et al., 2018). This is consistent with the current study participants who reported discretionary foods were the second highest daily intake which is also consistent with the ABS data for emerging adults' consumption (2018). This was an interesting finding given the 'body ideals' expressed by males (fit and lean) and females (thin). Furthermore, correct ADG-RDS for discretionary foods were also associated with higher disordered eating attitudes. The Theory of Cognitive Dissonance (TCD) may provide an explanation for this finding as people will work to resolve inconsistencies between their beliefs and actions (Festinger, 1957). Given the majority of the participants in this study were pursuing higher education in the area of health, therefore their beliefs regarding a healthy diet may be inconsistent with their behaviour of eating discretionary foods, resulting in discomfort regarding the inconsistency which could be represented by a higher disordered eating attitudes. They may be trying to reduce dissonance by restricting foods they consider fattening (grains and dairy) to compensate for their high consumption of energy dense discretionary and increasing exercise to 'work off' the weight at the gym and maintain their body ideals as suggested by the focus group responses.

> People really beat themselves up for eating one bad thing the day before, so they spend the next day at the gym to make up for it. [FG2]

> My justification for eating badly is that I go to the gym. I love food and I love bad food, and if I go to the gym and work out, then in my head it justifies eating worse than maybe I should. [MG1]

> I honestly don't really think about what I'm eating. I do a fair bit of exercise, so I think in the back of my mind I think "oh I can work it off at the gym." [MG2]

The responses from phase one also confirm a trend in seeking information in an attempt to achieve 'results' as quickly as possible.

> People are impatient, and they want something immediate. That's why they go to replacement shakes, and celebrity 'slim' diets and stuff like that. [FG3]

> There's a lot of stuff on social media about supplements. Fit guys are all about the supplements, how to get large. [MG4]

> Females want to be slim, want to be pretty, that's not going to change I don't think. The message is still very much about how you look. [FG3]

> It's about getting the right kind of knowledge about what's going to build the muscle mass, as opposed to weight that will just instantly turn to fat the minute you stop exercising. [MG2]

The fact that social media was identified as a major source of nutrition information for both males and females, appears be reinforcing these 'body ideals' and the strong desire to achieve them.

> Far too much comes from social media. I think it's a huge influence. There's a lot of information out there and you tend to get bombarded with it. [MG4]

These comments indicate an increase risk in extreme weight-reduction and body shaping activities which have been shown to have a negative impact on emotional and physical health (Ackard et al., 2002; Goncalves & Rui Gomes, 2012). The prevalence of social media as a source of nutrition information is of concern given this study confirms social media is associated with lower body satisfaction scores for body, overall size and shape and overall body image. Also, of concern, was that while participants reported they do not seek nutrition information it just appears on their social media 'newsfeed'. Their interest for further investigation was sparked by the appearance of the person in the post. If they desired to look like that person, they were more inclined to investigate and follow the 'diet and or exercise' program being promoted. Interestingly, qualifications and credibility of the person posting information was not a consideration for the study cohort. While there was some acknowledgement that not all information was credible there was also a strong

tendency to follow the information regardless of the qualifications of the person providing they believed the information could provide the 'body ideals' they desired. The primary driver was the appearance of the person posting the information and if their appearance matched their own 'body ideals'. This poses as a significant challenge for health promotion as credible sources of nutrition information seem to be under-utilised by this group.

Social media platforms, being largely image based continue to reinforce thin 'body ideals' which affect food intake. This finding supports international research that identified females are more likely to internalise societal 'body ideals' and therefore have higher prevalence of body dissatisfaction than males (DeBate et al., 2008; Furnham et al., 2002; Izydorczyk & Sitnik-Warchulska, 2018; Swami et al., 2017). The use of social media has been associated with body comparison leading to lower body satisfaction (Izydorczyk & Sitnik-Warchulska, 2018; Kling et al., 2018). The current study confirmed that eating behaviour influenced by social media, weight and appearance concerns resulted in lower levels of body satisfaction and higher risk of disordered eating behaviour among both male and female participants. This is consistent with the internalisation of 'body ideals' promoted on social media that has previously been associated with lower levels of body satisfaction for both males and females (Gitimu et al., 2016; Kling et al., 2018; Tylka, 2011). The words of the participants involved in the focus groups further explain the impact of social media.

> Social media plays a big role in telling us what we should look like [MG4]
>
> Instagram is full of girls that look happy and skinny, which brings out envy from a lot of people because you see it all the time. It comes across that they have the perfect life…so people strive for that. [FG2]
>
> I dropped 16kg in 12 weeks and lots of my girlfriends said, "oh we want to go on your diet" [FG4]
>
> People become motivated (to change their diet) if they see themselves putting on weight. [MG3]

Interestingly, given the eating behaviour of participants was very focused on weight and appearance, the current weight focussed nutrition messages such as *LiveLighter* - 'the grabbable gut', were perceived as irrelevant. This poses as significant challenge for health promotion professionals because while emerging adults are concerned about weight and appearance they also appear to be focused on quick 'results' driven by societal 'body ideals.' This places them at higher risk of extreme weight-reduction and body shaping

activities which have been proven to have a negative impact on emotional and physical health (Ackard et al., 2002; Goncalves & Rui Gomes, 2012).

The focus groups provided some insight into what nutrition information emerging adults are interested in and would deem relevant which may be of some help in formulating nutrition messages targeted at this group.

> Just easier to digest information. Portion sizes as well I think they're a big thing that people overlook all the time [MG2]

> People need to start value health more than body image because that's what matters not the stereotypical fit looking body. If people changed their mindset to "what makes me feel healthy and happy" rather than "I need to look like this person" it might make a difference. [FG3]

> It comes down to promoting fun - not "don't eat this, don't do this" Find a way to say, 'hey look what you can do if you're actually eat good food – it's fun. [FG3]

There was also a desire to see nutrition messages communicated via social media as this is where they are currently assessing diet information.

> You need something that can go viral on Facebook, but something that's targeted at people our age, rather than older people. [FG1]

> Instagram, snapchat, Facebook, social media in general. The look of the information would probably be more influential than the words. [FG2]

> You could try Facebook clickbait as I think they're very very effective at convincing people. Even if you don't click on it, it just sits there, and you scroll past it. And it keeps on popping up. [MG1]

In summary the studies that comprise this thesis provides a WA context because the influences on knowledge, eating behaviour and food purchases were identified by WA emerging adults in the qualitative phase of this study (Lambert et al., 2018). Many of the influences identified in this study demonstrated that they were similar to international research including, cost of healthy food, living situation, lack of peer support, social media, difficulty translating knowledge into food choices and body image concerns (DeBate et al., 2008; El Ansari et al., 2012; Fisher et al., 2016; Izydorczyk & Sitnik-Warchulska, 2018; Kelly et al., 2013; Korn et al., 2013; Ruddock et al., 2019; Sogari et al., 2018; Swami et al., 2017; Vaterlaus et al., 2015).

Quantitative findings indicated correct nutrition knowledge was not associated with nutritionally sound eating behaviour because other factors were influencers. The influence of social media on nutrition knowledge and eating behaviour resulted in participants recording higher disordered eating scores. To achieve the 'thin' body ideals promoted on social media, females particularly appear to be restricting intake of certain food groups such as grains and meat, fish and eggs. As there were no participants in this study that consumed even close to the RDS for grains suggests this behaviour may not be isolated to females. For all participants lower DEF summed scores for grains were also associated with higher disordered eating scores. Social media's influence on eating behaviour may be driving weight concerns, appearance concerns, and body comparisons among peers for both males and females as these influences were all associated with higher disordered eating scores. The risk of disordered eating was high for both males and females in this study posing a challenge for health promotion targeting this group.

9.5 Limitations

While this study is comprehensive in many aspects the findings still need to be interpreted in the context of several limitations which have been highlighted in the previous chapters. This study exclusively involved participants from a convenience sample drawn from one WA university campus which may limit the generalisability of the findings to other geographic locations. However this convenience sampling is typical of other college based studies in the field (Abraham et al., 2018; Alghamdi et al., 2018; Alzahrani et al., 2020; Bargordo et al., 2013; Kabir, Miah, & Islam, 2018; Sogari et al., 2018; Sprake et al., 2017) and provides a snap shot relevant to the WA context, particularly for informing future health promotion initiatives. Furthermore, the study relied on self-selecting purposive sampling to recruit participants. This creates a limitation as the majority of participants who self-selected were studying in health-related disciplines, therefore, it is possible that they may have provided socially desirable responses especially regarding vegetable and fruits intake which may represent a bias. The education level and study area of the participants could also mean that their nutrition knowledge is higher than other groups of emerging adults, therefore, results and associations cannot be generalised to the whole university or emerging adult populations. However, findings indicated very poor nutrition knowledge for some food groups which resulted in some statistical analyses being underpowered for group comparisons with modeling analysis. Conversely, this may be viewed as a strength given the expectation that this group would be more

knowledgeable that other groups, further reinforcing the significance of the gaps in knowledge for some food groups and the consequent impact on eating behaviour.

The study had no control over any public health initiatives such as media attention regarding changes to the food pyramid in Australia as of mid-May 2015 that may have added to nutrition knowledge and may explain why the *Healthy Living Pyramid* was the most recognised format of the ADG-RDS for this group. While participants demonstrated an adequate knowledge of food group placement on the *Healthy Living Pyramid* their knowledge of ADG-RDS was significantly less.

Food intake was assessed using FFQ which relies on participants to recall what they have eaten over the previous four-weeks and given the majority of participants were studying in health-related areas, this may represent a bias. Furthermore, the FFQ was not compared against actual dietary intake or any other measure (e.g. 24 -hour recall) to test its concurrent validity and serving sizes were not measured, making it impossible to make direct comparisons to ADG-RDS.

In this study, the impact of environmental stressors, eating disorders, mental health issues, emotional state or any risk and protective factors that may impact on the eating behaviours of participants was not assessed. It is acknowledged that these factors may have affected the findings, however, it was beyond the scope of this study to address their impact. Previous research has indicated that emotional state and environmental stressors such as study load can impact on eating behaviour (Alzahrani et al., 2020) and the eating disorder risk and extreme weight control behaviour is prevalent among this target group (Abiodun et al., 2018). It is possible that this limits the depth of the findings within the broader context of eating behaviour research among emerging adults. However, the high number of participants who scored above the cut off for disordered eating attitudes supports previous research with university students.

Methodological limitations should also be acknowledged, including the cross-sectional and correlational design of the study. While analytical approaches such as these have been useful to illustrate the relationships among variables, statements regarding causality cannot be made. Therefore, longitudinal research is needed to further examine the associations and differences over time in this target group.

9.6 Strengths

The current research possesses several strengths including the sequential design which enabled informed exploration of the complex topic of eating behaviours specific to emerging adults. Phase one of this study adhered to focus group methodology hence saturation of categories was achieved, and the content analysis performed through NVivo v11 (QSR International, 1999-2013) validated the initial manual coding, adding to the rigour of the results. Furthermore, the findings from the first phase was used to inform the development of the measures used in Phase two ensuring face and content validity and relevance to the emerging adult participants. The measures were then pilot tested and subsequently confirmed to be a valid and reliable measures of nutrition knowledge, food intake and influences on eating behaviour. FFQ are one of the most widely used tools due to the low cost and reduced burden on participants and are regarded as a robust measure for investigation of usual frequency of food consumption. Furthermore FFQ allows comparison across studies as they have been used with both adults and emerging adults (Crombie et al., 2009; Daly et al., 2011; Department of Health, 2006; El Ansari et al., 2012; Richards et al., 2006). The DEFs calculated from the FFQ data in this study were similar to the recent Australian Bureau of Statistics (2018) results over the same study period.

