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Food Selection Behaviour of University Students with Food Allergies and Celiac Disease

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Abstract

Purpose: Food allergies (FA) and celiac disease (CD) are becoming increasingly prevalent among Late Adolescents (LA) (18-24years). This period is a challenging developmental stage, whereby individuals transition from parental supervision to the self-management of their FA and CD. Hence, poor food selection behaviour (FSB) is common among these individuals. This study attempted to understand which factors influenced FSB in first-year university students with FA and CD.

Design/Methodology/Approach: A food selection (FS) survey was conducted among participants with FA and CD to determine how influential five factors (cost, taste, convenience, health and labelling) were. Descriptive statistics were conducted for the demographic results. The Mann-Whitney U test determined which factors were the most influential, along with sex differences. A comparison was made between FA and CD.

Findings: Taste and cost were the most influential determinants of FS in both groups of participants. Labelling was the least influential factor. Significant differences were found between the sexes. Females were more likely to be influenced by cost, whereas for males, taste was a greater determinant of food choice.

Originality/Value: This is the first study to explore FSB in LA with FA and CD. The present study confirms previous findings in relation to the FSB of LA. This study contributes evidence suggesting that individuals with and without FA and CD, are influenced by the same determinants of FS.

Keywords: Food Allergy**;** Celiac Disease; Food Selection; Predictors; University Environment; Late Adolescents;

Paper type: Research paper

1. Introduction

In recent years, the number of individuals diagnosed with food allergies (FA) and celiac disease (CD) has increased (Tang and Mullins. 2017). A FA is characterised as a "hypersensitivity reaction initiated by proven or strongly suspected immunologic mechanisms" (World Allergy Organisation, 2017). FA consist of immunoglobulin E (IgE) mediated reactions and non-IgE-mediated reactions. IgE-mediated reactions involve the 8 major food allergens (cereals containing gluten, peanuts, tree nuts, milk, eggs, fish, crustaceans, and soya). They are characterised by a rapid onset of symptoms, whereby adverse reactions, typically hives, vomiting, and anaphylaxis, occur within minutes of ingesting the offending food (Valenta *et al*., 2015). Non-IgE mediated reactions, though not fully understood, are thought to be related to different parts of the immune system and not associated with IgE antibodies. Adverse effects following non-IgE-mediated reactions are generally delayed, following ingestion of the offending food, with abdominal discomfort, vomiting, and diarrhoea, the most severe of symptoms. CD is not mediated by allergen specific antibodies including IgE and is an autoimmune condition, which causes inflammation of the small intestine (Fraser et al., 2021)

Food selection behaviour (FSB) plays a crucial role in determining nutritional status of individuals with FA and CD. While all individuals diagnosed with a FA or CD have difficulty in choosing safe food to eat, late adolescents (LA) studying at university, are considered the most vulnerable (Greenhawt, 2016; Warren *et al*., 2017). A child with a FA or CD is likely to experience fewer adverse reactions, because any contact with a food allergen is managed by parents/caregivers (Warren *et al*., 2017).

University is a critical period for LA as individuals attempt to navigate surroundings and achieve independence. It is a period of physical, cognitive, psychological, and social development (Roy *et al*., 2016; Tam *et al*., 2017; Sprake *et al*., 2018). This, coupled with responsibility of self-management of their FA or CD, makes it a stressful and significant period in their educational lives (Warren *et al*., 2017). Students between 18 and 24years will be in a state of transition from late adolescence to adulthood (Sawyer *et al*., 2018). Thus, poor FSB is becoming increasingly prevalent amongst these individuals (Deliens *et al*., 2014).

Previous research indicates adolescents at universities without FA or CD are influenced by a broad range of food choices.

