UNIVERSITI TEKNOLOGI MARA

ASSESSING THE ROLE OF INTRAPERSONAL, SOCIAL, PHYSICAL, AND SOCIETAL INFLUENCES AND MODERATING EFFECTS OF FOOD ALLERGY ON FOOD CHOICE BEHAVIOUR OF UNIVERSITY STUDENTS

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MSc

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Thesis submitted in fulfilment
of the requirements for the degree of
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CONFIRMATION BY PANEL OF EXAMINERS

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I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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ABSTRACT

Food choice behaviour among university students is a complex issue that influences nutritional status, overall health, and the risk of chronic diseases. Although previous research based on the Social Ecological Model (SEM) has recognised the influence of intrapersonal, social, physical, and societal factors, limited attention has been given to the moderating role of food allergy. This study examined the effects of these multilevel factors on the food choice behaviour of Malaysian university students, with food allergy as a moderator. A quantitative cross-sectional design guided by the SEM was employed. Data were collected from 574 Malaysian university students using a validated structured questionnaire and analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). The findings revealed that intrapersonal, social, and physical environmental factors significantly influenced food choice behaviour, whereas societal factors had no significant effect. Food allergy significantly moderated the relationships between intrapersonal factors and food choice behaviour, and between social factors and food choice behaviour, but did not moderate the effects of physical or societal factors. The study extends the SEM by incorporating food allergy as a health-specific moderating variable, providing a more comprehensive understanding of food choice behaviour among university students. The findings offer practical implications for universities, food service providers, public health policymakers, and the food industry in developing targeted interventions, improving campus dining safety, and promoting inclusive food policies for students with food allergies. Ultimately, this study contributes to Sustainable Development Goal 3 (SDG 3) by supporting efforts to promote good health and well-being among university students, particularly those living with food allergies.

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LIST OF SYMBOLS

Symbols

f^2	Effect Size
H_0	null hypothesis
R^2	Coefficient of Determination

LIST OF ABBREVIATIONS

Abbreviations

AVE	Average Variance Extracted
CMB	Common Method Bias
CR	Composite Reliability
DSM-5	Diagnostic and Statistical Manual of Mental Disorders-5
FA	Food Allergy
FAO	Food and Agriculture Organization
FCB	Food Choice Behaviour
FDA	Food and Drug Administration
H	Hypotheses
HTMT	Heterotraitmonotrait
IgE	immunoglobulin-E
IPF	Intrapersonal Factors
MAE	Mean Absolute Error
MLR	Multiple Linear Regression
MSAI	Malaysian Association of Allergy and Immunology
PEF	Physical Environmental Factors
PLS	Partial Least Squares
PLS-SEM	Partial Least Squares Structural Equation Modelling
RMSE	Root Mean Squared Error
RO	Research Objectives
RQ	Research Questions
SCT	Social Cognitive Theory
SDG 3	Sustainable Development Goal 3
SDT	Self-Determination Theory

SEF	Social Environmental Factors
SEM	Social Ecological Model
SEM	Structural Equation Modelling
SF	Societal Factors
SIE	Self-Injectable Epinephrine
SIgE	Specific Immunoglobulin-E
SPSS	Statistical Package for the Social Sciences Windows
TPB	Theory of Planned Behaviour
TTM	Transtheoretical Model
VIF	Variance Inflation Factor
VIF	Variance Inflation Factor
WHO	World Health Organization

CHAPTER 1
INTRODUCTION

1.1 Chapter Overview

As part of the preparation for the presentation of the problem, this chapter offers a comprehensive review of the setting in which the study was conducted. In addition to that, the study aims and research questions that are linked with the topic are discussed in this chapter. Additionally, a conceptual framework is offered in order to powerfully support the objectives that have been stated. At the end of this chapter, there is a discussion of the practical and academic value of the study, as well as a discussion of the organization of the study and simplified definitions of essential terminology.

1.2 Research Background

University students encounter numerous challenges in maintaining healthy dietary practices and making appropriate food choices. These challenges become even more pronounced among students who experience food-related health conditions, such as food allergies. Food choice refers to the process through which a person is preparing, selecting, consuming, and acquiring food, and this process is shaped by multiple interacting and reinforcing influences (Karanja et al., 2022). As students transition into university life, they gain greater independence and spend increasing amounts of time interacting with their peers (Daly et al., 2022). Consequently, peer influence, social acceptance, and prevailing social norms surrounding food become increasingly important determinants of their dietary decisions (Daly et al., 2022).

Food choice behaviour is recognised as a complex and highly individualised process that reflects the interaction of numerous factors affecting health and nutritional wellbeing (Marcone et al., 2020). Individuals' nutritional status is largely determined by their food choice behaviours, which are influenced by personal preferences, cultural values, social identities, and economic circumstances while simultaneously being constrained by available resources and environmental conditions (Caswell et al., 2013; Monterrosa et al., 2020). Previous research has consistently demonstrated that food

choice is influenced by multiple environmental dimensions, particularly intrapersonal, social, physical, and societal factors.

Among these dimensions, intrapersonal factors represent the personal characteristics that shape an individual's behaviour, including knowledge, beliefs, attitudes, motivation, and personality traits (Valaitis et al., 2018). Food choice behaviours begin to develop during childhood under the influence of personal experiences and parental guidance before being further shaped by peers and broader societal influences. According to Tao et al. (2024), the period of early adulthood (16–30 years) represents a critical stage during which individuals experience significant life transitions, creating opportunities to modify unhealthy dietary habits established during adolescence and develop healthier food choice behaviours that may continue into later adulthood. Nevertheless, research examining the influence of intrapersonal factors on the food choice behaviour of university students in Malaysia that is living with food allergies remains limited.

Subsequently, social environmental factors include the direct social context that influences the food choices of university students and the factors encompass relationship with their peers, roommates, and close friends (Higgs et al, 2022). Students in higher education are often shaped by the eating habits and choices of their close social circles. For university students that are living with food allergies, the necessity to steer clear of allergenic foods can pose difficulties in their social interactions. The degree to which food allergies affect the impact of peers and close social connections on food choices deserves careful examination.

Physical environmental factors include the settings and environments that influence the food choices of university students. The factors encompass the availability and accessibility of allergen-free food options in the university, the ease of availability safe food, the presence of allergen food labelling in food establishments, and the convenience of store characteristics such as shelf display, order, placement, and time (Redhwan et al., 2011; Chen & Antonelli, 2020). The physical environment is essential for university students with food allergies, significantly influencing their capacity to make safe food choices. Exploring the ways in which food allergies affect the impact of these physical factors is crucial for grasping the distinct challenges encountered by this group.

Finally, societal environmental reach beyond close social circles to incorporate wider societal and cultural impacts. In addition to the systems involved in food production and distribution, societal determinants also include distal and indirect elements that have an impact on individuals, such as advertising, mass media, and the social and cultural norms around eating (Story et al., 2002; Lee et al., 2022). University students, especially those with food allergies, face a distinct challenge in balancing cultural norms with the need to avoid allergens. Furthermore, the influence of media and marketing on food choices could vary for university students who are dealing with food allergies. Investigating the ways in which food allergies influence the effects of these societal factors is essential.

In addition to that, the well-being of individual consumers is greatly impacted by a range of factors, which subsequently shape their food choices. Ziegler et al. (2021) indicated that the level of control or autonomy an adolescent like university student possesses regarding food choices might be linked to various health outcomes, including eating disorders, obesity, and food allergies. Individuals diagnosed with food allergies encounter difficulties in choosing safe food options, and late adolescents such university students attending university are especially susceptible to these challenges (Laheri et al., 2023). The primary reason for food avoidance or restriction in both cohorts was the fear of aversive consequences, such as food allergies and intolerances. This was followed by avoidance due to sensory characteristics, including taste, scent, or texture (Jafri et al., 2021). The Food and Drug Administration [FDA] (2025) states that food allergies arise when the body's immune system reacts negatively to certain proteins present in food. The prevalence of food allergies is increasing among both children and adults (McLaughlin et al., 2021). Approximately 2–10% of individuals globally experience food allergies, and this figure is increasing across the world. In comparison to other Southeast Asian countries such as Hong Kong, the Philippines, and Singapore, Malaysia has an estimated prevalence rate of allergic rhinitis at 7.1% (Prasad et al., 2022).

Furthermore, some people's food allergies from childhood continue throughout their teen and early adult years, despite the fact that many children overcome their food allergies as they become older (McLaughlin et al., 2021). Approximately 30% of the population in Malaysia suffers from allergies, and nearly 90% of those patients with allergic disorders are not adequately treated, which has negative effects on both their

productivity at work and their quality of life (Kanagaraj, 2021). In fact, the consumption of allergenic meals will have a negative impact on customers by triggering allergic reactions in the human body system, which can ultimately lead to death (Ramli et al., 2024). A large percentage of allergy reactions, exceeding 90%, are induced by eight basic food groups, such as peanut, tree nuts, milk, wheat, soy, egg, fish, and shellfish (Pratap et al., 2020). Previous research have indicated that the Malaysian population is prone to food allergies caused by numerous allergens such as crab, prawn, squid, cockle, mackerel, anchovy, milk, egg, soy, wheat, rice, mutton, beef, chicken, banana, dust mite and cockroach allergens (Din et al., 2019; Kanagaraj, 2021).

Also, several studies have identified various risk factors associated with food allergy, including dietary, environmental and genetic (Lopes & Sichere, 2020). For those who suffer from food allergies, avoiding allergens in their environment as much as possible is an essential part of the food allergy management methods they need to follow (Lee et al., 2022). Since there is currently no cure for food allergies, the most crucial step in protecting an individual's health is to get an accurate medical diagnosis in order to determine which foods trigger an allergic reaction in a given individual, and then to avoid those foods as much as possible (Food Allergies, 2025). According to Lee et al. (2022) it has been recommended that those who suffer from food allergies steer clear of all foods that have even a remote possibility of containing food allergens and carefully examine the ingredient lists of all professionally prepared food products.

Food allergies can have a major effect on both physical and mental health, as well as on the financial burden for families and the healthcare system (Trogen et al., 2022). They also encounter other issues such as anxiety, food aversion, and refusal (Mahmoud et al., 2020). It has been found that avoiding certain foods might impact eating habits, which can then lead to food neophobia (fear of trying new foods) and pickiness (Vassilopoulou et al., 2021). These factors can contribute to an increased risk of poor nutrition, which in turn affects parental guidance and behavior when making food decisions (Mahmoud et al., 2020). Unfortunately, food allergies currently have no known treatment, therefore managing symptoms and avoiding trigger foods are key components of allergy management (Garcia-Carmona & Curotto de Lafaille, 2025).

Furthermore, in order to better understand the complicated mechanism and direct the creation of nutritional information to improve dietary behaviors and food choices, especially among university students at high risk of acquiring food allergies, it

is important to examine all of these factors simultaneously with university students' food allergy as moderating variable (Mahmoud & Grigoriou, 2022). It is challenging for some people who have food allergies to maintain a balanced diet during their crucial stages of growth because this may be due to a lack of nutrition education regarding proper elimination diets and alternative nutrient sources (Vassilopoulou et al., 2017; Wang, 2024). A person's dietary habits are established during childhood, and carried forward into adulthood and can be monitored and maintained over time (Scaglioni et al., 2018). Laheri (2019) also has identified several factors that can influence the eating habits of students. Some of these factors including peer influence, social norms, appearance, habit, state of mind, student life and social media. In addition, a study conducted by Mahmoud and Grigoriou (2022) is closely related to this study because their study makes a significant contribution to the current literature on food choice by empirically validating the moderating role of child food allergy.

In conclusion, the purpose of this study is to investigate how food allergies affect intrapersonal, social, physical, and societal aspects that affect university students' meal choice behavior. Through analyzing the relationship between food allergies and other influencing factors, this research seeks to give evidence-based insights to guide the development of effective therapies and institutional support systems. The ultimate goal is to protect the health and safety of college students who are dealing with food allergies while also supporting the goals of Sustainable Development Goal (SDG) Goal 3, which deals with promoting well-being and ensuring healthy lives for people of all ages.

1.3 Sustainable Development Goal (SDG)

Sustainable Development Goal (SDG) 3 of the 2030 Agenda for Sustainable Development seeks to improve global health by ensuring healthy lives and fostering well-being for people of all ages. (Weeks et al., 2023). A food safety hazard refers to contaminants that may cause a food product to be unsafe for production that has the potential to negatively impact the health of consumers (Grace, 2017; Kamboj et al., 2020). The challenge of achieving global food security involves assessing various aspects, including current and emerging risks in food safety. It is acknowledged that a significant factor in food safety involves microbial contamination and the growth of harmful microorganisms, along with the presence of microbial or biological toxins. These elements can render raw materials, commodities, and processed foods hazardous,

potentially leading to illnesses and infections that significantly affect health such as allergens and intolerances (Al-Rub, 2020). Therefore, this research aims to provide a better understanding of the impact of food allergies on health and well-being, as well as the other factors that influence the management of food allergies.

The results will contribute to the development of evidence-based policies and strategies for healthcare systems and public health initiatives, aligning with the objectives of SDG 3 and its emphasis on good health and well-being for all. According to Tan et al. (2023), receiving education on food safety, including food allergens, can improve knowledge and increase awareness. It is important to recognise the allergenic nature of certain foods as a potential food safety hazard for individuals who are susceptible to allergies (Code of Practice on Food Allergen Management for Food Business Operators, 2020).

1.4 Problem Statement

In developing countries like Malaysia, it used to be thought that food allergies were uncommon, however, recent studies from the past decade have shown that this is not true as the country's economy grows, the number of people with food allergies is also increasing (Tan et al., 2023). Food allergies in university students present a challenging scenario, as this period marks a time when many university students gain independence and experience reduced adult supervision (Hassan et al., 2020). University students must take responsibility for their own health, and a crucial aspect of this is being mindful of the foods they consume to prevent reactions from food allergies. Consequently, university students begin to disclose fewer of their daily activities to adults, which complicates parents' ability to keep track of those (Feng & Kim, 2019). Numerous individuals navigate this phase of their lives through higher education, and although adapting to university can be stressful for many students, those with food sensitivities may encounter further difficulties (Southwick, 2021).

The transition from secondary education to university introduces a unique set of challenges, as many university students begin living independently for the first time and assume primary responsibility for managing their food allergies on a daily basis (Yuan et al., 2024). Therefore, university students are frequently prone to engaging in risky behaviours because of the influence of their peers (Feng & Kim, 2019), including the consumption of potentially unsafe foods and those with "may contain" labels (Laheri,

2019). Particularly, the parent can directly monitor university student's daily food consumption if they are still at home and under their supervision, however, when they become teenagers and enter university, food consumption will be difficult without proper parental guidance and monitoring. Hence, this situation poses a threat to their lives. In fact, there were 63 recorded deaths from food-related anaphylaxis in two case series; 18 (28.5%) of these patients were between the ages of 18 and 25; and half of these deaths happened in university or high school institutions (Hassan et al., 2020).

When discussing university students who are no longer under their parent's supervision, they tend to eat whatever they want without considering their health condition, including any food allergies they may have. Understanding the nutrition information on a food label is crucial for consumers of all ages. It can aid them in making informed food choices and avoiding potential food allergies. According to Quaidoo et al. (2018), by using the nutrition information sources frequented by university students, it would be possible to spread widely the importance of implementing healthy nutritional behaviours, such as reading labels before purchasing packaged food products.

During students' university life, their food choices may be influenced by various factors, including intrapersonal factors, social environmental factors, physical environmental factors, and societal factors surrounding them. This is supported by Cao et al. (2023), as university students' gain more independence, certain personal characteristics and interpersonal factors become increasingly significant in shaping healthy behaviours and these factors play different roles compared to other stages of life. They included: (1) the development or establishment of psychosocial characteristics, such as self-efficacy, during emerging adulthood; (2) the influence of body shape-related beliefs, as university students tend to pay more attention to their body shape; and (3) the importance of peer support, as students spend more time with peers and less time with family (Cao et al., 2023). Eating behaviour can be shaped during childhood and subsequently influenced by personal choices, parental guidance, and later on, by peers and societal norms as these behaviours may evolve over time due to significant life changes and new influences (Sulaiman & Pei Sin, 2011; Street et al., 2024). As a result, an individual's eating habits are impacted by those of those they are socially connected to (Higgs et al., 2022). Additionally, university students tend to favor quick and simple meals that involve little cooking or cleanup because they frequently

have busy schedules due to the demands of school, sports or recreational activities, and their social lives (Daly et al., 2022). As a result, people are more likely to participate in dangerous activities, like consciously ingesting products marked "may contain," which could increase their risk of anaphylaxis (Laheri, 2019).

Furthermore, there is a scarcity of research focused on the factors that shape food choices among university students. It is crucial to pursue additional studies to enhance our understanding of the environmental and psychosocial elements that uniquely impact the food choices of university students, especially those with food allergies (Ziegler et al., 2021). Lee et al. (2022) carried out qualitative investigations to examine how food allergies affect the food-related behaviours and quality of life of university students, while also identifying the factors that influence the food choices of this specific group. Other studies used deductive thematic content analysis to identify themes and factors influencing the dietary behaviour of university students (Verstraeten et al., 2014), while another study employed a combination of focus group discussions and individual interviews (Sommer et al., 2012).

Most of studies focused on the food sensitivity and dietary behaviour of children (Vassilopoulou et al., 2017), parents (Mahmoud et al., 2020) and carers (Begen et al., 2017), but little is known about food allergy among university students (Southwick, 2021). Food choice decisions among university-aged consumers with food allergies have been understudied, despite the fact that the literature identifies a variety of crucial factors for food choice decisions among university students (Lee et al., 2022). In fact, the true incidence of food allergy in Malaysia is still lacking (Ibrahim et al., 2021). There are various factors that contribute to food avoidance and acceptance, including maintaining body weight, avoiding the health impacts of meat consumption, and ethical concerns. However, food allergies, which can be triggered by environmental factors, are the primary reason for food avoidance and acceptance in this particular context. Furthermore, Lee et al. (2022) suggested conducting a quantitative study in addition to the current qualitative exploratory research, which includes a restricted sample size among university students with food allergies, in order to address the existing research gaps. Therefore, conducting additional research using a quantitative technique would yield a more thorough grasp of the subject. Because it gives food marketers useful information, the relationship between environmental factors that affect the dietary choices of students with food allergies is an important topic.

1.5 Research Objectives (RO)

This study seeks to empirically investigate the relationship of the moderating effects of food allergy on intrapersonal, social, physical, and societal factors on the food choice behaviour of university students. Therefore, the researcher has specified the following objectives below:

a) To determine the influence of intrapersonal factors on food choice behaviour among university students with food allergy.

b) To determine the influence of social environmental factors on food choice behaviour among university students with food allergy.

c) To determine the influence of physical environmental factors on food choice behaviour among university students with food allergy.

d) To determine the influence of societal factors on food choice behaviour among university students with food allergy.

e) To investigate the moderating effect of food allergy between the intrapersonal factors toward food choice behaviour among university students with food allergy.

f) To investigate the moderating effect of food allergy between the social environmental factors toward food choice behaviour among university students with food allergy.

g) To investigate the moderating effect of food allergy between the physical environmental factors toward food choice behaviour among university students with food allergy.

h) To investigate the moderating effect of food allergy between the societal factors toward food choice behaviour among university students with food allergy.

1.6 Research Question (RQ)

To support the objectives of this study, the following research questions will elucidate the study's aims:

i) Do intrapersonal factors influence on food choice behaviour among university students with food allergy?

ii) Do social environmental factors influence on food choice behaviour among

university students with food allergy?

iii) Do physical environmental factors influence on food choice behaviour among university students with food allergy?

iv) Do societal factors influence on food choice behaviour among university students with food allergy?

v) Is there any moderating effect of food allergy between the intrapersonal factors toward food choice behaviour among university students with food allergy?

vi) Is there any moderating effect of food allergy between the social environmental factors toward food choice behaviour among university students with food allergy?

vii) Is there any moderating effect of food allergy between the physical environmental factors toward food choice behaviour among university students with food allergy?

viii) Is there any moderating effect of food allergy between the societal factors toward food choice behaviour among university students with food allergy?

1.7 Conceptual Framework

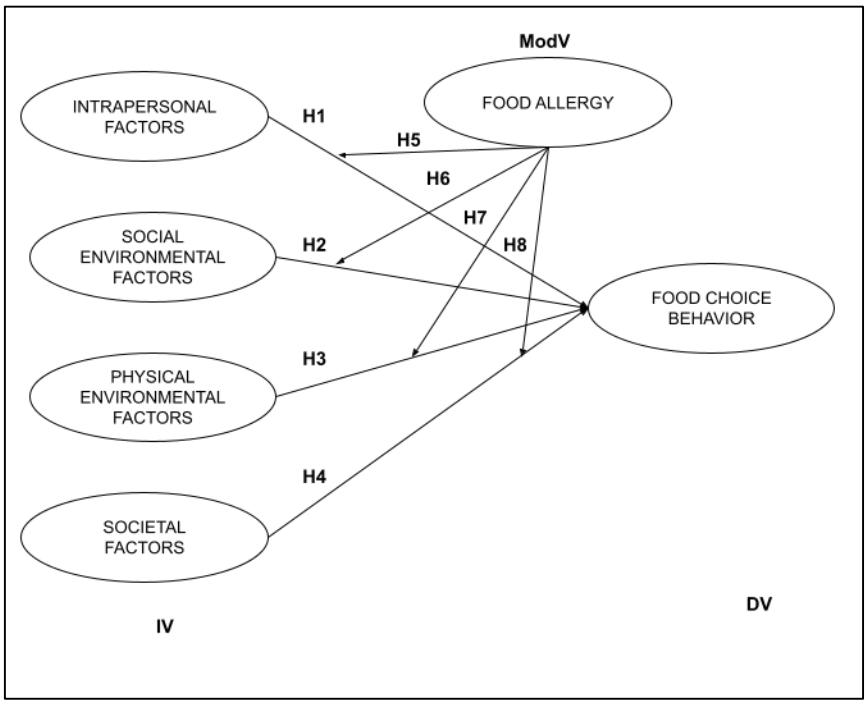


Figure 1.1 Conceptual Framework of Assessing the Role of Intrapersonal, Social, Physical, and Societal Influences and Moderating Effects of Food Allergy on Food Choice Behaviour of University Students

The framework in Figure 1.1 has been adapted and adopted from Lee et al. (2022) and the researcher has put forth four distinct levels of influence on the food choices made by university students as the independent variable. These levels include intrapersonal factors that are within the person themselves (e.g. knowledge, self-efficacy and eating habit). Intrapersonal factors are individual characteristics, such as attitudes, beliefs, knowledge, food preferences, behavioural factors, and lifestyle factors that can influence an individual's eating behaviours (Lee et al., 2022).Then, the social environmental factors that involve interactions with others like peers and family. Next, physical environmental factors that pertain to community settings (e.g. cost, limited hours and convenient). Last but not least, societal factors (e.g. food advertisement and social media). The societal factors encompass distal and indirect influences, including mass media, advertising, social and cultural norms related to eating, as well as the systems involved in food production and distribution (Story et al., 2002).

Additionally, Lee et al. (2022) provided the dependent variable, which is meal choice behavior. The variable that changes as a result of the modification of the independent variable is referred to as the dependent variable. Because food choices can be influenced by a number of factors, such as culture, economics, environment, and an individual's social networks, the dependent variable in this study is the meal choice (Fernqvist et al., 2024). A study by Lee et al. (2022) found a connection between these variables; for instance, a university student's diet choices may be influenced by their parents' eating habits. This is supported by a study by Mahmoud et al. (2020), which found that when parents feel pressured to eat, they are more likely to feed their children (university students) unhealthy foods. Moreover, convenience and ease of preparation are top factors in university student’s food choice in the home, school, restaurant, and store environments (Ziegler et al., 2021).

Meanwhile, the food allergy was adapted from Mahmoud and Grigoriou (2022) as a moderator variable. A moderator variable is a type of variable that has an impact on the direction and/or strength of the relationship between independent or dependent variable (Baron & Kenny, 1986; Tudu & Singh, 2022). Because food allergy has the potential to have an effect on both food choice behaviour and the factors that contribute to food choice, it was decided to include it as a moderator variable in this study. This is supported by a study which stated that food allergies have a significant impact on the preparation of meals and family social activities, reporting also a considerable impact

on the levels of stress experienced by parents (Polloni et al., 2013; Valero-Moreno et al., 2024). In addition to limiting their dietary options, the presence of allergens forces them to avoid certain foods, frequently without adequate replacements for essential nutrients particularly proteins, calcium, iron, zinc, iodine, folate, vitamin B12, and vitamin D (Fiocchi et al., 2010; Di Cesare et al., 2025). Based on the extensive literature review, as a result, food allergy was chosen to serve as the moderator variable in this investigation.

1.8 Hypotheses

Based on the previous literature review, the hypotheses has been developed as follows:

H1: Intrapersonal factors have positively influence on food choice behaviour among university students with food allergy.
H2: Social environmental factors have positively influence on food choice behaviour among university students with food allergy.
H3: Physical environmental factors have positively influence on food choice behaviour among university students with food allergy.
H4: Societal factors have an influence positively food choice behaviour among university students with food allergy.
H5: The impact of food allergy moderates the relationship between intrapersonal factors and food choice behaviour.
H6: The impact of food allergy moderates the relationship between social environmental factors and food choice behaviour.
H7: The impact of food allergy moderates the relationship between physical environmental factors and food choice behaviour.
H8: The impact of food allergy moderates the relationship between societal factors and food choice behavior.

1.9 Significance Aspect

The findings of this study will be discussed in relation to their theoretical and practical significance for understanding food allergies and food choice behaviour

among university students. Specifically, the research investigates how intrapersonal, social environmental, physical environmental and societal factors influence food choice behaviour, while positioning food allergy as a moderating variable within these relationships. Accordingly, the study contributes in two principal dimensions:

1.9.1 Practical Aspect

Practically, the study aligns with Sustainable Development Goal 3 by providing empirically grounded insights that enhance health protection and inclusive nutritional practices for individuals affected by food allergies. According to Aljameel et al. (2023), awareness of allergens is extremely important because a lack of awareness may result in cross-contact with an ingredient without realizing that it is a significant allergen, which can cause severe harm to people with allergies. By enhancing awareness and understanding of food allergies and their impact on individuals' lives, the study strives to improve the well-being and quality of life for those affected. It highlights the importance of creating an environment that is safe, supportive, and accommodating for individuals with dietary restrictions, thereby aligning with SDG 3's goal of ensuring healthy lives and promoting well-being for all, at all ages.

Moreover, the research promotes access to quality healthcare services by emphasizing the significance of food allergy management. It provides recommendations to foodservice operators, paving the way for improved service to individuals with special dietary requirements. In doing so, the study actively supports the objectives of SDG 3 by addressing health and well-being disparities, ultimately contributing to the broader global aim of achieving good health and well-being for all.

1.9.2 Academic Aspect

This research contributes to the existing knowledge regarding the impact of food allergies on food choice behaviour, especially in the context of university students. By concentrating on this demographic, it tackles a less explored aspect in the current literature. Lee et al. (2022) indicate that food choice decisions among university-aged consumers with food allergies have not been thoroughly examined, even though existing literature highlights several important factors influencing food choices in university students. Furthermore, the majority of research has concentrated on the food allergy and dietary habits of children, parents, and carers, leaving a gap in knowledge

regarding food allergies among university students. This research enhances academic knowledge by examining the intrapersonal, social, and physical environmental factors, along with societal influences on food choices, all framed within the context of food allergies.

This academic exploration enhances SDG 3 by offering insights and knowledge that can assist healthcare professionals, policymakers, and researchers in formulating effective strategies for managing food allergies. This initiative aligns with the overarching goal of SDG 3 by enhancing our comprehension of the intricate connection between food allergies and dietary choices, which is essential for fostering good health and well-being for everyone. This research enhances the academic conversation in this field, supporting the broader goal of realising SDG 3's vision of promoting healthy lives and well-being for individuals throughout all stages of life.

1.10 Definition of Terms

1.10.1 Food Choice

Food choice is defined as the process by which individuals select, acquire, prepare, and consume foods in response to a variety of competing, reinforcing, and interacting influences (Karanja et al., 2022). In the context of this study, food choice behaviour refers to the decisions made by university students regarding the selection and consumption of food within their daily living and learning environments.

1.10.2 Intrapersonal Factors

The term intrapersonal factors refers to the personal attributes of individuals, including their attitudes, beliefs, knowledge, food preferences, behavioural patterns, and lifestyle factors, which can have an impact on individuals, eating choices and behaviour (Lee et al., 2022). Within the context of this study, intrapersonal factors represent the internal influences that affect university students' food choice behaviour, particularly in relation to food safety, health consciousness, and dietary preferences.

1.10.3 Social Environmental Factors

Social environmental factors refer to the interpersonal influences arising from an individual's social network and interactions with family members, peers, lecturers, and the broader community. According to Park et al. (2025), social or interpersonal

factors are those that are related to an individual's social environment, and this includes their connections with family, friends, and community members, along with the support systems they have and the shared expectations within their social circles. Research has shown that parents have a significant influence on the dietary quality and intake of their children such university students; however, further efforts are necessary to develop effective intervention strategies that encourage parents to model healthy eating behaviours (Linde et al., 2022). In this study, social environmental factors refer to the influence of social relationships and interactions on university students' food choice behavior.

1.10.4 Physical Environmental Factors

The physical factors encompass the settings and environments in which university students make food choices. These factors include the availability and accessibility of allergen-free food options on campus, the convenience of accessing safe food, the presence of allergen labelling in food establishments and convenience in store characteristics such as shelf display, order, placement and time (Redhwan et al., 2011; Chen & Antonelli, 2020). In the university context, physical environmental factors encompass the availability of food options on campus, accessibility to allergen-free foods, food safety information, and the convenience of obtaining suitable meals. These environmental attributes may significantly influence students' food choice behavior.

1.10.5 Societal Factors

Societal factors, encompass distal and indirect factors that impact individuals including mass media, advertising, social and cultural norms related to eating, as well as the systems involved in food production and distribution (Story et al., 2002). These factors include cultural traditions, religious beliefs, government regulations, media influences, food marketing, public health campaigns, and societal norms that influence perceptions and consumption patterns. Societal factors operate beyond the immediate environment of individuals and contribute to the formation of collective attitudes and behaviours regarding food. In this study, societal factors refer to the macro-level influences that affect university students' food choice behaviour.

1.10.6 Food Allergy

According to Clinic (2024), allergic reactions can range from mild to severe and can be seen within minutes to hours of being exposed to a food allergen and it can affect one or more of the body's systems, such as the skin, gastrointestinal (GI) tract, breathing system and heart. Food allergies require individuals to avoid allergenic foods and carefully evaluate food ingredients and preparation methods before consumption. In this study, food allergy refers to the presence of a medically diagnosed or self-reported allergic reaction to specific foods and serves as a moderating variable influencing the relationship between ecological factors and food choice behaviour among university students.

1.11 Chapter Summary

In Chapter 1, an overview is provided on the relationship between environmental factors and the food choices of students with food allergies. The study includes a discussion of the problem, research objectives, and research questions that will guide the study. The scope of this study is clearly delineated through explicit articulation of its underlying assumptions, limitations, and delimitations, which collectively define the boundaries of the research. Defining key terms helps to make the project easier to understand. Then, Chapter 2 reviews the relevant literature to establish the key areas that have already been explored and form the foundation of the study. Finally, the study also discussed the conceptual framework. In Chapter 3, a comprehensive discussion is presented regarding the proposed methodology for this work.

CHAPTER 2
LITERATURE REVIEW

2.1 Chapter Overview

This chapter illustrates the relevant previous literature for the present study. It also includes university students' food choice behaviour and the environmental factors with moderating effect of food allergy. The article continues by presenting the conceptual underpinning, as well as the logical conceptual model and assumptions that are applicable to the study. To be more specific, this chapter is loaded with points of view and arguments that support the ideas presented in Chapter 1. It concluded with the gap of study, which aims to determine the gap between previous research and the present study, in particular on the fields of food choice behaviour, environmental factors and food allergy.

The first section will discuss food choice behaviour and provide an extensive context to influential viewpoints on the various factors that determine food choice behaviour. Meanwhile, the second section of this paper explains about the environmental factors of food choice such as intrapersonal factors, social environmental factors, physical environmental factors and societal factors. After that, the third section of this paper provides an overview of food allergies by discussing the epidemiology of the allergy as well as its symptoms, diagnosis, and therapy. Following this is a more in-depth overview of the current state of the art in the management of dietary food allergies, as well as a discussion of the nutritional considerations for individuals who have food allergies. The next part of this paper will provide some insight into the developmental concerns surrounding food and eating among university students. Following this, a selection of theories that have been shown to have widespread application in food choice behaviour study and their central principles are offered, along with a brief discussion regarding the relevance of these theories to the topic at hand**.**

2.2 Food Choice Behaviour

Food choice behaviour is a multidimensional process that encompasses the decisions individuals make regarding food throughout their lives. The food choice

process model provides a comprehensive theoretical framework for understanding the complexity of food-related decision-making across different life stages (Ziegler et al., 2021). According to Corallo et al. (2019), food choice behaviour extends beyond the act of eating and includes a wide range of activities, such as purchasing, preparing, serving, storing, consuming, sharing and disposing of food. These behaviours are influenced by numerous interrelated determinants that shape individuals' food decisions.

Food choices are driven by a combination of biological, psychological, physiological, social, and economic factors. Biological influences include hunger, appetite, and sensory preferences, whereas psychological factors encompass emotions, stress, mood, and feelings of guilt. Physiological considerations involve accessibility, educational background, and time constraints, while social influences arise from interactions with family members, peers, and cultural practices. Economic considerations, including food prices, household income, and product availability, also play a significant role in determining dietary choices (Wongprawmas et al., 2021).

Rapid urbanisation and economic development have substantially altered dietary patterns worldwide. As national incomes increase and urban lifestyles become more prevalent, individuals tend to consume larger quantities of animal-based proteins and processed food products (Chen & Antonelli, 2020). At the individual level, food choices are guided by personal food systems in which cognitive processes influence eating behaviour across various situations (Monterrosa et al., 2020). Saygi and Shipman (2021) reported that visible product attributes, particularly packaging characteristics, can shape consumer preferences and subsequently affect purchasing decisions. Established habits, such as repeatedly purchasing familiar products, together with taste preferences, also contribute significantly to food selection. Likewise, Abraham et al. (2018) observed that university students frequently consumed processed and fast foods because of their convenience and appealing taste, despite possessing adequate knowledge regarding food additives and the adverse health consequences associated with unhealthy dietary practices.

Dietary patterns are determined by the food choices made on a daily basis. It is important to provide accurate dietary advice based on a confirmed diagnosis of food allergy obtained through specific tests (Leone et al., 2023). These patterns encompass various aspects such as the amount of food consumed, the proportion of different food

groups, the variety of foods eaten, and the frequency and combinations of consumption. An individual's nutritional status and health are strongly influenced by their food choice behaviours, which in turn are linked to the social and economic expression of identities, preferences, and cultural meanings (Monterrosa et al., 2020). People are continuously put in situations where they are exposed to unhealthy food, such as grocery stores, food shops, fast food restaurants or vending machines (Monterrosa et al., 2020). It is common knowledge that the constant availability of unhealthy food contributes to individuals making decisions regarding their diets that are harmful, which in turn contributes to epidemic levels of obesity, diabetes, and other chronic diseases (Guiné et al., 2020). Moreover, allergies are common among children and adults alike, impacting around 20–30% of the population (Alska et al., 2025). The most frequently mentioned challenges to maintaining a healthy diet include limited time, the high cost and accessibility of food items, and the lack of desire for food preparation which is closely linked to intention (Sogari et al., 2018).

2.3 Food Allergy

Food Drug Administration [FDA] (Food Allergies, 2025) stated that food allergies occur when the immune system of the body has an adverse reaction to specific proteins found in food. Over the past few decades, there has been a significant rise in the number of people affected by allergic diseases, nowadays, approximately 20 to 30% of the global population is experiencing some form of allergy (Abbring et al., 2019). Meanwhile in Malaysia, according to Prasad et al. (2022), the prevalence rate of allergy rhinitis was estimated to be 7.1% which is higher than the prevalence rates seen in other Southeast Asian nations including Hong Kong, the Philippines, and Singapore. Moreover, according to data from the Malaysian Association of Allergy and Immunology (MSAI), approximately 15 to 20% of the Malaysian population experiences symptoms of allergies and this percentage is projected to be rising to 50% within the next indicating a significant increase in the prevalence of allergies in Malaysia (Rozario, 2011; Prasad et al., 2022).

Patients with food allergies can tolerate cooked or processed foods, but the symptoms of the allergy appear quickly after eating raw food, usually within a few seconds or at least within 5 to 10 minutes (Poncet et al., 2020). The clinical symptoms of food allergy were frequently observed in the skin, including pruritus, redness and

swelling and followed by redness, swelling and tingling around the mouth, as well as symptoms related to the circulatory, gastrointestinal, and respiratory systems (Feng et al., 2022). Even a small exposure to a food allergen can cause clinical symptoms and impact various organs and systems (Feng et al., 2022). The severity of the reaction can vary, with symptoms ranging from mild tingling or itching in the mouth to potentially life-threatening anaphylaxis (Althumiri et al., 2021). Severe anaphylaxis can put one's life at risk as it can cause breathing difficulties and/or problems with circulation even if there are no visible skin symptoms or signs of circulatory shock (Chong et al., 2020). This is supported by a study from Hassan et al. (2020), there were a total of 63 people who passed away as a result of anaphylaxis that was caused by food, 18 of these patients were between the ages of 18 and 25 years old and half of these deaths took place in educational institutions such as universities or schools.