Using a sequential mixed method research design allowed for triangulation between the qualitative and quantitative aspects of the study, with the depth of qualitative data helping to interpret the quantitative findings thereby increasing the methodological rigour of the study.

9.7 Conclusion

The current study used a sequential mixed method approach to identify associations between nutrition knowledge, food group intake, influences on knowledge and intake, level of body satisfaction and attitudes to eating of students aged 18-25 years from one WA University. It was underpinned by theoretical considerations from the Health Belief Model, the Theory of Cognitive Dissonance, and the Theory of Planned Behaviour. Phase one of this research used focus group interviews to identify knowledge, sources of nutrition knowledge and influences on eating behaviour. This phase of the research informed the development of the survey tool used to quantify level of nutrition knowledge, influences on knowledge, eating behaviour and food purchases and actual food intake (FFQ and DEF scores). This measure was tested and validated among university students

aged 18-25 years; followed by the exploration of potential associations between each factor and the actual food intake of this target group. Associations with body satisfaction and eating attitudes was also examined.

The outcomes from this study could be used by health promotion professionals and researchers interested in prevention and intervention to assist emerging adults make healthier food choices. It provides valuable insights into the food intake of university students within a WA context and the influences that impact on their food choices. Emerging adults are a particularly vulnerable group as they transition from adolescence and establish life-long eating behaviours. There is growing interest in this group as a target for health promotion, given they are not following dietary guidelines and consuming diets high in saturated fat and sugar, resulting in an obesity rates of 46% among 18-24-year-olds in Australia (ABS, 2018). Of greater concern is our finding that correct nutrition knowledge does not translate into higher adherence to the dietary guidelines indicating a new approach to engagement with emerging adults is needed.

While emerging adults have not been the target group the current weight focused public health messages, they may have had the unintended side effects that 'thin' equals healthy reinforcing the unrealistic 'body ideals' promoted on social media. Weight concerns have been identified as the major motivator for changing food choices and social media was identified as an influence on nutrition knowledge and eating behaviour. The influence of societal 'body ideals' for females to be thin and males to be muscular that are heavily promoted on social media presents the biggest challenge for health promotion strategies targeting emerging adults. Considering the detrimental impact food choices may have on the health and wellbeing of emerging adults, it is imperative for more research regarding the complex influences that drive the food choices of emerging adults to be conducted.

Given the general lack of knowledge of ADG-RDS and poor adherence to RDS for all food groups among the university students in this study suggests the need for further research to focus on sub-groups for example lower socio-economic groups that do not have the benefit of a university education.

9.8 Implications for Future Research

The results of this study provide an insight into the eating behaviour of WA emerging adults and identified significant knowledge gaps regarding ADG-RDS within a sample of university students. Given that the majority of participants in this purposive sample were pursuing higher education within the areas of health science, nursing and physiotherapy it

is reasonable to suggest that they may have more nutrition knowledge than other groups of emerging adults. The knowledge gaps therefore may be more substantial than these findings indicate, highlighting the need for more Australian research focused on the eating behaviour of a broader range of emerging adults.

Parents were identified as an influence on nutrition knowledge and eating behaviour. Findings suggest that parents' knowledge regarding ADG-RDS may be inadequate as parental influence was associated with lower than recommended intake of meat, fish and eggs and higher than recommended intake of discretionary foods such as baked goods and snacks. The increased intake of discretionary food may also be due to poor role modelling and / or access and availability of these foods within the home. Given that more emerging adults are living at home with parents and for longer (Arnett, 2000), further research is recommended to investigate how parents influence nutrition knowledge and eating behaviour post adolescence, as well as the influence of increased access to foods provided by parents in the family home.

Body image dissatisfaction research has largely focused on females and the findings of this study confirm and support previous research that females are less satisfied with their bodies than males (DeBate et al., 2008; Furnham et al., 2002; Izydorczyk & Sitnik-Warchulska, 2018; Kenardy et al., 2001; Korn et al., 2013; Swami et al., 2017). However, the findings of this study demonstrate that males' body satisfaction and eating behaviours were impacted by societal pressure regarding masculine 'body ideals' represented in social media. The current tools available for assessing body satisfaction focus on 'thin' ideals which are relevant to females but may not be appropriate for males. It is evident that males may wish to lose body fat but this is due to a desire to highlight muscle definition rather than become thin, therefore the response they provided for the BPSS-R may not give a true representation of their level of body satisfaction (Tylka, 2011). Further research is recommended to better understand the unique aspects of male 'body ideals' in order to develop a body satisfaction assessment that may be better suited to measure the impact of these ideals on the level of body satisfaction of young males. The mean score of the EAT-16 for males in this study exceeded the 'cut off' for disordered eating suggesting that societal 'body ideals' may be impacting their attitudes towards eating and their eating behaviour. More research is required with male emerging adults to investigate what influences their eating attitudes.

9.9 Implications for practice

The findings of this study confirm that WA university students do not identify with current health promotion nutrition messages dismissing them as irrelevant, further supporting international research involving this target group (Berry et al., 2018). Emerging adults are a vulnerable population as they transition to more independent decision-making regarding food choices. Based on the results from the current study participants, it appears that emerging adults may be deliberately opting not to follow ADG-RDS and are actively following exercise and diet information, which may not be sound advice, available on social media in an attempt to achieve unrealistic 'body ideals.' This poses a challenge for health promotion as current Australian nutrition campaigns target older Australians and focus on diet-related health risks which do not resonate with emerging adults. In order to have more impact on emerging adults the findings of this study suggest focusing on positive 'do' messages such as *Go for 2 & 5* campaign which may be a more successful approach for targeting this group. This supports previous research that suggests that *Go for 2 & 5* campaign has had a positive impact on improving RDS knowledge (Pollard et al., 2007). However, it appears emerging adults are confused regarding what constitutes a serving size which makes it difficult for them to translate knowledge into food choice. Given findings of this study highlighted significant knowledge gaps particularly for grains and cereals, it is recommended that campaigns such as *Go for 2 & 5* be developed to provide accurate information regarding RDS for other food groups. However, these types of messages may increase knowledge but to increase likelihood of messages being translated to food choice the messages need to resonate with emerging adults. Promoting benefits including weight management and improved energy may increase self-efficacy overtime. Based on the results of this study it is recommended that social media platforms be utilised to disseminate health promotion messages targeting this group as this is the source identified as most commonly used for nutrition information. However, extensive formative research needs to be conducted with emerging adults to identify what messages and formats are most likely to engage them to improve their eating behaviour.

School-based nutrition programs were identified in this study as an influence on nutrition knowledge, body image and eating attitudes potentially providing a useful early intervention strategy. While the Australian curriculum recommends that the ADG is addressed, it is unclear what content is being specifically taught in schools and there appears to be many inconsistencies (Sadegholvad et al., 2017). For this reason, it is not surprising that these programs did not impact actual food intake since the role of school-

based education is not necessarily to influence eating behaviour. This appears to be a lost opportunity. While the Australian Curriculum recommends addressing aspects such as social and environmental influences, and preparing and sharing healthy food with friends (ACARA, 2016), there appears to be a lack of consistency with students receiving different programs and messages depending on which school they attend (Sadegholvad et al., 2017). Focusing on more immediate health benefits such as 'feeling good', improved sleep quality, improved mood, and weight management may be more relevant to this group and could help reinforce positive 'do' messages such as *Go for 2 & 5* which was designed to improve knowledge. Coupled with an interactive, skills-based nutrition program rather than content-driven program may prove more engaging (Nation et al., 2003). The efficacy of current and future evidence-based programs should be explored to identify what aspects of nutrition programs enhance the potential to positively impact healthy eating, body image and eating attitudes.

Based on the findings of the current study eating behaviours of both males and females were impacted by societal pressure regarding 'body ideals.' Social media is the 'go to' source of nutrition information for emerging adults and, as such, appears to be negatively influencing nutrition knowledge and eating behaviours. It is unrealistic to reduce exposure to social media given its prolific use among this group, however, encouraging emerging adults to follow more body positive social media feeds may assist in promoting more realistic body ideals (Cohen, Fardouly, Newton-John, & Slater, 2019). Social media and health literacy are inter-connected and health promotion strategies should consider utilising these platforms as a promising opportunity for the promotion of body positive messages. It is important to understand the audience and use the unique culture and language of the target population in order to engage them (Roberts, Callahan, & O'Leary, 2017). The findings of this study suggest promotion of realistic body ideals coupled with positive 'do' messages regarding diet and nutrition may positively influence food intake.

Another factor affecting food intake is influences on food purchases. The findings of this study with emerging adults confirm that price of food and convenience influence food purchases and food intake. Discretionary foods accounted for the second largest daily intake among the participants of this study. Fast foods are heavily marketed towards emerging adults (Brownbill et al., 2018; Nelson et al., 2008) and their perceived low cost and easy access make them an attractive option for emerging adults. Participants indicated there was a large amount of unhealthy food promotion on social media platforms. Given

the amount of time spent on social media among this age group they are increasingly exposed to personalised and targeted advertising of products such as food high in saturated fat, salt and sugar, highlighting the need for restrictions on advertising via social media (WHO, 2019). International research reports that emerging adults perceive healthy food to be more expensive and requires more time to prepare (Fisher et al., 2016; Poobalan et al., 2014). The findings of the current study support this and, therefore, it is recommended that health promotion strategies include ideas for healthy meals that are low cost and easy to prepare. Working with social media providers to reduce the amount of advertising may be a useful strategy. Social media also provides an excellent platform for healthy recipes and meal ideas as emerging adults are familiar with using these platforms for nutrition information. The use of mobile food apps and tailored text messaging for emerging adults providing dietary feedback has shown to be integral to diet change according to Shoneye et al. (2019) and should therefore be explored further. The findings of this study also suggest the importance of creating a supportive environment for healthy food choice including strategies such as limiting access to unhealthy convenience foods, introducing a sugar tax and improving cooking skills (Kowalkowska et al., 2017). However, translating these recommendation successfully into action requires strong engagement and consultation with emerging adults and other key stakeholders.