Eating itself is an inherently social activity; therefore, social environments and peer influence play a significant role in food selection (FS). In particular, social environments and peer influence are most profound amongst LA, as individuals seek a sense of belonging and social identity (Hebden *et al*., 2015; Stok et al., 2016). Presently, thirty-four conceptual models of food choice highlight the significance of social environments and peer influence on FS (Chen and Antonelli, 2020). Eating outside the home is becoming a global lifestyle, and dependence on convenience foods and fast foods has rapidly increased (Lee *et al*., 2016; Munt *et al*., 2016). Research has shown 40% of eating in LA occurs outside of the home (Hebden *et al*., 2015). University itself signifies a transitional period. LA will likely move away from home for the first time, and thus become increasingly independent in their FS (Tam *et al*., 2017). During this period, individuals are exposed to new social groups and food cultures. The need to maintain social connections and increase social bonding becomes important, as individuals attempt to gain autonomy (Lee *et al*., 2016). However, foods eaten outside of the home are of poorer nutritional quality and related to an increased risk of obesity and several chronic diseases (e.g. type 2 diabetes, hypertension and cardiovascular disease) (Lee *et al*., 2016). Du *et al*. (2021) also suggested frequent consumption of convenience foods and foods from outside the home are a risk factor for all-cause mortality. Additionally, many students in this period of transition often have insufficient knowledge of cooking, or simply have no time for meal preparation while attempting to juggle studies, work and/or social commitments, and the ongoing developmental changes that occur. Therefore, the temptation for convenience and fast foods, which are of poor nutritional quality, greatly increases, making individuals more vulnerable to unhealthy eating (Sprake *et al*., 2018).

The cost of food items is also a significant predictor of FS among LA, with a large proportion of student diets dictated by value for money rather than nutritional quality (Hebden *et al*., 2015; Tam *et al*., 2017; Livingstone *et al*., 2020). Twenty-nine models emphasise the cost of food as a significant predictor of FS (Chen and Antonelli, 2020). The university campus presents an obesogenic environment. Highly processed and refined foods are found at a relatively cheaper price than their healthier counterparts.

This will inevitably lead to a high-energy diet rich in salt and saturated fat (Deliens *et al*., 2014; Hebden *et al*., 2015; Roy *et al*., 2016; Sprake *et al*., 2018; Vilaro *et al*., 2018; Whatnall *et al*., 2021). Additionally, university students will regularly be inundated with student offers of fast food, particularly through social media. The low cost of such foods, along with the ease and convenience in which they can be bought, will greatly appeal to students (Molenaar *et al*., 2021). As LA start to gain independence, the financial strain (student fees, accommodation, food and utilities) will likely lead students to engage in unhealthy eating, as they are more likely to purchase convenience and fast foods (Munt *et al*., 2016; Molenaar *et al*., 2021). Furthermore, the university campus is known to contain a reduced variety of foods and a reduced availability of healthy foods (Tanton *et al*., 2015; Roy *et al*., 2019). Vending machines which are ever present on campus significantly contribute to snacking among LA, providing easy access to unhealthy foods (Matthews and Horacek, 2015). LA are constantly surrounded by a poor nutritional environment during their university years; thus, it is not surprising that these individuals are more inclined to purchase and consume unhealthy foods.

Taste is also a highly influential determinant of FS in LA at university (Hebden *et al*., 2015; Livingstone *et al*., 2020). Sensory factors such as taste, have been proposed in twenty-six models of FS (Chen and Antonelli, 2020). Individuals have an innate preference for sweet, salty and high energy dense foods and consider these foods to be tastier (Bawajeeh *et al*., 2020). Many studies have indicated university students consume large amounts of fast food and sugar-sweetened beverages, with a reduced intake of fruits, vegetables and fibre. Therefore, resulting in a diet high in processed and refined foods, placing them at an increased risk of nutritional deficiencies (Deliens *et al*., 2014; Tanton *et al*., 2015; Munt *et al*., 2016; Tam *et al*., 2017; Sprake *et al*., 2018; Vilaro *et al*., 2018; Larson *et al*., 2020; Molenaar *et al*., 2021).

Furthermore, this poor diet consumed by LA during university can lead to excessive weight gain, which is a risk factor for chronic diseases (e.g. metabolic syndrome, type 2 diabetes and cardiovascular disease) (Munt *et al*., 2016). Weight gain is more pronounced during the first year of university because of significant changes in lifestyle (Deliens *et al*., 2014; Munt *et al*., 2016; Roy *et al*., 2016) but weight gained specifically during the transition from late adolescence to adulthood has been identified as a

significant predictor of obesity later in life (Sprake *et al*., 2018). The stress of higher education often leads to comfort eating among students, and this coupled with the low levels of physical activity, which is also common among LA can further contribute to this weight gain (Roy *et al*., 2019).