The determination of food allergy diagnosis primarily depends on the clinical history in order to determine the correlation to any symptoms that indicate an allergic reaction to food (Lopes & Sicherer, 2020). The early diagnosis of food allergies is crucial for effective treatment and appropriate dietary intervention but, even in developed countries, there is a delay of four months in diagnosis (Hossny et al., 2019). Nonetheless, the identification of an allergic reaction or the consumption of an appropriate amount of allergenic food without any complications will pose a significant diagnostic challenge (Foong et al., 2021). In addition, it is essential for university students with allergies to receive proper education on how to interpret and read food label. This is because this knowledge is very crucial in identifying and avoiding potential allergens, including those that may be hidden. By doing so, university students can prevent the occurrence of new allergic reactions and mitigate the severity of symptoms.

Food allergies currently have no known treatment (Garcia-Carmona & Curotto de Lafaille, 2025), therefore, management of food allergies requires strict avoidance measures, family counseling regarding constant vigilance, and prompt administration of emergency medications for allergic reactions (Anvari et al., 2019). In addition, understanding the factors that contribute to a patient's symptoms and the minimum amount of allergenic food that can trigger a reaction is crucial in effectively managing food allergies and anaphylaxis (Shin, 2021). The most effective way to prevent a reaction, which can vary from a minor skin reaction to a potentially life-threatening

anaphylactic reaction, is through strict avoidance of allergens (Costa et al., 2020). It has been observed in previous studies that university students with food allergies frequently fail to follow the dietary recommendations for avoiding consuming allergenic foods (Versluis et al., 2022). Moreover, research indicates that roughly 50% of adults who have received a doctor's diagnosis of a food allergy encounter an average of two accidental allergic reactions annually and these reactions may occur due to improper adherence to recommended dietary guidelines (Versluis et al., 2022).

It is common to underestimate the difficulty of putting an avoidance diet into practice. According to McLaughlin et al. (2021), university students with food allergies have endorsed risk-taking activities, high risk-taking behaviours and poor adherence to allergy care. This is because food allergy among university students offers a situation that is particularly challenging since this is the age when many university students become self-sufficient and spend more time away from parental supervision (Hassan et al., 2020). It is essential to focus on childhood and adolescence, as nutritional intervention during these stages can encourage the voluntary adoption of healthier eating habits and behaviors, ultimately contributing to good health and quality of life (Neri et al., 2024). Therefore, in order to manage the condition and avoid allergic reactions, patients with food allergies and their families need to follow several steps such as reading food labels, preparing food that is free of allergens and supporting safety when eating out or during meals (Herbert et al., 2021).

2.4 Developmental Issues in Food Choice Behavior among University Students with Food Allergy

The self-management of food allergies requires the individual to make decisions regarding the foods they consume, which is a known complicated human behavior (Lee et al., 2022). The way in which an individual with a food allergy makes decisions regarding their diet is an important factor in determining their nutritional state. According to Geuens (2023), previous research has identified four significant determinants that impact food choices. These determinants include social factors, such as parental style and household eating habits, product-related factors, which encompass product attributes, packaging, and labels, personal factors, such as food knowledge and cooking skills and situational factors, which include food availability, time pressure, and store design. Previous studies have shown that personal preferences may not be the

sole determinant of food choices, as other environmental factors such as social environment can play a more significant role (Hanemaayer et al., 2022).

Although those who have been diagnosed with food allergies struggle with choosing foods that are safe to consume (Laheri et al., 2023). Families are typically advised to avoid the food allergens, but food allergies can become challenging when dining out or shopping for groceries in places with limited food choices, such as convenience stores, cafes or restaurants (Tackett et al., 2019). According to Drakouli et al. (2023), the wellbeing of all family members is significantly affected due to the limited options for eating out and family activities, as more time is required for food preparation. The food choices made within a family setting can be influenced by a variety of factors, including family eating habits, social status, family structure, and cultural heritage (Mahmoud et al., 2020). Previous studies have shown how the pressure of everyday food allergy management, along with a lack of effective treatment alternatives, can have a negative influence on family connections and social activities, ultimately leading to reduced quality of life for those who suffer from food allergies (Warren et al., 2020). Previous research has highlighted the stress also associated with managing food allergies, including strain on family relationships, increased financial burdens, and limited social interactions for those with food allergies (Lee et al., 2022).

Nutritional status is an important issue among university students with food allergies as numerous studies have reported that these individuals often experience poor growth (Salsabila et al., 2021). This is including late adolescence who are still attending university are also thought to be in the most vulnerable situation (Laheri et al., 2023). This is because food allergy among university students offers a situation that is particularly challenging since this is the age when many university students become self-sufficient and spend more time away from parental supervision (Hassan et al., 2021). In addition, students have the option of moving out of their parents' home and taking full responsibility for every aspect of their lives, including their eating routines (Ismail et al., 2022). According to the findings of a number of studies, adolescents and university students who have food allergies are more likely to engage in risky behaviour, such as intentionally consuming goods labelled with the phrase "may contain" which has the potential to raise their risk of anaphylaxis (Laheri, 2019).

Furthermore, dining at restaurants or cafes also can pose a health risk, especially for individuals with food allergies since due to the fact that many establishments do not

provide comprehensive information about the ingredients used in their dishes on their menus (Aljameel et al., 2023). The university student's age group is especially prone to experiencing allergic reactions while dining at restaurants. According to the findings of a recent study, food allergic responses happened in 53.9% of restaurants in the United States despite the fact that restaurant workers had been informed of the customers' food allergies (Stankovich et al., 2023). During this transitional period, a lot of students struggle with limited cooking skills or lack of time to prepare meals due to their studies, work, and social commitments (Laheri et al., 2019). So, they often choose for convenient foods that are low in nutritional value and this can make them more susceptible to unhealthy eating habits and poor nutrition. Hence, it can show that university students with food allergies may exhibit poor self-management behaviors due to their general tendency towards risk-taking, rather than just being limited to their food allergies (Duncan & Annunziato, 2018).

Individuals who have multiple food allergies experience more limitations in their diets and those who have previously experienced anaphylaxis have an even greater reduction in their quality of life (Lee et al., 2022). This is supported by Hassan et al. (2020), patients with food allergies often experience a reduced quality of life due to the risk of severe allergic reactions and the anxiety associated with strictly avoiding allergenic foods. Feeding and eating disorders as a condition where there is a consistent disruption in eating or eating-related behaviours that leads to changes in food consumption or absorption and this condition significantly affects the individual's physical health and psychosocial functioning (Jafri et al., 2021). While it is important to have some level of concern about allergic reactions to promote proper management of food allergies, a few individuals may experience excessive anxiety that can hinder their ability to engage in academic and social activities (Herbert et al., 2021). Hence, the greater the number of foods that had to be avoided as a result of restricted diets, the lower the overall quality of life grew (Moen et al., 2019).

2.5 Underpinning Theory

There are several approaches to studying the understanding of food choice behavior that result from the involvement of various disciplines. Every field of study has its unique challenges and approaches to research. To provide an understanding of the various approaches taken, a concise summary of chosen theories and models

regarding food choice behavior from a social cognitive perspective is presented. These theories and models offer a framework for understanding the factors that influence food choice behavior. Afterward, frameworks that incorporate both perspectives and analyze food choice behavior at multiple levels are presented. It is important to acknowledge that the majority of theories and models have been created in Western societies. Therefore, the theories and models may need to be significantly modified to effectively address cultural issues and concerns in other contexts.

2.5.1 Social Ecological Model (Urie Bronfenbrenner, 1980)

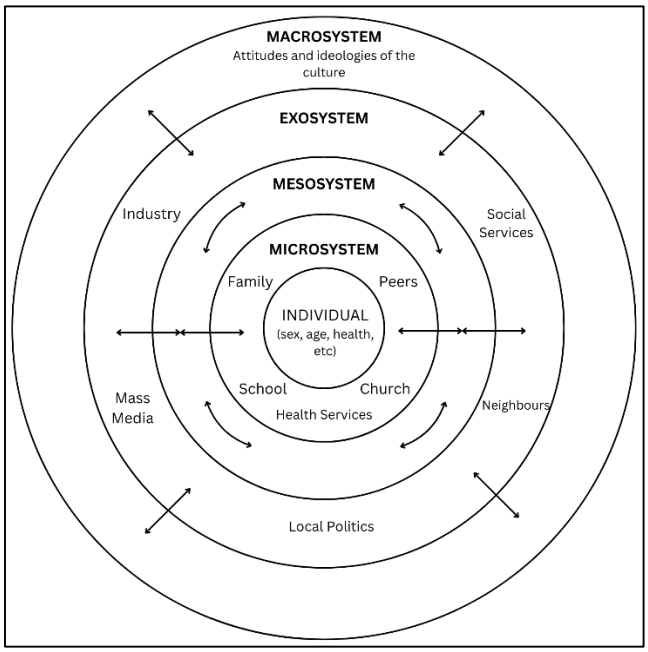


Figure 2.1 Social Ecological Model (Urie Bronfenbrenner, 1980)

Note. The social ecological model of human development. This figure illustrates the second revision to ecological theory (Bronfenbrenner, 1977). From "Bronfenbrenner's Bioecological Theory Revision: Moving Culture from the Macro into the Micro. Perspectives on Psychological Science," by Vélez-Agosto, Soto-Crespo, Vizcarrondo-Oppenheimer, Vega-Molina and García Coll, 2017, Perspectives on Psychological Science, 12(5), 900-910. 12(5), 900-910. Copyright 2017 by Association for Psychological Science.

According to Caperon et al. (2022), ecological system theory was initially introduced in the 1970s to gain a better understanding of human development then, it was later formalized as a theory in the 1980s by Broffenbrenner. Later, McLeroy and his colleague later redefined it as a framework that aims to promote behavioral changes related to health in 1988 (Scarneo et al., 2019). The Social Ecological Model (SEM) is a framework that describes how multiple elements at the individual, community, organizational, and societal levels intersect to impact personal choices such as eating

habits (Bronfenbrenner, 1977; Korom et al., 2023). Meanwhile, a study from Guy-Evans (2024) stated that Bronfenbrenner's ecological systems theory posits that the development of a child is an intricate process influenced by various levels of the surrounding environment from the close home and school settings to encompass broader cultural values, laws and practices. However, the complexity of the subject makes it challenging to effectively explain how different variables interact to influence behaviors (Holmes et al., 2021).

SEM have been found to be a useful framework for understanding and guiding behavior change interventions (Fent et al., 2023) because this framework takes into account various factors, including intrapersonal, interpersonal, organizational setting, community, environment, and political factors (De Villiers & Faber, 2019). The SEM also is a valuable comprehensive way to understand the various factors that influence nutrition-related behaviors since it offers an advantage over other models that focus primarily on individual-level factors when examining health behavior and food choices (Kodish et al., 2019). According to Buchan et al., (2012), there are four theories have been widely applied in the context of physical activity to enhance understanding of the psychological influences and processes that affect physical activity behavior such as the Social Cognitive Theory (SCT), the Theory of Planned Behavior (TPB), the Self-Determination Theory (SDT), and the Transtheoretical Model (TTM). Meanwhile, SEM proposes a comprehensive approach that considers multiple dimensions, including the social and physical environment as it also recognizes the significance of personal factors in influencing health behavior (McLeroy et al., 1988; El-Ammari et al., 2020).

The relationship between socio-ecological factors and health-related behaviors is a crucial issue since certain socio-ecological factors are associated with health-promoting behaviours, which can decrease the chances of university students making unhealthy choices especially in choosing food (Aura et al., 2016; El-Ammari et al., 2020). Philipsborn et al. (2020) also stated that food behavior is affected by a wide variety of personal and environmental factors, some of which can interact with one another to produce complex, multi-layered systems. This is why the SEM appears to be applicable to the task of explaining the environmental factors around university students in relation to the elements that affect their food behavior.

According to El-Ammari et al. (2020), environmental influences can be divided into three primary categories: social, physical, and macro-level environments. Elements

within the social environment can be linked to role modelling, social support, and the social norms demonstrated by family, friends, peers, and other individuals. The physical environment plays a crucial role in shaping university students' food choices and their access to food. The availability and accessibility of food products in different environments where individuals eat or acquire food significantly influence their dietary habits. The macro-level environment is shaped by a range of factors that are primarily distal in nature. Influences encompass social norms, agricultural and economic policies, food production and distribution systems, along with food marketing and pricing (El-Ammari et al., 2020).

The epidemiology of food allergies has been significantly affected by the current rapid growth of the adult and elderly population, likewise, environmental and lifestyle changes have also played a role in this transformation (De Martinis et al., 2020). In order to address this problem, it is important to have a deep understanding of the social aspects, as well as the various social-ecological environments involved by using the SEM as the theory. This knowledge can help to develop actions that are culturally relevant to the communities, households and individuals so, the positive health outcomes among university students will be achieve. Hence in this study, the researcher proposed some factors that influence university students' food choice behaviours in this framework which are intrapersonal factor, social environmental factors, physical factors, as well as societal factors. Intrapersonal factors are individual characteristics, such as attitudes, beliefs, knowledge, food preferences, behavioural factors, and lifestyle factors that can influence an individual's eating behaviours (Lee et al., 2022). Social environmental factors encompass factors related to family, friends, and peer networks. Meanwhile, physical factors including cost of food, limited hours due to preparing the food and convenient food. Therefore, based on the previous literature, a conceptual framework for this study has been proposed (Figure 2.1). Next, the hypotheses for this study will be explained in the next subtopic.

2.6 Conceptual Framework of the Research

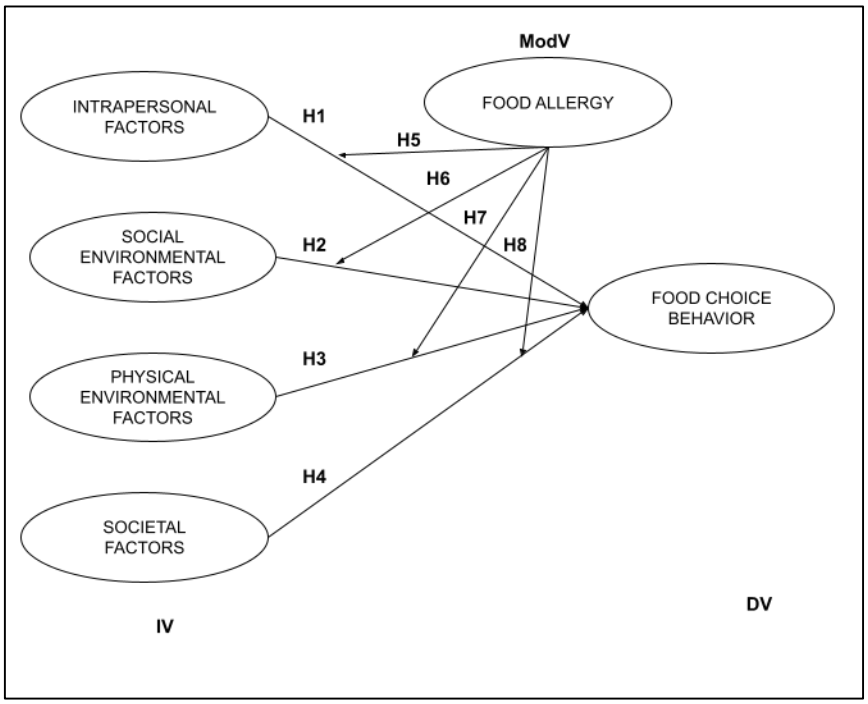


Figure 2.2 Conceptual Framework of Assessing the Role of Intrapersonal, Social, Physical, and Societal Influences and Moderating Effects of Food Allergy on Food Choice Behaviour of University Students

2.7 Hypotheses Development

Usually, hypotheses are specific predictions regarding the result of a particular study. They are developed by analyzing existing evidence and determining what will happen in the context of interest using logic. Hypotheses also should be supported by previously published research, which can be based on theory, observations, logical reasoning and may not predict the exact direction (Barroga & Matanguihan, 2022). Hence, the hypotheses have been developed based on previous study from Lee et al. (2022) which is based on the SEM by Bronfenbrenner (1977).

2.7.1 Intrapersonal Factors and Food Choice Behaviour among University Students with Food Allergy

Food choice behaviour among university students is strongly shaped by intrapersonal factors such as cooking skills, taste preferences, eating habits, nutrition-related knowledge, cultural background, moods, self-efficacy, health concerns, and

perceptions (Kabir et al., 2018; Lee et al., 2022). Entering university represents a critical transition period, as it is often the first time students assume full responsibility for managing their dietary practices, including allergies, without parental supervision (Sicherer, 2022). In this phase, individual decision-making becomes pivotal, and personal attitudes toward food, whether shaped by emotions, knowledge, or habits take on heightened importance.

Emotional states and moods are well-established determinants of eating behaviours, often leading to the development of habitual food patterns that vary according to psychological conditions (Guiné et al., 2020). For many students, additional academic pressures and lifestyle adjustments make the processes of selecting, purchasing, and preparing meals stressful (Mogeni & Ouma, 2022). These stressors are further compounded for students with food allergies, as they may exhibit inadequate self-management behaviours that are influenced not only by the allergy itself but also by a general predisposition toward risk-taking during university students (Duncan & Annunziato, 2018).

Adolescence and early adulthood also mark a developmental stage where taste preferences become especially salient in food decisions. For example, taste has consistently been identified as a central driver of food choice during this life stage (Bawajeeh et al., 2020). However, beyond taste, knowledge and perceptions of nutrition also play a crucial role. Although students acknowledge the importance of healthy eating, many display limited understanding of the health benefits of nutritious foods (Kabir et al., 2018). Such limitations in knowledge often translate into unhealthy dietary practices, including excessive consumption of fast foods and sugar-sweetened beverages, coupled with inadequate intake of fruits, vegetables, and fibre. This imbalance frequently results in diets high in processed and refined products, which heighten the risk of nutritional deficiencies (Laheri et al., 2023).

Empirical evidence further highlights the gap in nutritional literacy among university students. Żarnowski et al. (2022) reported that only 28.1% of their respondents possessed a good level of nutrition knowledge, while the proportion of students with chronic conditions who adhered to specific diets or sought dietary consultations remained relatively low. Nevertheless, existing research suggests that providing accurate and accessible nutritional information can significantly improve food choice behaviours. Scalvedi et al. (2021) found that when students receive reliable

dietary guidance and recognize the long-term implications of food consumption on health, they are more likely to modify their eating behaviours. Similarly, Guiné et al. (2020) demonstrated that enhanced nutrition knowledge is associated with improved decision-making, making healthier food choices easier and more sustainable.

Taken together, these studies highlight the critical role of intrapersonal factors, spanning from taste preferences and knowledge to psychological states and health perceptions in shaping the food choice behaviours of university students. These considerations form the basis for the following hypothesis:

H1: Intrapersonal factors have positively influence on food choice behaviour among university students with food allergy.

2.7.2 Social Environmental Factors and Food Choice Behaviour among University Students with Food Allergy

Food choice behaviour is also significantly influenced by the social environment in which students live and interact. Social environmental factors encompass the immediate relationships and networks that shape students' daily lives, including parents, siblings, teachers, friends, and peer groups (Ryan, 2001; Lee et al., 2022). Parental food choices and family practices are often mirrored in the food decisions of their children such university students, underscoring the intergenerational transfer of dietary habits (Lee et al., 2022). In the context of food allergies, the family plays a particularly vital role, as eating out and purchasing allergen-free products often present both financial and practical challenges (Zaher et al., 2023; Lung, 2020). This highlights the centrality of family support in fostering safe and healthy eating practices.

Family dynamics and home food environments exert a strong influence on dietary intake, particularly during childhood and adolescence, when individuals are still embedded in the household context (Chen & Antonelli, 2020). Emotional support within the family unit also contributes to university students' satisfaction with food-related life, as mealtimes often serve as opportunities for connection and parental guidance (Schnettler et al., 2018). Beyond the family, broader forms of social engagement such as friendships and community participation have similarly been shown to foster healthier dietary behaviours. For example, Bloom et al. (2017) and

Higgs et al. (2022) demonstrated that regular interaction with friends and family members can positively influence food-related habits in later life.

However, for students with food allergies, social contexts can be double-edged. The need for strict avoidance behaviours may lead to feelings of social isolation, depression, anxiety, and psychological distress, which can be further exacerbated by bullying (Brown et al., 2021). Empirical evidence has shown that bullying, teasing, and harassment related to food allergies are common among university students (Lee et al., 2022). Large-scale studies have further highlighted the damaging effects of bullying on both physical and psychosocial wellbeing (Albaladejo-Blázquez et al., 2018). Particularly concerning is the fact that university students may sometimes downplay or conceal the severity of their allergies due to social pressure or fear of stigma, which in turn increases their risk of adverse reactions and even fatal consequences (Vazquez-Ortiz et al., 2020).

During adolescence and young adulthood, peer influence becomes especially significant in shaping dietary patterns. University students often adjust their food choices to seek acceptance and popularity within their peer groups (Wahyuningtyas et al., 2021). Ragelienė and Grønhøj (2020) argue that peer group membership strongly affects the quality of social relationships, which in turn influences university students' food-related decisions. Yet, peer relationships can be particularly challenging for students with food allergies, since their peers may lack adequate knowledge of the condition (Newman & Knibb, 2020). Peer attitudes and responses also shape how willing university students are to disclose their allergies, which has direct implications for their safety and psychosocial wellbeing. On the positive side, receiving supportive feedback from peers has been shown to enhance expected liking, positive attitudes toward food, and overall valuation of shared eating experiences (Higgs et al, 2022). Conversely, negative experiences such as bullying are associated with appetite deregulation and meal skipping (Albaladejo-Blázquez et al., 2018).

The broader influence of social norms is also noteworthy. Eating behaviours are shaped not only by immediate family and peers but also by wider social expectations and cultural practices (Higgs et al, 2022). The strength and direction of social norms on health behaviour often depend on environmental contexts. Early in life, food choices are strongly guided by parental modelling and supervision (Sulaiman & Pei Sin, 2011; Schüz, Papadakis & Fergusonthe, 2018). However, as students enter university, new

peer groups, social contexts, and cultural environments exert growing influence, often reshaping food behaviours (Sulaiman & Pei Sin, 2011; Lee et al., 2016). The university years thus represent a critical transitional period marked by autonomy, exposure to new food cultures, and the need to balance social integration with individual health needs (Lee et al., 2016; Cao et al., 2023).

Collectively, these findings highlight that the social environment ranging from family and peer networks to broader social norms plays a crucial role in shaping food choices during the university years. These influences can either promote healthy and adaptive dietary practices or, in the case of food-allergic individuals, heighten social and psychological risks. Based on these insights, the following hypothesis is proposed:

H2: Social environmental factors have positively influence on food choice behaviour among university students with food allergy

2.7.3 Physical Environmental Factors and Food Choice Behaviour among University Students with Food Allergy

In addition to intrapersonal and social influences, the physical environment plays a critical role in shaping university students' food choice behaviour. Physical environmental factors encompass practical constraints such as time availability, accessibility, and economic conditions, which collectively determine the feasibility of making healthy dietary decisions (Lee et al., 2022). For university students with food allergies, such constraints can be particularly consequential, as safe food options are often limited and require additional planning and resources.

Time constraints represent one of the most widely reported challenges. Research has consistently highlighted that limited time significantly affects food choices, especially in environments where individuals are required to make quick decisions and having to check labels continuously proves to be very upsetting for people with allergies as it requires spending more time than needed (Sharma et al., 2018; Ferrer et al., 2025). University life is often characterized by a demanding schedule in which students must juggle academic responsibilities, employment, social activities, and personal development. As a result, many students report insufficient time to plan and prepare balanced meals (Laheri et al., 2023). During this transitional period, students may lack cooking knowledge or have limited time to prepare meals due to juggling studies, work,

social commitments, and developmental changes, so, this can lead to a preference for convenience and fast foods with poor nutritional quality, increasing the risk of unhealthy eating habits (Laheri et al., 2023). This shift in priorities often drives reliance on convenience-based alternatives.

The availability of convenient but less nutritious foods within the campus environment further reinforces these patterns. For instance, university students frequently report turning to vending machines for snacks or meal replacements, particularly during busy schedules filled with practices and meetings (Ziegler et al., 2021). Similarly, Daly et al. (2022) found that university students with multiple academic, athletic, and social commitments tend to prioritize foods that are quick to prepare and require minimal effort, further underscoring the role of convenience in shaping dietary choices.

Economic resources also substantially influence food behaviours. In low-income contexts, household financial constraints exacerbate challenges in accessing healthy foods, and such disparities are particularly pronounced when compared with more industrialized and globalized societies undergoing nutritional transitions (Guiné et al., 2020). Food allergies add another layer of economic burden. Families managing allergies often incur significant financial strain due to the high costs of allergen-free foods and specialized treatments (Fanning et al., 2021). Studies indicate that university students with food allergies may sometimes engage in risky behaviours, such as intentionally consuming products labelled with “may contain” warnings, either due to financial limitations or restricted availability of alternatives, thereby increasing their risk of anaphylaxis (Laheri, 2019). While guidelines recommend the complete avoidance of allergen-labelled foods, this is often only feasible for families who can afford specifically marked allergen-free products (Lung, 2020).

Another commonly reported barrier is the perception of insufficient time to purchase and prepare healthier meals. Sogari et al. (2018) found that many students felt unable to prioritize healthy food shopping, with some explicitly stating that they lacked the time to buy fruits or other nutritious items. Consequently, the temptation of fast and convenient foods typically high in calories but low in nutritional value becomes more appealing, further increasing vulnerability to unhealthy dietary habits (Sprake et al., 2018).

Taken together, these studies demonstrate that the physical environment through time constraints, economic pressures, and accessibility of healthy options plays a central role in shaping university students' food choices. Importantly, these factors intersect with the unique challenges faced by students with food allergies, amplifying the complexity of their dietary decision-making. On this basis, the following hypothesis is proposed:

H3: Physical environmental factors have positively influence on food choice behaviour among university students with food allergy.

2.7.4 Societal Factors and Food Choice Behaviour among University Students with Food Allergy

Beyond intrapersonal, social, and physical influences, food choice behaviour is also shaped by broader societal factors. These include the cultural and social norms embedded in communities, as well as structural influences such as food production and distribution systems, accessibility, availability, and pervasive media exposure (Story et al., 2002). While societal factors may exert a more distal effect compared to family or peer influences, they nevertheless create powerful environments that shape how university students interact with food.

In contemporary society, social media platforms such as TikTok, Facebook, YouTube, and Instagram have emerged as major sources of food inspiration, particularly among adolescents and university students. Social media (the appeal of online food trends and viral content) has been shown to strongly influence the eating behaviours of university students associated with increased food cravings and unhealthy food choices (Zimmerman & Shimoga, 2014; Rounsefell et al., 2020; Sadaf et al., 2023). Kent et al. (2019) reported that university students are exposed to food marketing on social media between 30 and 189 times per week, while earlier evidence indicates that junior high school students in the United States spend an average of more than eight hours daily engaging with media more than on any other activity (Story et al., 2002).

This high level of exposure is problematic because the majority of food and beverage products marketed through these platforms tend to be high in sugar, fat, and salt (Kent et al., 2019). Furthermore, marketing is increasingly integrated into entertaining and interactive media content, encouraging university students to share

these experiences with their peers, thereby normalising the consumption of less healthy foods (Coates et al., 2019). Consistent with these findings, excessive social media engagement has been linked to unhealthy snacking behaviours, poor dietary habits, and increased consumption of energy-dense, nutrient-poor foods (Chung et al., 2021). This trend has raised concerns not only about poor nutrition but also about the broader physical and mental health consequences of social media overuse, often described as social media addiction (Ayyıldız & Şahin, 2022).

Such prioritisation of market driven influences over health-related needs contributes to dietary imbalances, including meal skipping, excessive junk food intake, and insufficient nutrient consumption, which may exacerbate health risks such as food allergies (Ahmad & Bruno, 2021). Importantly, the influence of advertising and media exposure is not uniform. The type and nutritional value of the products being marketed can determine whether such influences promote healthier or less healthy choices, with corresponding implications for physical health, allergy management, and overall well-being (Ayyıldız & Şahin, 2022; Kucharczuk et al., 2022).

For university students, attitudes toward social media influencers also appear to play a direct role in shaping behavioural intentions around food. Ahmad and Bruno (2021) found that students' trust and engagement with influencers correlate with their likelihood of adopting promoted food choices. This dynamic may be particularly relevant for students managing food allergies, as societal influences mediated through media and advertising could either encourage safer eating practices or heighten risk by normalising the consumption of allergen-containing products.

Taken together, the evidence underscores that societal factors including media, cultural norms, and food marketing systems form a powerful backdrop against which students make their dietary choices. These influences, while often indirect, are nevertheless significant in determining patterns of food consumption during the university years. On this basis, the following hypothesis is proposed:

H4: Societal factors have positively influence on food choice behaviour among university students with food allergy

2.7.5 Food Allergy as a Moderator of the Relationship between Intrapersonal, Social, Physical, and Societal Factors and Food Choice Behaviour

Food allergies are conceptualized in this study as a moderating variable in the association between university students' food choice behavior and intrapersonal, social, physical, and societal aspects. Moderation occurs when the degree of a third variable, referred to as the moderator, affects the direction or intensity of the link between an independent variable and a dependent variable (Baron & Kenny, 1986; Dawson, 2015; Memon et al., 2019). In this scenario, food allergy is anticipated to influence the various factors affecting food choice behaviour among students, enhancing or modifying the impact of each element.

The literature suggests that food allergies introduce a set of unique challenges that significantly affect individuals' daily lives. For instance, students with allergies must constantly navigate physical risks of accidental allergen exposure, the psychological stress of vigilance, the social burden of stigma or exclusion, verbal teasing, social exclusion and physical threats (Nocerino et al., 2024). These challenges can limit autonomy, restrict available food options, and create tension in social contexts. Moreover, family and professional support can play a critical role in shaping dietary practices and enabling better coping strategies. Liu et al. (2025) highlighted the importance of familial influence on eating habits, while Team et al. (2017) underscored the role of health professionals in guiding food choices. Together, these findings suggest that food allergies not only affect food behaviour directly but may also alter the way students respond to other environmental and personal influences.

Recent empirical studies have begun to validate the moderating role of food allergies. For example, Mahmoud and Grigoriou (2022) demonstrated that child food allergy significantly moderated relationships between parental attitudes, education, and unhealthy food choices. Specifically, the presence of a food allergy altered the extent to which parents' beliefs, perceptions, and concerns influenced their children's dietary patterns. Parents of children with food allergies tend to exhibit heightened awareness of food ingredients, greater concern regarding the potential consequences of allergen exposure, and increased involvement in food choice and preparation. Such attitudes often lead to stricter control over food consumption and a more cautious approach towards food-related decisions.

Similarly, Lee et al. (2022) found that food allergies had wide-ranging effects on the food-related behaviours of university students, influencing them not only physically but also socially, psychologically, and financially. Such findings reinforce the idea that allergies amplify the impact of intrapersonal and contextual factors on dietary decisions, making food choices more complex and constrained compared to non-allergic individuals. In essence, food allergy acts as a moderator because it changes the strength and direction of the relationship between parental attitudes and unhealthy food choices. The presence of food allergy increases parents' risk perceptions and involvement in food decisions, making their attitudes more influential in determining the foods that children ultimately consume.

Furthermore, the presence and severity of food allergies are shaped by both environmental and personal determinants. Dubois et al. (2013) and Hejazi et al. (2024) noted that food choice behaviors' result from the interaction of genetic and environmental influences, while Ortiz and Barnes (2016) and Wang et al. (2023) pointed out that allergic diseases are complex phenotypes with strong genetic foundations and environmental factors. These insights highlight the importance of considering allergies not only as health conditions but also as dynamic moderators that interact with other determinants of food behaviour. Although there remains limited research on the moderating roles of food allergies, Mahmoud and Grigoriou's (2022) findings provide critical evidence that supports incorporating such a perspective into food choice research.

Based on this reasoning, the current study proposes that food allergy moderates the relationship between intrapersonal, social, physical, and societal factors and food choice behaviour among university students. Specifically, students with food allergies may respond differently to these influences than those without allergies, given their heightened need for vigilance, restricted access to safe foods, and sensitivity to social and economic pressures. Accordingly, the following hypotheses are proposed:

H5: The impact of food allergy moderates the relationship between intrapersonal factors and food choice behaviour.

H6: The impact of food allergy moderates the relationship between social environmental factors and food choice behaviour.

H7: The impact of food allergy moderates the relationship between physical environmental factors and food choice behaviour.

H8: The impact of food allergy moderates the relationship between societal factors and food choice behavior

2.8 Chapter Summary

This chapter has reviewed the key literature surrounding food choice behaviour and the moderating influence of food allergy, particularly in the context of university students. The review highlights that food choice is a complex, multifaceted, and dynamic process shaped by a wide range of determinants, encompassing intrapersonal, social, physical, and societal influences. To capture this complexity, the SEM was adopted as the guiding theoretical perspective, offering a comprehensive lens to understand how individual, interpersonal, and environmental factors interact to shape food choice behaviour. Nevertheless, integrating these multiple dimensions into a coherent conceptual framework has proven challenging due to the overlapping and interdependent nature of the determinants.

Food choices are not made in isolation but rather emerge from the interplay of biological, psychological, physiological, social, and economic determinants (Wongprawmas et al., 2021). At the individual level, personal food systems and cognitive processes guide decisions about what, when, and how to eat (Monterrosa et al., 2020). However, the presence of food allergy introduces additional complexity into this decision-making process. Individuals with food allergies often face heightened vulnerability as they navigate limited food options, the risk of accidental allergen exposure, and the psychological burden of anxiety or fear associated with eating. They may also encounter stigma, social exclusion from peers, and structural barriers in accessing allergen-free foods, which collectively make food choice an ongoing source of stress and negotiation (Nishida et al., 2025).

Taken together, the literature makes it clear that food allergy does not merely constrain dietary options but also interacts with broader determinants of food choice, amplifying the challenges of making safe and satisfying food decisions. Therefore, a nuanced understanding of the interrelationship between intrapersonal, social, physical, and societal influences is critical in order to explain variations in food choice behaviour among university students. By examining food allergy as a moderating factor, this study

seeks to contribute to a more comprehensive understanding of food choice behaviour, offering insights that can inform interventions, policies, and practices aimed at improving the dietary wellbeing and quality of life of students living with food allergies.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Chapter Overview

This chapter provides an overview of the approach that was applied during each phase of the research. This chapter explains the research design, the population that was intended to be studied, and the sampling techniques that were used. In addition to this, it defines the techniques for data collecting as well as the data collection tools that were utilized during the research. In its conclusion, it discusses the methodology employed for data analysis and presenting the findings of the research.

3.2 Research Design

This study utilized both quantitative and descriptive research methods to ensure diversity in the surveys by including university students from a range of backgrounds. This is because, Lee at al. (2022) suggested addressing the existing research gaps by conducting a quantitative study in addition to the current qualitative exploratory research, which include limited sample size among university students with food allergies. Therefore, investigating further through a quantitative approach would provide a more comprehensive understanding of the topic. A descriptive study is a type of research that aims to provide a detailed description of the distribution of one or more variables without focusing on establishing any causal relationships or testing specific hypotheses (Aggarwal & Ranganathan, 2019). This study employed a quantitative research approach as it involves a larger sample size, which can provide a more accurate representation of the diversity among university students and the population. All participants received a survey instrument under the same circumstances and with identical instructions. Moreover, according to Kotronoulas (2023), quantitative research focuses on analyzing numerical data to uncover trends and relationships, as well as to validate measurements that address questions such as who, how much, what, where, when, how many, and how. Quantitative research also encompasses various methodologies; including questionnaires, structured observations, experiments re-

evaluate existing theories deductively based on their experimental results (Coghlan & Brydon-Miller, 2014; Barroga et al., 2023).

Creswell (2009) asserts that quantitative research is a type of study that explains phenomena by collecting numerical data, which are analysed through mathematically based methods where statistics are particularly integrated, whereas, Bryman (2016) claims that it is a research strategy that emphasises quantification in the collection and analysis of data (Xiong, 2022). Quantitative data analysis is a systematic process that involves collecting and evaluating measurable and verifiable data as it utilizes statistical methods to assess and analyse quantitative data (Ali, 2021). According to Mohajan (2021), quantitative research also follows a formal, objective, rigorous, logical approach and a systematic set of procedures to generate and refine information for issue solving. Researchers can improve the reliability and accuracy of their findings by minimising subjectivity and bias through the use of standardised procedures and numerical measurements (Carmines & Zeller, 1979; Zyoud et al. 2024). As a result, the research findings become more credible due to the accuracy that allows for study replication and independent verification by other researchers (Zyoud et al., 2024).

3.3 Unit of Analysis

This study focused on university students in Malaysia who were living independently in either on-campus dormitories or off campus housing and had either self-reported or clinically diagnosed food allergies as the unit of analysis. The focus of this research is on respondents from public universities in Malaysia. This is because majority of students in public universities are Malaysians, while private universities have a more diverse student population, consisting of students from various countries worldwide. Since this study are focused on university students in Malaysia, hence the university students from public universities has been chose as the unit of analysis. Public universities also typically have a wider range of students in Malaysia, including people from different economic backgrounds. Having a wide range of people can help the researcher get a better understanding of the research topic, especially if it involves things like society, health, and culture.