APPENDICES

Appendix A Conference Presentation

A.1 World Nutrition Congress – Program

CONGRESS DAY 1

TIME	SESSION			
2:00pm – 3:30pm - Concurrent Session 2 – Knowledge Fairs – What is the evidence for policy and action? - Part 1				
Speaker Times	2A Engaging and supporting adolescents and young adults Room: Plaza Auditorium	2B Influence of locality on food access and safety Room: Plaza Rm P6	2C Childcare & school food environments Room: Plaza Rm P7	2D Advertising and marketing to children Room: Plaza Rm P8
2:00pm – 2:06pm	Prevalence and past decade trends in Australian adolescents' healthy lifestyle behaviours **Speaker:** Belinda Morely	Effectiveness of dietary interventions implemented in rural Australian communities: A systematic review **Speaker:** Stephanie Partridge	Benchmarking food provision guidelines for Australian Early Childhood Education and Care services **Speaker:** Alison Spence	Persuasive and abusive strategies directed to children on food and beverage advertising **Speaker:** Lais Amaral Mais
2:07pm – 2:13pm	A qualitative study exploring influences on the food choices of university students **Speaker:** Michelle Lambert	The influence of local food environments on dietary intake following residential relocation **Speaker:** Alexia Bivoltsis	What's in the lunchbox? Food provision in Family Day Care **Speaker:** Erin Kerr	What is on sale? Healthiness of Foods and Beverages Advertised on Ghanaian Television Programmes Targeting Children **Speaker:** Amos Laar
2:14pm – 2:20pm	Growing up fat: An ethnographic exploration of young people's weight bias experiences **Speaker:** Alexa Ferdinands	Food swamps and food retail environment trends in Greater Melbourne 2008 – 2016 **Speaker:** Cindy Needham	Implementation of practices to support healthy eating in childcare services **Speaker:** Nicole Pond	What is on sale? Healthiness of foods on promotional-flyers of Accra-Based Supermarkets **Speaker:** Amos Laar
2:21pm – 2:27pm	Food in my life: an adolescent perspective on food environments **Speaker:** Kora Uhlmann	Food swamps: inequalities in food access in Campinas, Brazil **Speaker:** Mariana Fagundes Grilo	Multi-arm RCT to support childcare service implementation of nutrition guidelines: 12-months follow-up **Speaker:** Alice Grady	Big Food/Soda's role in promoting unhealthy food advertising on Brazilian television **Speaker:** Fernanda Helena Marrocos Leite

A.2 World Nutrition Congress – Rapid Fire presentation

Results – Knowledge (what do they know?)

AGHE	• Majority aware of the Australian Guidelines for Healthy Eating (AGHE) • Majority stated they did not follow them *"I think the guidelines are good and I have a fair idea of what they are, but 9 times out of 10 I won't follow them"* (Male group #1)
Food Pyramid	• Food Pyramid the most common recognized format of (AGHE) • Consensus was that fruit and vegetables are in the **eat most** category • Consensus that sugar is in the **eat least** category • Great confusion regarding the positioning of meat and dairy products
Serving size	• General confusion over serving size *"In terms of actual (serving size) recommendations, I couldn't visualise one."* (Male Group # 2)

In their own words: A qualitative study exploring influences on the food choices of university students

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Aims:
- identify level of knowledge of Australian Guidelines for Health Eating & sources of nutrition information
- Identify factors that influence food choices and eating behaviours
- Identify relevant nutrition knowledge
- Determine ideal nutrition messages communication.

(Lambert, Chivers, & Farringdon, 2018)

What do we know so far?

Emerging adults
(18-25 year olds)
Living situation mix:
- Independent living
- at home with parents

Time of transition:
- university
- work
- semi-autonomy (Arnett, 2000)

Food intake
↑ 'fast food' consumption
↑ soft drink consumption
↓ vegetable & fruit intake
Healthy eating is not a priority
Little is known about influences affecting eating habits

(Abraham, Noriega, & Shin, 2018; Alghamdi, Farrash, Bakarman, & Mukhtar, 2018; Alzahrani, Saeedi, Baamer, Shalabi, & Alzahrani, 2020; Chung & Hoerr, 2005; du Plessis, 2011; Lytle et al., 2006; Neumark-Sztainer, Story , Perry & Casey, 1999; Stewart & Tinsley, 1995)

Methods

Design: Qualitative (Focus group interviews)

Participants: Convenience sample University age 18 and 25 years from one Australian University.

Measure:

- Four focus groups of males (n = 18)
- Four groups six to eight females (n = 31)

Data analysis:

- Thematic coding
- Nvivo

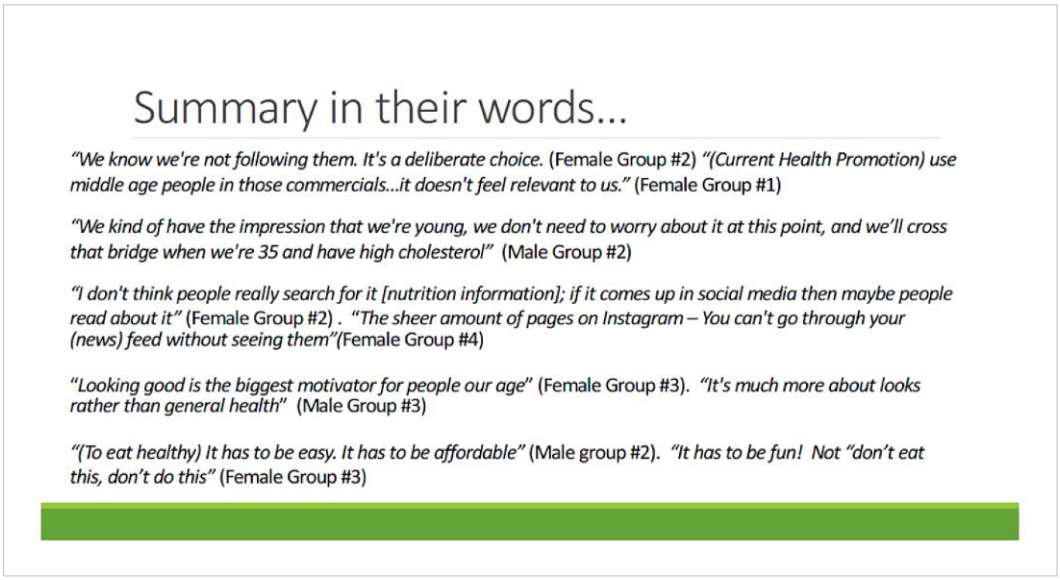
(Beyea & Nicoll, 2000; Liamputtong, 2013; Peterson-Sweeney, 2005)

Results – Knowledge (what do they know?)

AGHE	• Majority aware of the Australian Guidelines for Healthy Eating (AGHE) • Majority stated they did not follow them *"I think the guidelines are good and I have a fair idea of what they are, but 9 times out of 10 I won't follow them"* (Male group #1)
Food Pyramid	• Food Pyramid the most common recognized format of (AGHE) • Consensus was that fruit and vegetables are in the **eat most** category • Consensus that sugar is in the **eat least** category • Great confusion regarding the positioning of meat and dairy products
Serving size	• General confusion over serving size *"In terms of actual (serving size) recommendations, I couldn't visualise one."* (Male Group # 2)

Results – what Influences food choice…

Living situation	*"When you're living at home, you can't really control what your Mum and Dad buy and put in the cupboard, as opposed to when you live independently… you can" (Female group #2)* *"If you're sharing a house with friends, you're generally influenced by what your friends cook"* (Male Group # 3)
Convenience	*"It's a lot easier to just go and get take away then it is to actually make something, especially if you're home late. Because you have to go to the effort of buying it, making it, and cleaning up afterwards"* (Male Group # 4)
Body image	*"Yes. It's about appearance more than anything else… in advertising they use very slim attractive people, and you think, "Oh if I want to look like that then I should eat this" or "I shouldn't eat this"…*(Female Group #1)


Summary in their words...
"We know we're not following them. It's a deliberate choice. (Female Group #2) "(Current Health Promotion) use middle age people in those commercials...it doesn't feel relevant to us." (Female Group #1)
"We kind of have the impression that we're young, we don't need to worry about it at this point, and we'll cross that bridge when we're 35 and have high cholesterol" (Male Group #2)
"I don't think people really search for it [nutrition information]; if it comes up in social media then maybe people read about it" (Female Group #2) . "The sheer amount of pages on Instagram – You can't go through your (news) feed without seeing them"(Female Group #4)
"Looking good is the biggest motivator for people our age" (Female Group #3). "It's much more about looks rather than general health" (Male Group #3)
"(To eat healthy) It has to be easy. It has to be affordable" (Male group #2). "It has to be fun! Not "don't eat this, don't do this" (Female Group #3)

Appendix B Publication

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LONG RESEARCH ARTICLE

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In their own words: A qualitative study exploring influences on the food choices of university students

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Abstract

Issue addressed: University students generally make independent decisions regarding food choices. Current research about knowledge of Australian Dietary Guidelines (ADG), sources of nutrition information and influences on food choices for this group is scarce.

Methods: Qualitative data were collected from gender-separated focus groups comprising four female (n = 31) and four male (n = 18) to identify: knowledge of ADG; sources of nutrition information; factors that influence food choices; perceived relevant nutrition messages and how best to deliver them.

Results: Gaps in knowledge were identified particularly regarding number of serves and serving size for food groups. Social media was the most commonly reported source of knowledge. Social media was also a major influence on food choice due to its impact on body ideals.

Conclusion: Current health promotion nutrition messages were perceived irrelevant given the focus on long-term health risks. Health and adhering to the ADG were not identified as important. The desire to look a particular way was the major influence on food choices.

So what? While there is an awareness of ADG, our participants made a deliberate decision not to follow them. This provides a challenge for developing relevant preventive health messages for this target audience.

KEYWORDS
body ideals, food choices, social media, university students

1 | INTRODUCTION

Emerging adulthood describes 18-25-year olds,[1] when individuals are establishing independence and taking responsibility for life choices, including health behaviours.[2] As such this group is an important target population for health promotion and disease prevention. Previous research indicates that very few emerging adults meet current dietary guidelines, often consuming diets high in saturated fats, sugar and sodium along with decreased vitamin, mineral and fibre intake, all of which are associated with later life obesity and chronic disease.[3,4] The Australian Bureau of Statistics[5] reports that emerging adults are less likely than any other age group to consume recommended amounts of fruit and vegetables. They also typically display erratic eating behaviours and tend to skip meals.[3,4,6]

While some research has occurred with emerging adults internationally, little research has explored the evolving social influences affecting food choices of Australian emerging adults,[2] and in particular Australian university students. Emerging adulthood is a time when living situation may change, and this can influence food intake. Harris et al[7] found that as emerging adults leave home and live independently, there is a decline in healthy dietary habits. Specific to university students a study of four European countries

reported participants who had moved away from their parental home identified a lower consumption of healthy foods, specifically fruit and vegetables.[8] The authors speculated that students living at home did not have to pay for their food so financial constraints may not restrict the purchase of healthy food. In addition, meals containing nutritious foods such as vegetables were more likely to be prepared for them when living with parents. Therefore, healthier food was more freely available compared to the food options available to the students living away from home. Furthermore, Jackson et al[9] reported that those living at home with parents were more likely to bring a packed lunch, which may act as a protective factor against the consumption of fast food during their day at university. Kelly et al[10] identified that living with other university students can negatively influence eating behaviours because of a lack of peer support to eat healthily. Devine et al[11] found that university students in Northern Ireland who lived alone were more likely to eat fresh vegetables and salads regularly compared to students who lived with other students. This peer influence is further reinforced by McArthur and Pawlak[12] who reported that American university students perceived their peers did not enjoy consuming healthy food and this influenced their own food choices.

While nutrition knowledge is assumed to influence dietary habits and food preferences, Al-Khamees[13] study involving university students from Kuwait enrolled in nutrition and education courses noted that many were genuinely surprised that their diet did not comply with dietary guidelines. Even for this knowledgeable, unique, target group, translating dietary guidelines into their food choices was difficult. While not specific to university students, an Australian study by Kothe and Mullan[14] identified that emerging adults also had significant knowledge gaps regarding serving size and quantity of fruit and vegetables recommended by the ADG and appeared to have insufficient knowledge of food preparation and cooking skills. The authors suggested more research is needed to investigate these knowledge gaps and how these gaps might influence food choice in emerging adults.[14]

Australian public health campaigns have attempted to increase nutrition knowledge. The *Go for 2&5* campaign primarily targeted parents of children aged up to 17 years with the secondary target group youth aged 13-17 years and aimed to increase fruit and vegetable consumption by increasing knowledge of the importance of consuming these foods.[15] Several follow-on campaigns such as *Measure Up* in 2008, *Swap It Don't Stop It* in 2011, and the *Live Lighter* campaign in 2014, linking increased waist measurement with risk of chronic diseases targeted 25-50-year olds and focused on weight reduction messages.[16] Working emerging adults, however, appear to place little importance on the prevention of chronic disease because they believe this will not affect them until they are much older.[17] Consequently, the consumption of healthy food is not considered a priority, as there is no sense of urgency regarding the importance of food choices for health and wellbeing.[6,17,18] Further investigation is needed to explore if university students also have this perception.