While much research has been conducted on FSB in LA, little research is available on this topic in LA with FA and CD. To the best of our knowledge, only one study has investigated FS among adolescents with FA. Sommer *et al*. (2014) explored FS in early adolescence (12-18years) for individuals with FA. Results highlight that while adolescents felt the presence of a FA certainly impacted FS, this was not the most significant factor. Rather, enjoyment of the food and peer influence were greater motivators for FS. Sensory characteristics (taste and texture) were also found to be primary determinants of FS in adolescents with FA. Furthermore, adolescents with FA also acknowledged the importance of a healthy diet for overall health and maintaining a positive body image. However, taste was a major influencer of FS, and it was found that adolescents had a preference for snacks and fast foods. This is worrying, as previous research has indicated that those with FA are at an increased risk of an imbalanced diet, placing them at greater risk of health concerns (D'Auria *et al*., 2019; Larson *et al*., 2020). Overall, research by Sommer *et al*. (2014) determined that individuals with and without FA are influenced by similar determinants of FS and this is because those with FA strive to live a similar life to their peers.

The transition from late adolescence to adulthood presents many challenges. In fact, this period of transition into a new and unfamiliar environment, is the primary cause of poor FSB among many university students. Therefore, understanding FSB can prove useful in improving dietary status.

Cost, taste, convenience, and health have extensively been identified as significant contributors to FS among university students (Deliens *et al*., 2014; Ensaff *et al*., 2015; Hebden *et al*., 2015; Tam *et al*., 2017; Warren *et al*., 2017; Sprake *et al*., 2018; Vilaro *et al*., 2018; Roy *et al*., 2019; Livingstone *et al*., 2020; Whatnall *et al*., 2021). With little research existing on the FS of LA's with FA's and CD, these factors were chosen to determine if the presence of a food hypersensitivity altered FSB. Clear labelling is directly relevant to those with FA and CD, as ambiguous and incorrect labelling leads to accidental exposure and may consequently prove fatal (Allen *et al*., 2014).

Therefore, this factor was also explored to see its impact of the FSB of LA's with FA's and CD.

To our knowledge, this is the first study to examine FSB in LA (18-24years) with FA and CD. The study aims to look at how influential five factors are (cost, taste, convenience, health and labelling), with regard to FSB of university students with FA and CD. Consequently, this can lead to the implementation of tailored intervention programs that promote positive lifestyle changes, ultimately leading to a varied diet rich in essential nutrients.

2. Methodology

2.1. Subjects

All participants had to meet the following three criteria. First, only individuals enrolled in a foundation-entry or first-year undergraduate course were recruited. This was to ensure all participants were in a state of late adolescence and would be experiencing self-management of their FA or CD for the first time. This was clearly indicated by the eligibility criteria and communicated to all participants. Secondly, all participants recruited were between 18 and 24years, as research suggests this age range signifies late adolescence (Sawyer *et al*., 2018). Finally, all student participants were required to be diagnosed with FA or CD.

2.2. Ethics Approval

Ethical approval was obtained from the university's Science, Technology Engineering, Medicine, and Health (STEMH) ethics committee. Following approval (STEMH 980), information sheets were presented to prospective participants providing them with sufficient knowledge regarding the study. This allowed them to make an informed decision on their participation. Consent was obtained from all participating to ensure individuals fully agreed with their involvement in the study.

2.3. Recruitment

Students were recruited using flyers, which were placed around campus. Flyers were uploaded to course sites of different school hubs. Additionally, social media (Facebook and Twitter), was used to assist in recruitment. A student-led social enterprise known as SCRAN (Students Creating Resources Around Nutrition), which is based at the university, was also used. The Anaphylaxis Campaign also assisted in recruitment, by placing an advertisement on their website and a dedicated young person's Facebook page. Students from any background were able to participate, ensuring they met the subject criteria.