In addition, the researcher chose university students as the unit of analysis because university students with food allergies create a situation that is particularly hard for them. This is the time of life when many university students become independent

and spend less time under adult supervision (Hassan et al., 2020). They also are responsible for their own health and need to avoid some allergen food. A significant number of university students face allergic reactions, with a range of 42% to 63% of students with food allergies reporting experiencing allergic reactions to food during their time in university because of risk-taking behavior (Greenhawt et al., 2009; Wu & Wang, 2024). According to Sukor (2020), a study among rhinitis patients in Malaysia, which revealed that 47% of the subjects were allergic to shrimp, while 30% were allergic to rice so, it highlights that the severity of food allergies among Malaysians and emphasizes the need for proper attention to be given to this issue.

3.4 Population and Sample Size

The sample population and focus group for this study are collected amongst university students in Malaysia, and it will consist of the public universities located in Malaysia. The researcher chose Malaysia because there is still no specific number of university students who suffer from food allergies in Malaysia. A previous study stated that the true prevalence of food allergy in Malaysia remains to be unknown but recent study found that food allergy affects approximately 1.4% of children and 3% of adults in the general population (Azhar et al., 2020).

The population for this study is university students in Malaysia between the ages of 18 and 24 who had either self-reported or clinically diagnosed food allergies and living independently in either on-campus dormitories or off-campus housing. This is because according to Laheri et al. (2022), individuals between the ages of 18 and 24 are in a transitional phase from late adolescence to adulthood, therefore, there is a growing trend of poor food choice behaviour among this age group. University students with food allergies offers a situation that is particularly challenging since this is the age when many university students become self-sufficient and spend more time away from parental supervision (Hassan et al., 2020).

It is important to consider the type of sampling technique used in this section. The researchers discovered that surveying all university students in Malaysia was impossible due to the large number of students. Therefore, the snowball sampling method has been utilized to survey university students in Malaysia. This method is particularly appropriate when the target population is difficult to identify and when no complete sampling frame is available. In this study, the target respondents were

university students in Malaysia who had self-reported or clinically diagnosed food allergies and were living independently in either on-campus dormitories or off-campus housing. As this group represents a specific subgroup within the broader university student population, identifying eligible respondents through conventional probability sampling would be challenging. Therefore, snowball sampling was employed to recruit participants through referrals and existing social networks. According to Chan (2020), snowball sampling is a network-based sampling technique that maintains network structure information. Thus, this technique was considered appropriate for reaching a sufficient number of relevant respondents from a large and dispersed population.

There are several advantages to using snowball sampling such as it allows the researcher to recruit the hidden populations that may be difficult to access through other sampling methods (Dudovskiy, 2018). Snowball sampling effectively addresses these challenges by strategically utilizing social networks and taking advantage of established relationships, enabling researchers to reach otherwise unreachable groups (Ting et al., 2025). When respondents are referred by trusted contacts such as friends, relatives, colleagues, mentors, customers, or community members, it not only boosts response rates but also improves data quality, as respondents tend to offer genuine and comprehensive insights (Ting et al., 2025). Other than that, snowball sampling also a cost-effective way to collect primary data, as it does not require a large budget, this method can be completed relatively quickly and saving time for researchers and also, it requires minimal planning to initiate the primary data collection process (Dudovskiy, 2018).

The estimation of the student population was conducted by consulting the administrative department of each public university to ascertain the approximate number of enrolled students. The following Table 3.1 displays the total amount of university students in Malaysia, ascertained from the Ministry of Education Malaysia's published Statistics Categories data. However, the number of university students in the Table 3.1 include both those who suffer from food allergies and those who do not. Therefore, G*Power is the most effective software for calculating the minimum sample size required for this study. The G*Power software is capable of estimating sample size and conduct power calculations for a wide range of statistical methods, including F, t, $\chi 2$, z, and exact tests (Kang, 2021).

Based on G*Power analysis, the minimum sample size required for this study is 64. The minimum sample size calculation and statistical power using G*Power analysis depends on several factors including the effect size, power (1-β), significance level (α), and type of statistical analysis (Kang, 2021). First and foremost, the value of effect size that has been chosen to determine the sample size is 0.5 based on a study from Laheri et al. (2023). Next, two-tailed test has been utilised in calculating the sample in G*Power analysis. This is because it is to test the non-directional hypothesis which is it does not predict the exact direction or nature of the relationship between the two variables (Hayes et al, 2025). A non-directional hypothesis suggests that there may be a relationship between two variables (the independent and dependent variables), but it does not make a specific prediction about the direction of this relationship (Ali & Bhaskar, 2016; Barroga & Matanguihan, 2022). Moreover, according to Kang (2021), the most commonly used level of significance in practice is the 5 percent level, which is indicated as $\alpha = 0.05$ so, the level of significance to determine the sample size of this study by using G*Power is 0.05. Given that the significance level is set to a small value, the probability of rejecting the null hypothesis (H0) when it is actually true is also small (Kwak, 2023). Next, the ideal statistical power (1 – β err prob) of a study is commonly referred to as 0.8, which can also be expressed as 80% (Suresh & Chandrashekara, 2014; Kang, 2021). Hence, the statistical power (1 – β err prob) of 0.8 has been applied for calculating the sample size in G*Power analysis. Finally, the correlation coefficient ρ H0, also known as the null hypothesis, has been assigned a value of 0. This is due to the fact that the null hypothesis has no relationship exists between the predictor and outcome variables within the population (Banerjee et al., 2009; Capili, 2023). Once all the parameters have been filled, the minimum sample size has been displayed from the total sample size.

Table 3.1
Statistics Categories: Ministry of Education Malaysia

Level Of Studies	**Higher Education Institutions (HEIs) Category**	**Total Students Enrolment**
Doctor of Philosophy (Ph.D.)	Public Universities	46,422

Master	Public Universities	56,544
Postgraduate Diploma	Public Universities	5,235
Bachelor Degree	Public Universities	377,103
Advanced Diploma	Public Universities	113
Diploma	Public Universities	90,545
Certificate	Public Universities	356
Professional	Public Universities	1,117
Pre Universities/ Foundation	Public Universities	13,414
Others	Public Universities	4,775
Total	Public Universities	595,624
	Grand Total	1,191,248

3.5 Instrumentation Development

During the process of developing this study's instrument, few concerns were taken into consideration in order to avoid potentially biased responses. In order to account for the varying socio-demographic backgrounds of university students, the questionnaires were designed to be straightforward and easily comprehensible, with minimal written content. According to Ranganathan (2023), questionnaires are a type of written tool that presents a set of inquiries or statements to survey respondents, allowing them to indicate their responses through various means such as marking a page, writing a number, or checking a box on either paper or online platforms and thus learn about their knowledge, opinions, attitudes, beliefs, and behavior. A well-designed questionnaire should be easy for the respondent to understand and answer accurately

because it is easier for the researcher to record the data obtained (Abdullahi, 2019). It is important for questionnaires to have a clear and specific purpose that is directly related to the research objectives, and it should be clear from the beginning how the results of the questionnaire has been utilized (Roopa & Rani, 2012; Memon et al., 2025). In order to take into consideration the diverse backgrounds of university students and reduce the risk of misunderstanding, the researcher developed two versions of the questionnaire. These versions available in both Bahasa Malaysia and English and will undergo a thorough review by experts in both languages and content. The results of the survey provided an improved understanding of the targeted outcomes in the context of Malaysia population if the questionnaires were translated into Malay (Hang et al., 2022).

The questionnaire included questions that asked respondents to indicate their level of agreement using a numerical Likert scale. To facilitate this research, it would be more convenient for individuals to respond to these types of inquiries and complete the survey. The Likert scale typically offers five response options to a statement or question, enabling respondents to express their level of agreement or emotional intensity towards the statement or question, ranging from positive to negative (Mcleod, 2023). On a metric scale, participants are asked to indicate their level of agreement with the given statement (items), ranging from strongly disagreeing to strongly agreeing with the point of view (Joshi et al., 2015; Tanujaya et al., 2022). For example, 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree (Al-Ansari et al., 2022). The 5-point Likert-type scale has been chosen for this study because it has been used in several previous studies with a similar context. The examples of studies that have utilized the 5-point Likert-type scale include Majowicz et al. (2017), Laheri et al. (2023), and Tan et al. (2023). However, according to Koo and Yang, (2025), common challenges for Likert Scale include response bias, such as central tendency bias, where respondents tend to avoid extreme categories, and acquiescence bias, where individuals are predisposed to agree with statements regardless of their content.

Besides that, the questionnaire utilized closed-ended questions that encouraged respondents to indicate their level of agreement by selecting a numerical value on the Likert scale. Facilitating respondents' ability to provide answers and complete the survey would be advantageous for the objectives of this study. Closed-ended questions constrain the respondent to a predetermined set of options, whereas open-ended

questions enable the respondent to articulate their viewpoint without any influence from the researcher (Reja et al., 2003; Hansen & Świderska, 2023). The questionnaire for this study was divided into six main parts, each containing questions related to the research objectives' relevant variables. The questions in the questionnaire are derived from previous research, with minor modifications to suit the requirements of the present study. To ensure the questionnaire's reliability, the researcher carried out a pilot test using a smaller representative sample from the focus demographic.

The questionnaire items were adopted and adapted from a previous study, with slight alterations made to ensure their suitability for the current study. The research instrument was adapted and adopted based on previous studies conducted by Thurecht and Pelly (2021), Soon (2019), Conner et al. (2018), Ferrão et al. (2019), Kovacs (2018), Lee and Chen (2019) and Munir and Ahmed (2025). The modifications were made to ensure that the instrument was appropriate for the context of food choice among university students with food allergies. The survey questionnaire was designed with a quantitative approach to ensure that the variables were measured in a valid and reliable manner.

Furthermore, a screening question also was presented to identify students who may have food allergies. A screening question is a survey question designed to identify individual's demographic characteristics, inclusion criteria and prevents ineligible participants from survey completion (Glassman & Glassman, 1998; Shiyab et al., 2023). The screening question has been asked as part of the general demographic screening process. The screening question is presented to the respondents after they have made a decision to continue with the survey by answering it with a "Yes" or "No" for example. In order to assure the accuracy, the researcher engaged with university students who have received clinical diagnoses or have self-identified as having food allergies. The researcher asked these students to notify other university students with food allergies about an online survey in which they can take part. The participants were not allowed to respond more than once to the survey in order to prevent the possibility of duplicate responses.

The survey aimed to determine the prevalence of self-reported food allergies among the student population in Malaysia. The online survey was composed of 42 items that were divided into two main sections:

3.5.1 Question Used in section A of the Questionnaire

At the beginning of this section which is Section A, a demographic question was asked to verify that all of the participants who took part in this study were university students in Malaysia who either self-reported or had clinically diagnosed food allergies. In this portion, there were a total of 11 items and the purpose of these questions was to collect information about the demographic information of the participants. This information included the participants' ages, ethnicity, genders, educational levels, types of allergy test, types of allergies, family member who is suffering with food allergy, family member who is suffering with food allergy and how does the food allergy affect their diet.

This questionnaire also was included a list of food allergens among the Malaysian population according to Din et al. (2019) such as crab, prawn, squid, cockle, mackerel, anchovy, milk, egg, soy, wheat, rice, mutton, beef, chicken and banana. Moreover, the food allergen list has been adopted from the World Health Organization (WHO) and the Food and Agriculture Organization (FAO). The WHO and FAO have compiled a list consisting of eight groups of foods that cause most food allergies such as cow's milk, eggs, tree nuts, peanuts, shellfish, fish, soy and wheat. The participants were asked to identify the presence of these food allergens in their food choice behavior.

The remaining questions inquired about how often the individual had experienced food allergies within the last 12 months. The response options included experiencing it once, twice, many times or not at all. The survey has gathered data on the food choice of individuals with food allergies, including their experiences dining out at restaurants, university or ordering food online. This section also has explored the difficulties and barriers that these individuals encounter due to their allergic condition. Additionally, there were inquiries regarding symptoms of food allergies and severity of allergic reaction. The questionnaire was included a list of food allergy symptoms based on a study from Żukiewicz-Sobczak et al. (2013) and Kumagai et al. (2025). However, the findings from these inquiries are beyond the scope of the present paper and has been presented separately.

Table 3.2
Demographic Questions

Demographic Question	**Description**
Age	18-20
	21-24
	25-44
	45 and above
Ethnicity	Malay
	Chinese
	Indians
	Other
Gender	Male
	Female
Educational Level	Foundation
	Pre-Diploma
	Diploma
	Degree
	Master
	Doctor of Philosophy
Types of Allergy Test	Self-diagnosed
	Skin prick test
	Blood test
	Doctor's diagnosis
	Food challenge
	Other…
Types of Allergies	Crab
	Prawn
	Squid
	Cockle
	Mackerel
	Anchovy
	Milk

	Egg
	Soy
	Wheat
	Rice
	Mutton
	Beef
	Chicken
	Banana
	Other…
Family member who is suffering with food allergy	Father
	Mother
	Siblings
	Other…
Frequency symptoms within last 12 months	Once
	Twice
	Many times
	Not at all
Symptoms Experienced	Hives (itchy/rashes)
	Stomach Cramps
	Swelling (edema) of face / lip throat / tongue swells up
	Sick / vomiting
	Difficulty breathing, e.g. asthma
	Loss of consciousness
	Diarrhea
	Other…
Severity of Allergic Reaction	Mild
	Severe
	Life threatening
How does your food allergy affect your diet?	Not at all
	Slightly
	Moderately
	Very Much

Extremely

3.5.2 Question Used in section B of the Questionnaire

This section inquired about the influence of intrapersonal factors, social environmental factors, physical environmental factors and societal factors on the participants' food choices. Chapter 2 has discussed those factors that affect the food choices of university students. Eating behaviour can be shaped during childhood and subsequently influenced by personal choices, parental guidance, and later on, by peers and societal norms as these behaviours may evolve over time due to significant life changes and new influences (Sulaiman & Pei Sin, 2011; Street et al, 2024). As the decision making process behind food choices is influenced by multiple factors and these factors including biological determinants such as hunger, appetite, and taste, psychological determinants such as mood, stress, and guilt, physiological determinants such as access, education, and time, social determinants such as culture, family, and peers, and economic determinants such as cost, income, and availability.

The questionnaire was used to deduce the factors that influence participants' food choice behavior with the moderating effect of food allergies and was adapted and developed with modifications from similar studies such as Thurecht and Pelly (2021), Soon (2019), Conner et al. (2018), Ferrão et al. (2019), Kovacs (2018), Lee and Chen (2019), Ferrer et al. (2025) and Munir and Ahmed (2025).

Table 3.3
Research Instruments

Variables/Factors	Item/Measure	Item Code	Source
Food Choice (FC)	I tend to eat healthier meals because I have health issues.	FC1	Thurecht and Pelly (2021)
	I actively seek out allergen-free food options.	FC2	Soon (2019)
	I avoid certain foods because of my allergy, even if I like them.	FC3	Soon (2019)

Food Allergy (FA)	I have to choose food that won't make me ill	FA1	Thurecht and Pelly (2021)
	My food allergy affects my overall eating habits	FA2	Thurecht and Pelly (2021)
Intrapersonal Factors (IPF)	When I am stressed, my food choice behavior is disrupted.	IPF1	Thurecht and Pelly (2021)
	I feel embarrassed to discuss my food allergy with others.	IPF2	Conner et al. (2018)
	I consider my food allergy when planning my meals.	IPF3	Soon (2019)
	I read food labels on food I am not familiar with.	IPF4	Thurecht and Pelly (2021)
	I am aware of the health risks associated with my food allergy.	IPF5	Thurecht and Pelly (2021)
Social Environmental Factors (SEF)	My friends consistently influence my food choice.	SEF1	Thurecht and Pelly (2021)
	My family influence my food choice.	SEF2	Thurecht and Pelly (2021)
	My friends understand and accommodate my food allergy.	SEF3	Kovacs (2018)
	Food allergy restrict me from attending social events.	SEF4	Conner et al. (2018)
	I sometimes feel excluded from social events because of my food allergy.	SEF5	Conner et al. (2018)
Physical Environmental Factors (PEF)	The main reason for choosing food is its low price.	PEF1	Thurecht and Pelly (2021)
	I eat according to my needs and affordability.	PEF2	Thurecht and Pelly (2021).

	Products that are specialized to exclude certain food allergens can often come with a higher price tag.	PEF3	Conner et al. (2018)
	I am vigilant about checking food labels for allergen information.	PEF4	Thurecht and Pelly (2021)
	I take necessary precautions to avoid allergens in my environment.	PEF5	Soon (2019)
	I find it difficult to locate allergen-free food options in public places.	PEF6	Conner et al. (2018)
Societal Factors (SF)	I feel tempted to try a food item after seeing food advertisement.	SF1	Ferrão et al. (2019)
	Watching television can influence the subconscious desire for food even though it can trigger my allergy reaction.	SF2	Ferrão et al. (2019)
	I utilise social media platforms to gather information about food allergies.	SF3	Lee and Chen (2019)
	I believe there should be more public awareness campaigns about food allergies.	SF4	Munir and Ahmed (2025)
	Society's perception of food allergies impacts my food choices.	SF5	Ferrer et al. (2025)

3.6 Research Ethics

Ethical considerations are essential in all types of research as it allow the researchers to conduct quality research while at the same time, maintaining the efficiency of research and securing the interests of human subjects and society (Tripathi & Chaturvedi, 2023). Researcher have a responsibility to ensure the protection of all study participants, protecting them from any potentially harmful consequences that may arise as a result of their involvement. There is a growing trend among research ethics committees to require documented evidence of consent in the form of a written, signed, and preferably witnessed document, so, if the answer is yes, they will confirm this by signing the consent form (Sanjari et al., 2014; Borovecki et al., 2018). To ensure the safety of the researcher as well as the participants in the study, the researcher has submitted the survey questionnaire to the research ethics committee at Universiti

Teknologi MARA for clearance before conducting the study. The researcher has requested ethical clearance and received approval from the Research Ethic Committee (REC) of Universiti Teknologi MARA (UiTM) before starting data collection for this study and it has been approved on 13th August 2024 as shown in as shown in APPENDIX 5. The approval was needed because the study includes gathering primary data from human participants, particularly students from eight chosen universities. The researcher has followed all the guidelines for research involving humans set by UiTM to ensure ethical and responsible practices.

3.7 Pre-Testing and Validation of Instrument

Pre-testing is an important chance for researchers to assess the meaning of survey questions before it becomes too late. In other words, it allows them to guarantee that the respondents comprehend the questions in the survey questionnaire and that there are no concerns regarding the choice of wording (Sekaran & Bougie, 2016; Stockemer, 2019; Hashim et al., 2022). In fact, they argued that developing the questionnaire is incomplete without undergoing the pre-testing of items. Pre-testing is a method used to determine if the items in a questionnaire are clear, easy to understand, and acceptable. It is also used to test and improve the procedures for administering the instrument. It is important to carefully review each statement for clarity, proper use of terms, meaning, and relevance, as most of the items have been adapted and some have been newly developed.

Face validity is a critical factor in the process of validating the proposed questionnaire items. The process involves two steps, in which two separate parties will review the questionnaire items. The first group consists of individuals who are knowledgeable about the topic. They are responsible for evaluating whether the questions effectively capture the main subject of interest. The second review should be conducted by an expert in question construction to ensure that the questionnaire items do not include common errors like leading, confusing, or double-barreled questions. It is proposed that the draught of the questionnaire be reviewed by field experts. Their input has been sought to assess the validity of the questionnaire in terms of its content and question construction. The researcher will make necessary adjustments and improvements to the questionnaire items in the instrument based on the feedback and suggestions provided.

3.8 Pilot Study

After completing the pre-testing procedures, the researcher conducted a pilot test with a smaller group of individuals who represented the priority population, to ensure the reliability of the questionnaires. For the pilot test in this study, 46 respondents were selected, as recommended by Browne (1995). It is essential for researchers to meticulously outline the suitable inclusion and exclusion criteria during the study design phase and evaluate the impact of these choices on the external validity of the study's findings (Patino & Ferreira, 2018). A pilot study is usually carried out to evaluate the practicality of different techniques, methods, questionnaires, and interviews, along with their interplay within a particular context. Furthermore, it has the potential to reveal ethical and practical issues that could impede the primary research (Doody & Doody, 2016; Fraser et al., 2018).

In addition to pre-testing, a pilot study serves as a way to further validate the instrument by assessing the respondent's comprehension of all the items being used. Afterward, a pilot study has been conducted among one hundred households located across Malaysia. According to Teijlingen and Hundley (2002), as cited in Malmqvist et al. (2019), in research publications, pilot studies are rarely explored in detail, often lacking comprehensive descriptions of their execution and the adaptations made to the main study regarding procedural changes, instruments, and various management considerations. The alpha coefficient values of the pilot test for each construct and dimension has been analysed. Once the results have been obtained, the researcher has reviewed and make necessary corrections or amendments to the wording or arrangement of the questions.

The pilot study involved students who had experience with how food allergies affect food choices, providing a range of viewpoints and experiences related to the topics being studied. The data from the pilot study were analysed with SmartPLS 4 software to check how reliable the questionnaire was. Table 3.4 displayed the reliability coefficients calculated for each construct, which included food allergy, food choice behaviour, intrapersonal factors, social environmental factors, physical environmental factors, and societal factors. The results were important for figuring out how reliable the measurement scales were and for confirming that the data collection methods were appropriate for the main study.

Table 3.4
Reliability Test for the Pilot Study

	Cronbach's alpha	**Composite reliability**	**N of items**
Food Allergy	-0.380	-0.382	2
Food Choice Behavior	-0.215	-0.248	3
Intrapersonal Factors	0.184	0.184	5
Social Environmental Factors	0.692	0.683	5
Physical Environmental Factors	0.876	0.887	6
Societal Factors	0.184	0.184	5

The reliability results indicated varying levels of internal consistency across the constructs. Criteria, a Cronbach's Alpha value of 0.70 or above is generally considered acceptable for exploratory studies, while Composite Reliability (CR) values above 0.70 indicate satisfactory internal consistency (Nunnally & Bernstein, 1995; Izah et al, 2024). As shown in Table 3.4, the constructs related to Physical Environmental Factors ($\alpha = 0.876$; CR = 0.887) and Social Environmental Factors ($\alpha = 0.692$; CR = 0.683) demonstrated acceptable levels of reliability, suggesting that the items within these scales consistently measured the same underlying constructs. These findings imply that respondents were able to interpret and respond to these items consistently.

However, the constructs of Food Allergy, Food Choice Behaviour, Intrapersonal Factors and Societal Factors showed low or even negative Cronbach's Alpha and Composite Reliability values. Questions that were found to have lower reliability may need to be revised or replaced to better align with the overall construct of factors influencing food choice behavior among university students. These results suggested that respondents might have experienced confusion or ambiguity when interpreting some of the questions related to these constructs. Given that the Food Allergy and Food Choice Behaviour constructs had only two and three items respectively, the small number of items likely contributed to their low reliability values. Recognizing problematic items carries significant consequences for the design and enhancement of the survey (DeVellis, 2016; Tavakol & Dennick, 2011; Ahmad et al., 2024).

Despite the lower reliability observed for certain constructs, the pilot study achieved its primary purpose of identifying problematic items and ensuring that the instrument functioned as intended in the university student context. Following the pilot

test, items with poor internal consistency were carefully reviewed and reworded for better clarity. Conducting a pilot study enhances research quality and can significantly impact various aspects of the research process, therefore, it is particularly important for improving reliability and validity, making a pilot study an essential component of research design (Malmqvist et al., 2019; Kim, 2019; Teijlingen & Hundley, 2002).

Table 3.5
Research Instruments before Validation

Variables/Factors	Before Revision (Original Wording/Layout)	After Revision (Revised Wording/Layout)	Item Code
Food Choice (FC)	I tend to eat more balanced meals because I have health issues.	I tend to eat healthier meals because I have health issues.	FC1
	I tend to eat healthier meals because I have health issues.	I actively seek out allergen-free food options.	FC2
	The transition from home to the university influenced my food choice	I avoid certain foods because of my allergy, even if I like them.	FC3
	I actively seek out allergen-free food options.		
	I avoid certain foods because of my allergy, even if I like them.		
	My food allergy limits my food choices.		
	I prioritize safety over taste when selecting foods due to my allergy.		
	I am satisfied with the variety of allergen-free foods available to me.		
Food Allergy (FA)	I would like to try new foods but often it is safer to stick to what I know I can eat	I have to choose food that won't make me ill	FA1
	My allergy doesn't dominate my diet	My food allergy affects my overall eating habits	FA2

	I have to choose food that won't make me ill		
	A healthy diet is important, but my allergy comes first		
	If I eat foods containing allergens, I slowly get these reddish raised spots		
	I believe to have healthy food choice even though I have food allergy		
	My food allergy affects my overall eating habits		
Intrapersonal Factors (IPF)	When I am stressed, my food choice behavior is disrupted.	When I am stressed, my food choice behavior is disrupted.	IPF1
	The taste and appearance of food could affect my food choice.	I feel embarrassed to discuss my food allergy with others.	IPF2
	I can restrain myself from eating unhealthy food and maintain a healthy diet.	I consider my food allergy when planning my meals.	IPF3
	I ask about ingredients in food/drinks, especially when it's unclear (e.g., at potlucks, mixed drinks at parties).	I read food labels on food I am not familiar with.	IPF4
	I read food labels on food I am not familiar with.	I am aware of the health risks associated with my food allergy.	IPF5
	When I become sad, I tend to crave foods that are bad for me.		
	I have to be very careful with going to like Asian restaurants because they do serve a lot of allergen-food there as well.		
	I inform my roommates and classmates about the presence of my food allergy.		
	I am aware of the health risks associated with my food allergy.		

	My food allergy affects my food preferences.		
	I consider my food allergy when planning my meals.		
	My food allergy influences the types of foods I purchase.		
	When I feel hungry, I can eat any food including allergen food.		
	Overall intrapersonal factors influence my food choice.		
Social Environmental Factors (SEF)	My friends consistently influence my food choice.	My friends consistently influence my food choice.	SEF1
	I would eat whatever food that my parents prepared.	My family influence my food choice.	SEF2
	I was tempted to try the food items that my friends enjoyed.	My friends understand and accommodate my food allergy.	SEF3
	Food allergy restrict me from attending social events.	Food allergy restrict me from attending social events.	SEF4
	I did not feel socially isolated because of food allergies.	I sometimes feel excluded from social events because of my food allergy.	SEF5
	My friends discouraged me from consuming food that provoked food allergic reactions.		
	My family would prepare food separately for me to avoid cross-contamination with food allergens.		
	My parents influence what I eat.		
	My friends understand and accommodate my food allergy.		
	I feel supported by my family in managing my food allergy.		

	I feel embarrassed to discuss my food allergy with others.		
	I sometimes feel excluded from social events because of my food allergy.		
	Social pressure influences my food choices related to my allergy.		
	Overall social environmental factors influence my food choice.		
	I feel like I have to make healthy choices when people is doing the same.		
Physical Environmental Factors (PEF)	The main reason for choosing food is its low price.	The main reason for choosing food is its low price.	PEF1
	I choose cheap food even though they are not nutritious.	I eat according to my needs and affordability.	PEF2
	I eat according to my needs and affordability.	Products that are specialized to exclude certain food allergens can often come with a higher price tag.	PEF3
	In university, I always have something else to do instead of cooking, so I don't have time to make my own meal.	I am vigilant about checking food labels for allergen information.	PEF4
	Products that are specialized to exclude certain food allergens can often come with a higher price tag.	I take necessary precautions to avoid allergens in my environment.	PEF5
	I enjoyed purchasing food with proper food labelling because I can read more about the labels on packed food.	I find it difficult to locate allergen-free food options in public places.	PEF6
	Affordable price for allergen-free food influenced my food choice.		

	Preparing and eating allergen-free food takes time that I don't always have		
	I avoided food trucks because they are enclosed spaces that could potentially lead to cross-contact.		
	It is important to me that the food I eat on a typical day takes no time to prepare		
	When facing deadlines or during examination weeks, I look for food that can quickly consume regardless of my allergies		
	Consuming allergens triggers physical symptoms in me.		
	I experience anxiety when eating in public due to my food allergy.		
	I am vigilant about checking food labels for allergen information.		
	I take necessary precautions to avoid allergens in my environment.		
	My food allergy has led to changes in my physical health.		
	Overall physical environmental factors influence my food choice.		
Societal Factors (SF)	Social media affect my food choice.	I feel tempted to try a food item after seeing food advertisement.	SF1
	For most food advertisements, if it looks appealing, I will probably try it out.	Watching television can influence the subconscious desire for food even though it can trigger my allergy reaction.	SF2
	I feel tempted to try a food item after seeing food advertisement.	I utilise social media platforms to gather information about food allergies.	SF3

	The conventional media influences what I eat	I believe there should be more public awareness campaigns about food allergies.	SF4
	Watching television can influence the subconscious desire for food even though it can trigger my allergy reaction.	Society's perception of food allergies impacts my food choices.	SF5
	When I see a lot of posts about a specific food on social media, it can affect how I view that food.		
	I utilise social media platforms to gather information about food allergies.		
	The food posts I come across on social media always make me crave the taste of good food even though I have food allergies.		
	Society's perception of food allergies impacts my food choices.		
	I find it difficult to locate allergen-free food options in public places.		
	There is a lack of understanding about food allergies in society.		
	I am frustrated by the limited availability of allergen-free products.		
	I believe there should be more public awareness campaigns about food allergies.		
	Overall societal factors influence my food choice		

In summary, the pilot study validated the overall feasibility and internal consistency of the instrument. Constructs with satisfactory reliability (Social and Physical Environmental Factors) confirmed that the measurement approach was sound

for those domains. The constructs that produced low reliability values were revised accordingly to improve their psychometric properties in the final questionnaire. The pilot testing thus ensured that the final version of the instrument was more reliable, valid, and contextually appropriate for assessing the role of intrapersonal, social, physical, and societal influences and the moderating effects of food allergy on food choice behaviour among university students.

3.9 Data Collection Procedure

The data collection for this study took place between September 2024 and November 2024. It included students who have experience with online learning from various universities across Malaysia. All items in the questionnaire were taken from existing literature, previously checked for validity, and reviewed by experts during a pre-test process. Participants were clearly told about the confidentiality, anonymity, and voluntary nature of the online survey.

The study employed a self-administered questionnaire as a research instrument. The study was carried out on a sample of around 64 individuals based on G*Power analysis from multiple universities located in Malaysia. University students with food allergies were approached and consented to spread a link to the web-based survey on social media platforms such as WhatsApp, Instagram, Facebook, and Twitter. After approval, data gathering will take about 4 weeks. The online survey, also known as the Internet survey, is a widely used method for collecting data. It involves distributing a set of survey questions to a targeted sample, who can then respond to the questions via the Internet. Online data collection offers several benefits to researchers, such as convenient and rapid participant recruitment and a more diverse participant pool compared to traditional laboratory-based studies involving students (Desai & Reimers, 2019).

The data collection medium employed in this study was an internet-based survey utilizing the Google Form self-administered questionnaire. Individuals who consented to participate in the study were directed to the survey, which required a time commitment of approximately 15 to 20 minutes for completion. After that, each and every piece of information was categorized and entered into the SmartPLS software version 4 for measurement models and the structural model, including the Heterotraitmonotrait (HTMT) criterion, bootstrap based significance testing.

3.10 Data Processing

According to Sharma (2018), after the completion of the fieldwork, the gathered data was centralised and entered into the computer. The data gathered from the study needed to be thorough and precise, verified for both accuracy and sufficiency prior to moving forward. In this study, four processes were conducted in the data processing phase.

3.10.1 Data Screening and Preparation

Prior to conducting the main statistical analyses, a comprehensive data screening process was undertaken to ensure the accuracy, reliability, and suitability of the dataset for subsequent inferential procedures. Data screening is a critical preliminary step in quantitative research, as it helps to identify potential errors, inconsistencies, and biases that may compromise the validity of the findings (Hair et al., 2019; Tabachnick & Fidell, 2019).

First, respondent eligibility was verified to confirm that all completed questionnaires were provided by qualified participants who met the predefined inclusion criteria of the study. This step ensured that the data reflected the target population of university students and excluded responses from ineligible or incomplete cases, thereby enhancing the representativeness and internal validity of the dataset (Sekaran & Bougie, 2020).

Second, the dataset was examined for missing values. Missing data can distort parameter estimates and reduce statistical power if not appropriately addressed (Enders, 2010). The screening results indicated that the dataset was free from missing values, as the online survey platform required mandatory responses for all measurement items. Consequently, no imputation or case deletion procedures were necessary, and the full sample was retained for analysis.

Third, response quality was assessed through the detection of straightlining behavior using the standard deviation (SD) index, a widely adopted technique for identifying careless or non-differentiated responding in survey research (Hair et al., 2022). The SD index was computed for each respondent across all measurement items and across each construct. Straightlining refers to the tendency of respondents to choose

identical or nearly identical scale points across multiple items, reflecting low response variability and insufficient cognitive engagement (Sturgis & Brunton-Smith, 2023).

Overall, the data screening procedures confirmed that the dataset was clean, complete, and free from response biases that could adversely affect the analysis. As a result, the data were deemed suitable for further statistical analyses, including reliability testing, validity assessment, and hypothesis testing.

3.10.2 Data Coding

Following the completion of data screening procedures, the next step involved systematic data coding to facilitate accurate and efficient statistical analysis. Data coding refers to the process of assigning numerical labels and variable identifiers to individual questionnaire items so that they can be recognized and processed by statistical software packages (Hair et al., 2019; Sekaran & Bougie, 2020). Proper data coding is essential for ensuring consistency, minimizing analytical errors, and enabling reliable descriptive and inferential analyses.

In this study, each measurement item was coded according to its corresponding construct and item number. Specifically, items were labeled using a structured naming convention that reflected both the theoretical construct and the sequential position of the item within that construct (e.g., IPF1–IPF6 for intrapersonal factors, SEF1–SEF7 for social environmental factors). This approach enhances clarity and traceability between the questionnaire, dataset, and analytical outputs, which is particularly important in multivariate and structural equation modeling analyses (Tabachnick & Fidell, 2019).

All coded variables were entered into the statistical analysis software using consistent numeric formats, with Likert-scale responses coded in ascending order to reflect increasing levels of agreement or importance. Such standardized coding ensures that the directionality of the constructs is preserved and that the software can accurately compute descriptive statistics, reliability coefficients, correlations, and model estimates (Hair et al., 2022). Additionally, consistent coding conventions reduce the risk of data entry errors and facilitate replication and transparency in empirical research (Field, 2018).

Overall, the data coding process ensured that the dataset was logically structured, analytically compatible, and fully prepared for subsequent statistical

procedures. As a result, the coded dataset enabled the effective execution of descriptive analyses, reliability and validity assessments, and hypothesis testing in alignment with the study's conceptual framework.

3.11 Data Analysis

Data analysis for this study was conducted using a two-stage approach comprising descriptive and inferential statistical techniques. Descriptive statistics were first employed to summarize the characteristics of the respondents and the measurement instrument. Subsequently, inferential statistics were applied using Partial Least Squares Structural Equation Modeling (PLS-SEM) to test the measurement and structural models in accordance with the study's conceptual framework. PLS-SEM was deemed appropriate due to its suitability for theory development, complex models, and prediction-oriented research (Hair et al., 2022; Sarstedt et al., 2021).

3.11.1 Descriptive Statistics

Descriptive statistics were used to provide an initial overview of the dataset and to summarize the central tendencies and dispersion of the study variables. This step is essential for understanding the distributional properties of the data and for identifying any anomalies prior to inferential analysis (Field, 2018; Tabachnick & Fidell, 2019).

3.11.2 Descriptive Statistics of the Instrument

Descriptive statistics of the measurement instrument were computed for all items across the intrapersonal, social environmental, physical environmental, societal, food allergy, and food choice behavior constructs. Measures of central tendency (mean) and variability (standard deviation) were calculated to assess respondents' overall perceptions and response patterns for each item.

The examination of item-level descriptive statistics enabled the identification of items with extreme mean values or unusually low variability, which could indicate potential measurement issues such as ceiling or floor effects (Hair et al., 2019). The results demonstrated acceptable variability across items, suggesting that the instrument was capable of capturing meaningful differences in respondents' perceptions and behaviors.

3.11.3 Descriptive Statistics of the Respondent's Profile

Descriptive statistics were also used to summarize the demographic and background characteristics of the respondents, including variables such as gender, age, level of study, and other relevant profile attributes. Frequencies and percentages were reported for categorical variables. This analysis provided an overview of the sample composition and ensured transparency regarding the characteristics of the respondents. Such profiling is essential for assessing the representativeness of the sample and for contextualizing the study findings within the target population of university students (Sekaran & Bougie, 2020).

3.11.4 Inferential Statistics

Inferential statistical analysis was conducted using PLS-SEM, implemented through SmartPLS software. PLS-SEM allows for the simultaneous assessment of the measurement and structural models and is particularly suitable for models involving multiple constructs, mediating or moderating relationships, and non-normal data distributions (Hair et al., 2022; Henseler et al., 2016).

3.11.4.1 Measurement Model Assessment

The measurement model was evaluated to assess the reliability and validity of the reflective constructs used in the study. Indicator reliability was examined by evaluating outer loadings, with values of 0.70 or higher considered acceptable (Hair et al., 2019). Internal consistency reliability was assessed using Cronbach's alpha and composite reliability (CR), with threshold values of 0.70 indicating satisfactory reliability.