To date, in Australia, there have been no public health campaigns that target emerging adults and specifically university students' nutrition knowledge. Furthermore, it is unknown if health promotion campaigns delivered via the traditional media (television and radio) would resonate with this population. It is possible, however, that they have been exposed to these campaigns along with a variety of other nutrition messages from media including the internet and social media. These sources of nutrition information may impact nutrition knowledge and possibly influence food choices. From our review of the literature, further investigation of this assumption is required regarding its impact on university students.

Social media is an increasingly popular way for users to be both creators and consumers of health information by providing a platform to share, discuss, create, modify and exchange information with the "on-line" networks.[19] As 18-29-year old are regular social media users and are more likely to repost images and videos,[20,21] it is potentially an important vehicle to disseminate nutrition information. However, Wong et al[19] cautions that the information they engage with may be inaccurate, misleading or misinterpreted and therefore lead to health risk behaviours.[19] Another challenge facing health professionals is the rapid pace of evolution of these platforms. Further research needs to explore if social media would be effective in delivering nutrition messages to university students.[22,23]

Given the lack of evidence regarding Australian emerging adults' knowledge of dietary guidelines and their sources of nutrition information, it is important to explore this as a potential influence on eating behaviour. This information can be used to inform the development and best delivery of relevant and targeted nutrition messages as a key element of chronic disease prevention.

Hence, the aims of our study were to identify:

1. Knowledge of ADG and sources of nutrition information preferred among university students.
2. Factors that influence food choices and eating behaviours of students at one Australian university.
3. Nutrition knowledge deemed relevant to university students and how they would like nutrition messages to be communicated.

2 | METHODS

This study evolved from food-related research specifically focusing on adolescents conducted by members of the research team.[24] An qualitative approach using focus group was chosen to provide participants the opportunity to describe their experiences in their own words thus providing the researcher a clearer understanding of the experiences as seen from the individual's point of view.[25,26] University students aged 18-25 years currently studying at a private university in Australia were invited to participate in focus group discussions. This invitation was offered during oral presentation (five minutes) across various lectures. Students were provided with a summary of the purpose of the study and were offered the opportunity to participant via a signup sheet. Students, who indicated their interest via the signup sheet, were contacted on the email address they provided the researchers. Once consent was provided,

TABLE 1 Interview schedule

Focus group questions	Additional prompts
What do you know about the Australian Dietary Guidelines?	How relevant do you thing they are for people your age? Why/why not?
	Do you think people your age follow the guidelines? Why/Why not?
Does it make a difference to food choices for people your age if they are living at home or living independently?	What else influences what you choose to eat?
What other things influence what you eat?	Do you use anything specifically to get nutrition information? (eg, Internet? How do you use it?)
	Are any of these sources of information more important than others?
	What are your "go to sources" of information?
What messages or information have you seen in the media lately regarding food/nutrition? (where did you see or hear messages—Radio, TV, Internet, Social Media) (NEED TO EXPLORE THE PROMPTS FOR EACH MEDIA SOURCE IDENTIFIED)	Do you think this information is accurate?
	How do you know if it's accurate or not?
	Do you go looking for nutrition information or does it just come to you via your news feed?
Does any of the nutrition information or messages influence your eating behaviour?	What is it about the message or the information that influences your eating behaviour?
Traditionally health promotion messages about nutrition happen via TV. Is that relevant to people your age?	What would be the optimal way for people your age to get nutrition messages?
	What do you think people your age want to know about nutrition?
Is eating healthy important to you? Why/why not?	

students were allocated to focus groups. Ethics approval was obtained through the university's Human Research Ethics Committee prior to conducting this research (Ref: 015126F). A total of 49 students aged 18-25 years self-selected to participate from a variety of learning areas including Schools of Medicine, Arts and Sciences, Health Science, Business and Philosophy and Theology. Gender-separated focus groups were conducted consistent with focus group methodology that advised homogeneous groups assist participants to feel equal and to get to know each other more quickly, so they feel comfortable to share ideas and information.[27] Focus groups were conducted until the research team determined that data saturation had been met. A total of eight focus groups, four female groups (n = 31) and four male groups (n = 18) were conducted.

The research team used combined expertise in qualitative research and nutrition to develop the interview schedule outlined in Table 1. This was piloted with a small group of university students to ensure the questions elicited appropriate responses. The same interview schedule was used for all focus groups. Each focus group session was allocated 90 minutes. The primary author, experienced in conducting focus groups conducted all focus groups.[28] An independent note taker recorded additional notes and non-verbal interactions of participants to augment the audio-recording.[29]

2.1 | Analysis

With consent from participants, the focus groups were taped by the lead author, then transcribed verbatim by an independent contractor, with these transcripts checked by the lead author to ensure accuracy.[6,29] Content was inductively analysed by the lead author and codes were assigned based on themes to establish categories and identify the frequency by which they occurred.[30] These categories were identified across the focus groups, and any new themes were categorised as they emerged. Verification checks occurred by co-authors to ensure agreement in identification of categories.[29] The data were then re-analysed using NVivo data analysis software v11,[31] validating the categories and subcategories established by the initial content analysis.

3 | RESULTS

Common factors influencing food choices, including those that related to nutrition knowledge were grouped into two major categories: internal and external influences on food choices. Two additional categories emerged: nutrition knowledge deemed relevant by emerging adults; and preferred delivery method of nutrition knowledge.

3.1 | Internal influences on food choice

Internal influences on food choices included: level of nutrition knowledge based on the Australian Dietary Guidelines; knowledge of serving size for different food groups; perceived relevance of dietary guidelines; compliance to dietary guidelines; body image, appearance and weight control and cooking skill and confidence.

3.1.1 | Knowledge of Australian Dietary Guidelines

The majority of the participants were aware of ADG[32] with the most popular recollection being the visual format of the healthy food pyramid:

> Is that the food pyramid stuff?
>
> [Female Group 2 (FG2)]

There was consensus that fruit and vegetables comprised the bottom "*eat most*" section of the pyramid hence were healthy. Also, there was consensus that sugar was at the top of the pyramid indicating, "*eat least.*" All other details regarding the structure of the

pyramid varied. There was some confusion over the positioning of carbohydrates such as bread, pasta and rice some participants indicated these were "*eat sometimes*" and should not be eaten as frequently as fruit and vegetables, but the majority believed that they were on the same level as fruit and vegetables. The greatest confusion was regarding the correct positioning of meat and dairy products.

3.1.2 | Knowledge of serving sizes

When prompted about serving sizes for different food groups, there was a high level of disagreement and confusion. The majority agreed that it varied from food to food, but they were unsure regarding what constituted a serving size:

> In terms of actual (serving size) recommendations, I couldn't visualise one. [Male Group 2 (MG2)]

> A serving size is about the palm of your hand. [FG4]

> I thought it was the size of a deck of cards. [FG2]

> A cup. [MG1]

> It depends who you talk to. [FG4]

While there was a general awareness of the Australian Dietary Guidelines,[32] the majority indicated that they did not adhere to the guidelines. Of particular concern, not following the dietary guidelines was identified as a choice rather than lack of awareness:

> I think the guidelines are good, and I have a fair idea of what they are, but nine times out of ten, I won't follow them. [MG1]

> We know we're not following them. It's a deliberate choice. [FG2]

The most common reason for not adhering to the guidelines was they lacked importance or relevance due to no sense of urgency. The majority stated that healthy eating and following the guidelines only became relevant as a person grew older or started experiencing ill health or significant weight gain:

> I don't care enough! … because of my build, I've never really had any weight problems. But it may be something that occurs in the future. But at the moment, I don't have any reason to really change how I'm eating. [FG3]

> We kind of have the impression that we're young, we don't need to worry about it at this point, and we'll cross that bridge when we're 35 and have high cholesterol. [MG2]

3.1.3 | Body image, appearance and weight control

The majority of participants expressed that food choices, eating and eating behaviours were heavily influenced by body ideals:

> Looking good is the biggest motivator for people our age. [FG3]

> It's much more about looks rather than general health. [MG3]

While the desire to "look good" was expressed in all focus groups, the female groups consistently mentioned weight control and being skinny as the desired appearance. Some added they felt pressure from society to conform to the thin ideal:

> Yes. It's about appearance more than anything else… in advertising they use very slim attractive people, and you think, "Oh if I want to look like that then I should eat this" or "I shouldn't eat this"… [FG1]

> Society pressure, perception that women should look skinny, amazing…and eat nothing. [FG4]

Of particular concern was the general perception among females that being skinny was associated with being healthy:

> People perceive skinny as being healthy. [FG1]

Weight control was mentioned less by male participants and their desire to "look good" had a different focus. Muscle gain and how to best achieve it was mentioned most by the males:

> Guys focus on eating the right sort of portions so that they can gain the most weight, or muscle mass or fitness… but are those diets really healthy? [MG2]

> It tends to be more muscle gain for the blokes and weight loss for the girls. It's the pressure of every guy wanting to be huge and every girl wanting to be stick thin. [MG3]

3.1.4 | Cooking skills and confidence

Cooking skills were identified as important for eating a healthy diet. Cooking skill and confidence were also linked to cost. While these factors strongly influenced food choices for males, they were also a consideration for females. However, females generally expressed more confidence in cooking skills than males:

> Cooking skills are also a very big factor – I have very limited cooking skills. If it's going to take too long to

prepare, or it seems a bit too complex, then I'm more likely to just go out and buy something. [MG2]

Whether or not you can cook influences your food choices – if you can't cook then you go and get take away. [FG1]

Cooking skills and confidence were also linked to cost with many participants concerned about spoiling food and therefore wasting money:

You might have spent a lot of money on an expensive meal to prepare, and you burn it or stuff it up or something. [MG2]

3.2 | External influences on food choices

External influence of food choices included: sources of nutrition knowledge; current living situation and peer influence; cost, convenience, time, and effort required.