2.4. Questionnaire Development

Prior to collecting main data, a pilot test (n=18) was conducted to assess clarity and time taken to complete the questionnaire. Following this, revisions were made to enhance clarity. Most participants were confused about definitions of mild, moderate, and severe symptoms of FA and CD. Thus, a definition explaining what was considered a 'severe' reaction was provided in the questionnaire. A severe reaction for FA was characterised by 'obstructive swelling of the lips, tongue, and/or throat, trouble swallowing, shortness of breath, turning blue, drop in blood pressure, chest pain, weak pulse, and anaphylaxis' (Yue *et al*., 2018). Severe reactions for CD include 'diarrhoea, weight loss, fatigue, and anaemia' (Gujral *et al*., 2012).

The questionnaire was used to deduce participants' FS and was adapted from similar studies (Share and Stewart-Knox, 2012; Warren *et al*. 2017. Smart Survey (smartsurvey.co.uk) was used to create the questionnaire. Questions were divided into two sections. Section one included eight multiple-choice questions and covered participant demographics and information regarding participants' FA and CD. Section two comprised of FSB, of which five factors (cost, taste, convenience, clear labelling, and health) were used. The five factors were defined in the questionnaire to provide additional clarity. *(1) Cost: Cost of each food item. (2) Taste: Taste for each food item. (3) Convenience: Buying certain foods, because they are easily accessible and require little effort to prepare. (4) Clear labelling: Buying certain foods, as they provide maximum clarity in terms of labelling, that is, clear identification of affecting allergens and little/no use of precautionary allergen labelling. (5) Health: Buying foods based on their nutritional content or the impact they have on your health.*

Participants were asked to rate which of these factors was the most influential in terms of their FSB. The factors were quantified on a 5-point Likert scale using the numbers 1 – 5, with 1 being the least influential and 5 the most influential.

2.5. Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics version 24.0. Descriptive statistics (mean and standard deviation), were conducted on participants' demographic information from section one of the questionnaire. For section two, a Mann-Whitney U test analysis was conducted. This allowed us to firstly determine which of the five factors (cost, taste, convenience, labelling and health) were the most

297 influential in terms of FS, and, secondly, whether significant differences existed
298 between sexes. For all tests, the significance level was set at 0.05.

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3. Results and Discussion

3.1. Participant Demographics

219 participants (83 males and 136 females) completed the questionnaire. All participants were diagnosed with a FA or CD. Only 172 patients (63 males and 109 females; 18-24y old) who reported clinical diagnosis of a FA (n=62) or CD (n=110) were included in data analysis. The 47 respondents who reported having self-diagnosed FA, were not included because of the unreliability of self-diagnosis of FA (Ali, 2017). The marked sex differences may be because, on average, females are more likely than males to participate in surveys (Lobato *et al*., 2014). To ensure all participants self-managed their FA or CD for the first time, it was verified that participants were enrolled in a foundation-entry (n=57) or first-year undergraduate course (n=115).

3.2. Preparedness

To assess preparedness for managing FA reactions, participants were asked whether they carried an epinephrine auto-injector with them on campus. Of the 62 participants clinically diagnosed with a FA, 27% (n=17) carried an epinephrine auto-injector, while 73% (n=45) did not (Table I). 84% (n=52) of participants with a FA had also suffered from a previous severe reaction (see Fig 1).

These findings highlight that LA with FA will engage in risk taking behaviour and previous severe reactions will not necessarily increase epinephrine auto-injector use. This is worrying as an epinephrine auto-injector is the primary treatment of choice for severe food allergic reactions, without which reactions could prove fatal (Cooke and Meize-Grochowski, 2019). Previous literature indicates that self-management of a FA during the challenging phase of adolescence can contribute to this risky behaviour while at university, as LA attempt to gain autonomy and seek social identity (Greenhawt, 2016). Warren *et al*. (2017), further reinforces LA often experiment and are naturally thought to be risk takers. For instance, research has found individuals with FA knowingly ingest ‘may contain’ foods increasing risk of anaphylaxis (Greenhawt, 2016). Likewise, research indicates that in a peer social situation, LA are poorly equipped to deal with adverse reactions. They frequently feel hesitant to inform others about their FA and may refuse to continuously carry epinephrine auto-injectors.