Convergent validity was evaluated using the average variance extracted (AVE), with values of 0.50 or higher indicating that the construct explains more than half of the variance of its indicators (Fornell & Larcker, 1981). Discriminant validity was assessed using the Fornell–Larcker criterion and the heterotrait–monotrait (HTMT) ratio. HTMT values below 0.85 were considered indicative of adequate discriminant validity (Henseler et al., 2015).

These procedures ensured that the measurement items reliably and validly represented their respective latent constructs prior to hypothesis testing.

3.11.4.2 Structural Model Assessment

Following the establishment of a satisfactory measurement model, the structural model was assessed to examine the hypothesized direct and moderating relationships among the latent constructs using Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS 4. The evaluation of the structural model adhered to established methodological guidelines to ensure the robustness, validity, and predictive capability of the proposed model (Hair et al., 2019; Hair et al., 2022).

Prior to hypothesis testing, potential collinearity among the predictor constructs was assessed using variance inflation factor (VIF) values. All VIF values were below the conservative threshold of 5, indicating the absence of critical multicollinearity concerns and confirming that the estimated path coefficients were not adversely affected by collinearity issues (Hair et al., 2019).

The significance and strength of the hypothesized relationships were evaluated using a non-parametric bootstrapping procedure with 5,000 resamples, as recommended for PLS-SEM analyses to obtain stable and reliable parameter estimates (Hair et al., 2019). The statistical significance of the path coefficients (β) was determined using two-tailed hypothesis testing, with corresponding t-values and p-values derived from the bootstrapping results. Two-tailed tests were employed as the study did not impose a priori assumptions regarding the direction of the relationships, thereby providing a more conservative assessment of statistical significance.

The explanatory power of the structural model was assessed using the coefficient of determination (R^2), which indicates the proportion of variance in each endogenous construct (i.e., food choice behavior) explained by its respective exogenous predictors. In addition, effect sizes (f^2) were calculated to evaluate the relative contribution of each exogenous construct to the R^2 values of the endogenous variables, following Cohen's (1988) guidelines for small, medium, and large effects.

a) Moderation Analysis

This study went beyond assessing direct effects by conducting a moderation analysis to explore how food allergy moderates the relationships between intrapersonal factors, social environmental factors, physical environmental factors, societal factors,

and food choice behaviour among university students. Moderation takes place when the strength or direction of the relationship between an independent variable and a dependent variable changes based on the level of a third variable, known as the moderator (Dawson, 2015; Memon et al., 2019).

The moderation analysis was conducted following the confirmation of the significance of the direct effects. The moderator construct (food allergy) was defined as an ordinal variable and met all necessary criteria for evaluating the reflective measurement model, including indicator reliability, internal consistency reliability, convergent validity, and discriminant validity, before being incorporated into the structural model (Hair et al., 2021). All analyses were performed utilising SmartPLS 4.

The two-stage approach was employed to estimate the moderation effects, as this approach is appropriate for models involving latent variable interactions and enhances estimation accuracy when both the predictor and moderator constructs are measured reflectively. The same evaluation criteria applied to the direct-effects structural model were extended to the moderation model.

Particular emphasis was placed on the effect size (f^2) of the interaction terms, which reflects the extent to which the inclusion of the moderator increased the explanatory power of the endogenous construct. A statistically significant interaction path coefficient, together with a meaningful f^2 value, was interpreted as evidence that food allergy exerted a significant moderating effect on the relationship between the respective environmental factors and food choice behavior.

3.11.4.3 $PLS_{predict}$

To further evaluate the model's predictive performance, PLSpredict was employed as a holdout sample-based procedure. PLSpredict assesses the out-of-sample predictive power of PLS-SEM models by comparing prediction errors against a benchmark linear regression model (Shmueli et al., 2019).

Prediction errors were evaluated using Root Mean Squared Error (RMSE) and Mean Absolute Error (MAE) metrics. A PLS-SEM model is considered to demonstrate medium to strong predictive power when the majority of indicators yield lower prediction errors than the benchmark model (Hair et al., 2022). The inclusion of PLSpredict strengthens the methodological rigor of the study by addressing both

explanatory and predictive objectives, which is increasingly emphasized in contemporary SEM research (Shmueli et al., 2019).

3.11 Chapter Summary

This chapter provides a comprehensive discussion of the research design, including the unit of analysis, population and sample size, development of instrumentation, pre-testing and validation of the instrument, data collection method and data analysis procedure. The justification for the choice of methodology was provided, and the steps that followed were outlined to facilitate a comprehensive discussion and draw conclusive statements, which then informed the next phase of the research process. This study encompasses a larger sample size, which enhances the accuracy in representing the diversity among university students and the overall population. Therefore, a quantitative approach has been utilized to gather and analyse the data that has been collected.

CHAPTER 4
FINDING AND DISCUSSION

4.1 Chapter Overview

This study has reviewed several studies on the factors that influence the food choices of students with food allergies in order to answer the research question. A review of the literature on the factors that influence food choice behavior revealed that there are four main environmental factors that affect the food choices of university students. These factors include intrapersonal (individual), social, physical, and societal influences. The findings suggest that there are four main factors that have the greatest influence on food choices: intrapersonal factors (related to personal preferences and beliefs), social factors (influenced by interactions with others), physical factors (related to the availability and accessibility of food), and societal factors (influenced by social and environmental factors). An assessment of the moderation relationship among the factors is also conducted. This section concludes with a summary of the chapter.

4.2 Data Preparation

Before conducting statistical analysis, several data preparation steps were undertaken to ensure the accuracy, reliability, and validity of the dataset. The raw data collected through the survey was systematically coded, screened, and cleaned to ensure its suitability for analysis using SmartPLS4. The following subsections describe the procedures implemented.

4.2.1 Data Coding

Each questionnaire item was coded according to the specific construct it was designed to measure. Items representing intrapersonal, social, physical, and societal influences, as well as food allergy and food choice behaviour, were systematically labeled to correspond with their respective latent variables in SmartPLS. For Likert-scale items, numerical values were assigned consistently (e.g., 1 = strongly disagree, 5 = strongly agree) to maintain comparability across constructs. Demographic and

categorical variables were also recoded into numeric form to facilitate statistical analysis. This structured coding ensured that the dataset was organized logically, enabling clear identification of measurement indicators within each construct during subsequent analyses.

4.2.2 Data Screening

Prior to analysis, the dataset underwent a rigorous screening process to ensure completeness and consistency. Out of the total responses received, 581 respondents consented to participate in the study. However, only 574 respondents were retained for analysis. The exclusion was based on the eligibility criterion that participants must have a self-reported food allergy. Specifically, seven respondents indicated that they did not have any food allergy and were therefore excluded from the final dataset. Consequently, the valid sample size used for further analysis was n = 574.

4.2.3 Straightlining

Perfect straightlining refers to providing the exact same answer to every question in a series, whereas partial straightlining indicates a tendency to give unusually similar responses to consecutive questions within that series (Skogen et al., 2025). To detect potential straightlining behavior, the dataset was examined for instances. Responses with a standard deviation of less than 0.25 were excluded due to low variability (Wijesinghe et al., 2025). In this study, no cases met this criterion. Therefore, no responses were removed due to straightlining. This indicates that the respondents provided sufficiently varied answers, ensuring the reliability of the dataset for further analysis.

In summary, the data preparation process involved systematic coding of all items according to their respective constructs, rigorous screening to ensure that only eligible respondents were included, and checks for straightlining to safeguard against response bias. After these procedures, a total of 574 valid responses were retained for further analysis. With the dataset cleaned and validated, the next section presents the descriptive analysis of the respondents' demographic characteristics and key study variables.

4.2.4 Missing Values

In this study, the issue of missing data was addressed at the data collection stage. The online questionnaire was administered using Google Forms, which was preset to require participants to provide responses for every item before submission. This design ensured that incomplete questionnaires could not be submitted, thereby eliminating the possibility of missing values in the dataset. As a result, no missing data treatment procedures were necessary, and the dataset was complete and ready for subsequent analysis.

4.2.5 Outliers

Outlier assessment is commonly conducted in quantitative research to identify observations that deviate substantially from the overall data pattern and may potentially influence statistical results (Hair et al., 2022). Outliers may arise due to data entry errors, unusual respondent characteristics, or response patterns that differ markedly from the majority of observations (Tabachnick & Fidell, 2019). In studies involving continuous variables with unrestricted values, extreme observations can distort parameter estimates, bias standard errors, and compromise the validity of statistical inferences (Hair et al., 2022).

In the present study, all constructs were measured using five-point Likert Scale items ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Due to the response options were restricted to a predefined and finite range, the possibility of obtaining extreme univariate values was inherently limited (Huh & Gim, 2025). Unlike continuous measurements that permit an extensive range of numerical values, Likert Scale responses constrain the magnitude of individual observations and consequently reduce the likelihood of extreme scores exerting disproportionate influence on the analysis (South et al., 2022).

Furthermore, the study employed latent constructs represented by multiple indicators rather than relying on single-item measurements. The aggregation of multiple items into composite constructs tends to stabilise individual response variations and minimise the impact of any isolated response pattern. Given the large sample size and the bounded nature of the measurement scale, the data were considered less susceptible to the presence of influential univariate outliers (Tabachnick & Fidell, 2019).

Nevertheless, it is acknowledged that multivariate outliers may still occur in datasets comprising Likert Scale responses due to unusual combinations of responses across variables (Tabachnick & Fidell, 2019). However, since the data screening procedures revealed no evidence of data entry errors, implausible response patterns, or observations that could unduly influence the estimation process, no cases were removed on the basis of outlier considerations. Consequently, all valid responses were retained for subsequent analyses to preserve the representativeness and statistical power of the study.

4.2.6 Assumption Tests

Before proceeding with hypothesis testing using Partial Least Squares Structural Equation Modeling (PLS-SEM), it is essential to evaluate the underlying statistical assumptions to ensure that the dataset is suitable for analysis. The assumptions commonly considered include normality, linearity, constant variance (homoscedasticity) and autocorrelation. Each assumption is discussed in the following subsections.

4.2.6.1 Normality

In covariance-based SEM and regression analyses, multivariate normality is a key assumption. However, PLS-SEM is a variance-based technique that does not require data to follow a multivariate normal distribution (Hair et al., 2022). Since all items were measured using a five-point Likert scale, the data are bounded within a discrete range. Given the nature of Likert-type data, perfect normality cannot be assumed. However, PLS-SEM is robust to non-normal data distributions, and therefore the lack of strict normality does not compromise the validity of the analysis (Hair et al., 2022). Given that PLS-SEM is robust to deviations from normality, the dataset was deemed appropriate for analysis.

4.2.6.2 Linearity

PLS-SEM assumes that the relationships between observed indicators and their corresponding latent constructs, as well as between the latent constructs in the structural

model, are linear (Hair et al., 2022). SmartPLS does not provide a direct statistical test for linearity; therefore, this assumption must be assessed conceptually. In this study, all constructs were measured using five-point Likert scales, which are widely regarded in social science and educational research as producing data that reasonably approximate linear relationships (Joshi et al., 2015; Tanujaya et al., 2022). Accordingly, the assumption of linearity was considered satisfied for the purposes of this analysis.

a) Constant Variance (Homoscedasticity)

Homoscedasticity refers to the assumption that the variance of residuals is constant across all levels of the independent variables (Ohaegbulem & Iheaka, 2024). In PLS-SEM, heteroscedasticity does not bias path coefficient estimates but may affect the precision of standard errors and hypothesis testing (Kumar, 2023). To account for potential heteroskedasticity and non-normality in the data, bootstrapping with 5,000 resamples was conducted in SmartPLS 4 to derive robust standard errors and 95% confidence intervals for path coefficients (Obenza et al, 2025; Streukens & Leroi-Werelds, 2016). Hence, the analysis remains valid regardless of whether homoscedasticity is perfectly satisfied.

b) Autocorrelation

Autocorrelation commonly occurs in time series data, where observations from one time frame are linked to those from earlier time frames (Kumar, 2023). Since this study employed cross-sectional survey data collected at a single point in time, autocorrelation was not applicable. Consequently, no further testing was required in this context.

4.3 Assessment of Response Bias

Given that the data for this study were collected over a four-month period, from 28th May 2024 until 25th September 2024, it was important to examine whether response bias was present. Response bias, particularly non-response bias, can occur if the characteristics or responses of participants differ systematically between early and

late respondents (Si et al, 2024; Armstrong & Overton, 1977). Such differences may threaten the representativeness of the sample and, consequently, the validity of the study's findings.

To assess this potential bias, the early–late respondent technique was employed, which is a widely accepted procedure in survey-based research (Armstrong & Overton, 1977). The underlying assumption is that late respondents are more similar to non-respondents; hence, significant differences between early and late groups may indicate response bias. In this study, the dataset was first arranged chronologically by submission date and time. The earliest 30% of responses were categorised as "early respondents," while the latest 30% of responses were categorised as "late respondents." This grouping allowed for meaningful comparison across the two sets of respondents.

Construct scores were computed by averaging the items corresponding to each latent variable (intrapersonal, social, physical, societal influences, and food choice behaviour). Independent-samples t-tests with Welch's adjustment for unequal variances were then conducted to compare the means between early and late respondents for each construct. The results revealed no statistically significant differences across all constructs (all $p > 0.05$). In addition, the effect sizes (Cohen's d) were consistently small ($|d| < 0.20$), suggesting that any observed mean differences were negligible in practical terms. Furthermore, a comparison of demographic characteristics such as gender, age group, and academic year across early and late groups using Chi-square tests also indicated no significant differences (all $p > 0.05$).

Taken together, these findings indicate that response bias is unlikely to be a threat to the validity of this study. Both early and late respondents exhibited similar patterns of responses on the study constructs as well as comparable demographic distributions. Hence, the data collected can be considered robust and representative of the target population.

Table 4.1
Response Bias Analysis

Construct	Early Respondents (M, SD)	Late Respondents (M, SD)	t(df)	p-value	Cohen's d	Decision
Intrapersonal Factors	4.17 (0.63)	4.32 (0.67)	-2.037 (342)	0.042	-0.22	Significant difference (small effect)

Social Environmental Factors	4.16 (0.53)	4.29 (0.59)	-2.269 (342)	0.024	-0.24	Significant difference (small effect)
Physical Environmental Factors	4.18 (0.61)	4.35 (0.63)	-2.473 (342)	0.014	-0.27	Significant difference (small effect)
Societal Factors	4.16 (0.66)	4.31 (0.67)	-1.964 (342)	0.050	-0.22	Significant difference (small effect)

Based on the Table 4.1, the results indicated a statistically significant difference between early and late respondents for Intrapersonal Factors (p = .042). However, the effect size was small (d = -0.22), suggesting that while the difference exists, it is minimal and does not strongly indicate response bias. Although the difference between early and late respondents on Social Environmental Factors was statistically significant (p = .024), the effect size was small (d = -0.24). This suggests that while the groups differ slightly, the magnitude of the difference is minimal and unlikely to compromise the validity of the study. Furthermore, the results indicated a statistically significant difference between early and late respondents for Physical Environmental Factors (p = .014). However, the effect size was small (d = -0.27), suggesting that while differences exist, they are minor and unlikely to indicate substantial response bias. Last but not least, the results indicated a statistically significant difference between early and late respondents for Societal Factors (p = .041). However, the effect size was small (d = -0.22), suggesting the difference is minor. Therefore, no serious response bias concern was detected.

In conclusion, the results of the independent-samples t-tests (Comparisons between early and late respondents) are presented in Table 4.1 indicated statistically significant differences across all four constructs (Intrapersonal, Social Environmental, Physical Environmental and Societal factors) with p-values ranging between .014 and .042. Despite these significant findings, the effect sizes for all constructs were small (Cohen's d ranging from -0.22 to -0.27). This suggests that the magnitude of the differences between early and late respondents was minimal and does not indicate any meaningful systematic bias. Therefore, the results provide reasonable evidence that non-response bias was not a serious issue in this study, and the dataset can be considered reliable for subsequent analyses.

4.4 Assessment of Common Method Bias

Common Method Bias (CMB) refers to spurious covariance shared among variables due to the measurement method rather than the constructs the measures represent (Kock et al., 2021). It may arise when both independent and dependent variables are collected from the same respondents using a single survey instrument and a common response format (e.g., Likert-type scales) (Kock et al., 2021). Given that this study employed a cross-sectional survey design with self-reported measures, it was necessary to assess the potential presence of CMB prior to hypothesis testing.

Following the recommendations for variance-based structural equation modelling (PLS-SEM), common method bias was assessed using the full collinearity test in SmartPLS version 4.0. This approach examines Variance Inflation Factor (VIF) values by regressing each latent construct on all other constructs in the model (Kock, 2015; Hair et al., 2017). If the inner VIF values exceed the conservative threshold of 3.3, common method bias may be present; values below this cut-off suggest that CMB is unlikely to pose a serious concern (Kock, 2015; Hair et al., 2017).

Table 4.2 presents the full collinearity VIF values for the endogenous constructs. The VIF values obtained were 1.975 for Food Allergy (FA), 2.788 for Intrapersonal Factors (IPF), 3.109 for Social Environmental Factors (SEF), 3.216 for Physical Environmental Factors (PEF), and 3.259 for Societal Factors (SF). All VIF values were below the threshold of 3.3. Therefore, the results indicate that multicollinearity is not a critical issue and that common method bias is unlikely to substantially distort the relationships among Food Allergy (FA), Food Choice Behaviour (FCB), Intrapersonal Factors (IPF), Social Environmental Factors (SEF), Physical Environmental Factors (PEF), and Societal Factors (SF).

In addition to the statistical assessment, procedural remedies were implemented at the design stage to minimize the likelihood of common method bias. These included ensuring respondent anonymity, reducing evaluation apprehension, and carefully wording the questionnaire items to avoid ambiguity and leading statements such procedural strategies are recommended as primary safeguards against CMB in behavioral research (Podsakoff et al., 2024).

Overall, the findings from the full collinearity assessment using SmartPLS 4, together with the procedural remedies adopted, suggest that common method bias does not pose a serious threat to the validity of the results in this study.

Table 4.2
Common Method Bias Analysis

	FA	FCB	IPF	SEF	PEF	SF
Food Allergy		1.975				
Food Choice Behaviour						
Intrapersonal Factors		2.788				
Social Environmental Factors		3.109				
Physical Environmental Factors		3.216				
Societal Factors		3.259				

4.5 Demographic Information

After cleaning and testing all the data with the necessary assumptions, the next step is to conduct the descriptive analysis. This study, as mentioned in the previous chapter, does not include any direct personal interaction between the researcher and the respondents. Consequently, all the tests conducted significantly contribute to identifying any issues related to the response rate, as do the distributed questionnaires. The demographic details of the respondents are highlighted in Table 4.3. All respondents (n=581) consented to participate but only 574 respondents were completed the questionnaire in its entirety. This is due to that out of the total responses, only 574 individuals reported having a food allergy, whereas 7 respondents did not have any food allergy. As a result, these 7 respondents were unable to fully complete the questionnaire. According to Table 4.3, the majority of the respondents were between the ages of 21 to 24 years old, accounting for 43.7% (n=251) of the total respondents; followed by the age of 18 to 20 which is approximately 18.3% (n=105); and 45 and above of age has 5.2% (n=30) respondents. There are 344 male students, or 59.9% of the student population. In contrast, the number of female students is 230 and the proportion is 40.1%. This indicates that the majority of students who responded to the survey are male students. Based on the ethnicity of the students, Malay students has dominated the total number of responses when compared to other ethnicity which is 93.9% (n=539); followed by Indian students with 3.8% (n=22); and the least number of participants are from Chinese students with 2.3% (n=13) responses in total. Out of all the programs, the data collected shows that degree students hold the biggest number of the respondents which is 54% (n=310); Diploma students have the percentage of 35.7% (n=205);

followed by foundation students that holds 2.4% (n=14) responses in total. Meanwhile for Master students has percentage of 2.1% (n=12); and 5.7% (n=33) Pre-diploma students. Unfortunately, there are 0% (n=0) of students from Doctor of philosophy.

Furthermore, the highest percentage of food allergy diagnostic is from doctor's diagnosis which is 50.9% (n=292); followed by skin prick test with 59.6% (n=342); blood test with 55.4% (n=318); food challenge with 26.1% (n=150); and self-diagnosed with 30% (n=172). Majority of the respondents were allergy to squid which is 36.8% (n=211) in total; followed by cockle with 34.5% (n=198); prawn with 30.8% (n=177); anchovy with 28.2% (n=162); egg with 27.4% (n=157); milk with 24% (n=138); mackerel with 23.9% (n=137); crab with 20.7% (n=119); soy with 19.7% (n=113); mutton with 14.3% (n=82); wheat with 14.4% (n=81); beef with 9.8% (n=56); rice with 8.5% (n=49); chicken with 6.1% (n=35); banana with 6.1% (n=35) and the lowest percentage of respondent who have a food allergy is to strawberries, with only 0.2% (n=1). Majority of respondents with 57.5% (n=330) do have member of their family living with them suffer from a food allergy and another 42.5% (n=244) do not have any family member that suffer from food allergy. Out of a total of 574 participants, 149 individuals, which accounts for 61.3% of the sample, had food allergies that were inherited from their mothers; followed by their fathers 31.3% (n=76); and siblings 16.9% (n=41).

In addition, 299 (52.1%) participants reported experiencing food allergy symptoms twice in 12 months; followed by 237 (41.3%) participants experiencing multiple times within 12 months; 35 (6.1%) participants experiencing once within 12 months; and only 3 (0.5%) participants did not experience any food allergy symptoms within 12 months. During the allergic reaction, majority of participants, specifically 53.1% (n=305), reported swelling (edema) on the face, lips, neck, or tongue. In contrast, least number of participants, specifically 16.4% (n=94), suffered diarrhea as a result of the allergic reaction. A total of 52.6% (n=302) participants were experienced severe allergic reaction; followed by 42.9% (n=246) had a mild reactions and 4.5% (n=26) could threaten their lives. 48.1% (n=276) participants reported that food allergy has moderate effect their diet; followed by 20.7% (n=157) of participants reported that food allergy has slightly effect on their diet; 14.1% (n=119) reported that food allergy affect their diet very much. 2.3% (n=13) of respondents reported that food allergies greatly affected their diet; and 1.6% (n=9) reported that food allergies did not affect their diet.

Table 4.3
Respondents Profile

Demographic	Categories	n=574	Percentage (%)
Age	18 – 20	105	18
	21 – 24	251	45.5
	25 – 44	188	32.3
	45 and above	30	4.2
Ethnicity	Malay	539	93.9
	Chinese	13	2.3
	Indian	22	3.8
Gender	Male	344	59.9
	Female	230	40.1
Education Level	Foundation	14	2.4
	Pre-diploma	33	5.7
	Diploma	205	35.7
	Degree	310	54
	Master	12	2.1
	Doctor of Philosophy	0	0
How were you diagnosed with food allergy?	Self-diagnosed	172	30
	Skin prick test	342	59.6
	Blood test	318	55.4
	Doctor's diagnosis	292	50.9
	Food challenge	150	26.1
What foods are you allergic to?	Crab	119	20.7
	Prawn	177	30.8
	Squid	211	36.8
	Cockle	198	34.5
	Mackerel	137	23.9
	Anchovy	162	28.2

	Milk	138	24
	Egg	157	27.4
	Soy	113	19.7
	Wheat	81	14.1
	Rice	49	8.5
	Mutton	82	14.3
	Beef	56	9.8
	Chicken	35	6.1
	Banana	35	6.1
	Strawberry	1	0.2
Does another member of your family living with you suffer from a food allergy?	Yes	244	42.5
	No	330	57.5
If yes, how is he/she related to you?	Father	76	31.3
	Mother	149	61.3
	Siblings	41	16.9
Frequency of symptoms within the last 12 months	Once	35	6.1
	Twice	299	52.1
	Many times	237	41.3
	Not at all	3	0.5
Symptoms Experienced	Hives (itchy rash / bites)	131	22.8
	Stomach cramps	220	38.3
	Swelling (edema) of face/lips/throat/tongue swells up	305	53.1
	Sick/vomiting	274	47.7
	Difficulty breathing, e.g. asthma	267	46.5
	Loss of consciousness	182	31.7
	Diarrhea	94	16.4
Severity of Allergic Reactions	Mild	246	42.9
	Severe	302	52.6

	Life threatening	26	4.5
How does your food allergy affect your diet?	Not at all	9	1.6
	Slightly	157	27.4
	Moderately	276	48.1
	Very much	119	20.7
	Extremely	13	2.3

4.6 Descriptive Analysis of Instrument

A calculation of the mean, the standard deviation, and the variance was carried out with the assistance of the SmartPLS 4. Table 4.4 contains the results of the descriptive analysis that was performed on all of the indicators that were included in the study. This analysis included the reporting of the mean, standard deviation, variance, which included the minimum and maximum values for each item.

The mean score for the IPF construct ranged from 4.200 to 4.385, which suggested that the respondents had high agreement with the statements. The highest mean score was for IPF4, indicating that the respondents were more likely to read food labels on food when they are not familiar with. This may suggest that the respondents could concentrate on the ingredient list and any "contains" or "may contain" statements to pinpoint potential allergens. On the other hand, the lowest mean score was for IPF1. This suggested that the respondents' food choice behavior were not entirely disrupted when they are stressed. Some individuals may find themselves consuming more of certain foods (such as high-fat, high-sugar options) when under stress, while others might eat less, and some may not alter their food choices at all.

The SEF construct, which focused on social environmental factors, yielded high mean scores across all items ranged between 4.178 and 4.416. The highest mean score was observed for SEF4, suggesting that respondents were more inclined to express to their family their intention to prepare food separately in order to prevent cross-contamination with food allergens. This may indicate that consuming home-prepared meals can greatly lower the risk of cross-contamination with food allergens in comparison to dining out. Conversely, the lowest mean score was recorded for SEF7, indicating that respondents occasionally find it challenging to participate in social events due to feelings of exclusion stemming from their food allergies. This is accurate

as event attendees with food allergies had their experiential expectations negatively impacted by inherent risks from the beginning (Weber & Lugosi, 2021).

Within the range of 4.220 to 4.409, the mean score for the PEF construct was found to be. The PEF5 category received the highest mean score of 4.409, which indicates that respondents are in complete agreement that they take the required efforts to avoid allergens included within their environment. The fact that the mean scores for PEF1, PEF2, PEF3, PEF4, PEF6, and PEF7 ranged from 4.220 to 4.380 demonstrates that respondents had a very high degree of agreement about the pricing, affordability, information, and location of allergen-free food choices.

The average score for the SF construct varied from 4.171 to 4.265, suggesting that the respondents showed high to very high levels of agreement with the statements. The respondents demonstrated a significant level of agreement regarding the factors that influenced them in relation to social media, food advertisements, and public awareness. Among the individual items, SF6 achieved the highest mean score of 4.265, indicating that society's perception of food allergies influences their food choices. Conversely, SF3 recorded the lowest mean score of 4.171, suggesting a somewhat diminished impact of television viewing on the subconscious desire for food, despite its potential to provoke their allergy reaction. Overall, the high mean scores indicated a positive perspective on the societal factors that may influence food choices, particularly for those with food allergies.

Table 4.4
Descriptive Analysis Result

Constructs	Items	Mean	Median	Min	Max	Standard deviation
Food Allergy	FA1	1.699	2.000	1.000	5.000	0.784
	FA2	1.723	2.000	1.000	5.000	0.793
Food Choice Behavior	FCB1	4.317	4.000	1.000	5.000	0.786
	FCB2	4.253	4.000	1.000	5.000	0.856
	FCB3	4.244	4.000	1.000	5.000	0.822
Intrapersonal Factors	IPF1	4.200	4.000	1.000	5.000	0.887
	IPF2	4.289	4.000	1.000	5.000	0.868
	IPF3	4.378	5.000	1.000	5.000	0.886

	IPF4	4.385	5.000	1.000	5.000	0.772
	IPF5	4.366	4.000	1.000	5.000	0.769
Social Environmental Factors	SEF1	4.221	4.000	1.000	5.000	0.878
	SEF2	4.416	5.000	1.000	5.000	0.809
	SEF3	4.359	5.000	1.000	5.000	0.818
	SEF4	4.280	4.000	1.000	5.000	0.746
	SEF5	4.178	4.000	1.000	5.000	0.830
Physical Environmental Factors	PEF1	4.251	4.000	1.000	5.000	0.861
	PEF2	4.319	5.000	1.000	5.000	0.909
	PEF3	4.279	4.000	1.000	5.000	0.900
	PEF4	4.220	4.000	1.000	5.000	0.775
	PEF5	4.409	5.000	1.000	5.000	0.836
	PEF6	4.301	5.000	1.000	5.000	0.888
Societal Factors	SF1	4.190	4.000	1.000	5.000	0.812
	SF2	4.171	4.000	1.000	5.000	0.946
	SF3	4.228	4.000	1.000	5.000	0.834
	SF4	4.235	4.000	1.000	5.000	0.784
	SF5	4.265	4.000	1.000	5.000	0.841

4.7 Measurement Model Assessment

The measurement model assessment was conducted using SmartPLS version 4, following the two-stage analytical procedure recommended for partial least squares structural equation modeling (PLS-SEM), which involves the evaluation of the measurement model prior to the assessment of the structural model (Anderson & Gerbing, 1988; Hair et al., 2022). This approach ensures that the constructs are measured reliably and validly before examining the hypothesized relationships among latent variables.

In this study, all latent constructs were operationalized as reflective measurement models, as the indicators were assumed to be manifestations of the underlying constructs, expected to be highly correlated, interchangeable, and exhibit internal consistency (Hair et al., 2019). Reflective measurement models are appropriate

when changes in the latent construct lead to changes in all associated indicators, and when the indicators collectively represent a single conceptual domain.

The assessment of the reflective measurement model focused on indicator reliability, internal consistency reliability, convergent validity, and discriminant validity, in line with established PLS-SEM guidelines (Hair et al., 2017; Henseler et al., 2015). Indicator reliability was examined through outer loadings, with values of 0.70 or higher indicating that the indicators explain a substantial proportion of the variance in their respective constructs (Hair et al., 2022). Indicators with loadings below the recommended threshold were considered for removal only if their exclusion led to improvements in composite reliability and convergent validity while maintaining content validity.

Internal consistency reliability was evaluated using Cronbach's alpha (α) and composite reliability (CR). While Cronbach's alpha provides a lower-bound estimate of reliability, composite reliability is preferred in PLS-SEM as it does not assume tau-equivalence among indicators (Hair et al., 2019). Values ranging between 0.70 and 0.95 were considered acceptable, indicating satisfactory internal consistency without redundancy among indicators (Hair et al., 2022).

Convergent validity was assessed using the average variance extracted (AVE), which measures the extent to which a construct explains the variance of its indicators. An AVE value of at least 0.50 indicates that the construct accounts for more than half of the variance of its indicators, thus demonstrating adequate convergent validity (Fornell & Larcker, 1981).

Discriminant validity was evaluated using the Heterotrait–Monotrait (HTMT) ratio of correlations, which is currently regarded as a more reliable and sensitive criterion than traditional methods such as the Fornell–Larcker criterion (Henseler et al., 2015). HTMT values below 0.85 (or 0.90 for conceptually similar constructs) were considered indicative of adequate discriminant validity, suggesting that the constructs are empirically distinct from one another (Hair et al., 2022).

To test the statistical significance of indicator loadings and to support the robustness of the measurement model, a bootstrapping procedure with 5,000 resamples was employed, using a two-tailed test. Bootstrapping is a non-parametric resampling technique that is well suited for PLS-SEM, as it does not rely on distributional

assumptions and provides stable estimates of standard errors and confidence intervals (Hair et al., 2017).

Overall, the measurement model assessment followed established methodological recommendations for reflective constructs in PLS-SEM, ensuring that the latent variables demonstrated satisfactory reliability and validity prior to proceeding with the structural model evaluation.

4.8 Indicator and Internal Consistency Reliability

The reliability of the reflective measurement model was assessed by examining indicator reliability and internal consistency reliability, in accordance with established guidelines for PLS-SEM analysis using SmartPLS version 4 (Hair et al., 2019; Hair et al., 2022). Internal consistency reliability reflects the extent to which the indicators of a construct consistently measure the same latent concept.

Indicator reliability was evaluated through outer loadings, where values of 0.70 or higher indicate that an indicator explains at least 50% of the variance of its underlying construct (Hair et al., 2017). As shown in Table 4.5, the majority of indicator loadings exceeded the recommended threshold of 0.70, supporting adequate indicator reliability. One indicator (PEF6) exhibited a loading slightly below 0.70; however, it was retained as the overall composite reliability and AVE values for the construct remained satisfactory, and content validity was preserved (Hair et al., 2022).

Table 4.5
Indicator Reliability, Internal Consistency Reliability and Convergent Reliability

Constructs	**Items**	**Outer Loadings >0.7**	**Cronbach's alpha (>0.7)**	**Composite reliability (rho_c) >0.7**	**Average Variance Extracted (AVE) (>0.5)**
Food Allergy	FA1	0.894	0.678	0.860	0.755
	FA2	0.843			
Food Choice Behavior	FCB1	0.802	0.709	0.709	0.633
	FCB2	0.825			
	FCB3	0.758			

Intrapersonal Factors	IPF1	0.830	0.844	0.863	0.614
	IPF2	0.807			
	IPF3	0.767			
	IPF4	0.747			
	IPF5	0.763			
Social Environmental Factors	SEF1	0.844	0.876	0.887	0.668
	SEF2	0.869			
	SEF3	0.838			
	SEF4	0.753			
	SEF5	0.776			
Physical Environmental Factors	PEF1	0.826	0.875	0.883	0.618
	PEF2	0.844			
	PEF3	0.795			
	PEF4	0.815			
	PEF5	0.739			
	PEF6	0.685			
Societal Factors	SF1	0.830	0.892	0.898	0.698
	SF2	0.877			
	SF3	0.842			
	SF4	0.806			
	SF5	0.821			

Internal consistency reliability was assessed using Cronbach's alpha (α) and composite reliability (ρc). Cronbach's alpha is a widely used measure of scale reliability and provides a conservative estimate by assuming equal indicator loadings (Sekaran & Bougie, 2016). Values between 0.60 and 0.70 are considered acceptable in exploratory research, while values above 0.70 indicate satisfactory reliability (Hair et al., 2019; Pallant, 2020).

However, in PLS-SEM, composite reliability (ρc) is preferred over Cronbach's alpha, as it account for the actual outer loadings of the indicators and does not assume tau-equivalence (Hair et al., 2022). Values exceeding 0.70 indicate adequate internal consistency, whereas values above 0.95 may suggest indicator redundancy (Hair et al., 2019).

As reported in Table 4.5, all constructs demonstrated composite reliability (ρc) values above the recommended threshold of 0.70, confirming satisfactory internal consistency reliability. Although the Cronbach's alpha value for the Food Allergy construct (α = 0.678) fell slightly below 0.70, this value is considered acceptable given the construct comprises only two indicators and is supported by strong composite reliability (ρc = 0.860), consistent with recommendations for short scales (Hair et al., 2017; Nunnally & Bernstein, 1994).

Specifically, Food Choice Behavior demonstrated acceptable reliability (α = 0.709), while Intrapersonal Factors, Social Environmental Factors, Physical Environmental Factors, and Societal Factors all exhibited high internal consistency, with Cronbach's alpha values ranging from 0.844 to 0.892. These results indicate that the measurement instruments used to assess food allergy and environmental factors influencing university students' food choice behavior are reliable and internally consistent.

Overall, the findings confirm that all constructs meet the minimum reliability requirements, providing strong support for the adequacy of the measurement model and allowing for subsequent assessment of convergent and discriminant validity.

4.9 Convergent Validity

Convergent validity refers to the extent to which multiple indicators of a construct converge or share a high proportion of variance in common (Hair et al., 2019). In PLS-SEM, convergent validity is commonly assessed using outer loadings, composite reliability (CR), and the average variance extracted (AVE) (Fornell & Larcker, 1981; Hair et al., 2022). A construct is considered to demonstrate adequate convergent validity when indicator loadings are sufficiently high (preferably ≥ 0.70), composite reliability exceeds 0.70, and AVE values are 0.50 or higher, indicating that the construct explains more than half of the variance of its indicators.

As presented in Table 4.5, the majority of indicators across all constructs exhibited outer loadings above the recommended threshold of 0.70, supporting indicator reliability and convergence on their respective latent constructs (Hair et al., 2017). One indicator under the Physical Environmental Factors construct (PEF6) recorded a loading slightly below 0.70 (0.685). However, this indicator was retained because the construct's overall composite reliability (ρc = 0.883) and AVE (0.618) exceeded the

recommended thresholds, and the item contributed to maintaining content validity (Hair et al., 2022).

All constructs demonstrated AVE values well above the minimum criterion of 0.50, ranging from 0.614 to 0.755, indicating strong convergent validity. Specifically, the Food Allergy construct achieved an AVE of 0.755, suggesting that a substantial proportion of variance in its indicators was captured by the latent construct. Although the Cronbach's alpha value for this construct ($\alpha = 0.678$) was marginally below 0.70, this is considered acceptable given the construct comprises only two indicators and is supported by a strong AVE and satisfactory composite reliability, consistent with prior methodological recommendations (Hair et al., 2017; Nunnally & Bernstein, 1994).