3.2.1 | Sources of nutrition knowledge

Social media was the most common source of nutrition knowledge with the majority indicating that they do not search for nutrition information but they are exposed to it constantly:

I don't think people really search for it [nutrition information]; if it comes up in social media then maybe people read about it. [FG2]

Both males and females commented that the majority of nutrition information on social media was accompanied by images of thin females and muscular males "looking fit, healthy and happy." These images were associated with participants' knowledge about what contributed to being healthy:

Slim fit girls are presented on social media as being in their active wear, drinking a smoothie. Fit muscular guys are all about the supplements, how to get large. [MG4]

Instagram promotes this ideal that "healthiness equals happiness" and that's what everyone is striving for. [FG2]

While social media, in general, was mentioned, there was a notable difference between males and females in the social media platforms used. While Facebook was identified evenly across the male and female groups, Instagram was frequently mentioned by females but rarely by males as a source of nutrition information. The volume of nutrition information on social media were accompanied by images that created the desire to look "fit and healthy" and contributed to body dissatisfaction. Some participants indicated they were aware that the images were unrealistic but were still envious and strived to look like the bodies portrayed in the images:

On Instagram, in particular, there are a lot of unrealistic portrayals of, particularly girls…the pictures are very colourful, and the girls look very happy and skinny, which brings out envy. [FG2]

Participants all spoke of the high number of celebrities and micro-celebrities (those who have become famous via social media) who promoted diets, supplements and exercise programmes:

You see a lot of links on social media to things like "super diets" or "my friend did this and had these results in 12 weeks". [MG3]

Perfect bodies on the paleo diet. Stuff like that is all over social media. [FG4]

The sheer amount of pages on Instagram – all of them are just of girls in their bikini, or of their meal. You can't go through your (news) feed without seeing them. [FG4]

Accuracy of the nutrition information on social media was generally not a concern with the majority indicating that the most popular measure of "accuracy" was to ask friendship group if they had tried the diets or supplements and check if any had positive results. When asked to clarify what was meant by "a positive result" the common theme again was appearance:

I want to look fit and lean. [MG4]

Losing weight and looking good. [FG3]

Participants were asked if they could recall any health promotion campaigns as these may have contributed to nutrition knowledge. Recognition of the *Live Lighter* campaign and the *Go for 2&5* campaign were high with all female groups and the majority of male groups. While recognition was high, participants agreed that they were not the target audience with many questioning the relevance of these campaigns to their age group:

I don't think they target us. [MG3]

They use middle age people in those commercials…it doesn't feel relevant to us. [FG1]

While most identified a key message of the *Live Lighter* campaign was to reduce intake of sugary drinks, they indicated this message did not motivate behaviour change:

I probably drink a lot more soft drink than I should, but then I'm still skinny. So you wonder if anything is

> really going to happen. It makes me think about it, but it doesn't change my behaviour. [MG3]

Furthermore, the health consequences outlined in the campaign felt irrelevant to the participants because health consequences were "future concerns":

> I can't image my visceral fat being that bad compared to that man. It doesn't feel relevant. [FG4]

> People (our age) don't think the consequences of those ads will happen to them. [MG3]

Both male and female participants were adamant that focusing on negative consequences associated with food choice had no impact on their eating behaviour:

> Health promotion messages are so negative – like this is what happens to your gut when you drink coke. I know it's supposed to have an impact, but I don't feel like it has a significant impact. [FG3]

> There is as sense that it's not urgent and that it doesn't apply to us. [MG4]

3.2.2 | Living situation and peer influence

There was consensus that living at home with parents had a positive influence on food intake because parents stocked the fridge and pantry, which to some extent dictated food choice. Participants also noted the quality and variety of food improved when living at home with parents mainly due to the associated high cost of healthy food:

> When you're living at home, you can't really control what your Mum and Dad buy and put in the cupboard, as opposed to when you live independently… you can. [FG2]

> If you're by yourself your main consideration is finances rather than your health. Healthy food is more expensive. [MG2]

Consequently, the majority indicated that living at home made it easier to eat healthy food. Mothers were identified as a positive source of information and influence on food choice:

> My Mum always served veggies or salad with meals, and now it's just become a habit rather than a knowledge of the guidelines. [MG1]

> It comes back to cost. Last year I was out of home and not eating well at all – I was just eating whatever was on special. Now I'm back home, mainly to save money, Mum and Dad provide much more variety and better food. It makes a big difference. [MG3]

The majority indicated that being with friends, socially and also living with peers increased the likelihood of choosing unhealthy food:

> It depends on who you're with – if I'm hanging out with friends that are eating junk food, then I'll eat it with them. [FG3]

> If you're sharing a house with friends, you're generally influenced by what your friends cook. So if there's someone cooking, then you might be inclined to cook more, but if someone's always going out to get crap food, then you're more inclined to do that as well. [MG3]

3.2.3 | Cost, convenience, time and effort required

Regardless of living situation cost, convenience, time and effort required were recurring themes across all focus groups having significant impact on their food choices. There was a very strong perception among participants that university students consumed fast foods because they were cheaper and more convenient even though they acknowledged it was unhealthy:

> You're normally going for the cheap stuff, which ends up being the bad stuff. [FG3]

While cost and convenience made fast food an attractive option, another influencing factor was effort. Many participants identified that healthy eating required more time, effort and preparation than they were prepared to give:

> It's a lot easier to just go and get take away then it is to actually make something, especially if you're home late. Because you have to go to the effort of buying it, making it, and cleaning up afterwards. [MG4]

3.2.4 | Nutrition knowledge emerging adults want and how best to deliver it

Weight loss and appearance were again the predominant focus of the type of information participants wanted. Related to weight loss, many identified a need for accurate information particularly regarding serving sizes:

> It's important to know how big a serving size is because frequently you think it's bigger than it actually is. [FG2]

> A lot of people don't realise it's not just eating healthier; it's lowering your portion size as well that helps lose weight. [MG2]

Accurate information regarding healthy ways to lose weight quickly was considered important particularly by female participants:

> The quickest way to lose the weight and being healthy as possible. [FG1]

The majority identified that correct information regarding fad diets would also be relevant to ensure more of a balance of food consumed:

> People go on extreme diets where they just focus far too much on eating one type of food when there needs to be more of a balance. [MG3]

> People our age need information about skipping meals and meal replacements shakes; how they are not effective in actually helping people lose weight. [FG2]

Participants highlighted that nutrition information focusing on body image and appearance rather than health risks would be more relevant:

> The approach needs to be image based - not "it's going to make you feel better" but "it's going to make you look better"…results that appeal to us might make a difference. [MG1]

Many participants, especially females, indicated they would like to see more of a positive body image focus:

> Promoting what is a realistic amount of weight loss for different body types. [FG4]

> Not using unattainable, unrealistic bodies or celebrities, just use normal people. [FG3]

Participants also identified that nutrition messages need to be more positive and focus on immediate benefits rather than long-term health risks:

> It comes down to promoting fun - not "don't eat this, don't do this". Finding a way to say "hey look what you can do if you're actually get out there and do stuff and you eat good food – it's fun". [FG3]

> Might be more effective if they focus on something that we can see or feel almost immediately. [MG4]

Another important aspect mentioned by participants related to cost of food. It was strongly suggested that healthy food be more cost-effective:

> If you made the healthier, more nutritious food cheaper than the less healthy foods that could make some difference. [MG1]

> Cheap places to pick up vegies and maybe healthy cheap meal ideas. [FG2]

Regarding how best to deliver nutrition Information there was consensus it should be online incorporating social media:

> People our age don't watch TV…it's got to be online. [MG3]

> Social media because that's what we're exposed to the most – but the dietary guidelines aren't on social media. [FG3]

4 | DISCUSSION

This study provides an Australian context to international evidence regarding influences on dietary behaviour among university students aged 18-25 years.[2,8,10–13,33] Findings confirm that the cost of food when living independently influences food choice with a strong perception among participants that healthy food costs significantly more than unhealthy food.[7–9] Also consistent with international studies the participants in this study acknowledged that peers influenced their decision to consume unhealthy foods while living with parents positively affected this food choice.[10–12] This study also identified that cooking skills and confidence, as well as time and effort required in the preparation of food, were considerations with participants reporting that convenience, confidence and cooking skill often influences food choices. More research needs to be conducted to further explore how significant these influences are on food choices.

Our findings support previous research concerning Australian emerging adults' diets not adhering to recommended dietary guidelines.[3,34,35] A novel finding of this study is that while emerging adults have some knowledge about ADG[32] they deliberately choose not to follow them because they do not consider healthy eating a priority or relevant to their age group, and ADG information is not promoted on social media. While previous health promotion campaigns in Australia have attempted to promote the importance of healthy eating,[15,36,37] they have not specifically targeted emerging adults. Although our study supports previous findings that suggest some key messages such as eat more fruit and vegetables and less sugar seem to reach emerging adults[13,14,38,39]; however, these messages do not translate to the eating behaviour of our cohort. For example, participants identified difficulty in translating messages such as *Go for 2&5* in "real life" food choices due to confusion over what constitutes a serving size. Further, many Australian campaigns have focused on the effects of poor nutrition, such as obesity, visceral fat on vital organs, diabetes, high blood pressure, cancer and heart problems. While participants could recall messages from

campaigns such as *Live Lighter* they perceived these messages as irrelevant and reported they had no influence on food choices because the health consequences highlighted generally occur in middle age or even later. Consequently, our study participants were not motivated to change their food choices because there is no sense of urgency.[6,13,14,17,40]

Regarding sources of nutrition knowledge, participants indicated that they do not watch commercial television, which has traditionally been the major medium for communicating public health messages. Participant identified social media as the most commonly used source of nutrition information. A novel finding was these social media users do not specifically search for nutrition knowledge rather they have constant access to this information via their social media "newsfeed." The majority of participants stated their interest was "sparked" based on the physical appearance of the person in the "post" shared on social media. Once engaged by the "post" they reported following the "fad diets" promoted by this individual regardless of nutritional value or accuracy of the information. This is concerning given the majority of the participants were studying health-related degrees at the university. Future research should consider if this finding is similar across other emerging adult populations including those with less access to education. Participants reported a strong desire to look "fit and lean" and this was associated with being healthy. As most of these "fad diets" focus on body ideals, this could explain why appearance and body dissatisfaction, generally in the form of weight control emerged as the largest influence on food choices for the participants in our study. Given that approximately 89% of online 18-29-year olds are regularly using social media[21] the consumption of "weight appearance" focused nutrition information is clearly contributing to the participants' perception that being skinny (for females) and muscular (for males) is healthy. This supports the findings of Tiggemann and Miller[41] in their study of adolescent girls which found girls who spent more time on social media had higher levels of drive for thinness.

Our study highlighted that female participants specifically identified Instagram as the primary social media platform utilised. Given that Instagram is an image-based platform this may be further contributing to the emphasis on weight control and appearance, which may be reinforcing the perception that being thin is ideal and also healthy. Further reinforcing these "thin ideals" may be the "weight control" approach to nutrition currently used in Australian health promotion campaigns such as *Live Lighter*.[16,36,37] It is recommended that nutrition messages focus on general health rather than weight loss for this target group.[42] This would seem to be important as females in our study acknowledged there was societal pressure to conform to the thin ideal and there was also a general agreement that being thin meant being healthy. Regardless of gender, this belief that appearance is the main marker of health is concerning as it may further contribute to body dissatisfaction and influence food choices among emerging adults as a way of achieving this thin or buff body. More research focusing with this target group is needed to further understand these associations.

The findings of this study must be considered in light of some limitations. The participants were a convenience sample drawn from one university campus. However replication of some results suggests this group is similar to others university and college-based studies reported in the literature. As a select sample of university students, their education level may mean that their nutrition knowledge is higher than other groups of emerging adults, therefore, results and associations cannot be generalised to the whole emerging adult community. While the sample may not be fully representative of the emerging adult population, the participants were keen to have their voices heard and provided in-depth insights into the influences on their food choices and implications for communicating nutrition information. A strength of the study was the design that adhered to focus group methodology hence saturation of categories was achieved, and the initial content analysis was validated by the content analysis performed through NVivo v11[31] adding to the rigour of the results.