The need to conform to certain situations dominates self-preservation and is one of the leading causes of food-induced anaphylaxis in adolescents (Warren *et al*., 2017). Furthermore, research highlights cost, inconvenience and poor knowledge of use, are some reasons for this behaviour (Gallagher et al., 2011; Ponda and Berwald, 2018). Therefore, the data indicate these individuals are at risk of fatal reactions. Hence, there is a need to educate participants who possess severe FA on the importance of preparedness to manage future FA reactions.

Insert Table I here

For individuals with CD, 71% (n=78) had previously experienced a severe reaction (see Fig.1). Although a high number of participants had been subjected to severe reactions, individuals with this autoimmune disorder will not experience anaphylaxis when gluten is consumed. Thus, they will not require an epinephrine auto-injector to manage severe reactions, which explains why no participants with CD carried an epinephrine auto-injector on campus. However, severe reactions in patients with CD lead to an increased damage to the villi of the small intestine. This causes risk of malabsorption of essential nutrients and consequently, malnutrition, leading to chronic disease (Green *et al*., 2015). While the questionnaire did not assess whether participants with CD were observing a strict gluten-free diet (the only proven treatment for CD) (Jnawali *et al*., 2016), previous literature indicates that adolescents self-managing their food hypersensitivities for the first time (as was the case for these participants) have a low adherence rate to this diet (Darling, 2013). The primary reasons for this include inadequate screening of food labels while attempting to prove autonomy as well as social conformity (Dashiff, *et al*., 2008; MacCulloch and Rashid, 2014). Therefore, adolescents with CD, with a known history of ingesting gluten-containing foods, will be susceptible to severe reactions in the future. Consequently, participants with CD should be educated on the importance of reading food labels and the negative nutritional impact of consuming gluten while attempting to navigate university life.

Insert Figure 1 here

3.3. Food Selection

Participants were asked to rate how five different factors - cost, taste, convenience, labelling, and health influenced FS. Descriptive statistics for those with FA revealed taste was the most influential (2.9 ± 1.1), followed by cost (2.4 ± 0.9), convenience (2.2 ± 0.7), health (2.2 ± 0.8) and finally labelling (1.8 ± 0.8) (Table II). Similarly, descriptive statistics for those with CD revealed taste as the most influential (2.9 ± 1.0), followed by cost (2.2 ± 1.0), convenience (2.1 ± 0.7), health (2.1 ± 0.8), and finally labelling (1.9 ± 0.8) (Table III). These results suggest individuals with FA and CD, are influenced by the same predictors of FS.

The Mann-Whitney U test determined sex differences in relation to FS for both groups of participants. For participants with a FA, there was a significant difference between sexes for three factors: cost ($U = 271$ [$Z = -2.062$], $p = 0.039$), labelling ($U = 271$ [$Z = -2.090$], $p = 0.037$), and health ($U = 281$ [$Z = -1.932$], $p = 0.053$). Effect size was calculated to determine the significance of these differences. A small difference existed between sexes for cost ($r = -0.26$), labelling ($r = -0.26$), and health ($r = 0.25$). No significant difference existed between sexes in taste and convenience (Table II). In contrast, for participants with CD there was a significant difference between sexes for only two factors; cost ($U = 887$ [$Z = -3.643$], $p < 0.001$) and taste ($U = 1079$ [$Z = -2.505$], $p = 0.012$). Effect size highlighted a small difference between sexes for both cost ($r = -0.35$) and taste ($r = -0.24$). No significant differences were found between sexes for convenience, labelling, and health (Table III).

Insert Table II here

Insert Table III here

3.3.1. Taste

Taste was the most influential determinant of FS among students with FA and CD. This finding is supported by previous research (Ensaff *et al*., 2015; Hebden *et al*., 2015; Livingstone *et al*., 2020). More specifically, foods high in fat, salt, and sugar were considered by students as 'tastier,' also consistent with previous research (Deliens *et al*., 2014; Hebden *et al*., 2015; Roy *et al*., 2016; Sprake *et al*., 2018; Whatnall *et al*., 2021). This is concerning, because an increased consumption of low-quality foods places individuals at an increased risk of nutritional deficiencies, negatively impacting health (Deliens *et al*., 2014; Tanton *et al*., 2015; Munt *et al*., 2016; Tam *et al*., 2017; Sprake *et al*., 2018; Larson *et al*., 2020; Molenaar *et al*., 2021).