Similarly, Food Choice Behavior demonstrated adequate convergent validity, with all indicator loadings exceeding 0.75, a composite reliability of 0.709, and an AVE of 0.633. The remaining constructs Intrapersonal Factors, Social Environmental Factors, Physical Environmental Factors, and Societal Factors all exhibited strong convergent validity, as evidenced by high indicator loadings, composite reliability values exceeding 0.86, and AVE values ranging from 0.614 to 0.698.

Overall, the results confirm that convergent validity was successfully established for all constructs in the measurement model. The indicators demonstrated adequate convergence in representing their respective latent variables, thereby supporting the adequacy of the measurement model and justifying progression to the assessment of discriminant validity and the structural model.

4.10 Discriminant Validity

Discriminant validity assesses the extent to which a construct is empirically distinct from other constructs in the model, ensuring that each latent variable captures a unique phenomenon (Hair et al., 2019). Establishing discriminant validity is essential to confirm that the relationships observed in the structural model are not affected by conceptual overlap among constructs.

In this study, discriminant validity was primarily assessed using the Heterotrait–Monotrait (HTMT) ratio of correlations, which is currently regarded as the most reliable and stringent criterion for evaluating discriminant validity in variance-based structural equation modeling (Henseler et al., 2015). HTMT values below 0.85 indicate strict

discriminant validity, while values below 0.90 are considered acceptable for conceptually related constructs (Hair et al., 2022).

As shown in Table 4.6, all HTMT values were below the conservative threshold of 0.90, ranging from 0.659 to 0.884, thereby demonstrating adequate discriminant validity among all constructs. Although several construct pairs particularly between Food Choice Behavior and Social Environmental Factors (HTMT = 0.884), and between Food Choice Behavior and Physical Environmental Factors (HTMT = 0.849) exhibited relatively higher HTMT values, these remained within acceptable limits and are theoretically justifiable given the conceptual proximity of environmental influences on food choice behavior. Importantly, none of the HTMT values exceeded the recommended cutoff, indicating that the constructs are empirically distinguishable.

To further support these findings, discriminant validity was also examined using the Fornell–Larcker criterion. According to this criterion, the square root of the AVE for each construct should be greater than its correlations with other constructs (Fornell & Larcker, 1981). As reported in Table 4.7, the diagonal elements (square roots of AVE) for all constructs exceeded the corresponding inter-construct correlations, providing additional evidence of discriminant validity.

Taken together, the results from both the HTMT ratio and the Fornell–Larcker criterion confirm that discriminant validity was successfully established for all constructs in the measurement model. These findings indicate that each construct measures a distinct concept and that multicollinearity among latent variables is not a concern, thereby supporting the robustness of the measurement model and allowing for confident interpretation of the structural model results.

Table 4.6
Discriminant validity (HTMT)

Construct	**FA**	**FCB**	**IF**	**PEF**	**SEF**	**SF**
FA						
FCB	**0.876**					
IPF	0.659	**0.774**				
PEF	0.740	0.849	**0.773**			
SEF	0.736	0.884	0.763	**0.859**		
SF	0.668	0.742	0.849	0.807	**0.802**	

Table 4.7
Discriminant validity (Fornell-Lacker's Criterion)

	FA	FCB	IPF	PEF	SEF	SF
FA	0.869					
FCB	-0.613	0.795				
IPF	-0.514	0.620	0.783			
PEF	-0.585	0.682	0.672	0.786		
SEF	-0.579	0.706	0.657	0.754	0.817	
SF	-0.529	0.595	0.745	0.716	0.704	0.836

4.11 R-Square Value (R^2)

The coefficient of determination (R^2) was examined to assess the model's in-sample explanatory power, indicating the proportion of variance in the endogenous construct explained by its exogenous predictors (Hair et al., 2019). In PLS-SEM, R^2 serves as a key criterion for evaluating the predictive accuracy of the structural model, particularly for theory development and exploratory research contexts.

As shown in Table 4.8, the endogenous construct Food Choice Behavior (FCB) achieved an R^2 value of 0.658, indicating that 65.8% of the variance in food choice behavior among university students is explained by the predictor constructs included in the model. According to established guidelines, R^2 values of approximately 0.75, 0.50, and 0.25 can be described as substantial, moderate, and weak, respectively (Hair et al., 2017). Therefore, the obtained R^2 value reflects a moderate to substantial level of explanatory power, suggesting that the proposed model effectively explains food choice behavior in the context of food allergy.

To account for model complexity and the number of predictor variables, the adjusted R^2 value was also examined. The adjusted R^2 penalizes the inclusion of unnecessary predictors and provides a more conservative estimate of explained variance (Hair et al., 2022). In this study, the adjusted R^2 value for Food Choice Behavior was 0.653, which is only marginally lower than the R^2 value. The minimal difference between R^2 and adjusted R^2 indicates that the model does not suffer from overfitting and that the included predictors contribute meaningfully to explaining the variance in the endogenous construct.

Overall, the results demonstrate that the structural model exhibits adequate explanatory power, supporting the relevance of intrapersonal, social, physical, and societal factors in explaining food choice behavior among university students with food allergy.

Table 4.8
R^2 Values

	R-square	**R-square adjusted**
Food Choice Behavior (FCB)	0.658	0.653

According to Table 4.8, the R-Square value for Food Choice Behaviour is 0.658, which is equivalent to 65.8%. This indicates that the Food Choice Behaviour variable is influenced by the intrapersonal factors, social environmental factors, physical environmental factors, and societal factors variable by 65.8%. The remaining 34.2% of the variance is influenced by other variables that are not discussed in this study. The dependent variable (R^2 = .658) indicates a medium to strong correlation among the independent variables IPF, PEF, SEF, and SF, with the range being ($0 < (R^2 < 1$). When ($R^2 = 0$, it signifies that the independent variable fails to account for any variability in the dependent variable. When $R^2 = 1$, the independent variable fully accounts for the variability in the dependent variable, a scenario that is uncommon in practice (Ab Hamid et al., 2017).

4.12 Assessment of the Effect Size (f^2)

The f2 quantifies the relative influence of a predictor construct on endogenous constructs. According to Sullivan and Feinn (2012), as cited in Boscardin et al. (2024), it is crucial to report both effect size (substantive significance) and p-value (statistical significance) in addition to the p-value. Cohen (1988) provided a guideline for measuring effect size. The f^2 effect size is categorized as small (0.02), medium (0.15), or large (0.35) according to Cohen's (1988), as cited in Suhan (2018) criteria. Values below 0.02 indicate the absence of an effect (Braimllari, 2018; Hair et al., 2017). Table 4.9 displays the f^2 values, which assess the effect size.

Based on the findings, it was seen that the effect sizes of IPF, SF, and the interaction term (FA×SF) were relatively modest, with respective values of 0.008,

0.002, and 0.014. This indicates that these factors contributed to a relatively little amount of variability. Regarding SS, on the other hand, OCC did not have any impact. Aside from that, FA had a moderate impact (0.025), whilst PEF and SEF had a significant impact (0.046 and 0.047, respectively). Furthermore, the interaction term, which encompasses both FA×IPF and FA×SEF, also had a moderate impact. However, the interaction term, which was FA×PEF, did not have any effect size.

Table 4.9
Effect Size (f^2) Values

	FA	FCB	IPF	PEF	SEF	SF	FA x IPF	FA x SEF	FA x PEF	FA x SF
FA		0.025								
FCB										
IPF		0.008								
PEF		0.047								
SEF		0.046								
SF		0.002								
FA x IPF		0.025								
FA x SEF		0.023								
FA x PEF		0.000								
FA x SF		0.014								

4.13 Assessment of Moderation Analysis

Following the evaluation of the moderating effect, the moderation hypothesis is subsequently examined. A moderator is defined as a third construct that can influence or alter the relationship between the independent and dependent variables (Baron & Kenny, 1986; Dawson, 2015; Hair et al., 2017; Memon et al., 2019). This study employed ordinal types of data for moderation, with the analysis carried out using SmartPLS 4. This study hypothesised that:

H5: The impact of food allergy moderates the relationship between intrapersonal factors and food choice behaviour.

H6: The impact of food allergy moderates the relationship between social environmental factors and food choice behaviour.

H7: The impact of food allergy moderates the relationship between physical environmental factors and food choice behaviour.

H8: The impact of food allergy moderates the relationship between societal factors and food choice behaviour

This study conducted a moderating analysis to explore the moderator effect of food allergies on intrapersonal factors, social environmental factors, physical environmental factors, and societal factors influencing food choice behavior among university students. The moderator variable (FA) satisfied all the relevant criteria for reliability and validity assessment, as detailed in the Table 4.10. However, these criteria were not necessary for the interaction terms (FA×IPF, FA×SEF, FA×PEF, and FA×SEF).

Table 4.10
Moderation Results

Constructs	Path coefficients(β)	t-values	p-values
FA → FCB	-0.131	2.985	0.003
IPF → FCB	0.087	2.164	0.031
SEF → FCB	0.221	4.736	0.000
PEF → FCB	0.228	4.256	0.000
SF → FCB	-0.046	0.946	0.345
FA x IPF → FCB	0.143	2.693	0.007
FA x SEF → FCB	0.134	2.231	0.026
FA x PEF → FCB	-0.012	0.160	0.873
FA x SF → FCB	-0.100	1.816	0.070

In order to ensure the comprehensiveness of the results, the study also investigated the f^2 effect size of the moderator. Table 4.11 presents the f^2 effect size of the interaction term (FA×IPF, FA×SEF, FA×PEF, and FA×SEF) concerning the endogenous latent variable (FCB). Kenny (2018) suggests that 0.005, 0.01 and 0.025 serve as more realistic benchmarks for small, medium, and large effect sizes in

moderation analysis, respectively. The f^2 effect size of the interaction term was 0.025 and 0.023 (FA×IPF and FA×SEF) in this study, suggesting a substantial effect. In the meantime, the f^2 effect size for the interaction term of 0.000 (FA x PEF) indicates a small effect, while 0.014 (FA x SF) represents a medium effect.

Table 4.11
Effect Size (f^2) of Interaction Term

Constructs	f-square
FA x IPF → FCB	0.025
FA x SEF → FCB	0.023
FA x PEF → FCB	0.000
FA x SF → FCB	0.014

4.13.1 The Moderating Role of Food Allergy in the Relationship between Intrapersonal Factors and Food Choice Behaviour

As suggested by Dawson (2015), as cited in Memon et al. (2019), to further elaborate on the moderating phenomenon of initial trust, the interaction effect is plotted to examine the direction and strength of the moderating effect of the relationship between intrapersonal factors and food choice behavior.

As seen in Figure 4.1 the interaction plot illustrates that the connection between IPF and FCB is influenced by the level of FA. When FA is low (−1 SD), a higher IPF corresponds to a minor reduction in FCB, as demonstrated by the downward slope of the red line. At the mean level of FA, the connection between IPF and FCB is characterized by a weak positive correlation, illustrated by the subtly ascending blue line. Conversely, when FA is elevated (+1 SD), an increase in IPF significantly boosts FCB, as indicated by the sharp upward trajectory of the green line. The three lines converge at elevated IPF values, indicating that variations in FA levels exert a diminished impact on FCB when IPF is high. The results suggest that IPF positively influences FCB mainly when FA levels are elevated; however, this influence may become neutral or even negative at lower FA levels.

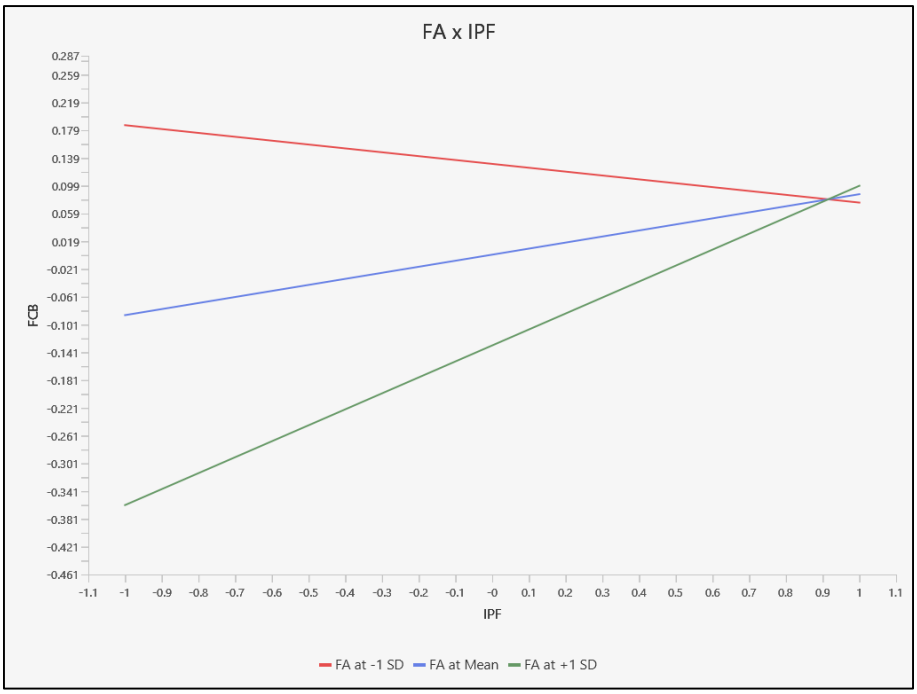


Figure 4.1 Interaction Plot FA × IPF

4.13.2 The Moderating Role of Food Allergy in the Relationship between Social Environmental Factors and Food Choice Behaviour

The interaction plot demonstrates a clear moderating effect of SEF on the relationship between FA and FCB (Figure 4.2). Specifically, the positive slope of SEF is evident across all three levels of FA (−1 SD, mean, and +1 SD), indicating that higher levels of SEF are consistently associated with higher FCB. However, the strength of this positive relationship varies systematically by FA, which confirms the presence of a meaningful interaction effect. At low levels of FA (−1 SD), the relationship between SEF and FCB is relatively weak, as reflected by the shallow slope of the red line. This suggests that when FA is low, increases in SEF translate into only modest improvements in FCB. In contrast, at the mean level of FA, the slope becomes noticeably steeper, indicating that SEF exerts a stronger positive influence on FCB when FA is at an average level.

Most importantly, at high levels of FA (+1 SD), the slope is the steepest among the three conditions. This pattern implies that SEF has its strongest positive effect on FCB when FA is high. In practical terms, individuals with higher FA experience a substantially greater increase in FCB as SEF increases, compared to those with lower FA. An additional noteworthy feature of the plot is that the three lines converge at high

levels of SEF, suggesting that when SEF is high, differences in FCB across levels of FA become minimal. This convergence implies that strong SEF may compensate for lower FA, effectively leveling FCB outcomes regardless of FA differences. Conversely, at low levels of SEF, the lines are widely separated, indicating that FA plays a much more critical role in shaping FCB when SEF is weak.

Overall, the interaction pattern indicates that FA amplifies the positive effect of SEF on FCB. The findings suggest a synergistic relationship whereby SEF becomes increasingly influential in promoting FCB as FA increases. This result underscores the importance of considering FA as a boundary condition in explaining how SEF translates into food choice behaviour and provides strong empirical support for the hypothesized moderating effect.

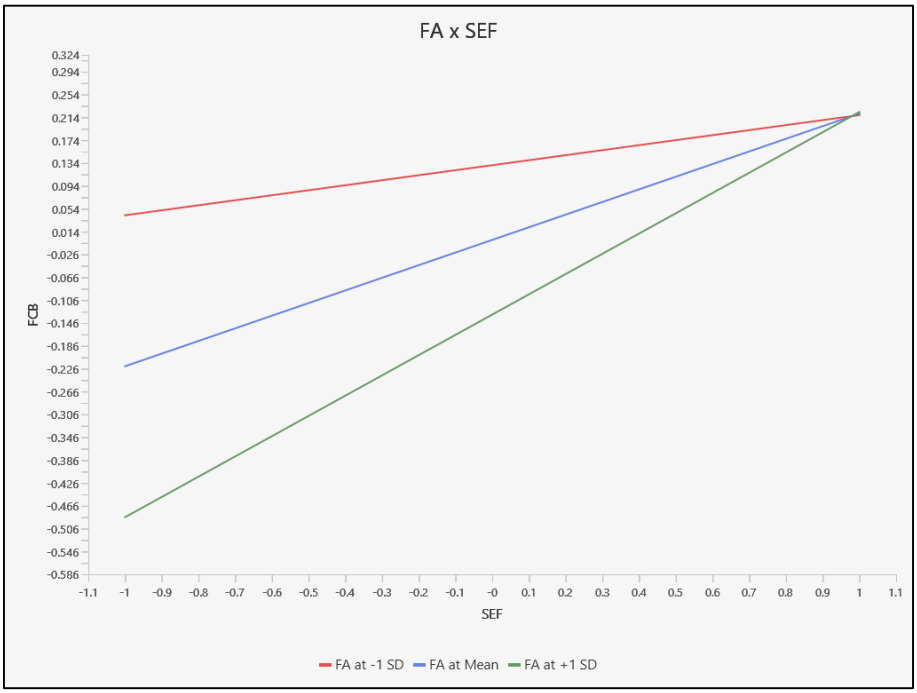


Figure 4.2 Interaction Plot FA × SEF

4.13.3 The Moderating Role of Food Allergy in the Relationship between Physical Environmental Factors and Food Choice Behaviour

The interaction plot illustrates how FA moderates the relationship between PEF and FCB, revealing a clear and theoretically meaningful interaction pattern. Across all three levels of FA (−1 SD, mean, and +1 SD), the slopes of the lines are positive, indicating that higher levels of PEF are consistently associated with higher FCB. This

suggests that PEF exerts a generally positive influence on food choice behaviour regardless of FA. However, the magnitude and positioning of this relationship differ substantially across levels of FA, confirming the presence of a moderating effect.

When FA is low (−1 SD), the red line is positioned highest across the entire range of PEF and displays the steepest upward trajectory. This indicates that individuals with lower FA exhibit relatively higher levels of FCB and derive the greatest benefit from increases in PEF. In other words, PEF appears to be particularly influential in shaping FCB when FA is low, suggesting a compensatory role whereby strong PEF can offset limitations associated with lower FA.

At the mean level of FA, the positive association between PEF and FCB remains evident but is comparatively more moderate, as shown by the blue line. This implies that while PEF continues to enhance FCB, its effect is less pronounced when FA is neither low nor high. In contrast, when FA is high (+1 SD), the green line is consistently the lowest and exhibits the least steep slope. This pattern suggests that although increases in PEF still contribute positively to FCB, the incremental gains are smaller for individuals with higher FA. Thus, FA appears to attenuate the strength of the PEF–FCB relationship, indicating a substitutive rather than synergistic interaction.

Notably, the three lines remain largely parallel and do not converge across the range of PEF, implying that the differences in FCB across FA levels are relatively stable. This indicates that FA primarily shifts the overall level of FCB rather than altering the direction of the PEF effect. Nevertheless, the consistent vertical separation among the lines underscores the importance of FA as a boundary condition in understanding how PEF translates into food choice behaviour.

Overall, the interaction pattern suggests that PEF is more impactful on FCB when FA is low, whereas its influence diminishes as FA increases. This finding highlights the nuanced role of FA in moderating environmental influences on food choice behaviour and provides empirical support for the hypothesized interaction effect between FA and PEF.

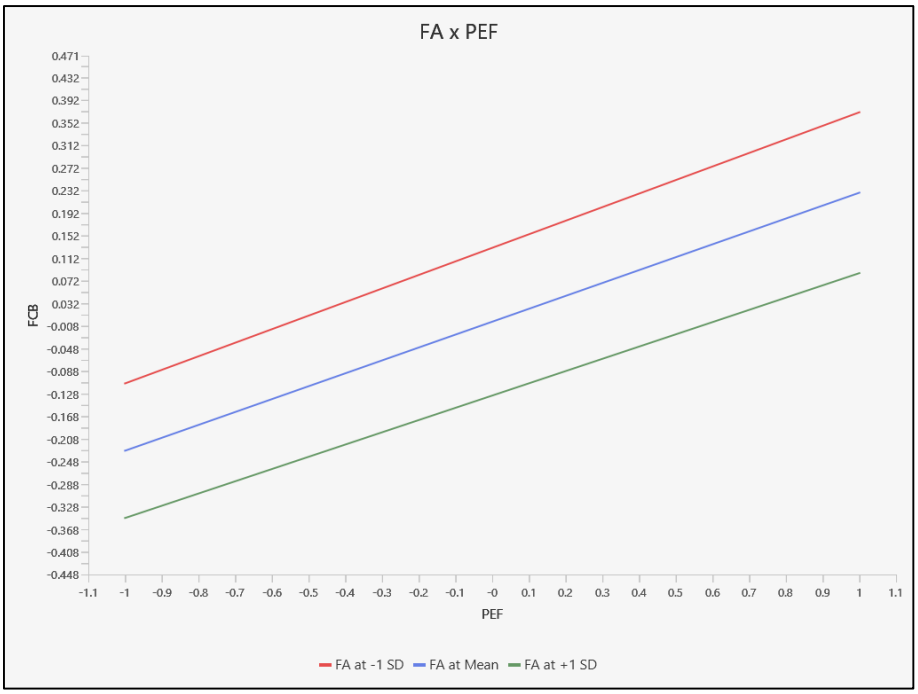


Figure 4.3 Interaction Plot FA × PEF

4.13.4 The Moderating Role of Food Allergy in the Relationship between Societal Factors and Food Choice Behaviour

Figure 4.4 shows a moderation (interaction) effect of FA on the relationship between SF and FCB. The key insight from this plot is that the effect of SF on FCB is contingent on the level of FA, and the direction of this effect changes meaningfully across levels of FA.

At low levels of FA (–1 SD), the slope of SF is positive, indicating that as SF increases, FCB also increases. This suggests that when FA is relatively low, higher SF is associated with greater FCB. In this condition, SF appears to function as a facilitating or enabling factor for FCB. At the mean level of FA, the slope of SF becomes slightly negative, implying a weak inverse relationship between SF and FCB. Here, increases in SF are associated with modest reductions in FCB, suggesting that the beneficial effect of SF observed at low FA diminishes and begins to reverse as FA reaches average levels. At high levels of FA (+1 SD), the slope of SF is strongly negative, indicating that increases in SF are associated with substantial decreases in FCB. Under conditions of high FA, SF appears to undermine or suppress FCB rather than enhance it.

Taken together, this pattern reflects a clear crossover interaction. The direction of the SF–FCB relationship reverses as FA increases: SF is positively related to FCB

when FA is low, unrelated or weakly negative at average FA, and strongly negatively related when FA is high. Importantly, the increasing separation between the lines across the SF range indicates that the moderating effect of FA intensifies as SF increases, not merely at extreme values. Substantively, this interaction suggests that FA fundamentally alters how SF translates into FCB. SF cannot be interpreted as having a uniform effect on FCB; instead, its impact depends critically on the contextual or individual level of FA. Ignoring this interaction would obscure these opposing processes and potentially lead to misleading conclusions about the role of SF.

In sum, the graph provides strong visual evidence that FA is a decisive moderator, transforming SF from a positive predictor of FCB into a negative one as FA increases. This pattern is theoretically rich and underscores the necessity of conditional, rather than main-effect, interpretations.

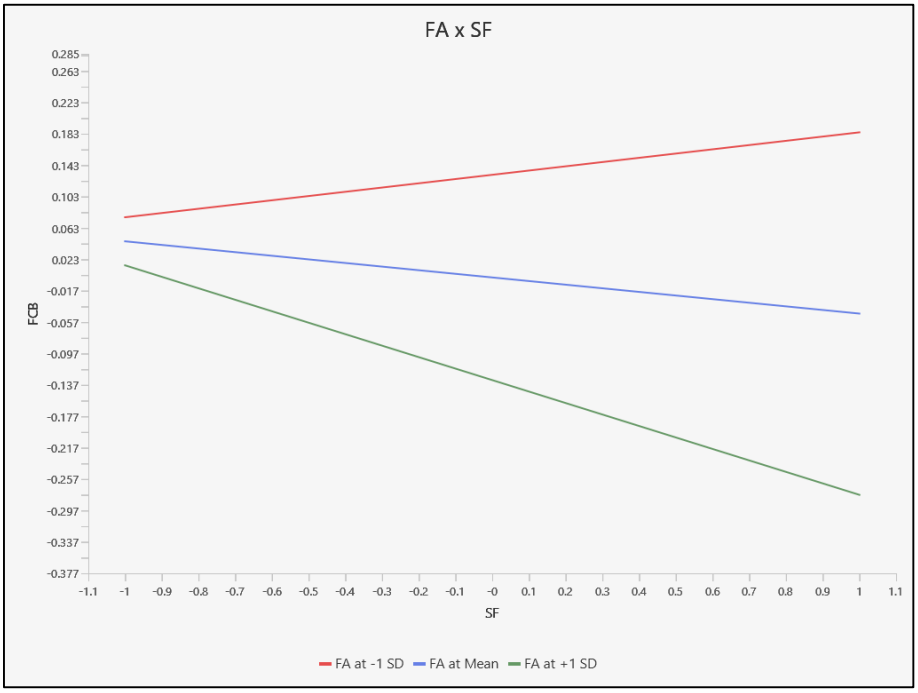


Figure 4.4 Interaction Plot FA × SF

4.14 Hypothesis Testing

Following the evaluation of the direct effect, the moderation hypothesis is subsequently examined. A moderator is defined as a third construct that can influence or alter the relationship between the independent and dependent variables (Baron & Kenny, 1986; Dawson, 2015; Hair et al., 2017; Memon et al., 2019). This study

employed continuous types of data for moderation, with the analysis carried out using SmartPLS 4.

The investigation analysed the hypotheses H1, H2, H3, H4, H5, H6, H7 and H8 through the application of PLS-SEM utilising the SmartPLS statistical package. The investigation set up the model utilising the PLS-SEM algorithm, employing the path weighting scheme along with the standardised results type. The execution of the algorithm yielded the correlations of the latent variables, illustrating both the direction and magnitude of the relationships between the variables, as shown in the table below. A positive correlation and a positive linear relationship exist between SEF and FCB with moderating variable FA (r=0.154), SF and FCB (r =0.146), PEF and FCB (r=0.130), IPF and FCB (r=0.123), SEF and FCB (r=0.120), PEF and FCB with moderating variable FA (r=0.009) and SF and FCB with moderating variable FA (r=0.006). Meanwhile, a negative correlation and negative linear relationship only exist between IPF and FCB with moderating variable FA (r=-0.063).

Table 4.12
Hypothesis Result

No	Hypothesis Statement	Decision
H1	Intrapersonal factors have positively influence on food choice behaviour among university students with food allergy.	Supported
H2	Social environmental factors have positively influence on food choice behaviour among university students with food allergy.	Supported
H3	Physical environmental factors have positively influence on food choice behaviour among university students with food allergy.	Supported
H4	Societal factors have positively influence on food choice behaviour among university students with food allergy.	Not Supported
H5	The impact of food allergy moderates the relationship between intrapersonal factors and food choice behavior with food allergy.	Supported
H6	The impact of food allergy moderates the relationship between social environmental factors and food choice behaviour.	Supported
H7	The impact of food allergy moderates the relationship between physical environmental factors and food choice behaviour.	Not Supported

H8	The impact of food allergy moderates the relationship between societal factors and food choice behaviour	Not Supported

Table 4.13
Result of Hypothesis Testing (Direct Effects)

Hypothesis	Path	β	Standard Error	t-value	p-value	Decision
H1	IPF → FCB	0.087	0.040	2.164*	0.031	Supported
H2	SEF → FCB	0.221	0.047	4.736***	0.000	Supported
H3	PEF → FCB	0.228	0.054	4.256***	0.000	Supported
H4	SF → FCB	-0.046	0.049	0.946	0.345	Not Supported

Note: IPF = Intrapersonal Factors, SEF = Social Environmental Factors, IPF = Physical Environmental Factors, SF = Societal Factors
*p<0.05, **p<0.01, ***p<0.001

For H1, the path from intrapersonal factors (IPF) to food choice behaviour (FCB) was found to be positive and significant (β = 0.087, SE = 0.040, t = 2.164, p = 0.031). This result indicates that students' intrapersonal characteristics, such as attitudes, preferences, and personal health concerns, exert a significant but modest influence on their food choices. Thus, H1 is supported.

Moreover, for H2, the relationship between social environmental factors (SEF) and food choice behaviour (FCB) was also significant (β = 0.221, SE = 0.047, t = 4.736, p < 0.001). The relatively stronger effect suggests that social influences, such as peer groups, family, and social interactions, play a more prominent role in shaping students' food choice compared to intrapersonal factors. Therefore, H2 is supported.

Similarly, H3 tested the effect of physical environmental factors (PEF) on food choice behaviour. The findings show a significant and positive relationship (β = 0.228, SE = 0.054, t = 4.256, p < 0.001). This implies that the availability, accessibility, and convenience of food options significantly drive students' food choices. Among the factors examined, physical environmental factors showed the strongest direct influence, highlighting the importance of the food environment in decision-making. Accordingly, H3 is supported.

In contrast, H4 examined the direct influence of societal factors (SF) on food choice behaviour. The results were not statistically significant (β = -0.046, SE = 0.049,

t = 0.946, p = 0.345). This suggests that broader societal-level influences, such as cultural norms, public policies, or media messages, do not exert a direct effect on students' food choice behaviours in this context. Thus, H4 is not supported.

Overall, the results highlight that food choice behaviour among university students is primarily shaped by intrapersonal, social, and physical environmental factors, whereas societal factors may operate more indirectly or require interaction with other factors to influence decision-making.

Table 4.14
Result of Hypothesis Testing (Moderating Effects)

Hypothesis	Path	β	Standard Error	t-value	p-value	Decision
H5	FA x IPF → FCB	0.143	0.053	2.693**	0.007	Supported
H6	FA x SEF → FCB	0.134	0.060	2.231*	0.026	Supported
H7	FA x PEF → FCB	-0.012	0.073	0.160	0.873	Not Supported
H8	FA x SF → FCB	-0.100	0.055	1.816	0.070	Not Supported

Note: IPF = Intrapersonal Factors, SEF = Social Environmental Factors, IPF = Physical Environmental Factors, SF = Societal Factors
*p<0.05, **p<0.01, ***p<0.001

Table 4.14 shows the moderating effects of food allergy (FA) on the relationships between intrapersonal, social, physical, and societal factors and food choice behaviour (FCB). For H5, the interaction between food allergy and intrapersonal factors (FA × IPF) had a significant positive effect on food choice behaviour (β = 0.143, SE = 0.053, t = 2.693, p = 0.007). This indicates that the influence of intrapersonal factors on food choice behaviour is strengthened when students have food allergies. In other words, personal attitudes, preferences, and health-related concerns become more salient in shaping food choices among individuals with allergies. Therefore, H5 is supported.

For H6, the moderating effect of food allergy on the relationship between social environmental factors (FA × SEF) and food choice behaviour was also significant (β = 0.134, SE = 0.060, t = 2.231, p = 0.026). This suggests that food allergies intensify the impact of social influences such as family, peers, and social networks on food decision making. University students with allergies may rely more heavily on social

support and advice when navigating safe and appropriate food choices. Thus, H6 is supported.

In contrast, H7 tested the moderating effect of food allergy on the link between physical environmental factors (FA × PEF) and food choice behaviour. The result was not significant (β = -0.012, SE = 0.073, t = 0.160, p = 0.873). This finding suggests that food allergies do not alter the way availability, accessibility, or convenience of food options affect students' choices. Regardless of allergy status, the physical environment appears to exert a similar influence on food behaviour. Therefore, H7 is not supported.

Finally, H8 examined the moderating role of food allergy in the relationship between societal factors (FA × SF) and food choice behaviour. The result was not statistically significant (β = -0.100, SE = 0.055, t = 1.816, p = 0.070). Although the path coefficient was negative, the effect was not strong enough to reach significance, indicating that societal level influences such as cultural norms, policy, or media are not differentially impactful for students with or without food allergies. Thus, H8 is not supported.

Overall, the results demonstrate that food allergy significantly moderates the effects of intrapersonal and social environmental factors, but not physical or societal factors, on food choice behaviour. This highlights the heightened importance of personal and social considerations among students managing food allergies.

4.15 Chapter Summary

This chapter presented the results of the data analysis conducted to examine the role of intrapersonal, social, physical, and societal influences on food choice behaviour, as well as the moderating effect of food allergy among university students. Prior to the main analyses, several preparatory steps were undertaken to ensure the quality and integrity of the dataset. Data preparation included coding of the questionnaire items according to their respective constructs, screening of responses to remove ineligible participants, and checks for straightlining, missing values, and outliers. The results indicated that no cases required removal due to straightlining or missing data, and no serious outlier concerns were detected. Furthermore, assumption testing confirmed that the dataset met the requirements for analysis using Partial Least Squares Structural Equation Modelling (PLS-SEM).

In addition, response bias was assessed by comparing early and late respondents through independent-samples t-tests. While statistically significant differences were observed across intrapersonal, social, physical, and societal factors, all effect sizes were small, indicating that response bias was not a major concern in this study. Thus, the final dataset was deemed robust and suitable for hypothesis testing.

Subsequent sections of this chapter reported the results of measurement model assessment, including indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. The results confirmed that all constructs met the required thresholds, supporting the reliability and validity of the measurement instruments. The structural model was then evaluated to test the hypothesised relationships. Path coefficient estimates, t-values, and p-values obtained through bootstrapping provided evidence for the significance of several hypothesised relationships, including the moderating effects of food allergy on selected pathways.

Overall, the findings presented in this chapter provide empirical support for the proposed conceptual model. The results highlight the multidimensional nature of food choice behaviour and the important role played by food allergy as a moderating factor. The implications of these findings are further elaborated in Chapter 5, which discusses the theoretical and practical contributions of the study, as well as its limitations and recommendations for future research.

CHAPTER 5
CONCLUSION

5.1 Chapter Overview

This chapter synthesizes the main findings of the study, interprets the theoretical and practical significance and outlines the implications for this study. It also discusses the study's limitations and proposes directions for future research. The aim is to provide a coherent integration of how intrapersonal, social, physical and societal factors, together with the moderating role of food allergy and shape food choice behaviour among university students in Malaysia. By embedding the findings within the Social Ecological Model (SEM), this discussion demonstrates how interpersonal, social, physical, and societal factors influences interact in complex ways to determine food choices, particularly for university students living with food allergies.

The chapter is structured as follows; Section 5.2 presents a summary of the research findings according to the five core research dimensions, Section 5.3 discusses implications, while Section 5.4 acknowledges the study's limitations. Section 5.5 provides recommendations for future research and Section 5.6 presents the overall conclusions and contributions of this study.

5.2 Summary of Research Findings

The research questions and results of its corresponding hypotheses are summarized below:

i. Do intrapersonal factors influence on food choice behaviour among university students with food allergy?
ii. Do social environmental factors influence on food choice behaviour among university students with food allergy?
iii. Do physical environmental factors influence on food choice behaviour among university students with food allergy?
iv. Do societal factors influence on food choice behaviour among university students with food allergy?

v. Is there any moderating effect of food allergy between the intrapersonal factors toward food choice behaviour among university students?

vi. Is there any moderating effect of food allergy between the social environmental factors toward food choice behaviour among university students?

vii. Is there any moderating effect of food allergy between the physical environmental factors toward food choice behaviour among university students?

viii. Is there any moderating effect of food allergy between the societal factors toward food choice behaviour among university students?

Table 5.1 Hypothesis Result

No	Hypothesis Statement	Decision
H1	Intrapersonal factors have positively influence on food choice behaviour among university students with food allergy.	Supported
H2	Social environmental factors have positively influence on food choice behaviour among university students with food allergy.	Supported
H3	Physical environmental factors have positively influence on food choice behaviour among university students with food allergy.	Supported
H4	Societal factors have positively influence on food choice behaviour among university students with food allergy.	Not Supported
H5	The impact of food allergy moderates the relationship between intrapersonal factors and food choice behavior with food allergy.	Supported
H6	The impact of food allergy moderates the relationship between social environmental factors and food choice behaviour.	Supported
H7	The impact of food allergy moderates the relationship between physical environmental factors and food choice behaviour.	Not Supported
H8	The impact of food allergy moderates the relationship between societal factors and food choice behaviour	Not Supported

5.2.1 Intrapersonal Factors and Food Choice Behaviour among University Students with Food Allergy

The results confirmed that intrapersonal factors significantly influence food choice behaviour among university students, supporting Hypothesis 1 (Intrapersonal

Factors have positively influence on food choice behaviour among university students with food allergy). This result indicates that personal characteristics, including knowledge, attitudes, self-efficacy, motivation and health consciousness, play a crucial role in shaping how students make decisions about their food choices. Within the framework of this study, intrapersonal factors represent the internal cognitive and emotional mechanisms that drive food-related behavior. The presence of food allergy intensifies the importance of these internal characteristics, as university students must engage in conscious self-regulation, risk evaluation and informed decision-making to prevent allergic reactions and maintain overall health.

At the university level, students with food allergies assume full responsibility for their eating practices, often without parental guidance. The study suggests that those who possess greater nutritional knowledge, food safety awareness and understanding of food allergen risks are more capable of managing their dietary behaviours effectively. This is consistent with earlier literature indicating that food knowledge and self-awareness play a decisive role in determining healthy eating patterns and risk-avoidance practices (Kabir et al., 2018; Guiné et al., 2020). In particular, the ability to read and interpret food labels, identify allergenic ingredients and recognise cross-contamination risks forms the basis for safe food choice among allergic individual (university student). University students who are confident in these competencies demonstrate higher self-efficacy and are more likely to adhere to strict dietary management and food choices.