5 | CONCLUSION AND IMPLICATIONS

Given that emerging adults attending university do not consider dietary guidelines or health promotion campaigns relevant, the findings of this investigation have implications for preventive health strategies targeting this age group. Future campaigns could deliver positive nutrition messages and present benefits of healthy eating rather than focus on weight loss and future health risks.[42] In addition, accurate information regarding serving sizes was identified as important because participants found it difficult to translate current nutrition messages into actions they could utilise in their daily lives. There was also a desire for accurate information regarding current "fad-diets" as well as healthful strategies for weight loss. This presents a challenge for health promotion to counteract current appearance related perceptions regarding health in a rapidly changing, social media-saturated environment that heavily promotes thin or muscular body ideals. There were calls for more realistic body shapes on social media, especially by the female participants. Perhaps this is where health promoters should direct their attention because the insidious nature of the constant appearance comparison ever present on social media makes it unrealistic for many to achieve the current ideal body in a healthful way.

Another consideration for future health promotion campaigns is the mode of delivery. Given the participants in this study do not watch television and identified social media as the preferred source of nutrition information, health professionals need to rethink how to best communicate future public health nutrition messages to this audience. While social media appears to negatively influence perceptions of health and eating behaviour it may also provide the potential solution. However, more research is needed regarding potential barriers and challenges associated with social media and emerging adults health behaviours.[23] Many platforms exist in the social media space, and little is known about which platform would be the most effective for this target group. The results of this study indicate that Instagram could be an avenue for further investigation

as female participants identified it as their most commonly utilised social media platform. Clearly, more research in this area is required to confirm the findings of our study so that emerging adults' transition into adulthood with accurate, useful nutrition knowledge that will potentially result in a healthy diet and the accompanying health benefits.[2,14,33]

This study highlights the challenges and importance of developing relevant messages and considering new modes of communicating with this target group. Berry et al[42] suggests it may be beneficial to present some of these messages in practical forms such as recipes for emerging adults. While the authors acknowledge the importance of developing relevant nutrition messages for this cohort, simply increasing knowledge does not appear to influence their food choices. Therefore, it is recommended that alongside developing relevant messages future public health interventions need to consider additional strategies to create an environment that supports healthy eating. Our participants reinforced the findings of Ansari et al[8] indicating the need for healthy food choices to be made more affordable particularly for those living away from home to encourage healthy eating. Other strategies such as limiting advertising of energy dense foods,[43] limiting access to unhealthy convenience foods, introducing a sugar tax and improving cooking skills[44] may also support healthy eating. Further research focused on emerging adults is needed to assist in developing a comprehensive approach to address the issues identified by this cohort in order to positively influence their food choices.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest in connection with this article.

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Appendix C Contributions of co-authors

Michelle Lambert: I am primary author of the publication: In their own words: A qualitative study exploring influences on the food choices of university students. *Health Promotion Journal of Australia, 30*(1), 66-75. doi:10.1002/hpja.180.

Michelle Tarrie Lambert
PhD Candidate
20 August 2020

Associate Professor Fiona Farringdon: I am the primary supervisor of this thesis and co-author of the publication: In their own words: A qualitative study exploring influences on the food choices of university students. *Health Promotion Journal of Australia, 30*(1), 66-75. doi:10.1002/hpja.180. I contributed to the formation of focus group questions and my expertise helped guide the compilation of key findings and direction of this publication.

Associate Professor Fiona Farringdon
Co-Author
20 August 2020

Dr. Paola Chivers: I am the co-supervisor of this thesis and co-author of the publication: In their own words: A qualitative study exploring influences on the food choices of university students. *Health Promotion Journal of Australia, 30*(1), 66-75. doi:10.1002/hpja.180. I contributed to the formation of focus group questions and my expertise helped guide the compilation of key findings and direction of this publication.

Dr. Paola Chivers
Co-Author
20 August 2020

Appendix D Summary of Australian studies over the last ten years

Theme	Country	First Author	Year	Title	Research Design	Size of sample	Demographic of sample	Measure	Key findings
Eating habits	Australia (QLD)	Williams	2020	Association between dietary patterns and socio-demographics: A cross-sectional study of Australian nursing students	Quantitative	548	Students at two universities aged >18	Self-developed Plus FFQ	Majority are not meeting recommendation for core food groups and are exceeding recommendation for discretionary food intake Budget stress and time spent on academics contribute to unhealthy eating behaviours
Influences on eating behaviour	Australia (NSW)	Whatnall	2019	Determinants of eating behaviours in Australian university students: A cross-sectional analysis	Quantitative	3062	Students aged 17-24 years at one university (5 campuses)	Student healthy lifestyle survey	Females enrolled in post-grad or health degrees consumed higher nutrient rich foods than other students. Higher meat and take-away scores were recorded for males and younger participants Very limited studies in Australia to compare with but findings are similar to other western countries

Theme	Country	First Author	Year	Title	Research Design	Size of sample	Demographic of sample	Measure	Key findings
Influences on eating behaviour	Australia (Vic)	Pendergast	2019	Examining the correlates of meal skipping in Australian young adults	Quantitative	578	Emerging adults aged between 18-30 years	FoodNow diary App (IPAQ -Craig 2003) Self-developed BMI	15% were breakfast skippers 12% lunch skippers 10% dinner skippers 10% overall meal skippers Not having a uni degree was associated with meal skipping Time scarcity was associated with breakfast and lunch skipping
Mobile Dietary Assessment	Australia	Shoneye	2019	Image-based dietary assessment and tailored feedback using mobile technology: Mediating behaviour change in Young Adults	Experimental	143	Emerging adults aged between 18-30 years	mFR (mobile food record)	Those who agreed to think about their vegetable intake were four time more likely to increase their intake by more than half a serve per day Those who agreed that text message made them think about their consumption of "junk food" were twice as likely to decrease their consumption by greater than half a serve Using text messages increased motivation and awareness of dietary behaviour

Theme	Country	First Author	Year	Title	Research Design	Size of sample	Demographic of sample	Measure	Key findings
Influences on eating habits	Australia	Munt	2017	The barriers and enablers of healthy eating among young adults: A missing piece of the obesity puzzle: A scoping review	Systematic review of literature				Minimal research with this population – 34 studies conducted in the past 10 years Internationally (23 countries) men were less likely than women to follow healthy eating recommendations Social norms are an important influence (not only face-to-face daily experiences but also social media). By replicating eating behaviours, they gain a sense of inclusion and acceptance Healthy diet is seen as a burden – difficult to balance study, work & social. Availability of convenience foods is a significant barrier to healthy eating Lack of food preparation skill
Disordered eating behaviour	Australia (QLD)	Rocks	2017	Prevalence of exercise addiction symptomology and disordered eating in Australian students studying nutrition and dietetics	Quantitative	165	Undergrad students	(EAI - Szabo 2004) (IPAQ - Craig 2003) (EAT-26 - Garner, 1982) (TEFQ-R18 Karisson 2000)	23% at risk of exercise addition & a further 72% show symptoms Disordered eating and exercise attitudes and practices are linked in females but these associations were not found in male participants.

Theme	Country	First Author	Year	Title	Research Design	Size of sample	Demographic of sample	Measure	Key findings
Body image and disordered eating	Australia (SA)	Pellizzer	2017	Measures of body image: Confirmatory factor analysis and association with disordered eating	Quantitative	328	Female undergrad student aged 17-25 at one university	(BI-AAQ - Sandoz et al., 2013) (EDE-Q - Fairburn 1994) (BIAQ - Rosen 1991) (CIA - Bohn 2008) (BCQ -Reas 2002) (DASS - Lovibond 1995) (EDI - Garner, 1991).	The strongest predictors of both disordered eating and quality of life was the body image flexibility Monitoring in eating disorder treatment focuses on negative body image only and positive body image assessment has largely been neglected in eating disordered prevention and intervention (There is currently no assessment of positive body image) Given positive body image is conceptualised as a protective factor this may be relevant for future research
Intervention to improve eating behaviour	Australia (WA)	Kerr	2016	The connecting health and technology study: a 6- month randomized controlled trial to improve nutrition behaviours using a mobile food record and text messaging support in young adults	Experimental/ Tailored intervention	247	Young adults 18-30 years	mFR (mobile food record)	Men showed a reduction in EDNP foods while women increased their daily vegetable serves and also reduced EDNP food intake Go for 2&5 messages were useful, however men may need different motivation to increase vegetable intake Appears to be low awareness of what constitutes EDNP foods and why they should be limited Text messages may not have been perceived as personally relevant Further research is needed to identify message content for specific dietary behaviours

Theme	Country	First Author	Year	Title	Research Design	Size of sample	Demographic of sample	Measure	Key findings
Stress and eating behaviour	Australia (QLD)	Papier	2015	Stress and dietary behaviour among first-year university students in Australia: Sex differences	Quantitative	728	Undergrad student >18 years across five campuses of one university	Depression, Anxiety & Stress Scale FFQ (CSIRO)	52% had some degree of stress. Stressed students consumed significantly more "less healthy" foods (high in fat & sugar) Males consumed significantly more unhealthy food and females ate significantly higher fruit and vege than males
Influences on eating behaviour	Australia (NSW)	Hebden	2015	You are what you choose to eat: factors influencing young adults' food selection behaviour	Quantitative	112	Students 19-24 at one university	Self-developed Food choice questionnaire (Steptoe – 1995) (IPAQ – Dinger 2006)	Taste, convenience, and cost were the top three influences on food purchases – these were all more important than health considerations Dieters and highly physically active individuals placed less importance on taste. Female dieters placed less importance on taste and value for money Participants with high stress placed more importance on functional properties of certain food to "help them cope" or "make them feel good"
Influences on eating behaviour	Australia (SA)	Kemp	2014	Exposure to television food advertising primes food-related cognitions and triggers motivation to eat	Quantitative	160	Female students 18-44	Food ads Self-developed word stems	Exposure to food advertisements increased food related cognitions which led to completion of word stems food & eating related. Television view ads did not affect rating of desire to eat

Theme	Country	First Author	Year	Title	Research Design	Size of sample	Demographic of sample	Measure	Key findings
Nutrition knowledge & compliance to dietary guidelines	Australia (NSW)	Kothe	2011	Perceptions of fruit and vegetable dietary guidelines among Australian young adults	Quantitative	106	Undergrad students aged 18-24	Self-developed	Australian young adults have significant knowledge gaps. Participants were not able to recall dietary guidelines for fruit and vegetables even when prompted. They were not able to correctly identify serving size for three of the four fruit and vegetables assessed in this study Participants also did not have sufficient food knowledge to assess whether or not a range of fruits and vegetable do or do not fall under the Australian guidelines
Influences on eating behaviour	Australia	Du Plessis	2011	Diet and nutrition: A literature review of factors influencing blue-collar apprentices	Review of literature				men, in particular, face perceived obstacles to consuming particular foods such as fruit and vegetables, including a lack of nutritional knowledge and a lack of cooking skills fruit and vegetable consumption rate lowly in Australian men's culture as stereo-typically masculinities would be relatively unconcerned with their health and diet practices

Appendix E Ethics approval

THE UNIVERSITY OF NOTRE DAME AUSTRALIA | CELEBRATING 25 YEARS 1989 - 2014

19 Mouat St (PO Box 1225) Fremantle WA 6959
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2 October 2015

Michelle Lambert, A/Professor Farringdon & Dr Paola Chivers
School of Health Sciences
The University of Notre Dame, Australia
Fremantle Campus

Dear Michelle,

Reference Number: 015123F

Project Title: "Mixed messages: Where do emerging adults get their nutrition knowledge and how does that knowledge influence their eating behaviour?"