3.3.2. Cost

The second most influential factor of FS was cost. Multiple studies reinforce how the cost of a food item is a decisive factor for late adolescent students (Ensaff *et al*., 2015; Hebden *et al*., 2015; Tam *et al*., 2017; Vilaro *et al*., 2018; Livingstone *et al*., 2020). Ensaff *et al*. (2015), suggest the importance of cost depends on the eating occasions. Their research highlights that adolescent students are more cautious about prices when eating out. However, in the university environment, students were aware the price was within certain limits, so were not as concerned with the cost. This could potentially explain why cost, although influential, was not the most significant determinant of FS. Additionally, research indicates that campus foods which are cheap and affordable, are often those low in fibre and rich in fat, salt, and sugar. Thus, as prices increased, students were more likely to consume fewer fruits and vegetables and more sugar-sweetened beverages and added sugars (Vilaro *et al*., 2018; Roy *et al*., 2019). Adolescent students are more willing to purchase nutrient-rich foods such as fruits and vegetables, if sold at more reasonable prices (Deliens *et al*., 2014; Roy *et al*., 2016; Tam *et al*., 2017). Therefore, universities should consider making healthier foods more affordable for students in an attempt to improve health status.

3.3.3. Convenience

Students often select foods based on convenience, such as ease of preparation and portability of the food item ('grab and go') (Tanton *et al*., 2015; Munt *et al*., 2016;

Molenaar *et al*., 2021). Although convenience was not the most significant predictor in this study, it was of greater importance than health and clear labelling. While students attempt to balance a stressful university lifestyle, opting for convenience foods seems a smart choice (Warren *et al*., 2017). Pelletier and Laska, (2013), suggest that universities compete with fast-food chains for student patronage and as such, offer an increased amount of energy-dense foods on campus. The increased consumption of these convenience foods which are abundant in added sugar, is associated with poor dietary intake, consequently leading to nutritional decline (Deliens *et al*., 2014; Tanton *et al*., 2015; Munt *et al*., 2016; Tam *et al*., 2017; Sprake *et al*., 2018; Vilaro *et al*., 2018; Larson *et al*., 2020; Molenaar *et al*., 2021).

3.3.4. Health

Health was the second least influential factor in participants' FS. This is surprising, as previous research indicates that FS in late adolescence is driven by a healthy aesthetic (Ensaff *et al*., 2015; Vilaro *et al*., 2018). Sprake *et al*. (2018) and FS choice and found that in comparison to males, females are more health conscious. This difference between sexes is further supported by the findings of this study.

For the participants in this study, the most influential determinants (taste, cost, and convenience) all led to poor dietary intake, thus supporting existing literature. A high-quality diet, enriched with a variety of nutrients is essential, in optimising academic performance in students (Abraham *et al*., 2018; Larson *et al*., 2020). Therefore, it is vital to address barriers to healthy eating.

3.3.5. Labelling

Clear labelling was the least influential factor in FS. This is worrying as all participants were diagnosed with FA or CD and for these individuals, clarity in labelling is the only means of achieving safety (Rachid and Keet, 2018). LA often display a risky, care-free attitude as they attempt to navigate the unfamiliar surroundings of university life (Greenhawt, 2016). Therefore, it seems that as individuals attempt to adapt to a life of independence, the quest to lead a normal life often precedes safety. FS is greatly influenced by the components of a university lifestyle, consequently leading to carelessness with regard to individuals food hypersensitivity.

3.4. Practical Implications and Interventions

This study is the first piece of research investigating FSB in LA with FA and CD. Three key findings emerged, which have important implications for future research.

Firstly, cost and taste were found to be the most influential predictors of FS. As discussed previously, 'cheaper' and 'tastier' foods are often those high in fat, salt and sugar and low in nutritional content, indicating individuals will be at risk of consuming a poor quality diet, negatively impacting their health. Therefore, this research emphasises the importance of using the cost and taste of food items to positively influence healthier FS, in particular for this group of individuals who are at an increased risk of nutritional deficiencies due to their food hypersensitivity. Previous research indicates how reducing costs of food items within the university campus was well received by students (Tam *et al*., 2017). Similarly, stocking vending machines with healthier products at a reduced cost has proven effective in providing a healthier food environment (Deliens *et al*., 2014). With students spending most of their time on campus, this can prove an effective means of promoting healthier FS.