Moreover, the results indicate that emotional and psychological factors also shape food choice behaviour at the intrapersonal level. University students frequently experience academic stress, social adaptation and time pressure, which can influence their food choice and eating patterns. For those with food allergies, anxiety related to accidental allergen exposure or limited food availability can further complicate their food choice. Nevertheless, university students with stronger self-control and positive health attitudes are more capable of balancing psychological stress with the need for safety. This finding reinforces the argument that emotional regulation and perceived behavioural control are key components of intrapersonal influence in food decision-making (Lee et al., 2022).

Additionally, taste preferences, habits and perceived convenience continue to guide individual food choices. However, university students with food allergies are often required to modify these preferences to avoid allergic triggers. The adaptation

process involves substituting allergenic foods with safe alternatives while maintaining nutritional adequacy. This behavioural adjustment reflects an individual's (university students) capacity to integrate knowledge, attitudes and beliefs into daily practice.

In summary, the significant relationship between intrapersonal factors and food choice behaviour among university students with food allergies highlights the dominant role of personal cognition, emotion and self-efficacy in guiding safe food choice behavior. Strengthening university students' intrapersonal capabilities through targeted nutrition education, food allergy awareness programmes and self-management training can therefore enhance their ability to make informed and health-conscious food choices. These findings reaffirm that behaviour modification at the individual level forms the foundation for broader environmental and social interventions aimed at promoting safe and inclusive eating practices and food choices among allergic populations especially university students.

5.2.2 Social Environmental Factors and Food Choice Behaviour among University Students with Food Allergy

The study found significant effects of social environmental factors on food choice behaviour, supporting Hypothesis 2 (Social Environmental Factors have positively influence on food choice behaviour among university students with food allergy). Within the framework of this study, social environmental factors refer to the network of relationships and social dynamics that affect how individuals make, justify and sustain their food choices. Within this context, food choice among university students are not made in isolation but are shaped by continuous social interactions and expectations within their immediate surroundings.

For university students with food allergies, the influence of social relationships is especially crucial as their ability to manage food-related risks often depends on the understanding, mood and cooperation of others. Family members, for example, serve as the earliest and most consistent source of food-related norms and practices. Previous research has shown that parents, particularly mothers, significantly affect dietary habits through their food purchasing, preparation and modelling behaviours (Mahmood et al., 2021; Yee et al., 2017). Although, university students are more independent in managing their meals. Parental influence may continue indirectly through established habits, knowledge transfer and health-related values developed before leaving home.

These familial foundations equip allergic university students with the confidence and skills to make safer dietary decisions and food choices when navigating new environments especially in their university life.

Furthermore, parents play a critical role in shaping nutritional knowledge, attitudes towards healthy eating, and perceptions of food-related risks and benefits. These early experiences contribute to the development of enduring health-related values and decision-making frameworks that continue to guide students' food choices even after leaving home. In many cultural contexts, including collectivist societies, university students also maintain regular communication with their parents and may continue to seek parental advice regarding health and dietary matters. Additionally, parents may still provide financial support, which indirectly influences students' food purchasing decisions and access to certain food options.

Peer influence also plays a dominant role in shaping food-related choices during university life. As university students who spend more time in social settings such as cafeterias, campus events or restaurants, the behaviours and opinions of peers can strongly determine their eating preferences. The findings indicate that university students with supportive peers who respect their dietary restrictions are more likely to make safer food choices and to disclose their allergies confidently. Conversely, a lack of peer awareness or sensitivity may expose them to situations of discomfort, exclusion or even risk-taking behaviours in an attempt to conform socially.

Furthermore, the findings highlight that the social environment provides both emotional and practical support mechanisms for university students with food allergies. Emotional support from friends, classmates or roommates can help mitigate anxiety associated with allergen exposure and increase confidence in communicating dietary needs. Practical assistance such as peers reminding others about allergens or helping to identify safe foods fosters a collective sense of responsibility and inclusion. Within university dining facilities, social interactions with foodservice staff and administrators also influence food safety outcomes as their knowledge and responsiveness determine whether allergic university students can access safe food choices.

The study also suggests that social norms and cultural expectations surrounding food shape university students’ attitudes toward eating in groups. In collectivist cultures, where communal dining is common, university students with food allergies may face pressure to share meals or try dishes that could pose allergenic risks. Such

pressures can affect decision making and potentially compromise safety if allergy awareness is low. Therefore, enhancing social understanding and sensitivity toward food allergies within the university student community is critical in fostering inclusive dining experiences.

In conclusion, the significant association between social environmental factors and food choice behaviour among university students with food allergies underscores the need to recognise interpersonal (social) influence as a central determinant of dietary decision-making. Strengthening peer and institutional awareness, promoting empathy and developing structured social support networks can empower university students to make informed and safe food choices without compromising their social participation. The findings affirm that the social environment operates as a key enabler of safe and health-conscious eating practices, particularly for individuals managing food allergies within the university setting.

5.2.3 Physical Environmental Factors and Food Choice Behaviour among University Students with Food Allergy

The study found significant effects of physical environmental factors on food choice behaviour, supporting Hypothesis 3 (Physical Environmental Factors have positively influence on food choice behaviour among university students with food allergy). This finding indicates that environmental attributes such as food availability, accessibility, affordability and safety significantly influence university students' decisions regarding their food choices. Within the framework of this study, physical environmental factors represent the tangible and structural conditions surrounding the individual that facilitate or constrain food-related behaviour. For university students with food allergies, the physical environment holds heightened importance as it determines their ability to identify, access and consume allergen-free food within university and community settings.

The results indicate that the physical environment, encompassing the university dining facilities, local food outlets and surrounding community infrastructure, plays a decisive role in determining university students' dietary practices. For university students with food allergies, accessibility to allergen-free foods, clear allergen labelling and the presence of safe food preparation spaces are essential elements in promoting healthy and safe eating behaviour. When allergen-free options are limited or

inadequately labelled, university students with food allergies are often forced to compromise on safety or skip meals, which can lead to nutritional deficiencies and anxiety surrounding food choice.

Time constraints and convenience are also significant physical environmental factors that shape food choice behaviour among university students. University students often face busy schedules due to academic workloads, part-time employment and social commitments, leaving them with limited time to prepare or seek allergen-free meals. This study's findings reflect that when faced with time limitations, university students tend to prioritise convenience and accessibility, even if it may increase the risk of allergen exposure. The tendency to rely on quick, ready-to-eat or processed food options becomes more pronounced when allergen-free meals are not readily available within the university facilities. Such behaviours highlight the need for universities to implement practical interventions that address time efficiency without compromising safety for university students with food allergies.

Affordability and economic accessibility further influence the food choices of allergic university students. Specialised allergen-free or gluten-free food products are often more expensive than standard meals, placing an additional financial burden on university students who already face economic constraints. As a result, university students may occasionally engage in risk-taking behaviours by purchasing cheaper but less safe food options labelled "may contain," thereby increasing their vulnerability to allergic reactions (Laheri, 2019). Therefore, the economic dimension of the physical environmental factor must be acknowledged as a structural barrier to safe and consistent dietary management for university students with food allergies.

Moreover, food labelling practices and allergen information transparency are critical elements of the physical environmental factor that affect university students' confidence in making food choices. The availability of clear ingredient lists, allergen statements and educational signage within cafeterias and food service areas directly influences the perceived safety and trustworthiness of food sources. When such information is lacking or ambiguous, university students with food allergies may experience anxiety or avoidance behaviour, which limits their food choices. Consequently, institutional especially university responsibility in ensuring that allergen labelling and food handling comply with safety standards becomes imperative for supporting the wellbeing of allergic university students.

In summary, the significant influence of physical environmental factors on food choice behaviour among university students with food allergies underscores the central role of environmental accessibility, convenience and safety in food decision-making. To support allergic university students effectively, universities and food service providers should enhance allergen management practices by ensuring comprehensive food labelling, providing affordable allergen-free options and fostering safe dining environments. Such initiatives align with the SEM's emphasis on environmental determinants of behaviour and contribute to promoting healthier and more inclusive food systems for all university students, particularly those living with food allergies.

5.2.4 Societal Factors and Food Choice Behaviour among University Students with Food Allergy

The study found that societal factors exerted a significant influence on food choice behaviour, supporting Hypothesis 4 (Societal factors have positively influence on food choice behaviour among university students with food allergy). This result indicates that broader societal and cultural influences such as mass media, advertising, social and cultural norms and food system structures may exert a relatively weaker effect on students' food choices compared to intrapersonal, social and physical environmental factors. The absence of a significant relationship suggests that, for university students managing food allergies, immediate personal and environmental concerns outweigh societal-level pressures in guiding food choices.

Several possible explanations support this finding. Firstly, students with food allergies tend to base their food choices primarily on health and safety considerations rather than on media messages, social trends or cultural expectations. Their heightened awareness of allergic risks often overrides the influence of external social norms that may promote popular or convenience-based eating patterns. This self-protective behaviour reflects the prioritisation of physiological safety over societal conformity, particularly when the consequences of allergen exposure can be severe or life-threatening. Thus, even though mass media and food marketing play influential roles in shaping general consumer behaviour (Story et al., 2002), their impact on allergic individuals appears limited because these university students must adopt selective and cautious eating habits that prioritise allergen avoidance.

Secondly, the non-significant effect of societal factors may reflect the limited presence of food allergy awareness and advocacy within Malaysian society. Although awareness of healthy eating is growing, public understanding of food allergies remains insufficient, and allergen-free food culture is still emerging (Kanagaraj, 2021). In this context, societal influences may not yet provide adequate guidance, representation, or structural support for individuals managing food allergies. The lack of visible campaigns, regulations or media emphasis on food allergy management may contribute to the weak societal influence observed in this study. Consequently, university students may rely more heavily on personal knowledge and immediate social support rather than on societal cues when making food choices.

Thirdly, the results may also reflect the cultural and environmental diversity across Malaysian universities. Food availability and menu options on campus like universities are often shaped by local customs and cultural cuisines, which may or may not accommodate allergen-free alternatives. Societal factors such as cultural food traditions, collective dining habits and media advertising often promote mainstream foods that are not always suitable for individuals with allergies. Therefore, the lack of inclusivity in these broader cultural and institutional practices may further discourage allergic students from relying on societal norms to guide their food decisions.

Additionally, the findings indicate that despite the growing influence of digital and social media on food trends among university students, their effect remains secondary for those managing food allergies. University students in this group are more likely to consult reliable sources of allergen information, such as food labels, dietary guidelines or medical recommendations, rather than advertisements or social influencers. This behaviour aligns with the self-protective tendencies observed among allergic populations, where decision-making is rooted in verified health information rather than popular social narratives.

In summary, the lack of a significant relationship between societal factors and food choice behaviour suggests that university students with food allergies rely more on proximal influences such as personal awareness, social interactions and physical food environments than on distant cultural or media influences when managing their diets. This outcome highlights the need for greater public health efforts, policy advocacy and educational campaigns to raise awareness of food allergies at the societal level. By strengthening food safety policies, media communication and allergen

information dissemination, societal structures can play a more meaningful role in promoting safe and inclusive food practices for individuals especially university students with food allergies in the future.

5.2.5 Food Allergy as a Moderator of the Relationship between Intrapersonal, Social, Physical, and Societal Factors and Food Choice Behaviour

The study tested the moderating role of food allergy across the four predictor domains. Findings indicated partial support for the moderating hypotheses. Specifically, the impact of food allergy significantly moderated the relationship between intrapersonal factors and food choice behaviour (H5 supported), as well as Hypothesis 6 (The impact of food allergy moderates the relationship between social environmental factors and food choice behaviour) is supported. However, Hypothesis 7 (The impact of food allergy moderates the relationship between physical environmental factors and food choice behaviour) and Hypothesis 8 (The impact of food allergy moderates the relationship between societal factors and food choice behavior) are not supported. The inclusion of food allergy as a moderating variable contributes a novel dimension to the understanding of food-related decision-making, as it highlights the influence of a health condition on the behavioural responses to personal, social, and environmental determinants.

The significant moderating effect of food allergy on the relationship between intrapersonal factors and food choice behaviour suggests that internal characteristics such as nutrition knowledge, attitudes, self-efficacy and health consciousness become more critical among individuals managing allergic conditions. University students with food allergies are compelled to engage in conscious and deliberate food choices practices to prevent adverse reactions. This heightened awareness leads to greater reliance on self-regulatory abilities, label reading and understanding of allergenic ingredients. The findings imply that food allergy amplifies the effect of intrapersonal determinants because university students develop a stronger sense of control and responsibility toward their eating behaviours. Hence, personal knowledge and self-efficacy play a more decisive role in guiding food decisions for allergic university students compared to those without such conditions.

Similarly, the moderating effect of food allergy on the relationship between social environmental factors and food choice behaviour indicates that interpersonal

relationships and social influences have heightened significance in shaping the food choice behaviours of allergic university students. The findings show that students with supportive peers, family and social networks are more confident in disclosing their dietary needs and making safe food choices. Conversely, those who experience social misunderstanding or lack of support may be at risk of unsafe food choice and eating behaviours, either due to social pressure or attempts to fit in during communal dining. Therefore, food allergy strengthens the importance of the social environment as an enabling or constraining factor in food-related decision making. When social awareness and acceptance of food allergies are high, university students are more likely to make informed and cautious food choices.

However, the findings indicated that food allergy does not significantly moderate the relationships between physical environmental factors and food choice behaviour, nor between societal factors and food choice behaviour. This outcome suggests that food accessibility, affordability and availability exert a consistent influence on food decisions regardless of the presence of food allergies. While allergic students may demonstrate more caution in navigating food environments, their behavioural responses remain largely determined by the structural realities of food provision within the university and surrounding areas.

Similarly, societal-level factors such as media, culture and policy do not appear to interact meaningfully with food allergy to influence behavioural outcomes. This may be attributed to the limited public awareness and institutional attention given to food allergies in Malaysian contexts, resulting in minimal variation in behaviour attributable to this interaction.

When university students faced with time limitations, they tend to priorities convenience and accessibility, even if it may increase the risk of allergen exposure. So, we can conclude that food accessibility, affordability and availability exert a consistent influence on food decisions regardless of the presence of food allergies. University students may rely more heavily on personal knowledge and immediate social support rather than on societal cues when making food choices. Hence, societal-level factors such as media, culture and policy do not appear to interact meaningfully with food allergy to influence behavioural outcomes.

Overall, the moderation analysis confirms that food allergy serves as a conditional factor that intensifies the effects of individual-level and social-level

determinants of food choice behaviour, while exerting limited influence on structural and cultural factors. This finding contributes to a more nuanced understanding of food choices among university students with health-related dietary restrictions. It underscores the need for universities and policymakers to consider food allergy not only as a medical condition but also as a behavioural determinant that interacts with psychological and social dynamics. Strengthening personal competencies, promoting peer awareness and developing inclusive dining environments are therefore essential for supporting safe and informed food choices among university students with food allergies.

5.3 Implications of the Study

The study's theoretical implications add to existing understanding about online learning. The study's practical implications pertain to how the findings can be applied in the actual world. This study has some possible ramifications.

5.3.1 Implications for Food Allergy Students in Terms of Food Choice Behaviour

The findings of this study reveal several important implications for university students managing food allergies. The results indicate that food allergy alters the way intrapersonal and social environmental factors influence food choice behavior. University students with food allergies tend to depend more heavily on their personal knowledge, confidence and attitudes, as well as on the understanding and support they receive from their peers when making food-related decisions. Consequently, interventions should not focus solely on medical aspects of allergy management but also address the social, psychological and behavioural challenges experienced in daily life.

At the intrapersonal level, strengthening food-related knowledge and self-efficacy is crucial. Although many university students demonstrated awareness of food allergen risks and engaged in label reading, others admitted to occasionally taking risks with ambiguous products labelled “may contain.” This highlights the need for enhanced education and training to build confidence in managing allergies, foster consistent safe practices and prevent accidental exposure. Universities, healthcare providers and

university student wellness centres could collaborate to deliver workshops or online modules on allergen identification, safe meal planning and food preparation.

At the social level, the study highlights the significant role of peer support in shaping the experiences of allergic students at university level. Supportive peers foster confidence and inclusion, whereas social misunderstanding and insensitivity can result in stress, stigma or even dangerous incidents. This finding underscores the necessity for awareness campaigns and peer education programmes aimed at improving understanding of food allergies within the wider student community. By promoting empathy and inclusivity, universities can cultivate safer social environments that empower allergic students to make informed food choices without fear of judgment or exclusion.

Furthermore, the findings show that food allergy affects not only physical health but also psychological wellbeing. Feelings of anxiety, isolation or even fear were commonly reported among allergic students, particularly in shared dining contexts. As such, institutional support systems should encompass counselling services, peer mentoring and emotional support initiatives designed to address these psychological dimensions. Overall, the study advocates for a holistic approach to supporting allergic students, one that integrates knowledge enhancement, social inclusion and emotional resilience to promote safer, healthier and more confident food choice behaviour.

5.3.2 Implications for Society

From a societal perspective, the findings illustrate how broader food environments intersect with health conditions to shape behaviour. Food choice behaviour is determined by multiple layers of influence, but also indicate that vulnerabilities such as allergies redistribute the weight of these influences. This means that improving food-related outcomes for university students, particularly those with allergies, requires action beyond the individual level.

First, the study highlights the need for stronger public awareness of food allergies. Many university students reported the difficulties with fears of judgment and disclosure, peers acceptance, stigma and misunderstanding from peers (Engel et al., 2025). This reflects a broader issue where society often underestimates the seriousness of food allergies. Public education campaigns, school programmes, and media

initiatives could help to normalise discussions about allergies, reduce stigma and encourage more supportive behaviours in everyday social and dining situations.

Second, the findings point to the importance of clearer allergen labelling and regulation. Many allergic students in this study expressed uncertainty about food labels or struggled with vague information such as “may contain” warnings. Stronger government policies on labelling and better enforcement of food safety standards are needed to reduce this uncertainty and improve consumer confidence. This is not only relevant to university students but also to the wider population, since allergies affect both children and adults across society.

Third, the role of media and cultural practices must be considered. The study showed that social media, advertising and cultural norms strongly influence food choices, sometimes promoting unhealthy or unsafe behaviours. Policymakers and educators could work with media platforms and cultural organisations to promote healthier, safer and more inclusive food messages. For example, campaigns could encourage restaurants, food outlets and cultural event organisers to offer allergen-safe options and to create eating environments that are welcoming for everyone.

Finally, there are implications for social equity and inclusion. University students with food allergies often face additional costs, risks and emotional burdens compared to their peers. By recognising food allergy as not only a health issue but also a matter of social justice, society can take steps to create more equitable environments. Universities, workplaces and public institutions should be encouraged to provide allergen-safe food options, implement inclusive policies and support individuals in managing their condition without fear of exclusion or disadvantage.

In sum, the findings of this study suggest that creating safer and healthier food environments requires collective responsibility. Society must move beyond viewing food allergies and food choice simply as personal issues and instead address them through public policy, education, cultural practices, and community support. Doing so will not only improve the wellbeing of university students but also contribute to healthier, more inclusive societies overall.

5.4 Limitations of the Study

Several limitations must be acknowledged. First, the research design was cross-sectional, meaning that all data were collected at one point in time. This makes it

difficult to establish cause and effect relationships. For example, while the study found significant links between intrapersonal and social factors and food choice behaviour, it cannot definitively prove that these factors caused changes in behaviour. A longitudinal design, which follows students over time, would provide stronger evidence of causal relationships.

Moreover, the sample was drawn from Malaysian public universities, which may limit the generalizability of the findings. While the results provide valuable insights into the experiences of this group, they may not fully represent students in private universities, technical colleges or other countries. Cultural and institutional differences may influence food choice behaviour in ways that were not captured in this study.

Furthermore, participants with self-diagnosed and clinically diagnosed food allergies were grouped into a single category of food allergy sufferers, and no comparative analysis was conducted between these two subgroups. Although self-reported food allergy is widely recognised as the initial stage of the diagnostic process, confirmation of food allergy typically requires further clinical evaluation, including medical history, physical examination, and appropriate laboratory tests (Tengku Azhar et al., 2020). Consequently, differences may exist between individuals with self-diagnosed and clinically confirmed food allergies in terms of symptom severity, dietary restrictions, risk perception, and food choice behaviour. However, the primary objective of this study was to examine the moderating effect of food allergy status on the relationships between the proposed determinants and food choice behaviour, rather than to investigate variations based on diagnostic status. Therefore, all participants who reported having a food allergy were analysed as a single group to ensure sufficient statistical power for moderation analysis. Future research should distinguish between self-diagnosed and clinically diagnosed food allergy sufferers and compare these groups to determine whether the method of diagnosis differentially influences food choice behaviour and the relationships among the study constructs.

Besides that, one limitation of this study was identified during the pilot testing of the research instrument. The constructs of Food Allergy (Cronbach's alpha = -0.380; Composite Reliability = -0.382), Food Choice Behaviour (Cronbach's alpha = -0.215; Composite Reliability = -0.248), Intrapersonal Factors (Cronbach's alpha = 0.184; Composite Reliability = 0.184), and Societal Factors (Cronbach's alpha = 0.184; Composite Reliability = 0.184) demonstrated low or negative reliability coefficients,

indicating inadequate internal consistency. These findings suggested that several measurement items did not adequately represent their intended constructs. Consequently, the questionnaire was revised by refining, replacing, or removing problematic items before the main data collection. As the primary purpose of the pilot study was instrument refinement, these reliability issues were addressed prior to the main study, where the revised instrument demonstrated satisfactory reliability and validity.

A further limitation concerns the measurement of certain constructs. The study adapted validated scales to measure intrapersonal, social, physical, and societal factors, as well as food choice behaviour. However, some items may not fully capture the nuances of allergen management behaviour or specific challenges faced by allergic students in Malaysian university settings. Although the reliability and validity of the instruments were statistically confirmed, future research could refine these measures through context-specific items or qualitative insights from allergic individuals.

In addition, this study faced a limitation in terms of the availability of scholarly literature directly linking food allergy and food choice behaviour among university students. While there is an abundance of research on general food choice determinants and dietary behaviour, relatively few studies have examined how food allergies specifically influence the decision-making processes of university students in higher education contexts. As a result, some of the discussions and comparisons in this study relied on broader literature related to health behaviour, food safety or nutrition awareness rather than direct empirical evidence on the topic. This scarcity of focused research constrained the depth of comparative analysis and theoretical integration. The limited number of empirical studies in this specific area highlights a research gap that future scholars could address to strengthen the academic foundation of food allergy related behavioural studies.

In summary, while these limitations do not undermine the contributions of the study, they highlight areas where caution is needed when generalising the findings. They also point to opportunities for future research to build on and extend the evidence base.

5.5 Recommendations for Future Research

In light of the study's findings and limitations, several directions for future research can be recommended. To begin with, future studies should adopt longitudinal research designs in order to capture how food choice behaviour evolves across time. Such designs would help establish causal pathways between intrapersonal, social, physical and societal factors and provide a clearer understanding of how food allergies continue to influence university students' dietary practices throughout their university years and beyond.

At the intrapersonal level, future research should explore more detailed aspects of individual characteristics such as food literacy, emotional regulation, coping strategies and risk-taking tendencies. While this study confirmed the importance of self-efficacy and knowledge, further work could investigate how interventions aimed at strengthening nutrition education or psychological resilience can enhance healthier food choice behaviour among university students with and without allergies. Additionally, studies could integrate objective measures such as dietary records, wearable monitoring devices, or biomarker analyses to complement self-reports and provide more accurate data on individual food consumption patterns.

At the social level, further investigation is warranted into the role of peer influence, family dynamics, and social support systems in shaping the dietary behaviour of food-allergic students. Qualitative methods such as in-depth interviews or ethnographic studies could provide valuable insights into the lived experiences of students navigating social pressures, stigma, and peer acceptance. Moreover, intervention-based studies testing the effectiveness of peer-support programmes, anti-bullying initiatives, or group-based nutrition education could help identify strategies to reduce social isolation while promoting safe eating practices.

At the physical environmental level, more attention should be directed toward institutional contexts, such as university canteens, campus food outlets, and accommodation facilities. Research could examine the availability, affordability, and labelling of allergen-free foods, as well as evaluate institutional policies aimed at improving the inclusivity of food environments. Comparative studies across different types of higher education institutions, public and private universities, technical colleges, or international campuses would further illuminate how structural and contextual factors shape food choice behaviour differently across settings.

At the societal level, future studies should expand the scope to investigate the impact of media, cultural norms, and food marketing in more depth. For instance, analysing how social media influencers shape perceptions of allergen-free diets or how cultural practices intersect with allergen avoidance could provide a richer understanding of broader structural influences. Large-scale cross-cultural studies would also be valuable in comparing how societal norms and national food policies affect students' ability to make safe and healthy food choices.

Finally, intervention based research is strongly encouraged across all levels of the SEM. Evaluating the effectiveness of strategies such as digital health applications for allergen management, culturally sensitive nutrition campaigns and campus-wide policies for allergen-free labelling would generate evidence for both practical improvements and theoretical refinements. By integrating multilevel interventions, future research can not only strengthen the predictive capacity of ecological models but also contribute to evidence-based solutions that support the wellbeing of all students, particularly those managing food allergies.

In summary, future research should continue to address food choice behaviour across intrapersonal, social, physical and societal levels, while giving special attention to the moderating role of food allergy. Doing so will not only refine conceptual models such as the Social Ecological Model (SEM) but also generate evidence-based strategies to improve the dietary wellbeing of university students. Importantly, such efforts align with the objectives of Sustainable Development Goal 3 (SDG3), which seeks to ensure healthy lives and promote well-being for all. By advancing knowledge on how to create safer, more inclusive and health-promoting food environments, future studies can directly contribute to reducing health inequalities, enhancing the quality of life of students and fostering resilience in populations vulnerable to food-related health risks such as allergies.

5.6 Conclusions of the Study

This study examined the role of intrapersonal, social, physical and societal factors in shaping food choice behaviour among university students, with food allergy as a moderating variable. Results confirmed significant effects of intrapersonal, social and societal factors, while the influence of physical factors was weaker. Food allergy

was shown to moderate the influence of intrapersonal and social factors, but not physical or societal influences.

Theoretically, these findings extend the Social Ecological Model by demonstrating how health vulnerabilities such as allergies reshape the relative importance of determinants. Practically, the results highlight the need for comprehensive interventions that empower allergic students through improved nutritional knowledge, strengthened peer support, and more inclusive food environments.

By bridging individual, interpersonal, and societal levels of analysis, this study contributes to both academic knowledge and practical efforts to improve dietary wellbeing among university students. In doing so, it advances the goals of Sustainable Development Goal 3 by promoting health and wellbeing for a population navigating the dual challenges of emerging adulthood and food allergy management.

REFERENCES

Ab Hamid, M. R., Sami, W., & Mohmad Sidek, M. H. (2017). Discriminant Validity Assessment: Use of Fornell & Larcker criterion versus HTMT Criterion. *Journal of Physics: Conference Series*, *890*(1). https://doi.org/10.1088/1742-6596/890/1/012163

Abbring, S., Wolf, J., Ayechu-muruzabal, V., Diks, M. A. P., Alhamwe, B. A., Alhamdan, F., Harb, H., Renz, H., Garn, H., Garssen, J., Potaczek, D. P., & van Esch, B. C. A. M. (2019). Raw cow's milk reduces allergic symptoms in a murine model for food allergy—A potential role for epigenetic modifications. *Nutrients*, *11*(8), 1–15. https://doi.org/10.3390/nu11081721

Abdullahi, Y. S. (2019). *Questionnaire Research Method*. https://www.academia.edu/39137163/Questionnaire_Research_Methodology

Abraham, S., R. Noriega, B., & Shin, J. Y. (2018). College students eating habits and knowledge of nutritional requirements. *Journal of Nutrition and Human Health*, *02*(01). https://doi.org/10.35841/nutrition-human-health.2.1.13-17

Aggarwal, R., & Ranganathan, P. (2019). Study designs: Part 2 – Descriptive studies. *Perspectives in Clinical Research*, *10*(1), 51–56. https://doi.org/10.4103/picr.PICR

Ahmad, N., Alias, F. A., Hamat, M., & Mohamed, S. A. (2024). Reliability Analysis: Application of Cronbach's Alpha in Research Instruments. *Pioneering the Future: Delving Into E-Learning's Landscape*, 114–119.

Ahmad, S. A., & Bruno, D. E. (2021). Social Media Influencers and the Dietary Choices among University Students. *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, *6*(10), 543–557. https://doi.org/10.47405/mjssh.v6i10.1125

Al-Ansari, R. A. R., Alawad, A. A., & Hareri, R. H. B. (2022). An Exploratory Study on the Effect of Indoor Lighting for Buildings on Light Pollution. *Art and Design Review*, *10*(01), 120–135. https://doi.org/10.4236/adr.2022.101009

Albaladejo-Blázquez, N., Ferrer-Cascales, R., Ruiz-Robledillo, N., Sánchez-Sansegundo, M., Clement-Carbonell, V., & Zaragoza-Martí, A. (2018). Poor dietary habits in bullied adolescents: The moderating effects of diet on depression. *International Journal of Environmental Research and Public Health*, *15*(8). https://doi.org/10.3390/ijerph15081569

Ali, A. (2021). Title : Quantitative Data Analysis Author : Ameer Ali. *Research Gate*, *May*, 1–10. https://doi.org/10.13140/RG.2.2.23322.36807

Ali, Z., & Bhaskar, S. B. (2016). Basic statistical tools in research and data analysis. *Indian Journal of Anaesthesia*, *60*(9), 662–669. https://doi.org/10.4103/0019-5049.190623

Aljameel, G. M., AlSedairy, S. A., Binobead, M. A., Alhussain, M. H., Bin Obaid, M. A., Al-Harbi, L. N., Alshammari, G. M., & Arzoo, S. (2023). Awareness of Food Allergies and Allergens on the Menus of Restaurants and Cafes among Saudi Female University Students. *Healthcare (Switzerland)*, *11*(9). https://doi.org/10.3390/healthcare11091259

Al-Rub, F. A. (2020). *Food Safety Hazards* (F. A. Al-Rub, P. Shibhab, S. A. Al-Rub, P. Pittia, & A. Paparella (Eds.)). GAVIN PUBLISHERS. https://doi.org/10.29011/978-1-951814-03-8-005

Alska, E., Doligalska, A., Napiórkowska-Baran, K., Dolina, M., ´nska, K. O., Pilichowicz, A., Wojtkiewicz, A., Kaczor, J. J., Szymczak, B., & Bartuzi, Z. (2025). *Global Burden of Allergies : Mechanisms of Development, Challenges in Diagnosis, and Treatment*. *15*(878), 1–22. https://doi.org/https://doi.org/10.3390/ life15060878

Althumiri, N. A., Basyouni, M. H., Almousa, N., Aljuwaysim, M. F., Bindhim, N. F., & Alqahtani, S. A. (2021). Other Health Conditions among Adults in Saudi Arabia. *Int. J. Environ. Res. Public Health*, *18*, 347. https://doi.org/10.3390/ijerph18010347

Anderson, J. C., & Gerbing, D. W. (1988). Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach James. *Psychological Bulletin*, *103*(3), 411–423. https://doi.org/10.1037/0033-2909.103.3.411

Antoniadis, K., Zafiropoulos, K., & Mitsiou, D. (2022). Measuring Distance Learning System Adoption in a Greek University during the Pandemic Using the UTAUT Model, Trust in Government, Perceived University Efficiency and Coronavirus Fear. *Education Sciences*, *12*(625), 1–19. https://doi.org/10.3390/educsci12090625

Anvari, S., Miller, J., Yeh, C., & Davis, C. M. (2019). *IgE-Mediated Food Allergy*. *57*(October 2018), 244–260. https://doi.org/10.1007/s12016-018-8710-3

Armstrong, J. S., & Overton, T. S. (1977). Estimating Non Response Bias Mail Surveys. *Journal of Marketing Research*, *14*, 396–402. https://doi.org/10.2307/3150783

Aura, A., Sormunen, M., & Tossavainen, K. (2016). The relation of socio-ecological factors to adolescents' health-related behaviour: A literature review. *Health Education*, *116*(2), 177–201. https://doi.org/10.1108/HE-03-2014-0029

Ayyıldız, F., & Şahin, G. (2022). Effect of social media addiction on eating behavior, body weight and life satisfaction during pandemic period. *British Food Journal*, *124*(9), 2980–2992. https://doi.org/10.1108/BFJ-01-2022-0018

Azhar, T. N. T., Idris, S. N. M., Ghani, R. A., Hassan, M. R. C., Haridan, U. S., Mohamed, M., Wahab, N. A. A., & Zazi, N. M. (2020). Self-reported on food allergy among university students in Dengkil, Selangor. *International Journal of Advanced Science and Technology*, *29*(9 Special Issue), 1591–1599.

Baron, R. M., & Kenny, D. A. (1986). The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173–1182. https://doi.org/10.1037//0022-3514.51.6.1173

Barroga, E., & Matanguihan, G. J. (2022). A Practical Guide to Writing Quantitative and Qualitative Research Questions and Hypotheses in Scholarly Articles. *The Korean Academy of Medical Sciences*, *37*(16), 1–18. https://doi.org/10.3346/jkms.2022.37.e121

Barroga, E., Matanguihan, G. J., Furuta, A., Arima, M., Tsuchiya, S., Kawahara, C., Takamiya, Y., & Miki, I. (2023). Conducting and Writing Quantitative and Qualitative Research. *The Korean Academy of Medical Sciences, 38*(37), 1–16. https://doi.org/10.3346/jkms.2023.38.e291

Bawajeeh, A. O., Albar, S. A., Zhang, H., Zulyniak, M. A., Evans, C. E. L., & Cade, J. E. (2020). Impact of taste on food choices in adolescence— systematic review and meta-analysis. *Nutrients*, *12*(7), 1–17. https://doi.org/10.3390/nu12071985

Begen, F. M., Barnett, J., Barber, M., Payne, R., Gowland, M. H., & Lucas, J. S. (2017). Parents' and caregivers' experiences and behaviours when eating out with children with a food hypersensitivity. *BMC Public Health*, *18*(1), 1–10. https://doi.org/10.1186/s12889-017-4594-z

Bloom, I., Lawrence, W., Barker, M., Baird, J., Dennison, E., Sayer, A. A., Cooper, C., & Robinson, S. (2017). What influences diet quality in older people? A

qualitative study among community-dwelling older adults from the Hertfordshire Cohort Study, UK. *Public Health Nutrition*, *20*(15), 2685–2693. https://doi.org/10.1017/S1368980017001203

Borovecki, A., Mlinaric, A., Horvat, M., & Smolcic, V. S. (2018). *Informed consent and ethics committee approval in laboratory medicine*. *28*(3), 1–9. https://doi.org/10.11613/BM.2018.030201

Boscardin, C. K., Sewell, J. L., Tolsgaard, M. G., & Pusic, M. V. (2024). How to Use and Report on p-values. *Perspectives on Medical Education*, *13*(1), 250–254. https://doi.org/10.5334/pme.1324

Braimllari, A. (2018). Information Technology Inhibitors and Information Quality in Supply Chain Management: A PLS-SEM Analysis. *Academic Journal of Interdisciplinary Studies Vol*, *7*(2007), 125–138. https://doi.org/10.2478/ajis-2018-0064

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist*, *32*(7), 513–531. https://doi.org/10.1037/0003-066x.32.7.513

Brown, D., Negris, O., Gupta, R., Herbert, L., Lombard, L., Bozen, A., Assa'ad, A., Chura, A., Andy-Nweye, A. B., Fox, S., Mahdavinia, M., Tobin, M., Robinson, A., Sharma, H., Coleman, A., Jiang, J., Bilaver, L., Fierstein, J. L., Galic, I., … Warren, C. (2021). Food allergy-related bullying and associated peer dynamics among Black and White children in the FORWARD study. *Annals of Allergy, Asthma and Immunology*, *126*(3), 255-263.e1. https://doi.org/10.1016/j.anai.2020.10.013

Browne, R. H. (1995). On the Use of a Pilot Sample for Sample Size Determination. *Statistics In Medicine*, *14*(17), 1933–1940. https://doi.org/10.1002/sim.4780141709

Bryman, A. (2016). *Social Research Methods: The nature and process of social research* (Fifth Edit).

Buchan, D. S., Ollis, S., Thomas, N. E., & Baker, J. S. (2012). Physical activity behaviour: An overview of current and emergent theoretical practices. *Journal of Obesity*, *2012*. https://doi.org/10.1155/2012/546459

Cao, J., Wang, K., Shi, Y., Pan, Y., Lyu, M., Ji, Y., & Zhang, Y. (2023). *Effects of personal and interpersonal factors on changes of food choices and physical*

activity among college students. *18*(7), 1–16. https://doi.org/10.1371/journal.pone.0288489

Caperon, L., Saville, F., & Ahern, S. (2022). Developing a socio-ecological model for community engagement in a health programme in an underserved urban area. *PloS One*, *17*(9), e0275092. https://doi.org/10.1371/journal.pone.0275092

Capili, B., & Anastasi, J. K. (2023). Observational Studies: Methods to Improve Causal Inferences. *American Journal of Nursing*, *123*(1), 45–49. https://doi.org/10.1097/01.NAJ.0000911536.51764.47

Carmines, E. G., & Zeller, R. A. (1979). *Reliability and Validity Assessment*. SAGE Publications, Inc. https://doi.org/https://doi.org/10.4135/9781412985642

Caswell, J. A., & Yaktine, A. L. (2013). *Supplemental Nutrition Assistance Program: Examining the Evidence to Define Benefit Adequacy*. National Academy of Sciences.