Thank you for submitting the above project for Low Risk ethical review. Your application has been reviewed by a sub-committee of the university's Human Research Ethics Committee in accordance with the *National Statement on Ethical Conduct in Human Research* (2014). I advise that approval has been granted conditional on the following issues being addressed:

- Researcher to remove the *'Mixed messages'* statement in the title as members agreed that it may lead the answers of the participants.
- Researcher to amend 5.1c to include *"all data hard and electronic copies should be stored on campus after completion of the study"*.

Please send your response addressing each of the issues as listed above, including supporting information where applicable, to Natalie.Giles@nd.edu.au by **Friday 30th October 2015**. Failure to respond and/or communicate by this time could result in a suspension of the ethical review of the project.

Yours sincerely,

Professor Selma Alliex
Chair, Human Research Ethics Committee

cc: Prof Naomi Trengove, Dean, School of Health Sciences;
Prof Gerard Hoyne, SRC Chair, School of Health Sciences;

Appendix F Phase 1 Coding Matrix

Themes	Sub theme	Female Group 1	FG2	FG3	FG4	Male Group 1	MG2	MG3	MG4
Internal Influences	Awareness of AGHE	Yes Consensus		X	X	X	X	X	X
				No	X		X	X	
	Awareness of Food pyramid	X	X	X	X	X	X		X
	Serving size	Confusion over serving size		X	X	X	X		X
	Knowledge of Food Pyramid	sugar on top	X	X	X	X	X	X	
		Protein in middle	X	X			X	X	
		F &V bottom	X	X	X	X	X	X	
			Bread & Carbs on bottom with F&V	X	X	X	X		
	AGHE relevance to emerging adults	Not relevant	X	X	X	X	X		X
	Prompted: Why is it not relevant?		eat what we want	X	X		X		
		important but don't follow			X	X			X
		don't think about it			X		X	X	
				No urgency		X	X	X	X
	Following guidelines	No	X	X	X			X	X
	Body image & appearance	skinny = healthy & happy	X		X				
		Appearance / most important	X	X	X	X	X	X	X
		Emphasis on losing weight		X	X			X	
		Emphasis on looking good / fit	X	X	X			X	X
	Effort (food prep takes effort)		X	X	X	X			
	Taste		X		X	X	X	X	X
	Time (food prep takes time)			X	X	X		X	

Categories	sub categories	Female Group 1	FG2	FG3	FG4	Male Group 1	MG2	MG3	MG4
External influences	Living situations affects food choice	Yes	X	X	X	X	X	X	X
	Living at home with parents	Parents cook		X	X	X			
		Parents stock the fridge and pantry	X	X					
		we don't choose the food		X		X			
	Living independently	eat unhealthy because you living independently	X	X	X			X	
		Cost Bad food is cheaper	Healthy more expensive	X	X	X	X	X	X
		Easier to eat healthy at home						X	X
	What else influences food choice?	Convenience	X	X	X	X		X	X
		Cooking skills	X	X		X	X	X	
		Peers	X	X	X				X
		Family eating habits	X	X	X		X	X	X
		Who you follow on social media	X	X			X	X	
		Food advertising	X	X		X		X	X

Categories	sub categories	FG1	FG2	FG3	FG4	Male Group 1	MG2	MG3	MG4
Sources of information	Where do you get nutrition knowledge?	Mum	X	X		X	X		
			internet				X	X	X
		Social media	X	X	X	X	X	X	X
		School-based programs	X	X		X		X	
		Peers		X					
	Prompted - Do people your age go looking for nutrition information?	No		X		X	X	X	
			don't search / constantly on social media feed	X			X		X
	Prompted - social media as a source of information	Yes	X	X	X	X	X	X	X
		Instagram / Facebook feeds	X	X	X	X	X	X	X
		Celebrities	X	X					
	Accuracy of information on Social media	It's hard to tell	don't check or care	Not very accurate	Hard to tell		X		
	Prompted - what health messages can you recall?	2 & 5	X	X	X		X	X	X
		fat inside the guy (grabable gut) sugary drinks	X	X	X	X	X	X	X

Categories	sub categories	Female Group 1	FG2	FG3	FG4	Male Group 1	MG2	MG3	MG4
Relevant knowledge	Relevance of current nutrition health messages	Not aimed at us	X	X	X	X	X	X	X
	What do you want to know about nutrition?	Quickest ways to lose weight (and be healthy)	X	X					
		Accurate information	X		X	X	X	X	X
			Serving sizes				X	X	
			Cheap places to get healthy food / recipes			X		X	X
				Value health more than body image	X				
	What would be the best way to get nutrition knowledge to EA	Not on TV – we're not watching TV	X		X	X		X	
		Social media	Instagram	X	X	X	X	X	
			Facebook	X	X	X	X	X	
					Apps		X		X
	Is healthy eating important to you?	NO				X		X	
		Yes / but I don't do it				X	X	X	
			Important but not integral		X	X	X		X

Appendix G Student Information: survey

THE UNIVERSITY OF NOTRE DAME AUSTRALIA

Mixed Messages: Where do emerging adults get their nutrition knowledge and how does that knowledge influence their eating behaviour?

Dear Student

My name is Michelle Lambert and I am from The University of Notre Dame Australia, in Fremantle. I would like to invite you to take part in a research project that I am doing. It is about finding out what university students know about dietary guidelines, where you get your knowledge from and what foods you eat.

I am asking for your help with the project because the research focuses on nutrition knowledge and eating behaviours of university students between 18 and 25 years old. I will be asking students who are currently enrolled at the university of Notre Dame to be involved.

What would I be asked to do?
You will be asked to complete an anonymous questionnaire. The first section of the questionnaire will have some tick the box responses, some short sentences, and a ranking scale, telling me what you know about nutrition, where you get this information and what are some of the influences on your food choices. Then you will be asked about the food you have eaten over the last 4 weeks. Finally you will be asked to complete a body parts satisfaction scale and an eating attitudes test. This will take about 15 minutes. If you feel like you may want to talk to someone about food or your feelings about food please visit the Butterfly Foundations website http://thebutterflyfoundation.org.au/

Do I have to take part?
You are free to say yes or no. I will respect your decision whichever choice you make, and I will not question it.

Your decision about participating in this research will not affect your grades, your relationship with your Lecturer(s), or with the university.

What if I wanted to change my mind?
If you say no, but then change your mind and want to take part, contact me and I will let you know if you can still join in.

If you say yes, but then want to stop participating, that's OK. Just let me know and you can withdraw any time.

What will happen to the information I give - is it private and confidential?
Information that identifies you will be removed from the data collected. The data is then stored securely and can only be accessed by the research team. The data will be stored for a minimum period of 5 years. After that hard copy identified consent forms will be shredded. Any de-identified electronic data will be kept for potential follow up studies according to University policy

After I have collected all the information for the project and analysed all of it, I intend to publish it in peer-reviewed academic journals, and use it in conference presentations. When I do this, I won't write or tell anyone your name, or the names of any other participants. A summary of the findings will be made available to you upon request. The project should be completed by the end of semester 1, 2017.

Will you tell anyone what I say while I am contributing to the project?
In most situations, I will treat what you tell me as being private and confidential. If you tell me something that I need to tell someone else because the law requires me to do so, then I will have to.

1

Is this research approved?
The research has been approved by the Human Research Ethics Committee of The University of Notre Dame Australia.

Who do I contact if I wish to talk about the project further?
If you would like to talk with me more, please contact me on the number provided below. If, at any time, you wish to speak with a person who is not involved in the project about how something was handled, please contact the Executive Officer of the Human Research Ethics Committee, Research Office, The University of Notre Dame Australia, PO Box 1225, Fremantle 6959, phone 9433 0943.

OK – so how do I become involved?
If you want to complete the questionnaire then please remain in class now to complete. It should only take about 15 minutes to complete.

Thank you for your consideration. This information letter is for you to keep.

Yours sincerely,

Michelle Lambert
Masters of Philosophy candidate
PO Box 1225, Fremantle 6959
Ph: 9433 0906
email: michelle.lambert@nd.edu.au

Appendix H Student Information: focus groups

THE UNIVERSITY OF NOTRE DAME AUSTRALIA

Mixed Messages: Where do emerging adults get their nutrition knowledge and how does that knowledge influence their eating behaviour?

Dear Student

My name is Michelle Lambert and I am from The University of Notre Dame Australia, in Fremantle. I would like to invite you to take part in a research project that I am doing. It is about finding out what university students know about dietary guidelines, where you get your knowledge from and what foods you eat.

I am asking for your help with the project because the research focuses on nutrition knowledge and eating behaviours of university students between 18 and 25 years old. I will be asking students of this age group who are currently enrolled at the university of Notre Dame to be involved.

What would I be asked to do?
I am seeking males and females aged 18 – 25 years to be involved in focus groups. These focus groups will involve talking about nutrition. They will be small groups of about 8 people and will take no more than 90 mins. As a thank you for begin involved you will be provided with refreshments and you will also go into a draw for movies tickets.

Do I have to take part?
You are free to say yes or no. I will respect your decision whichever choice you make, and I will not question it.

Your decision about participating in this research will not affect your grades, your relationship with your Lecturer(s), or with the university.

What if I wanted to change my mind?
If you say no, but then change your mind and want to take part, contact me and I will let you know if you can still join in.

If you say yes, but then want to stop participating, that's OK. Just let me know and you can withdraw any time.

What will happen to the information I give - is it private and confidential?
Information that identifies you will be removed from the data collected. The data is then stored securely and can only be accessed by the research team. The data will be stored for a minimum period of 5 years. After that hard copy identified consent forms will be shredded. Any de-identified electronic data will be kept for potential follow up studies according to University policy

After I have collected all the information for the project and analysed all of it, I intend to publish it in peer-reviewed academic journals, and use it in conference presentations. When I do this, I won't write or tell anyone your name, or the names of any other participant. A summary of the findings will be made available to you upon request. The project should be completed by the end of semester 1, 2017.

Will you tell anyone what I say while I am contributing to the project?
In most situations, I will treat what you tell me as being private and confidential. If you tell me something that I need to tell someone else because the law requires me to do so, then I will have to.

Is this research approved?
The research has been approved by the Human Research Ethics Committee of The University of Notre Dame Australia.

Who do I contact if I wish to talk about the project further?
If you would like to talk with me more, please contact me on the number provided below. If, at any time, you wish to speak with a person who is not involved in the project about how something was handled, please contact the Executive Officer of the Human Research Ethics Committee, Research Office, The University of Notre Dame Australia, PO Box 1225, Fremantle 6959, phone 9433 0943.

OK – so how do I become involved?
Students who consent to be involved in the focus groups will go into the draw for movies tickets to thank you for your time. To register for involvement in the focus groups please see me today to sign up. I will then email you to provide you with times of the focus groups so that you can select a time that best suits you. If you have any questions about this project please don't hesitate to email or call me using the contact details listed below.

Thank you for your consideration. This information letter is for you to keep.

Yours sincerely,

Michelle Lambert
Masters of Philosophy candidate
PO Box 1225, Fremantle 6959
Ph: 9433 0906
email: michelle.lambert@nd.edu.au

Appendix I Student Consent Form: focus groups

THE UNIVERSITY OF NOTRE DAME AUSTRALIA

Consent Form

Mixed messages: Where do emerging adults get their nutrition knowledge and how does that knowledge influence their eating behavior?

- I know that I don't have to be involved in this project, but I would like to be.
- I know that I will be involved in a focus group interview for approximately 90 mins where the group will discuss the recommended daily intake of different food groups, where our nutrition information comes from and what influences food choices as part of the project.
- I understand that these focus groups will be audio taped and that my name will not be linked to any transcript.
- I understand I am free to stop and withdraw from the project at any time
- I understand that participating in this project will not affect my grades, my relationship with my lecturer(s), tutor(s) or the university.
- I understand that I need to sign my name in the space below, before I can be a part of the project.