Secondly, significant differences were found between both sexes. These findings support previous research in that females are more likely to be influenced by cost, while taste is a greater predictor of FS for males (Vilaro *et al*., 2018). Likewise, the findings suggest that females are more concerned with eating healthily, which is also consistent with previous research (Manippa *et al*., 2017; Sprake *et al*., 2018; Livingstone *et al*., 2020). Based on these findings, the importance of considering a sex-specific approach can be beneficial in promoting positive FS among LA.

Finally, participants were found to be influenced by the same factors as those without FA or CD. Therefore, suggesting that having a food hypersensitivity in a university setting does not greatly impact FS. Rather, this highlights that living a similar life to that of their peers is a key aspect of university and of great importance for LA with food hypersensitivities. In fact, the results also highlight that in order to achieve this sense of normality and fully experience university life, students were willing to take unnecessary risks. For instance, consuming unsafe foods, not carrying the epinephrine-autoinjector and/or not paying greater attention to food labels. Individuals with food hypersensitivities struggle with the feeling of being different and do not want

to be seen as different to their peers and this impacts their FS. Therefore, universities have a responsibility to better accommodate for those with food hypersensitivities, enabling and encouraging them to openly discuss their food requirements. The transition from late adolescence to adulthood is clearly a vulnerable stage. Uncertainty, anxiety and the pressures of university can make dealing with a food allergy or intolerance at university extremely challenging. Therefore, students are in need of additional support and reassurance from their peers, academics and the university as a whole, to allow for successful management of their food hypersensitivity. With food allergies and intolerances rising, there has been a growth in the number of higher education institutes providing resources and support for LA. However, given our findings, there is still a need for increased education, advocacy and support for students with hypersensitivities, within the university environment.

Students with food hypersensitivities must be able to rely on their university to provide a safe environment, whilst minimising risk and still being included socially. Universities should consider collaborating with UK charities (e.g. Anaphylaxis Campaign and Foods Standards Agency), who have previously ran campaigns to increase allergen awareness for young adults at universities.

To further improve FS and consequently healthier eating behaviours, consulting university students prior to implementation has proven significant. (Vilaro et al., 2018). Universities should involve students in creating interventions to maximise the potential of healthy eating. For example, student-led social enterprises such as SCRAN and MetMunch were established as part of a healthy, safe, and sustainable food policy at the university level in North West, England. These organisation are currently involved in encouraging consumption of healthy, safe, and sustainable food, through student recruitment and ‘cook and eat sessions’ on campus and within the local communities. In the past, their work has proven inspirational for students and staff. Perhaps allowing groups like SCRAN/MetMunch a more integral role within the university (e.g. collaborating with catering staff to influence the current menu and snack options, along with portion size and methods of cooking), could greatly benefit the overall health and well-being of all those at the institution (Healthy University Plan, 2018). Although these examples showcase only two organisation at two different universities, the initiative can easily be applied to different institutes and form the basis of positive change.

Moreover, universities should provide students with food education and food preparation classes using healthy ingredients and various cooking techniques. This will assist in increasing nutritional knowledge, allowing better planning of meals. This is vital, as research suggests increasing university students' knowledge of healthy eating allows them to make more informed choices throughout their lives (Deliens *et al*., 2014; Lee *et al*., 2016; Munt *et al*., 2016; Sprake *et al*., 2018). Providing information on the negative impact of unhealthy eating can also allow students to make better food choices (Whatnall *et al*., 2021).

4. Limitations

The following limitations should be acknowledged. Self-reported questionnaires were used. Participants may not have been entirely truthful when responding. Socially desirable answers may have been provided when answering questions relating to their FS. Participants may also not have been truthful regarding diagnosis of their food hypersensitivity, as no medical history was collected to support their response. Likewise, no medical records of previous severe reactions were collected, therefore participants reported severity of their food hypersensitivity, is subjective, Also, Likert scale statements may be interpreted differently by different participants, reducing reliability of the results. Additionally, no healthy control group was included for this study, with results being compared to existing literature. Moreover, only university students were asked to take part in the study. LA attending other forms of higher education were excluded, therefore results cannot be generalised to all those in this age group. Furthermore, this study did not determine the nutritional status of individuals. Therefore, taking into account the aforementioned limitations, caution is required when interpreting results of this study.