Cesare, G. Di, Carciofi, A., Borgiani, F., Cappelletti, D., Monachesi, C., Gatti, S., & Lionetti, M. E. (2025). *Are We Meeting the Needs? A Systematic Review of Nutritional Gaps and Growth Outcomes in Children with Multiple Food Allergies*. 1–13. https://doi.org/10.3390/nu17091590

Chan, J. T. (2020). Snowball Sampling Andsample Selection in a Social Network. *Advances in Econometrics*, *42*, 61–80. https://doi.org/10.1108/S0731-905320200000042008

Cheah, J.-H., Memon, M. A., Chuah, F., Ting, H., & T.Ramayah. (2018). Assessing Reflective Models in Marketing Research: A Comparison Between PLS and PLSc Estimates. *International Journal of Business and Society*, *19*(1), 139–160.

Chen, P., & Antonelli, M. (2020). Conceptual Models of Food Choice : Influential Factors Related to Foods, *Foods*, *9*(1898), 1–21.

Chong, K. W., Ruiz-Garcia, M., Patel, N., Boyle, R. J., & Turner, P. J. (2020). Reaction phenotypes in IgE-mediated food allergy and anaphylaxis. *Annals of Allergy, Asthma and Immunology*, *124*(5), 473–478. https://doi.org/10.1016/j.anai.2019.12.023

Chung, A., Vieira, D., Donley, T., Tan, N., Jean-Louis, G., Gouley, K. K., & Seixas, A. (2021). Adolescent Peer Influence on Eating Behaviors via Social Media: Scoping Review. *J Med Internet Res*, *23*(6), 1–12. https://doi.org/10.2196/19697.

Clinic, M. (2024). *Food Allergy*. Mayo Clinic. https://www.mayoclinic.org/diseases-conditions/food-allergy/symptoms-causes/syc-20355095#:~:text=For some people%2C an allergic, Dizziness%2C lightheadedness or fainting.

Coates, A. E., Hardman, C. A., Halford, J. C. G., Christiansen, P., & Boyland, E. J. (2019). *Social Media Influencer Marketing and Children's Food Intake: A Randomized Trial*. *143*(4), 2018–2554. https://doi.org/10.1542/peds.2018-2554.

Code of Practice on Food Allergen Management for Food Business Operators. (2020).

Coghlan, D., & Brydon-miller, M. (2014). *The SAGE Encyclopedia of Action Research* (V. J. Friedman, D. J. Greenwood, S. Sankaran, B. Dick, S. Flicker, P. Gaya, J. Zhao, R. Tandon, M. Guhathakurta, B. Hall, & N. Jaitli (Eds.)). Delia Martinez Alfonso.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (Second). Lawrence Erlbaum Associates.

Conner, T. S., Mirosa, M., Bremer, P., & Peniamina, R. (2018). *The Role of Personality in Daily Food Allergy Experiences*. *9*, 29. https://doi.org/10.3389/fpsyg.2018.00029

Corallo, A., Latino, M. E., Menegoli, M., & Spennato, A. (2019). A Survey to Discover Current Food Choice Behaviors Angelo. *Sustainability*, *11*(8), 15–17. https://doi.org/10.3390/su11185041

Costa, C., Coimbra, A., Vítor, A., Aguiar, R., Ferreira, A. L., & Todo-Bom, A. (2020). Food allergy—from food avoidance to active treatment. *Scandinavian Journal of Immunology*, *91*(1), 1–11. https://doi.org/10.1111/sji.12824

Creswell, J. W. (2009). *Table of Contents PART I - Preliminary Considerations* (Third Edit). SAGE Publications, Inc.

Daly, A. N., O'Sullivan, E. J., & Kearney, J. M. (2022). Considerations for health and food choice in adolescents. *Proceedings of the Nutrition Society*, *81*(1), 75–86. https://doi.org/10.1017/S0029665121003827

Dawson, J. F. (2015). Moderation in Management Research: What, Why, When, and How. *Journal of Business and Psychology*, *29*, 1–19. https://doi.org/10.1007/s10869-013-9308-7

De Martinis, M., Sirufo, M. M., Suppa, M., & Ginaldi, L. (2020). New perspectives in food allergy. *International Journal of Molecular Sciences*, *21*(4), 1–21. https://doi.org/10.3390/ijms21041474

De Villiers, A., & Faber, M. (2019). Changing young people's food-related behaviour: A socio-ecological perspective. *Public Health Nutrition*, *22*(11), 1917–1919. https://doi.org/10.1017/S136898001900123X

Desai, S. C., & Reimers, S. (2019). *Comparing the use of open and closed questions for Web-based measures of the continued-influence effect*. *51*, 1426–1440. https://doi.org/10.3758/s13428-018-1066-z

DeVellis, R. F. (2016). *Scale Development Theory and Applications* (L. Bickman & D. J. Rog (Eds.); Fourth). SAGE Publications. Inc.

Din, A., Rashid, B., Ramli, K.I., Mansor, N.A., Abdullah, D. (2019). Revelation of Children and Adult's Food Allergen in Malaysia. *Preprints*, *July*, 1–7. https://doi.org/10.20944/preprints201907.0122.v1

Doody, O., & Doody, C. M. (2016). Conducting a pilot study: case study of a novice researcher. *British Journal of Nursing*, *24*(21), 1074–1078. https://doi.org/10.12968/bjon.2015.24.21.1074

Drakouli, A. E., Kontele, I., Poulimeneas, D., Saripanagiotou, S., Grammatikopoulou, M. G., Sergentanis, T. N., & Vassilakou, T. (2023). Food Allergies and Quality of Life among School-Aged Children and Adolescents: A Systematic Review. *Children*, *10*(3), 1–25. https://doi.org/10.3390/children10030433

Dubois, L., Diasparra, M., Bédard, B., Kaprio, J., Fontaine-Bisson, B., Tremblay, R., Boivin, M., & Pérusse, D. (2013). Genetic and environmental influences on eating behaviors in 2.5- and 9-year-old children: a longitudinal twin study. *The International Journal of Behavioural Nutrition and Physical Activity*, *10*(1), 1–12. https://doi.org/10.1186/1479-5868-10-134.

Dudovskiy, J. (2018). *The Ultimate Guide to Writing a Dissertation in Business Studies : A Step-by-Step Assistance January 2018 edition* (J. Dudovskiy (Ed.); January 20). Business Research Methodology.

Duncan, S. E., & Annunziato, R. A. (2018). Barriers to self-management behaviors in college students with food allergies. *Journal of American College Health*, *66*(5), 331–339. https://doi.org/10.1080/07448481.2018.1431898

Dust Allergies. (2018). American College of Allergy, Asthma and Immunology. https://acaai.org/allergies/allergic-conditions/dust-allergies/

El-ammari, A., Kazdouh, H. El, Bouftini, S., Fakir, S. El, & Achhab, Y. El. (2020). Social-ecological influences on unhealthy dietary behaviours among Moroccan adolescents: a mixed-methods study. *Public Health Nutrition*, *23*(6), 996–1008. https://doi.org/10.1017/S1368980019003641

Enders, C. K. (2010). *Applied missing data analysis* (T. D. Little (Ed.); Second Edi). The Guilford Press.

Engel, M. L., Herbert, L. J., Ramos, A., Gupta, R. S., & Warren, C. M. (2025). Food allergy- related social anxiety : Novel conceptualization of an important but overlooked construct. *Pediatric Allergy and Immunology : Official Publication of the European Society of Pediatric Allergy and Immunology*, *36*(9), e70189. https://doi.org/10.1111/pai.70189

Fanning, L., Woods, E., Hornung, C. J., Perrett, K. P., Tang, M. L. K., & Dalziel, K. (2021). Cost-Effectiveness of Food Allergy Interventions in Children: A Systematic Review of Economic Evaluations. *Value in Health*, *24*(9), 1360–1376. https://doi.org/10.1016/j.jval.2021.02.010

Feng, C., & Kim, J. H. (2019). Beyond Avoidance: the Psychosocial Impact of Food Allergies. *Clinical Reviews in Allergy and Immunology*, *57*(1), 74–82. https://doi.org/10.1007/s12016-018-8708-x

Feng, H., Liu, Y., Xiong, X., Xu, Q., Zhang, Z., Wu, Y., & Lu, Y. (2022). Epidemiological survey of self-reported food allergy among university students in China. *Medicine (Baltimore)*, *101*(31), e29606. https://doi.org/10.1097/MD.0000000000029606.

Fent, E. T., Tiruneh, M. G., & Anagaw, T. F. (2023). Exploring Enablers and Barriers of Healthy Dietary Behavior Based on the Socio-Ecological Model, a Qualitative Systematic Review. *Nutrition and Dietary Supplements 2023:15*, *2023*(15), 13–23. https://doi.org/10.2147/NDS.S395444

Fernqvist, F., Spendrup, S., & Tellstr¨om, R. (2024). Understanding food choice: A systematic review of reviews. *Heliyon*, *10*(June). https://doi.org/10.1016/j.heliyon.2024.e32492

Ferrão, A. C., Guiné, R. P. F., Correia, P., Ferreira, M., Duarte, J., & Lima, J. (2019). Development of A Questionnaire to Assess People's Food Choices

Determinants. *Current Nutrition & Food Science*, *13*(3), 281–295. https://doi.org/10.2174/1573401313666171117150648

Ferrer, E. A., Fernández-pastor, S., & Guerrero, A. (2025). Impact of Food Allergies on the Food Safety and Life Quality of Adults in Spain. *Foods (Basel, Switzerland)*, *14*(6), 939. https://doi.org/10.3390/foods14060939

Field, A. (2018). *Discovering Statistics Using IBM SPSS Statistics* (Fifth Edit). SAGE Publications Ltd.

Fiocchi, A., Bognanni, A., Brożek, J., Ebisawa, M., Schünemann, H., & Group, the W. D. guideline. (2010). World Allergy Organization (WAO) Diagnosis and Rationale for Action against CowÕs Milk Allergy (DRACMA) Guidelines Authorship. *The World Allergy Organization Journal*, *15*(1), 1–125. https://doi.org/10.1016/j.waojou.2021.100609

Food Allergies. (2025). Food and Drug Administration. https://www.fda.gov/food/nutrition-food-labeling-and-critical-foods/food-allergies

Food Allergies. (2025). U.S. Food and Drug Administration. https://www.fda.gov/food/nutrition-food-labeling-and-critical-foods/food-allergies

Foong, R. X., Dantzer, J. A., Wood, R. A., & Santos, A. F. (2021). Improving Diagnostic Accuracy in Food Allergy. *Journal of Allergy and Clinical Immunology: In Practice*, *9*(1), 71–80. https://doi.org/10.1016/j.jaip.2020.09.037

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/https://doi.org/10.2307/3151312

Fraser, J., Fahlman, D. W., Arscott, J., & Guillot, I. (2018). Pilot Testing for Feasibility in a Study of Student Retention and Attrition in Online Undergraduate Programs. *The International Review of Research in Open and Distributed Learning*, *19*(1). https://doi.org/0.19173/irrodl.v19i1.3326

Gao, J. (2024). R-Squared (R) – How much variation is explained ? *Research Methods in Medicine & Health Sciences*, *5*(4), 104–109. https://doi.org/10.1177/26320843231186398

Garcia-Carmona, Y., & Curotto de Lafaille, M. A. (2025). Advances in food allergy immunotherapy: Current strategies and role of antibodies isotypes. *Cells*, *14*(12), 900.

Geuens, M. (2023). Research on Influencing Factors of Food Choice and Food Consumption. *Foods*, *12*(6), 1306. https://doi.org/10.3390/foods12061306

Glassman, N. A., & Glassman, M. (1998). Screening Questions How screening questions can cause self-selection bias. *Marketing Research*, *10*(3), 26. https://openurl.ebsco.com/EPDB%3Agcd%3A5%3A3036693/detailv2?sid=ebsco%3Aplink%3Ascholar&id=ebsco%3Agcd%3A1303510&crl=c&link_origin=scholar.google.com

Grace, D. (2017). *Food safety Food safety is not salient in SDGs but may become more important*. International Livestock Research Institute. https://hdl.handle.net/10568/100694

Greenhawt, M. J., Singer, A. M., & Baptist, A. P. (2009). Food allergy and food allergy attitudes among college students. *Journal of Allergy and Clinical Immunology*, *124*(2), 323–327. https://doi.org/10.1016/j.jaci.2009.05.028

Guiné, R. P. F., Bartkiene, E., Ucs, V. S., Tarcea, M., LjubičicÂ´, M., Ernelič-Bizjak, M. C., Isoldi, K., El-Kenawy, A., Ferreira, V., Straumite, E., Korzeniowska, M., Vittadini, E., Leal, M., Frez-Munõz, L., Papageorgiou, M., Djekíc, I., Ferreira, M., Correia, P., Cardoso, A. P., & Duarte, J. (2020). Study about Food Choice Determinants According to Six Types of Conditioning Motivations in a Sample of 11,960 Participants. *Foods*, *9*(7). https://doi.org/10.3390/foods9070888

Guy-Evans, O. (2024). *Bronfenbrenner's Ecological Systems Theory*. https://www.simplypsychology.org/bronfenbrenner.html

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate Data Analysis* (Eight Edit). Cengage.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (Second Edi). SAGE Publications, Inc.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). An Introduction to Structural Equation Modeling. In *Partial Least Squares Structural Equation*

Modeling (PLS-SEM) Using R (pp. 1–29). Springer. https://doi.org/10.1007/978-3-030-80519-7_1

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). An Introduction to Structural Equation Modeling. In *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R* (pp. 1–29). Springer. https://doi.org/10.1007/978-3-030-80519-7_1

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R*. Springer.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Hair, J., & Alamer, A. (2022). Partial Least Squares Structural Equation Modeling (PLS-SEM) in second language and education research: Guidelines using an applied example Joseph. *Research Methods in Applied Linguistics*, *1*(3), 100027. https://doi.org/10.1016/j.rmal.2022.100027

Hanafiah, M. H. (2020). Formative vs. Reflective Measurement Model: Guidelines for Structural Equation Modeling Research. *International Journal of Analysis and Applications*, *18*(5), 876–889. https://doi.org/10.28924/2291-8639-18-2020-876

Hanemaayer, R., Neufeld, H. T., Anderson, K., Haines, J., Gordon, K., Lickers, K. R. L., Xavier, A., Peach, L., & Peeters, M. (2022). Exploring the environmental determinants of food choice among Haudenosaunee female youth. *BMC Public Health*, *22*(1156), 1–14. https://doi.org/10.1186/s12889-022-13434-z

Hang, L. J., Mat, W. R. W., Tan, I. T. M. A., Jing, L. H., Zain, J. M., & Mahdi, S. N. M. (2022). Validation of Malay Language Translated Questionnaire on Adult Intensive Care Unit Nurses' Perception and Involvement in End-of-life Care. *Malaysian Journal of Medicine and Health Sciences*, *18*(6), 13–22. https://doi.org/10.47836/mjmhs.18.5.3

Hansen, K., & Świderska, A. (2023). Integrating open - and closed - ended questions on attitudes towards outgroups with different methods of text analysis. *Behavior Research Methods*, *56*(5), 4802–4822. https://doi.org/10.3758/s13428-023-02218-x

Hashim, S., Mohamad, S. F., Lim, S., & Ahmat, N. H. C. (2022). Pretesting Survey Questionnaire : A Guide on Dissemination. *International Journal of Academic Research in Economics and Management Sciences*, *11*(3). https://doi.org/10.6007/IJAREMS/v11-i3/15228

Hassan, A., Alsaihati, A., Al Shammari, M., Alaithan, H., Al-Johani, W., Alshamlan, N., & Aljubran, S. (2020). Food allergy among university students: Uncharted territory. *Allergy, Asthma and Clinical Immunology*, *16*(1), 17. https://doi.org/10.1186/s13223-020-0415-5

Hayes, A., Kindness, D., & Li, T. (2025). *Two-Tailed Test: Definition, Examples, and Importance in Statistics*. Investopedia. https://www.investopedia.com/terms/t/two-tailed-test.asp

Hejazi, J., Amiri, R., Nozarian, S., Tavasolian, R., & Rahimlou, M. (2024). Genetic determinants of food preferences : a systematic review of observational studies. *BMC Nutrition*, *10*(1), 24. https://doi.org/10.1186/s40795-024-00828-y

Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS Path Modeling in New Technology Research: Updated Guidelines. *Industrial Management & Data Systems*, *116*(1), 2–20. https://doi.org/10.1108/IMDS-09-2015-0382

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A New Criterion for Assessing Discriminant Validity in Variance-based Structural Equation Modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8

Herbert, L., Marchisotto, M. J., & Vickery, B. (2021). Patients' Perspectives and Needs on Novel Food Allergy Treatments in the United States. *Current Treatment Options in Allergy*, *8*(9), 9–20. https://doi.org/10.1007/s40521-020-00274-8

Higgs, S., Bouguettaya, A., & Ruddock, H. (2022). Awareness of Social Influences on Eating Is Dependent on Familiarity With Imagined Dining Partners and Type of Eating Occasion. *Frontiers in Psychology*, *13*, 841422. https://doi.org/10.3389/fpsyg.2022.841422

Holmes, A. U., Golman, M., Wiginton, K., & Amuta, A. O. (2021). Examining Social Cognitive Theory and the Social Ecological Model in Reversing Predictors (Family Meals, Sleep, Media Use) of Childhood Weight Status within the Home Environment. *TWU Student Journal*, *1*(1), 68–75.

Hossny, E., Ebisawa, M., El-gamal, Y., Arasi, S., Dahdah, L., El-Owaidy, R., Galvan, C. A., Lee, B. W., Levin, M., Martinez, S., Pawankar, R., Tang, M. L. K., Tham, E. H., & Fiocchi, A. (2019). Challenges of managing food allergy in the developing world. *World Allergy Organization Journal*, *12*(11), 100089. https://doi.org/10.1016/j.waojou.2019.100089

Huh, I., & Gim, J. (2025). Exploration of Likert scale in terms of continuous variable with parametric statistical methods. *BMC Medical Research Methodology*, *25*(1), 218.

Ibrahim, I. S., Baharudin, N., Isa, M. R., Ismail, I. H., Mohamed-Yassin, M. S., Kamarudin, I. K., Latiff, A. H. A., Zahedi, F. D., Ali, A., & Arshad, A. I. (2021). Adaptation, translation and validation of the food allergy quality of life questionnaire-parent form (Faqlq-pf): The malay version. *Children*, *8*(11), 1–16. https://doi.org/10.3390/children8111050

Ismail, L. C., Osaili, T. M., Mohamad, M. N., Hashim, M., Stojanovska, L., Daour, R. Al, Nader, D., Alrayis, H., Alzaabi, N. S., Elbarag, L., Binkhadim, S., Jarrar, A. H., Dhaheri, A. S. Al, & Hasan, H. (2022). Psychosocial factors affecting dietary habits of university students: A cross-sectional study. *Heliyon*, *8*(6). https://doi.org/10.1016/j.heliyon.2022.e09768

Izah, S. C., Sylva, L., & Hait, M. (2024). Cronbach ' s Alpha : A Cornerstone in Ensuring Reliability and Validity in Environmental Health Assessment. In *ES Energy & Environment* (Vol. 23). https://doi.org/10.30919/esee1057 Cronbach's

Jafri, S., Frykas, T. L., Bingemann, T., Phipatanakul, W., Bartnikas, L. M., & Protudjer, J. L. P. (2021). Food Allergy, Eating Disorders and Body Image. *Journal of Affective Disorders Reports*, *6*, 100197. https://doi.org/10.1016/j.jadr.2021.100197

Jones, C. J., Smith, H. E., Frew, A. J., Toit, G. Du, Mukhopadhyay, S., & Llewellyn, C. D. (2014). Explaining adherence to self-care behaviours amongst adolescents with food allergy: A comparison of the health belief model and the common sense self-regulation model. *British Journal of Health Psychology*, *19*(1), 65–82. https://doi.org/10.1111/bjhp.12033

Joshi, A., Kale, S., Chandel, S., & Pal, D. K. (2015). Likert Scale : Explored and Explained Likert Scale : Explored and Explained. *British Journal of Applied*

Science & Technology, *7*(4), 396–403. https://doi.org/10.9734/BJAST/2015/14975

Juanamasta, I. G., Aungsuroch, Y., & Fisher, M. L. (2023). Reliability and Validity of the Indonesian Version of the McCloskey / Mueller Satisfaction Scale. *Journal of Nursing Management*, *2023*(1), 1–7. https://doi.org/10.1155/2023/9999650

Kabir, A., Miah, S., & Islam, A. (2018). Factors influencing eating behavior and dietary intake among resident students in a public university in Bangladesh : A qualitative study. *PloS One*, *13*(6), e0198801. https://doi.org/10.1371/journal.pone.0198801

Kamboj, S., Gupta, N., Bandral, J. D., & Gandotra, G. (2020). Food safety and hygiene : A review Food safety and hygiene : A review. *International Journal of Chemical Studies*, *8*(2), 358–368. https://doi.org/10.22271/chemi.2020.v8.i2f.8794

Kamis, A., Saibon, R. A., Yunus, F. A. N., Rahim, M. B., Herrera, L. M., & Montenegro, P. L. Y. (2020). The SmartPLS Analyzes Approach in Validity and Reliability of Graduate Marketability Instrument. *Social Psychology of Education*, *57*(8), 987–1001.

Kanagaraj, P. (2021). *Tackling Allergies and Ways to Prevent Them*. Business Today. https://www.businesstoday.com.my/2021/05/17/tackling-allergies-and-ways-to-prevent-them/

Kang, H. (2021). Sample size determination and power analysis using the G * Power software. *Journal of Educational Evaluation for Health Professions*, *18*(17). https://doi.org/10.3352/jeehp.2021.18.17

Karanja, A., Ickowitz, A., Stadlmayr, B., & McMullin, S. (2022). Understanding drivers of food choice in low- and middle-income countries: A systematic mapping study. *Global Food Security*, *32*, 100615. https://doi.org/10.1016/j.gfs.2022.100615

Kent, M. P., Pauzé, E., Roy, E.-A., Billy, N. de, & Czoli, C. (2019). Children and adolescents' exposure to food and beverage marketing in social media apps. *Pediatric Obesity*, *14*(6), e12508. https://doi.org/10.1111/ijpo.12508

Kim, Y. (2019). The Pilot Study in Qualitative Inquiry The Pilot Study in Qualitative Inquiry. *Qualitative Social Work*, *10*(2), 190–206. https://doi.org/10.1177/1473325010362001

Kock, F., Berbekova, A., & Assaf, A. G. (2021). Understanding and managing the threat of common method bias: Detection, prevention and control. *Tourism Management*, *86*. https://doi.org/10.1016/j.tourman.2021.104330

Kock, N. (2015). Common Method Bias in PLS-SEM: A Full Collinearity Assessment Approach. *International Journal of E-Collaboration (Ijec)*, *11*(4), 1–10. https://doi.org/10.4018/ijec.2015100101

Kodish, S. R., Grey, K., Matean, M., Palaniappan, U., Gwavuya, S., Gomez, C., Iuta, T., Timeon, E., Northrup-lyons, M., Mclean, J., & Erasmus, W. (2019). Socio-Ecological Factors That Influence Infant and Young Child Nutrition in Kiribati : A Biocultural Perspective. *Nutrients*, *11*(6). https://doi.org/10.3390/nu11061330

Koo, M., & Yang, S. (2025). Likert-Type Scale. *Encyclopedia*, *5*(1), 18. https://doi.org/10.3390/encyclopedia5010018

Korom, B., Malloy, M., Remmers, C., Cevilla, M., Dione, K., Papanek, P., Condit, J., & Nelson, D. (2023). "It's about being healthy"; a novel approach to the socio - ecological model using family perspectives within the Latinx community. *BMC Public Health*, *23*(1), 1–10. https://doi.org/10.1186/s12889-023-15005-2

Kotronoulas, G., Miguel, S., Dowling, M., Fernández-Ortega, P., Colomer-Lahiguera, S., Bağçivan, G., Pape, E., Drury, A., Semple, C., & Dieperink, K. B. (2023). An Overview of the Fundamentals of Data Management, Analysis, and Interpretation in Quantitative Research. *Seminars in Oncology Nursing*, *39*(2), 151398. https://doi.org/10.1016/j.soncn.2023.151398

Kovacs, S. (2018). *Young people and food allergies and intolerances*. https://www.food.gov.uk/sites/default/files/media/document/young-people-and-food-allergies-2018_0.pdf

Kucharczuk, A. J., Oliver, T. L., & Dowdell, E. B. (2022). Social media's influence on adolescent's ′ food choices : A mixed studies systematic literature review. *Appetite*, *168*. https://doi.org/10.1016/j.appet.2021.105765

Kumagai, C., Kawamoto, N., Miwa, Y., Kaneyama, T., Kadowaki, S., Kawamoto, M., & Ohnishi, H. (2024). Questionnaire-based real-world survey of diagnosing food allergy in children : Utilization of oral food challenge tests and other

diagnostic methods. *Journal of Allergy and Clinical Immunology Global*, *4*(1), 100356. https://doi.org/10.1016/j.jacig.2024.100356

Kumar, N. K. (2023). Autocorrelation and Heteroscedasticity in Regression Analysis. *Journal of Business and Social Sciences*, *5*(1), 9–20. https://doi.org/10.3126/jbss.v5i1.72442

Kwak, S. (2023). Autocorrelation and Heteroscedasticity in Regression Analysis. *Journal of Lipid and Atherosclerosis*, *12*(2), 89–95. https://doi.org/10.12997/jla.2023.12.2.89

Laheri, Z. (2019). *Diet Diversity of University Students with Food Allergies and Food Allergen Knowledge and Practices of Catering Staff*. *September*.

Laheri, Z., Soon, J. M., & Dillon, S. (2023). Food selection behaviour of university students with food allergies and celiac disease. *British Food Journal*, *125*(3), 907–920. https://doi.org/10.1108/BFJ-12-2021-1344

Lee, J. H., Mat, W. R. W., Tan, I. T. M. A., Low, H. J., Zain, J. M., & Mahdi, S. N. M. (2022). Validation of Malay Language Translated Questionnaire on Adult Intensive Care Unit Nurses' Perception and Involvement in End-of-life Care. *Malaysian Journal of Medicine and Health Sciences*, *18*(6), 13–22. https://doi.org/10.47836/mjmhs.18.5.3

Lee, K. W., Song, W. O., & Cho, M. S. (2016). Dietary quality differs by consumption of meals prepared at home vs. Outside in Korean adults. *Nutrition Research and Practice*, *10*(3), 294–304. https://doi.org/10.4162/nrp.2016.10.3.294

Lee, Y. M., & Chen, H. (2019). An Exploration of Activities, Reasons, and Barriers of Using Social Media for Food Allergy Management. *The Journal of Social Media in Society*, *8*(1), 87–104.

Lee, Y. M., Sozen, E., & Wen, H. (2022). A qualitative study of food choice behaviors among college students with food allergies in the US. *British Food Journal*, *125*(5), 1732–1752. https://doi.org/10.1108/BFJ-10-2021-1077

Leone, L., Mazzocchi, A., Maffeis, L., Cosmi, V. De, & Agostoni, C. (2023). Nutritional management of food allergies : Prevention and treatment. *Frontiers in Allergy*, *3*, 1–8. https://doi.org/10.3389/falgy.2022.1083669

Lim, W. M. (2024). A typology of validity : content, face, convergent, discriminant, nomological and predictive validity. *Ournal of Trade Science*, *12*(3), 155–179. https://doi.org/10.1108/JTS-03-2024-0016

Linde, J. A., Dehmer, M. L. H., Lee, J., Friend, S., Flattum, C., Arcan, C., & Fulkerson, J. A. (2022). Associations of parent dietary role modeling with children's diet quality in a rural setting: Baseline data from the NU-HOME study. *Appetite*, *174*(4). https://doi.org/10.1016/j.appet.2022.106007.Associations

Liu, K. S. N., Chen, J. Y., Kang, Q., Sun, K.-S., Tsang, J. P. Y., Ip, P., Wong, R. S. M., Wong, C. K. H., & Lam, C. L. K. (2025). Assessing family influence on adolescent healthy eating: insights from knowledge, attitudes, and practices in a cross-sectional survey in Hong Kong. *BMC Public Health*, *25*(1), 1793. https://doi.org/10.1186/s12889-025-22999-4

Lopes, J. P., & Sicherer, S. (2020). Food allergy: epidemiology, pathogenesis, diagnosis, prevention, and treatment. *Current Opinion in Immunology*, *66*(Dc), 57–64. https://doi.org/10.1016/j.coi.2020.03.014

Lung, D. S. (2020). *Digital Commons @ WOU Food Allergies and Identity Construction in Young Adults*.

Mahmood, L., Flores-barrantes, P., Moreno, L. A., Manios, Y., & Gonzalez-gil, E. M. (2021). The Influence of Parental Dietary Behaviors and Practices on Children's Eating Habits. *The International Journal of Behavioral Nutrition and Physical Activity*, *13*(4), 1138. https://doi.org/10.3390/nu13041138

Mahmoud, A. B., & Grigoriou, N. (2022). Modelling parents' unhealthy food choices for their children: the moderating role of child food allergy and implications for health policy. *Journal of Family Studies*, *28*(1), 89–107. https://doi.org/10.1080/13229400.2019.1682642

Mahmoud, A. B., Hack-polay, D., Fuxman, L., Naquiallah, D., & Grigoriou, N. (2020). Trick or treat ? – When children with childhood food allergies lead parents into unhealthy food choices. *BMC Public Health*, *20*(1), 1453. https://doi.org/10.1186/s12889-020-09556-x

Majowicz, S. E., Jung, J. K. H., Courtney, S. M., & Harrington, D. W. (2017). Exploring the Concern about Food Allergies among Secondary School and University Students in Ontario, Canada: A Descriptive Analysis. *Journal Of Allergy*, *May*, 8. https://doi.org/10.1155/2017/2051916

Malmqvist, J., Hellberg, K., Möllås, G., Rose, R., & Shevlin, M. (2019). Conducting the Pilot Study: A Neglected Part of the Research Process? Methodological Findings Supporting the Importance of Piloting in Qualitative Research Studies.

International Journal of Qualitative Methods, *18*, 1609406919878341. https://doi.org/10.1177/1609406919878341

Marcone, M. F., Madan, P., & Grodzinski, B. (2020). An Overview of the Sociological and Environmental Factors Influencing Eating Food Behavior in Canada. *Frontiers in Nutrition*, *7*, 77. https://doi.org/10.3389/fnut.2020.00077

McLaughlin, A. M., Macaulay, T., & Peterson, C. C. (2021). College students' knowledge and management of food allergies. *Journal of American College Health*, *69*(6), 610–616. https://doi.org/10.1080/07448481.2019.1705832

McLeod, S. (2023). *Likert Scale Questionnaire: Examples & Analysis*. Simple Psychology. https://www.simplypsychology.org/likert-scale.html

Mcleroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An Ecological Perspective on Health Promotion Programs. *Health Education & Behavior*, *15*(4), 351–377. https://doi.org/10.1177/109019818801500401

Memon, M. A., Jun-Hwa, C., T. Ramayah, Hiram Ting, Francis, C., & Tat Huei, C. (2019). Moderation analysis: Issues and guidelines. *Journal of Applied Structural Equation Modeling*, *3*(1), 2590–4221.

Memon, M. A., T., R., Ting, H., & Cheah, J.-H. (2025). Purposive Sampling: A Review and Guidelines for Quantitative rsearch. *Journal of Applied Structural Equation Modeling*, *9*(1), 1–23. https://doi.org/10.47263/JASEM.9 (1)01

Memona, M. A., Ramayahb, T., Cheahc, J.-H., Ting, H., Chuahe, F., & Cham, T. H. (2021). PLS-SEM Statistical Programs: A Review. *Journal of Applied Structural Equation Modeling*, *5*(1), 1–14. https://doi.org/10.47263/JASEM.5 (1)06

Moen, Ø. L., Opheim, E., & Trollvik, A. (2019). Parents Experiences Raising a Child with Food Allergy ; a Qualitative Review. *Journal of Pediatric Nursing*, *46*, e52–e63. https://doi.org/10.1016/j.pedn.2019.02.036

Mogeni, B. K., & Ouma, L. O. (2022). Dietary patterns, behaviours, and their associated factors among university students in coastal Kenya. *Cogent Food & Agriculture*, *8*(1). https://doi.org/10.1080/23311932.2022.2132873

Mohajan, H. K. (2021). Quantitative Research: A Successful Investigation in Natural and Social Sciences. *Journal of Economic Development, Environment and People*, *9*(4), 50–79. https://doi.org/10.26458/jedep.v9i4.679

Monterrosa, E. C., Frongillo, E. A., Drewnowski, A., de Pee, S., & Vandevijvere, S. (2020). Sociocultural Influences on Food Choices and Implications for Sustainable Healthy Diets. *Food and Nutrition Bulletin*, *41*(2_suppl), 59S-73S. https://doi.org/10.1177/0379572120975874

Munir, M. M., & Ahmed, N. (2025). Using Social Media Platforms to Raise Health Awareness and Increase Health Education in Pakistan: Structural Equation Modeling Analysis and Questionnaire Study. *JMIR Human Factors*, *12*, e65745. https://doi.org/10.2196/65745

Neri, L. de C. L., Guglielmetti, M., Fiorini, S., Quintiero, F., Tagliabue, A., & Ferraris, C. (2024). Nutritional counseling in childhood and adolescence: a systematic review. *Frontiers in Nutrition*, *11*, 1270048. https://doi.org/10.3389/fnut.2024.1270048

Newman, K., & Knibb, R. (2020). The Psychosocial Impact of Adolescent Food Allergy: A Review of the Literature. *EMJ Allergy & Immunology*, *5*(1), 54–60. https://doi.org/10.33590/emjallergyimmunol/20-00087

Nishida, N., Maeda, Y., Okafuji, I., & Ueki, S. (2025). Lived Experiences of School-Age Children with Food Allergies: A Qualitative Systematic Review and Meta-Synthesis. *Children*, *12*(8), 1053. https://doi.org/https://doi.org/10.3390/children12081053

Nocerino, R., Mercuri, C., Bosco, V., Aquilone, G., Guillari, A., Simeone, S., & Rea, T. (2024). Food Allergy-Related Bullying in Pediatric Patients : A Systematic Review. *Children*, *11*(12), 1485. https://doi.org/10.3390/children11121485.

Nunnally, J., & Bernstein, I. (1995). *Psychometric Theory* (Third Edit, Vol. 19, Issue 3). Educational Researcher.

Obenza, B. N., Fordan, M. J. G., Tripole, J. M. S., Cantor, F. D. E. C., Parantar, A. J. G., Florenosos, A. J. M., Ando, A. J. B., Reyes, A. M. C., & Sumayo, G. S. (2025). Bridging Academic Stress and Burnout: Procrastination as a Mediator and Implications for Education Policy. *Journal of Social Knowledge Education*, *6*(2), 154–163. https://doi.org/10.37251/jske.v6i2.1422

Ohaegbulem, E. U., & Iheaka, V. C. (2024). The Impact of Macroeconomic Factors on Nigerian-Naira Exchange Rate Fluctuations (1981-2021). *Asian Journal of Probability and Statistics*, *26*(2), 18–36. https://doi.org/10.9734/AJPAS/2024/v26i2589

Ortiz, R. A., & Barnes, K. C. (2016). Genetics of Allergic Diseases. *Immunology and Allergy Clinics of North America*, *35*(1), 19–44. https://doi.org/10.1016/j.iac.2014.09.014.Genetics

Pallant, J. (2020). *SPSS Survival Manual A step by step guide to data analysis using IBM SPSS* (7th Editio). https://doi.org/https://doi.org/10.4324/9781003117452

Park, J., Prochnow, T., Vigil, J. A., & Smith, M. L. (2025). A Systematic Literature Review of the Relationships between Social and Interpersonal Factors and Physical Activity among Older Adults. *American Journal of Health Promotion : AJHP*, *39*(4), 664–678. https://doi.org/10.1177/08901171241302925

Patino, C. M., & Ferreira, J. C. (2018). Inclusion and exclusion criteria in research studies: definitions and why they matter. *Jornal Brasileiro de Pneumologia*, *44*(2), 6548. https://doi.org/10.1590/s1806-37562018000000088

Philipsborn, P. von, Stratil, J. M., Burns, J., Busert, L. K., Pfadenhauer, L. M., Polus, S., Holzapfel, C., Hauner, H., & Rehfuess, E. A. (2020). Environmental Interventions to Reduce the Consumption of Sugar-Sweetened Beverages: Abridged Cochrane Systematic Review. *Obesity Facts*, *13*(4), 397–417. https://doi.org/10.1159/000508843

Podsakoff, P., Podsakoff, N. P., Williams, L. J., Huang, C., & Yang, J. (2024). Common method bias: It's bad, it's complex, it's widespread, and it's not easy to fix. *Annual Review of Organizational Psychology and Organizational Behavior*, *11*(1), 17–61. https://doi.org/10.1146/annurev-orgpsych-110721-040030

Polloni, L., Toniolo, A., Lazzarotto, F., Baldi, I., Foltran, F., Gregori, D., & Muraro, A. (2013). Nutritional behavior and attitudes in food allergic children and their mothers. *Clinical and Translational Allergy*, *3*(1), 41. https://doi.org/10.1186/2045-7022-3-41

Poncet, P., Sénéchal, H., & Charpin, D. (2020). Update on pollen-food allergy syndrome. *Expert Review of Clinical Immunology*, *16*(6), 561–578. https://doi.org/10.1080/1744666X.2020.1774366

Prasad, V., Abdullah, M., Nordin, F., & Subha, S. T. (2022). Prevalence, causes and treatments of allergic rhinitis in Malaysia: a literature review. *The Egyptian Journal of Otolaryngology*, *38*(1), 170. https://doi.org/10.1186/s43163-022-00361-4

Pratap, K., Taki, A. C., Johnston, E. B., Lopata, A. L., & Kamath, S. D. (2020). A comprehensive review on natural bioactive compounds and probiotics as potential therapeutics in food allergy treatment. *Frontiers in Immunology*, *11*, 996. https://doi.org/10.3389/fimmu.2020.00996

Quaidoo, E. Y., Ohemeng, A., & Amankwah-Poku, M. (2018). Sources of nutrition information and level of nutrition knowledge among young adults in the Accra metropolis. *BMC Public Health*, *18*(1), 1323. https://doi.org/10.1186/s12889-018-6159-1

Ragelienė, T., & Grønhøj, A. (2020). The influence of peers' and siblings' on children's and adolescents' healthy eating behavior. A systematic literature review. *Appetite*, *148*, 104592. https://doi.org/10.1016/j.appet.2020.104592

Ramli, M. H., Rosman, A. S., Khan, A., Jamaludin, M. A., Bayoumi, N. A. F., Hassan, A. M., Darawi, A. B. B. S. @, & Bayoumi, K. A. M. (2024). Food Allergy Consumption According to Halalan Tayyiban Perspective : A Food Allergy Consumption According to Halalan Tayyiban Perspective : A Review. *REVISTA GEINTEC-GESTAO INOVACAO E TECNOLOGIAS*, *11*(2), 955–969.