Name of Participant (printed): _____

Signature of Participant: _____ Date: / /

Please ensure your signed consent form is returned at your earliest convenience

Michelle Lambert
Masters of Philosophy candidate
michelle.lambert@nd.edu.au

Appendix J Complete Survey Tool

Appendix 1: General information

Gender (mark X) Male ☐ Female ☐ **Date of birth**_____

Postcode_____**Year of course (ie: 1st, 2nd, 3rd, 4th)**_____**Course**_____

Where do you live most of the time? (mark X in appropriate box)

At home with parent(s) or family ☐ Away from home ☐

Who does the food shopping most of the time? (mark X in appropriate box)

Parent(s) ☐ Partner ☐ Housemate(s) ☐ You ☐ Shared equally ☐

Who does the cooking most of the time? (mark X in appropriate box)

Parent(s) ☐ Partner ☐ Housemate(s) ☐ You ☐ Shared equally ☐

What (if any) public health campaigns regarding food and nutrition can you recall?

_____

Have you seen the revised food pyramid launched in May 2015? YES ☐ NO ☐

What nutrition knowledge do you want / need?

Accurate information about nutrition

☐_____☐_____☐_____☐_____☐

strongly disagree disagree unsure agree strongly agree

Access to easy healthy recipes / meal ideas

☐_____☐_____☐_____☐_____☐

strongly disagree disagree unsure agree strongly agree

How much to eat of different types of food (serving sizes)

☐_____☐_____☐_____☐_____☐

strongly disagree disagree unsure agree strongly agree

Other nutrition information that you would like

_____

_____

Social media is the best way to get that information to you?

☐_____☐_____☐_____☐_____☐

strongly disagree disagree unsure agree strongly agree

Health promotion campaigns? (TV, radio & billboards)

☐_____☐_____☐_____☐_____☐

strongly disagree disagree unsure agree strongly agree

Other

_____

Appendix 2: Knowledge of key food groups & servicing sizes

How much of the following should you eat? (Mark column with an X for each food group)

Please DON'T guess if you don't know please indicate that you don't know

Food Group	Eat most	Eat least	Eat sometimes	Don't know
Fruit				
Vegetables				
Grains				
Lean meat, poultry, fish & alternatives				
Milk, yoghurt, cheese and alternatives				
Extra foods, soft drink, hot chips, lollies, doughnuts, etc.				
Water				

How many serves per day is recommended for each food group?

Food Group	Number of serves per day (write in a number)	Don't know (X)
Fruit		
Vegetables		
Grains		
Lean meat, poultry, fish & alternatives		
Milk, yoghurt, cheese and alternatives		
Extra foods, soft drink, hot chips, lollies, doughnuts, etc.		
Water		

Appendix 3: Influences

1. What influences your KNOWLEDGE about nutrition? (mark boxes with an X)

Influence	Yes	No
Food & nutrition school based education		
Peers		
Parents/family		
Television		
Food advertisements		
Healthy food promotion advertisements		
Internet /google		
Instagram/Facebook Newsfeeds		
YouTube		
Other (please indicate): _____		

2. What influences your eating BEHAVIOUR? (mark boxes with an X)

Influence	Yes	No
Food & nutrition school based education		
Peers		
Parents/family		
Television		
Food advertisements		
Healthy food promotion advertisements		
Nutrition knowledge		
Weight concerns		
Other appearance concerns		
Health concerns		
Internet / google		
Instagram/Facebook Newsfeeds		
Other social media (please indicate):_____		
Other (please indicate): _____		

3. What influences you FOOD PURCHASES?

Influence	Yes	No
Price of food		
Quality or freshness of the food		
Cooking skill		
Taste		
How much money I have		
Convenience		
Habit or routine (family eating habits)		
The availability of the food in the shops where I go		
Someone else decides on most of the food I eat		

Appendix 4: Please place a X in one box for each food item listed *Food Frequency Questionnaire*

	Average number of times consumed in the past month								
DAIRY FOODS	**Never**	**Once per month**	**Once per fortnight**	**Once per week**	**2-4 times per week**	**5-6 times per week**	**Once per day**	**2-3 times per day**	**4+ times per day**
Flavoured milk/soy drink (eg milkshake, iced coffee)									
Milk/soy milk as a drink (eg glass of milk)									
Milk/soy milk on breakfast cereals									
Milk/ soy milk in hot beverages (eg coffee, tea, hot chocolate)									
Cream or sour cream (eg on dessert)									
Ice cream									
Yoghurt (including plain, frozen, flavoured, natural)									
Cottage or ricotta cheese									
Cheddar and all other cheeses									
BREAD AND CEREAL FOODS	**Never**	**Once per month**	**Once per fortnight**	**Once per week**	**2-4 times per week**	**5-6 times per week**	**Once per day**	**2-3 times per day**	**4+ times per day**
White bread, toast or rolls									
Wholemeal or multigrain bread, toast or rolls									
English muffin, crumpet, focaccia or flat bread									
Savoury biscuits, crackers, crispbread									
Muesli									
Cooked porridge									
Breakfast cereal									
Rice (white or brown)									
Pasta (including spaghetti, noodles , filled eg ravioli)									
MEAT, FISH, EGGS	**Never**	**Once per month**	**Once per fortnight**	**Once per week**	**2-4 times per week**	**5-6 times per week**	**Once per day**	**2-3 times per day**	**4+ times per day**
Red meat (steak, lamb, veal, pork)									
White meat (chicken, turkey, duck)									
Fish (fried, battered, grilled, crumbed, canned eg. tuna)									

Other seafood (prawns, oysters, mussels, calamari)									
Processed Meat (ham, polony, salami, bacon)									
Sausages or frankfurters (red sausages)									
Eggs or egg dishes (eg fried, scrambled, omelette)									
VEGETABLES	**Never**	**Once per month**	**Once per fortnight**	**Once per week**	**2-4 times per week**	**5-6 times per week**	**Once per day**	**2-3 times per day**	**4+ times per day**
Green/mixed salad (eg lettuce, tomato, cucumber etc) in a sandwich or side salad									
Stir-fry and mixed cooked vegetables (including mixed vegetable soup)									
Excluding the above dishes, please indicate how often you eat the following vegetables:	**Never**	**Once per month**	**Once per fortnight**	**Once per week**	**2-4 times per week**	**5-6 times per week**	**Once per day**	**2-3 times per day**	**4+ times per day**
Potato cooked without fat (eg boiled, mashed, baked)									
Potato cooked with fat (eg chips, gems, wedges, roast)									
Carrots									
Pumpkin or sweet potato									
Peas , green beans, snow peas (frozen or fresh)									
Capsicum									
Corn (on the cob, kernels)									
Mushrooms									
Celery, asparagus or bean sprouts									
Broccoli or cauliflower									
Zuccinni, eggplant or squash									
Salad greens (including lettuce or rocket)									
Tomatoes (tinned, fresh, sundried									
Avocado									
Onion or leeks									
Beans (baked beans, soy beans, tofu, kidney, chickpeas, lentils									

FRUITS (fresh, frozen or tinned)	**Never**	**Once per month**	**Once per fortnight**	**Once per week**	**2-4 times per week**	**5-6 times per week**	**Once per day**	**2-3 times per day**	**4+ times per day**
Mixed fruits (eg fruit salad)									
Excluding mixed fruit, please indicate how often you eat the following fruits:									
Apple or pear									
Orange, mandarin or grapefruit									
Peach, nectarine, plum, apricot or cherries									
Banana									
Mango or pawpaw									
Pineapple									
Berries (eg strawberries, blackberries, blueberries, mulberries)									
Melon (eg watermelon, rockmelon, honeydew melon)									
Other fruit (eg kiwi, grapes)									
FRUITS (dried)									
All types (sultanas, apricots, mango, prunes)									
BAKED GOODS AND SNACKS	**Never**	**Once per month**	**Once per fortnight**	**Once per week**	**2-4 times per week**	**5-6 times per week**	**Once per day**	**2-3 times per day**	**4+ times per day**
Meat pie, sausage roll or other savoury pastry (eg pasty)									
Pizza									
Hamburger with bun									
Cakes, sweets, muffins, scones or pikelets									
Sweet pies or sweet pastries (eg apple pie, Danish)									
Other puddings or desserts (eg sticky date pudding)									
Sweet biscuits (eg chocolate biscuit, scotch finger, shortbread cream)									
Chocolate (including chocolate bars eg Mars bar, Boost bar)									
Other confectionary (eg lollies)									
Nuts (salted or unsalted)									
Potato chips (eg salt and vinegar, BBQ, twisties, burger rings etc)									

SUGAR, SPREADS AND DRESSINGS	Never	Once per month	Once per fortnight	Once per week	2-4 times per week	5-6 times per week	Once per day	2-3 times per day	4+ times per day
Sugar, syrup or honey									
Jam or marmalade									
Peanut butter or other nut spreads (eg Nutella)									
Butter, dairy blends or margarine									
Vegemite, Marmite or Promite									
Oil and vinegar dressing (eg balsamic salad dressing)									
Mayonnaise or other creamy dressing (eg coleslaw dressing, honey-mustard)									
NON-MILK BEVERAGES	**Never**	**Once per month**	**Once per fortnight**	**Once per week**	**2-4 times per week**	**5-6 times per week**	**Once per day**	**2-3 times per day**	**4+ times per day**
Fruit juice (eg orange, apple, orange and mango)									
Cordial									
Soft drinks (including flavoured mineral water)									
Electrolyte or sports drinks (eg Powerade, Gatorade)									
Energy drinks (eg Red Bull, V, Mother)									
Coffee									
Tea									
Alcohol									

Body Parts Satisfaction Scale-Revised (Berscheid et al., 1973)

Below is a list of body parts. Please rate with an X in the box 1-6 how satisfied you are at this moment with each body part. Please respond to all items and respond honestly as they apply to you. All of the information you provide will be kept strictly confidential.

	Extremely dissatisfied	1	2	3	4	5	6	*Extremely satisfied*
Height								
Weight								
Hair								
Complexion								
Overall face								
Shoulders								
Arms								
Stomach								
Chest								
Back								
Buttocks								
Legs/thighs								
Lower legs (calves)								
General muscle tone								
Overall satisfaction with size and shape of your body								

Eating Attitudes Test-16 (Ocker et al., 2007).

Please respond to the items below as honestly as possible.

	Never 1	Rarely 2	Sometimes 3	Often 4	Usually 5	Always 6
1. I am preoccupied with the desire to be thinner.						
2. I am preoccupied with the thoughts of having fat on my body.						
3. I am terrified about being overweight.						
4. I engage in dieting behaviour.						
5. I feel extremely guilty after eating.						
6. I think about burning up calories when I exercise.						
7. I like my stomach to be empty.						
8. I feel uncomfortable after eating sweets.						
9. I particularly avoid foods with high carbohydrate content.						
10. I avoid foods with sugar in them.						
11. I eat diet foods.						
12. I am aware of the calorie content of foods that I eat.						
13. I find myself preoccupied with food.						
14. I feel that food controls my life.						
15. I give too much time and thought to food.						
16. I have gone on eating binges where I feel I am not able to stop.						

Additional comments (anything else you would like to say?)

_____
_____
_____

Thank you for taking the time to complete the survey ☺

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