5. Further Research

Understanding FS, due to its' multi-factorial nature is highly complex. Although only five such factors were addressed, many different variables not investigated in this study, could also influence university students' eating habits. For instance, peer influence, social norms, socioeconomic status, state of mind and social media also contribute to students' eating habits (Deliens *et al*., 2014; Verstraeten et al., 2014; Ensaff *et al*., 2015; Hebden *et al*., 2015; Tanton *et al*., 2015; Vilaro *et al*., 2018; Vadeboncoeur et al., 2015; Vilaro et al., 2018). Thus, research into these areas should be conducted to further understand reasons behind participants' FS, which can enable universities to foster healthier eating habits.

Future studies should also compare the dietary status of first year adolescents, with students towards the end of their time at university. This can be useful to see if the transition period which first year university students undergo, is a key factor in influencing their dietary status. Similarly, research should also compare the dietary status of individuals with food hypersensitivities to those without, to see if the presence of a food allergy/intolerance is an influential factor. A greater focus on investigating which specific unhealthy foods are consumed in excess at the university setting, will also prove beneficial in creating more targeted intervention plans.

It would be beneficial if further studies identified any specific dietary regimes that were implemented by participants. The types of diet that were being observed e.g. a vegetarian/ vegan diet, along with adherence rates could also potentially have influenced the dietary status of participants, irrespective of their food hypersensitivity.

Obtaining further information with regards to participants' home life (e.g. if they were living on campus or in halls or alone or with a partner/roommate) along with frequent places of food consumption, could have proven beneficial, in providing an insight into the purchasing and eating habits of participants. This information could also help to pinpoint the source of potential food allergic reactions. This could then allow for specific interventions, as not all individuals with a food hypersensitivity will be reliant upon university canteens for food, with multiple outside vendors made easily accessible to students.

Furthermore, additional research should be conducted to evaluate the long-term effectiveness of these intervention programs in promoting students' healthy eating. It is clear universities are responsible for their students, and acknowledging this crucial role can undoubtedly help in creating a long-lasting healthy environment (Whatnall *et al*., 2021).

Eating behaviours established during LA are likely to persist into adulthood; thus, promoting positive change during this life stage is critical (Tam *et al*., 2017; Sprake *et al*., 2018; Vilaro *et al*., 2018). With no single theory completely explaining FS, many conceptual models currently exist, that provide an in-depth understanding of the food choice process. Eating practices is one way for LA's to establish and express their identity as they attempt to gain autonomy. This combined with knowledge that unhealthy eating is more common in this group, makes for a compelling case for further investigation (Share and Stewart-Knox, 2012; Stok et al., 2016). Story et al., (2002) proposes a conceptual model of FS based on the social cognitive theory and ecological theory. This model places an emphasis on the period of transition from late adolescence to adulthood, through which individuals will move from parental influences to individual influences. Thus, this model can be used as a framework to further explore FS in LA's – perhaps through the use of qualitative methods such as focus groups, which will allow for an in-depth analysis of FS to fully understand the differing perspective of FS in LA's.

6. Conclusion

The purpose of the current study was to determine FSB of university students with FA and CD. Results showed taste and cost were the most influential factors, while clear labelling was the least significant. Significant differences were found between sexes for both cost and taste, with females more likely to be influenced by cost, while for males, taste was a greater determinant of FS. This is the first study to explore FSB in LA with FA and CD. The present study confirms previous findings in relation to adolescents' behavioural eating habits. It further verifies that all university students engage in health-risking behaviours. Furthermore, the study contributes further evidence suggesting individuals with and without FA and CD are influenced by the same determinants of FS.

Declaration of Competing Interest: None

Acknowledgements: The authors would like to thank all participants, The Anaphylaxis Campaign and Students Creating Resources around Nutrition (SCRAN), for their contribution to this research. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author Contributions: ZL, SD, and JMS conceived the study. ZL collected and analysed the data and wrote the manuscript. JMS critically edited the manuscript. All authors have read and approved the final manuscript.

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