Ranganathan, P., & Caduff, C. (2023). Designing and validating a research questionnaire - Part 1 Priya. *Perspectives in Clinical Research*, *14*(3), 152–155. https://doi.org/10.4103/picr.picr

Redhwan, A. A., Low, W. Y., Mustafa, F. M., Robert, C., & Ali, A. (2011). Perceptions about food allergy among medical science students in a university in Shah Alam, Selangor, Malaysia. *International Food Research Journal*, *18*(1), 451–458.

Reja, U., Manfreda, K. L., Hlebec, V., & Vehovar, V. (2003). Open-ended vs . Close-ended Questions in Web Questionnaires. *Developments in Applied Statistics*, *19*(1), 159–177.

Roemer, E., Schuberth, F., & Henseler, J. (2021). HTMT2–an improved criterion for assessing discriminant validity in structural equation modeling. *Industrial Management & Data Systems*, *121*(12), 2637–2650. https://doi.org/10.1108/IMDS-02-2021-0082

Rombe, E., Zahara, Z., Sant, I. N., & Rahadhini, M. D. (2021). Exploring e-mobile banking implementation barriers on Indonesian millennial generation consumers. *International Journal of Data and Network Science*, *5*, 579–586. https://doi.org/10.5267/j.ijdns.2021.8.010

Roopa, S., & Rani, M. (2012). Questionnaire Designing for a Survey. *Journal of Indian Orthodontic Society*, *46*, 273–277. https://doi.org/10.5005/jp-journals-10021-1104

Rounsefell, K., Gibson, S., McLean, S., Blair, M., Molenaar, A., Brennan, L., Truby, H., & McCaffrey, T. A. (2020). *Social media, body image and food choices in healthy young adults : A mixed methods systematic review*. *77(1)* (July 2019), 19–40. https://doi.org/10.1111/1747-0080.12581

Rozario, B. (2011). *When allergies turn life-threatening*. Malaysian Society of Allergy and Immunology. https://allergymsai.org/in-the-press-02.html

Sadaf, S., Safdar, M., & Amjad, N. (2023). Effect of Social Media on Food Choices of University Students. *Online Media and Society*, *4*(4), 32–42. https://doi.org/10.71016/oms/f84ps116

Salsabila, H. Y., Putera, A. M., & Baskoro, A. (2021). Correlation between nutritional status and children's activity with food allergy: A cross-sectional study. *Annals of Medicine and Surgery*, *68*(6), 102652. https://doi.org/10.1016/j.amsu.2021.102652

Sanjari, M., Bahramnezhad, F., Fomani, F. K., Sho-, M., & Cheraghi, M. A. (2014). Ethical challenges of researchers in qualitative studies: the necessity to develop a specific guideline. *Journal of Medical Ethics and History of Medicine*, *7*, 14.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). *Partial Least Squares Structural Equation Modeling* (Handbook o). Springer International Publishing. https://doi.org/10.1007/978-3-319-05542-8

Savitri, C., Hurriyati, R., Wibowo, L. A., & Hendrayati, H. (2022). The role of social media marketing and brand image on smartphone purchase intention. *International Journal of Data and Network Science*, *6*(1), 185–192. https://doi.org/10.5267/j.ijdns.2021.9.009

Scaglioni, S., Cosmi, V. De, Ciappolino, V., Brambilla, P., & Agostoni, C. (2018). Factors Influencing Children's Eating Behaviours. *Nutrients*, *10*(6), 706. https://doi.org/10.3390/nu10060706

Scalvedi, M. L., Gennaro, L., Saba, A., & Rossi, L. (2021). Relationship between Nutrition Knowledge and Dietary Intake : An Assessment among a Sample of Italian Adults. *Frontiers in Nutrition*, *8*, 714493. https://doi.org/10.3389/fnut.2021.714493

Scarneo-miller, S. E., Kroshus, E., Register-mihalik, J., & Hosokawa, Y. (2019). The Socioecological Framework: A Multifaceted Approach to Preventing Sport-Related Deaths in High School Sports. *Journal of Athletic Training*, *54*(4), 356–360. https://doi.org/10.4085/1062-6050-173-18

Schnettler, B., Zapata, E. D. M., Lobos, G., & Saracostti, M. (2018). The Mediating Role of Family and Food-Related Life Satisfaction in the Relationships between Family Support, Parent Work-Life Balance and Adolescent Life Satisfaction in Dual-Earner Families. *International Journal of Environmental Research and Public Health (IJERPH)*, *15*(11), 2549. https://doi.org/10.3390/ijerph15112549

Schüz, B., Papadakis, T., & Ferguson, S. G. (2018). Situation-specific social norms as mediators of social influence on snacking. *Health Psychology*, *37*(2), 153–159. https://doi.org/10.1037/hea0000568

Sekaran, U., & Bougie, R. (2020). *Research Methods for Business: A Skill-Building Approach* (Fifth Edit). Wiley & Sons.

Sharma, A., Moon, J., Bailey-davis, L., & Conklin, M. (2017). Food choices and service evaluation under time constraints: the school lunch environment. *International Journal of Contemporary Hospitality Management*, *29*(4), 3191–3210. https://doi.org/10.1108/IJCHM-06-2015-0269

Sharma, B. (2018). Processing of data and analysis. *Biostatistics and Epidemiology International Journal*, *1*(1), 3–5. https://doi.org/10.30881/beij.00003

Shela, V., Ramayah, T., Aravindan, K. L., Ahmad, N. H., & Alzahrani, A. I. (2023). Heliyon Run ! This road has no ending ! A systematic review of PLS-SEM application in strategic management research among developing nations. *Heliyon*, *9*(12), e22476. https://doi.org/10.1016/j.heliyon.2023.e22476

Shin, M. (2021). Food allergies and food-induced anaphylaxis : role of cofactors. *Clinical and Experimental Pediatrics*, *64*(8), 393–399. https://doi.org/10.3345/cep.2020.01088

Shiyab, W., Ferguson, C., Rolls, K., & Halcomb, E. (2023). Solutions to address low response rates in online surveys. *European Journal of Cardiovascular Nursing*, *22*(4), 441–444. https://doi.org/10.1093/eurjcn/zvad030

Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J.-H., Ting, H., Vaithilingam, S., & Ringle, C. M. (2019). Predictive model assessment in PLS-SEM: guidelines for using

PLSpredict. *European Journal of Marketing*, *53*(11), 2322–2347. https://doi.org/10.1108/EJM-02-2019-0189

Si, Y., Little, R. J. A., Mo, Y., & Sedransk, N. (2024). Nonresponse Bias Analysis in Longitudinal Studies: A Comparative Review with an Application to the Early Childhood Longitudinal Study. *Nternational Statistical Review*, *92*(3), 383–405. https://doi.org/10.1111/insr.12566

Sicherer, S. H., Wood, R. A., & TePas, E. (2022). *Food allergy in college and university students: Overview and management*. UpToDate. https://www.uptodate.com/contents/food-allergy-in-college-and-university-students-overview-and-management

Sogari, G., Velez-argumedo, C., Miguel, I. G., & Mora, C. (2018). College Students and Eating Habits: A Study Using An Ecological Model for Healthy Behavior. *Nutrients*, *10*(12), 1823. https://doi.org/10.3390/nu10121823

Sommer, I., MacKenzie, H., Venter, C., & Dean, T. (2012). Factors influencing food choices of food-allergic consumers: Findings from focus groups. *Allergy: European Journal of Allergy and Clinical Immunology*, *67*(10), 1319–1322. https://doi.org/10.1111/j.1398-9995.2012.02883.x

Soon, J. M. (2019). Food allergen knowledge, attitude and practices among UK consumers : A structural modelling approach. *Food Research International*, *120*(December 2018), 375–381. https://doi.org/10.1016/j.foodres.2019.03.008

South, L., Saffo, D., Vitek, O., Dunne, C., & Borkin, M. A. (2022). Effective use of Likert scales in visualization evaluations: A systematic review. In Computer graphics forum (Vol. 41, No. 3, pp. 43-55).

Southwick, C. (2021). *Students with a Food Allergy: College Adjustment and Allergy Disclosure*. Fordham University.

Sprake, E. F., Russell, J. M., Cecil, J. E., Cooper, R. J., Grabowski, P., Pourshahidi, L. K., & Barker, M. E. (2018). Dietary patterns of university students in the UK : a cross-sectional study. *Nutrition Journal*, *17*(1), 90. https://doi.org/10.1186/s12937-018-0398-y

Sprumont, F., Scheffer, A., Caruso, G., Cornelis, E., & Viti, F. (2022). Quantifying the Relation between Activity Pattern Complexity and Car Use Using a Partial Least Square Structural Equation Model. *Sustainability*, *14*(9), 12101. https://doi.org/10.3390/su141912101

Stankovich, G. A., Warren, C. M., Gupta, R., Sindher, S. B., Chinthrajah, R. S., & Nadeau, K. C. (2023). Food allergy risks and dining industry – an assessment and a path forward. In *Frontiers in Allergy* (Vol. 4). https://doi.org/10.3389/falgy.2023.1060932

Statistik Categories. (n.d.). Ministry of Higher Education. https://www.mohe.gov.my/en/download/statistics

Stockemer, D. (2019). *Quantitative Methods for the Social Sciences A Practical Introduction with Examples in SPSS and Stata*. Springer International Publishing AG 2019. https://doi.org/10.1007/978-3-319-99118-4

Story, M., Neumark-Sztainer, D., & French, S. (2002). Adolescent Eating Behavior. *Nutrition Reviews*, *102*(3 Suppl), S40-51. https://doi.org/10.1016/s0002-8223(02)90421-9

Street, S., Simoncini, K., & Byrne, R. (2024). Peer influence on eating behaviour in early childhood : A scoping review. *Appetite*, *203*, 107708. https://doi.org/10.1016/j.appet.2024.107708

Streukens, S., & Leroi-werelds, S. (2016). Bootstrapping and PLS-SEM: A step-by-step guide to get more out of your bootstrap results. *European Management Journal*, *34*(6), 618–632. https://doi.org/10.1016/j.emj.2016.06.003

Sturgis, P., & Brunton-smith, I. (2023). Personality and Survey Satisficing. *Public Opinion Quarterly*, *87*(3), 689–718. https://doi.org/10.1093/poq/nfad036

Suhan, Samartha, V., & Kodikal, R. (2018). Measuring the Effect Size of Coefficient of Determination and Predictive Relevance of Exogenous Latent Variables on Endogenous Latent Variables through PLS-SEM. *International Journal of Pure and Applied Mathematics*, *119*(18), 39–48.

Sukor, R. (2020). *Alergi Makanan Boleh Mengundang Maut*. INSTITUT PERTANIAN TROPIKA DAN SEKURITI MAKANAN (ITAFoS). https://itafos.upm.edu.my/article/food_allergy_could_lead_to_death-57793

Sulaiman, N., & Sin, Y. P. (2011). Factors influencing food choice among students in a residential college of a malaysia public university. *Malaysian Journal of Youth Studies*, 90–109. https://doi.org/10.56390/apjys2024.4.6

Sullivan, G. M., & Feinn, R. (2012). Using Effect Size—or Why the P Value Is Not Enough. *Journal of Graduate Medical Education*, *4*(3), 279–282. https://doi.org/10.4300/JGME-D-12-00156.1

Suresh, K. P., & Chandrashekara, S. (2014). Sample size estimation and power analysis for clinical research studies. *Journal of Human Reproductive Sciences*, *5*(1), 7–13. https://doi.org/10.4103/0974-1208.97779

Tabachnick, B. G., & Fidell, L. S. (2019). *Using Multivariate Statistics* (Seventh Ed). Perason Education.

Tackett, A. P., Roberts, C. M., Farrow, M., & Mcquaid, E. L. (2019). Food insecurity and caregiver perceptions of food allergen risk by food purchase location in children with food allergies. *Translational Behavioral Medicine*, *9*(3), 404–412. https://doi.org/10.1093/tbm/ibz059

Tan, A. L., Trupp, A., & Tan, J. X. (2023). Dining out safely with food allergies: A comparative perspective from restaurant managers and servers in Malaysia. *International Food Research Journal*, *30*(3), 750–763. https://doi.org/10.47836/ifrj.30.3.17

Tanujaya, B., Prahmana, R. C. I., & Mumu, J. (2022). Likert Scale in Social Sciences Research: Problems and Difficulties. *FWU Journal of Social Sciences*, *164*(4), 89–101. https://doi.org/10.51709/19951272/Winter2022/7

Tao, Y., Wall, M., Larson, N., Neumark-Sztainer, D., & Winpenny, E. M. (2024). Changes in diet quality across life transitions from adolescence to early adulthood: a latent growth analysis. *The American Journal of Clinical Nutrition*, *120*(5), 1215–1224. https://doi.org/10.1101/2024.02.14.24302819.

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach ' s alpha. *International Journal of Medical Education*, *2*, 53–55. https://doi.org/10.5116/ijme.4dfb.8dfd

Team, V., Manderson, L., & Markovic, M. (2017). Cultural Competence in Health: Understanding the Food Choices of Older Ukrainian Australians. In Y. Mao & R. Ahmed (Eds.), *Culture, Migration, and Health Communication in a Global Context* (pp. 87–104). Routledge. https://doi.org/10.4324/9781315401348-6

Teijlingen, E. R. van, & Hundley, V. (2002). The importance of pilot studies. *Nursing Standard: Official Newspaper of the Royal College of Nursing*, *16*(40), 33–36. https://doi.org/10.7748/ns2002.06.16.40.33.c3214

Tengku Azhar, T. N., Mohd. Idris, S. N., Abdul Ghani, R., Che Hassan, M. R., Haridan, U. S., Mohamed, M., . . . Mohd. Zazi, N. (2020). *Self-reported on food allergy among university students in Dengkil, Selangor*.

Thurecht, R. L., & Pelly, F. E. (2021). The Athlete Food Choice Questionnaire (AFCQ): Validity and Reliability in a Sample of International High-Performance Athletes. *Medicine and Science in Sports and Exercise*, *53*(7), 1537–1543. https://doi.org/10.1249/MSS.0000000000002611

Ting, H., Memon, M. A., Thurasamy, R., & Cheah, J. (2025). Snowball Sampling: A Review and Guidelines for Survey Research. *Asian Journal of Business Research*, *15*(1), 1–15. https://doi.org/10.14707/ajbr.250186

Tripathi, S., & Chaturvedi, R. K. (2023). Exploring Ethical Considerations in Research: Guidelines and Practices. *Adhyayan A Journal of Management Sciences*, *13*(1), 41–45. https://doi.org/10.21567/adhyayan.v13i1.08

Trogen, B., Jacobs, S., & Nowak-Wegrzyn, A. (2022). Early Introduction of Allergenic Foods and the Prevention of Food Allergy. *Nutrients*, *14*(13), 2565. https://doi.org/10.3390/nu14132565

Tudu, B., & Singh, S. (2022). Conceptualizing the moderating effects between work from home and individual performance – Developing a conceptual framework using the self-determination theory. *Current Psychology*, *0123456789*. https://doi.org/10.1007/s12144-022-03950-x

Valaitis, R. K., Mara, L. O., Wong, S. T., Macdonald, M., Murray, N., Martin-Misener, R., & Meagher-Stewart, D. (2018). Strengthening primary health care through primary care and public health collaboration: the influence of intrapersonal and interpersonal factors. *Primary Health Care Research & Development*, *19*(4), 378–391. https://doi.org/10.1017/S1463423617000895

Valero-moreno, S., Torres-llanos, R., & Pérez-Marín, M. (2024). Impact of Childhood Food Allergy on Quality of Life : A Systematic Review. *Applied Science*, *14*(23), 10989. https://doi.org/10.3390/app142310989

Vassilopoulou, E., Vardaka, E., Efthymiou, D., & Pitsios, C. (2021). Early life triggers for food allergy that in turn impacts dietary habits in childhood. *Allergologia et Immunopathologia*, *49*(3), 146–152. https://doi.org/10.15586/aei.v49i3.181

Vazquez-Ortiz, M., Angier, E., Blumchen, K., Comberiati, P., Duca, B., DunnGalvin, A., Gore, C., Hox, V., Jensen, B., Pite, H., Santos, A. F., Sanchez, S., Alviani, C., Garriga-Baraut, T., Knibb, R., Mortz, C. G., Gowland, M. H., Timmermans, F., & Roberts, G. (2020). Understanding the challenges faced by adolescents

and young adults with allergic conditions : A systematic review. *Journal of Allergy*, *75*(8), 1850–1880. https://doi.org/10.1111/all.14258

Vélez-agosto, N. M., Soto-crespo, J. G., Mónica Vizcarrondo Oppenheimer, & Vega-Molina, S. M. (2017). Bronfenbrenner's Bioecological Theory Revision : Moving Culture from the Macro into the Micro. *Perspectives on Psychological Science*, *12*(5), 900–910. https://doi.org/10.1177/1745691617704397

Versluis, A., Le, H., Erp, F. C. van, Blankestijn, M. A., Houben, G. F., Knulst, A. C., & Medendorp, H. van O. (2022). Low dietary adherence after a positive food challenge in food allergic adults. *Clinical and Translational Allergy*, *12*(2), e12119. https://doi.org/10.1002/clt2.12119

Verstraeten, R., Van Royen, K., Ochoa-Avilés, A., Penafiel, D., Holdsworth, M., Donoso, S., Maes, L., & Kolsteren, P. (2014). A conceptual framework for healthy eating behavior in ecuadorian adolescents: A qualitative study. *PLoS ONE*, *9*(1). https://doi.org/10.1371/journal.pone.0087183

Wahyuningtyas, R., Wisnusanti, S. U., & Kusuma, M. T. P. L. (2021). Factors associated with food choice motives of adolescents in Yogyakarta Special District. *Jurnal Gizi Klinik Indonesia*, *18*(2), 86. https://doi.org/10.22146/ijcn.63152

Wang, J., Zhou, Y., Zhang, H., Hu, L., Liu, J., Wang, L., Wang, T., Zhang, H., Cong, L., & Wang, Q. (2023). Pathogenesis of allergic diseases and implications for therapeutic interventions. *Signal Transduction and Targeted Therap*, *8*(1), 138. https://doi.org/10.1038/s41392-023-01344-4

Wang, X. (2024). The Impact of Food Allergies on Nutrient Intake during Children's Growth and Development Stage and Possible Interventions. *Highlights in Science, Engineering and Technology*, *123*, 345–350.

Warren, C. M., Jiang, J., & Gupta, R. S. (2020). Epidemiology and Burden of Food Allergy. *Current Allergy and Asthma Reports*, *20*(2). https://doi.org/10.1007/s11882-020-0898-7

Weber, L., & Lugosi, P. (2021). The event experiences of attendees with food allergies, intolerances and coeliac disease: risk loaded value-creation/destruction. *International Journal of Event and Festival Management*, *12*(2), 184–202. https://doi.org/10.1108/IJEFM-11-2020-0066

Weeks, W. B., Weinstein, J. N., & Lavista, J. M. (2023). All Sustainable Development Goals Support Good Health and Well-Being. *International Journal of Public Health*, *68*, 10–12. https://doi.org/10.3389/ijph.2023.1606901

Why Is Quantitative Research Important? (2021). Grand Canyon University. https://www.gcu.edu/blog/doctoral-journey/why-quantitative-research-important

Wong, K. K. (2013). Partial Least Squares Structural Equation Modeling (PLS-SEM) Techniques Using SmartPLS. *Marketing Bulletin*, *24*(1), 1–32.

Wongprawmas, R., Mora, C., Pellegrini, N., Guin, R. P. F., Carini, E., Sogari, G., & Vittadini, E. (2021). Food Choice Determinants and Perceptions of a Healthy Diet among Italian Consumers. *Foods*, *10*(2), 318. https://doi.org/10.3390/foods10020318.

Wu, A. C., & Wang, A. L. (2024). Preventing Anaphylaxis in College Students with Food Allergies. *The Journal of Allergy and Clinical Immunology: In Practice*, *11*(4), 1047–1048. https://doi.org/10.1016/j.jaip.2023.02.004.Preventing

Xiong, X. (2022). Critical Review of Quantitative and Qualitative. *Advances in Social Science, Education and Humanities Research*, *670*, 956–959. https://doi.org/10.2991/assehr.k.220704.172

Yee, A. Z. H., Lwin, M. O., & Ho, S. S. (2017). The influence of parental practices on child promotive and preventive food consumption behaviors: a systematic review and meta-analysis. *The International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 47. https://doi.org/10.1186/s12966-017-0501-3

Zaher, S., Bookari, K., Arrish, J., Alnaifisah, R., Alobaid, R., Albuayjan, N., Binammar, A., Alsayegh, A., A.Abduljawad, E., Halwani, R. A., Alkhalaf, M. M., & Al-Otaibi, H. (2023). Prevalence of self-reported food allergies among the Saudi population and investigation of the challenges faced by people with food allergy: a cross sectional online survey- based study. *Progress in Nutrition*, *25*(1), e2023017. https://doi.org/10.23751/pn.v25i1.13504

Żarnowski, A., Jankowski, M., & Gujski, M. (2022). Nutrition Knowledge, Dietary Habits, and Food Labels Use-A Representative Cross-Sectional Survey among Adults in Poland. *International Journal of Environmental Research and Public Health*, *19*(8), 11364. https://doi.org/10.3390/ijerph191811364

Ziegler, A. M., Kasprzak, C. M., Mansouri, T. H., Gregory, A. M., Barich, R. A., Hatzinger, L. A., Leone, L. A., & Temple, J. L. (2021). An Ecological Perspective of Food Choice and Eating Autonomy among Adolescents. *Frontiers in Psychology*, *12*, 654139. https://doi.org/10.3389/fpsyg.2021.654139

Zimmerman, F. J., & Shimoga, S. V. (2014). The effects of food advertising and cognitive load on food choices. *BMC Public Health*, *14*(1), 1–10. https://doi.org/10.1186/1471-2458-14-342.

Żukiewicz-sobczak, W. A., Wróblewska, P., Adamczuk, P., & Kopczyński, P. (2013). Causes, symptoms and prevention of food allergy. *Postępy Dermatologii i Alergologii*, *30*(2), 113–116. https://doi.org/10.5114/pdia.2013.34162

Zyoud, M. M., Bsharat, T. R. K., & Dweikat, K. (2024). Quantitative Research Methods : Maximizing Benefits, Addressing Limitations, and Advancing Methodological Frontiers Quantitative Research Methods : Maximizing Benefits, Addressing Limitations, and Advancing Methodological Frontiers Introduction : *ISRG Journal of Multidisciplinary Studies (ISRGJMS)*, *2*(4), 10–14. https://doi.org/10.5281/zenodo.10939470

APPENDICES

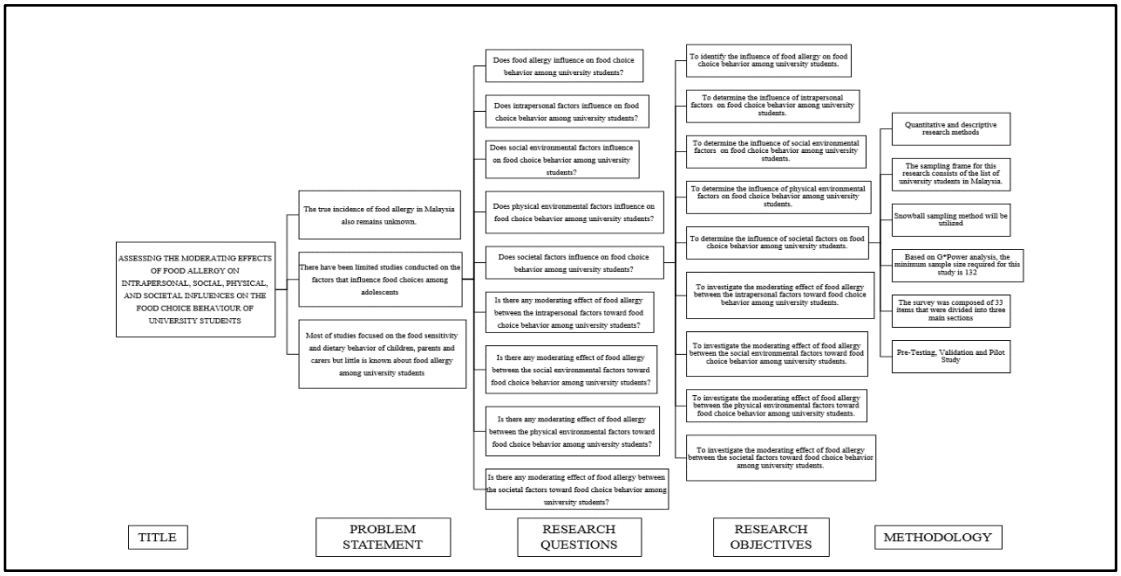
APPENDIX 1

Research Activities/Gantt Chart

GANTT CHART	SEMESTER OCTOBER 2023 - FEBRUARY 2024																			
	OCTOBER				NOVEMBER				DECEMBER				JANUARY				FEBRUARY			
	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11	WEEK 12	WEEK 13	WEEK 14	WEEK 15	WEEK 16	WEEK 17	WEEK 18	WEEK 19	WEEK 20
Application for research ethics																				
Conduct a pilot test																				
Information gathering																				
Conduct data collection																				
Analyze the data																				
Write the discussion																				
Conclusion of the research																				
Review research paper (SV)																				
Finalise research paper																				
Viva presentation																				

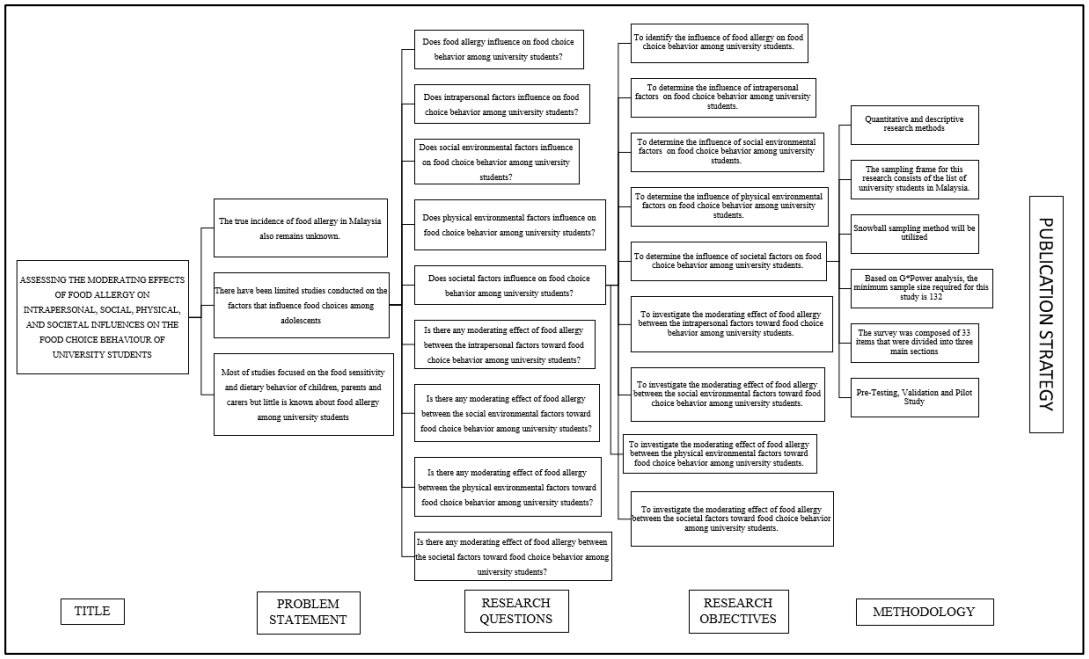
APPENDIX 2

Proposal Mapping



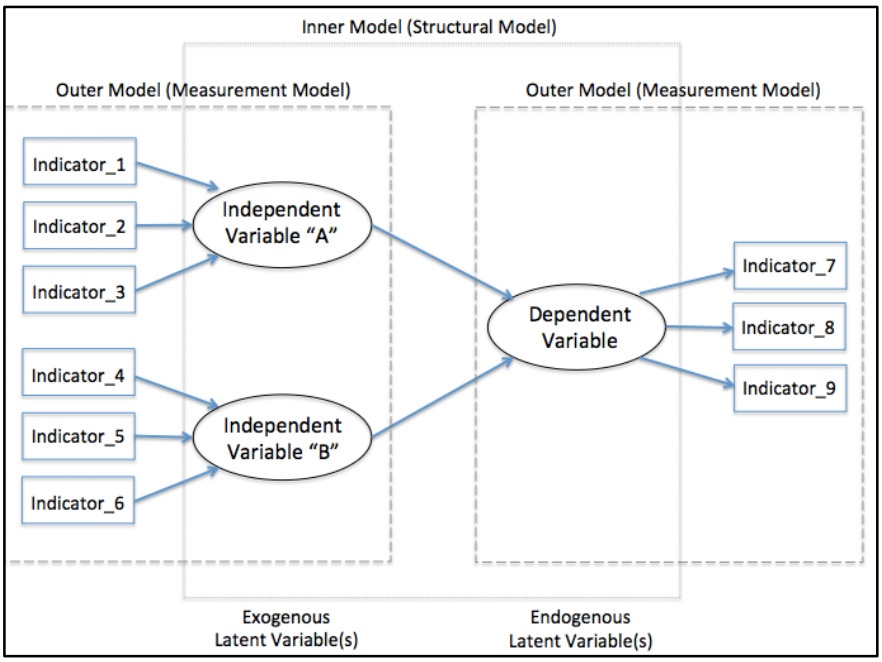
APPENDIX 3

Publication Planning



APPENDIX 4

Inner vs. Outer Model in a SEM Diagram



APPENDIX 5

Approval Letter – UiTM Research Ethics Committee

www.uitm.edu.my

UNIVERSITI TEKNOLOGI MARA

Pejabat
Timbalan Naib Canselor
(Penyelidikan dan Inovasi)

Reference : 600-TNCPI (5/1/6)
Our reference : REC/08/2024 (PG/MR/394)
Date : 1445H صفر 10
13 August 2024

Ms Ainul Hayati Abdull Aziz - 2022455042
(Supervisor: Dr Norrina Din)
UiTM Pulau Pinang Branch
Permatang Pauh Campus
13500 Permatang Pauh, Seberang Perai
PULAU PINANG

سلام عليكم ورحمة الله وبركاته and Greetings

Ms

APPROVAL LETTER - UiTM RESEARCH ETHICS COMMITTEE

Thank you for submitting your research proposal to the Research Ethics Committee (REC). After considering your application, the Committee approved your proposal titled "Assessing the Role of Intrapersonal, Social, Physical, and Societal Influences and Moderating Effects of Food Allergy on Food Choice Behaviour of University Students" in Malaysia. Details of the approval are as follows:

Ref. number:	REC/08/2024 (PG/MR/394)
Approval Period:	13 August 2024 until 1 September 2024
Authorised personnel:	1. Ainul Hayati Abdull Aziz 2. Dr Norrina Din

The UiTM Research Ethics Committee operates in accordance to the ICH Good Clinical Practice Guidelines, Malaysian Good Clinical Practice Guidelines and the Declaration of Helsinki. The approval of this project is conditional upon your continuing compliance with these guidelines and declaration.

We draw to your attention the requirement that a report on this research, must be submitted every 12 months from the date of the approval or on the completion of the project, whichever occurs first. Failure to submit reports will result in withdrawal of consent for the project to proceed. Amendments, if any, to the study documents are to be submitted to the REC for approval.

If you require further information, please contact the REC Secretariat at 03-55448069/03-55442794 or email at recsecretariat@uitm.edu.my.

اوسها، تقوى، مولیا
"MALAYSIA MADANI"
"BERKHIDMAT UNTUK NEGARA"

Yours sincerely,

(EMERITUS PROFESSOR DATO' DR RAYMOND AZMAN ALI)
Chairman
UiTM Research Ethics Committee

c.c.: Deputy Rector (PJIM&A), UiTM Pulau Pinang Branch

Universiti Teknologi MARA
Aras 3, Bangunan Wawasan
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Tel: (+603) 5544 2004/2255
Faks: (+603) 5544 2070

ISO 9001:2015 No. Sijil: 10120156

UiTM di hatiku

APPENDIX 6

Publication Certificate – Towards Sustainable Food Systems: Exploring the Impact of Food Allergies on Health and Well-being in University Settings



Indexed in Web of Science (WoS) and ScienceOPEN

AcE-Bs2024Langkawi

https://www.amerabra.org

12th ASIAN Conference on Environment-Behaviour Studies

Holiday Villa Resort & Spa, Langkawi Island, Malaysia, 01-03 Mar 2024

Certificate of Appreciation

Is hereby awarded to

Ainul Hayati Abdull Aziz1, Norrina Din1, Dahlan Abdullah1, Mazarina Devi2

1 Faculty of Hotel & Tourism Management, Universiti Teknologi MARA, 13500 Penang, Malaysia, 2 Faculty of Applied Science and Technology (FAST) Universitas Negeri Malang, Malang 65114, Indonesia.

In recognition as

Paper Contributors

Paper Title:

Towards Sustainable Food Systems: Exploring the impact of food allergies on health and well-being in university settings

Prof. Dr. Mohamed Yusoff Abbas
Chair, AcE-Bs2024Langkawi

Prof. Dr. Masran Saruwono
Co-Chair, AcE-Bs2024Langkawi

Another international conference organised by:

AMER cE-Bs

Association of Malaysian Environment-Behaviour Researchers
Centre for Environment-Behaviour Studies, College of Built Environment, UiTM, Malaysia

Secretariat:

emAs

AMER Event Management & Services
X2-26-A, Blok K, Pusat Komersial Seksyen 7, 40000 Shah Alam, Selangor, D.E., Malaysia
acebs2024langkawi@gmail.com; cebsuitm@gmail.com

APPENDIX 7

Publication Certificate – Assessing Multilevel Determinants of Food Choice Behaviour among University Students: The Moderating Role of Food Allergy



CERTIFICATE
OF ACHIEVEMENT

This certificate is proudly presented to

Ainul Hayati Abdull Aziz, Norrina Din, Dahlan Abdullah

for achieving

BRONZE AWARD

in the

3rd International Tinker Innovation and Entrepreneurship Challenge 2026

under the category of

Social Science

with the project entitled

Assessing Multilevel Determinants of Food Choice Behaviour among University Students: The Moderating Role of Food Allergy

in recognition of outstanding innovation, creativity, and excellence.

Date: 17 April 2026

Associate Professor Dr. Saunah Zainon
Rector
UiTM Johor Branch

AUTHOR'S PROFILE



Ainul Hayati Abdull Aziz is a Postgraduate Student in Food Service Management at UiTM Permatang Pauh, Pulau Pinang. Her research interests focus on food choice behaviour, food allergies, student health and well-being, and sustainable food systems, particularly within university settings. She has published studies on the impact of food allergies on health and sustainability in higher education and on caffeine consumption and its effects on university students' academic performance. Her work employs quantitative methods, including structural equation modelling, to address contemporary food and nutrition challenges.

LIST OF PUBLICATIONS

Assessing Multilevel Determinants of Food Choice Behaviour among University Students: The Moderating Role of Food Allergy (3rd International Tinker Innovation & Entrepreneurship Challenge [I-TIEC 2026])

Aziz, A. H. A., Din, N., Abdullah, D., & Devi, M. (2024). Towards sustainable food systems: exploring the impact of food allergies on health and well-being in university settings. Environment-Behaviour Proceedings Journal, 9(28), 25-30.