

Student Voices: The influence of the University Campus  
environment on physical activity and healthy eating habits

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## **Thesis Abstract**

This study investigated the experience of Auckland University of Technology (AUT)'s students in terms of the campus environment and how it affected their physical activity, eating and sedentary behaviours. The research question that this study aimed to answer was: How does the physical environment of AUT City Campus affect students' physical activity levels, sedentary behaviour and eating behaviours?

Tertiary students have been found to spend most of their time in lectures and studying. Both of which mainly consists of sitting for long periods of time (Rouse & Biddle, 2010). There is limited research on prolonged sedentary behaviour in university students and its effect on health and wellbeing. Health and wellbeing, in this study, is defined as the absence of non-communicable diseases and maintaining a healthy lifestyle by being physically fit and having a balanced nutrition. Extensive research has been conducted on the determinants of students' eating and physical activity behaviour-however, there is limited amounts of research on the ways a university campus can facilitate healthy physical and eating habits using students' own suggestions.

In a case-design, eight participants were recruited to obtain what they considered as barriers and facilitators to being sedentary, physically active and eating healthy in the university campus. The citizen science for health equity methodology and participatory action research approach using the first two stages were followed: Discover (campus walk using an app and online surveys) and Discuss (action group). PhotoCap, an app, gathered information on individuals' perception of enablers and barriers by capturing photos of the area or item and captioning it with brief explanations. Three surveys were included which investigated the participants' physical and eating habits. An action group was formed to

discuss possible solutions to overcome identified barriers from the campus walk. Thematic analysis of the campus walks showed the following themes related to barriers and facilitators: indoor and outdoor environment, affordability, variety, convenience, promotions and advertisements. In particular, barriers relating to: unhealthy content of vending machines, high cost of foods and gym membership, escalators and elevators that discourage stair use. Common perceived facilitators were healthy campus eateries, student kitchen areas to prepare home-cooked meals, bike racks that encourage active transport, convenient on-campus gym, basketball court and stairs promoting physical activity. Other barriers discovered in the action group were the lack of time, prioritising studying, lacking the knowledge of student benefits such as rental of sport equipment, gym location, student membership price, team sport opportunities.

In summary, a need for change was identified in the lifestyle of tertiary students to facilitate physical activity, decrease sedentary activity and eat healthy through the environmental barriers identified. This study aimed to set the foundation of future research relating to the different aspects of tertiary students' wellbeing and how it can be improved with the input of students. A case-study design gave an in-depth understanding of the campus environment effect on students and gave an insight into underlying effects.

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### **Attestation of Authorship**

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material to which a substantial extent has been accepted for the award of any degree or diploma of a university or other institution of higher learning, except where due acknowledgement is made.

Name                      Nehal Natasha

Date                        3<sup>rd</sup> March, 2019

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Since this research involved human participants, I would like to acknowledge the ethics approval by the Auckland University of Technology Ethics Committee. Date of approval 1<sup>st</sup> October 2018, reference number 17/346. See Appendix 1 and 2 for complete proof.

## Chapter 1: Introduction

### Background

In the past few years, obesity in New Zealand has drastically increased as well as in most OECD (organisation for economic co-operation and development) countries such as Australia and United States of America. According to the World Health Organisation (WHO), obesity has globally increased by more than 50% since 1980 with 39% of adults being overweight ("Obesity and overweight", 2017). Thirteen percent of which are obese. Being obese or overweight is categorised by one's body mass index (BMI). A BMI of 25 or more is categorised as being overweight; 30 or more is classed as obese (Mei et al., 2002).

There are many factors that can contribute to being overweight such as diet, lifestyle, physical activity, environmental factors and sedentary behaviour (Salbe et al., 2002; Haslam & James, 2005). These factors can also lead to non-communicable diseases such as type 2 diabetes, cardiovascular diseases, high blood pressure and metabolic syndromes (Mokdad et al., 2003; Luppino et al., 2010). All of which are preventable.

In New Zealand, the recommended amount of physical activity for adults is 2.5 hours of moderate or 1.25 hours of vigorous intensity physical activity per week ("Physical activity", 2018). For children and teenagers, at least one hour of moderate or vigorous physical activity per day is recommended. However, only 51% of all adults are physically active for at least 30 minutes per week and only 10% of high school students meet the recommended 60 minutes per week ("Physical activity", 2018). Physical inactivity identifies people who don't meet the recommended amount of regular physical activity as established by the Ministry of Health or other health departments per their country (Kohl et al., 2012).

Sedentary behaviour refers to any waking behaviour with an energy expenditure of less than 1.5 metabolic equivalents. This includes lying down, sitting, driving, sitting in a reclining position, and engaging in screen-based and non-screen-based behaviours (Pate, O'Neill & Lobelo, 2008; Sedentary Behaviour Research Network, 2012; Tremblay et al., 2017). Metabolic equivalent is a measure of exercise based on energy consumption per unit of body weight. Currently, there are no official guidelines or recommendations on sedentary behaviour for youth from the Ministry of Health New Zealand, other than mentioning to limit the behaviour. According to University of Auckland's Youth 12 survey, 28% of high school students watch television for 3 or more hours. Thirty-five percent use the internet for 3 or more hours (Clark, Fleming, Bullen, Denny, Crengle, Dyson, & Rossen, 2013). Long periods of sedentary behaviour, regardless of physical activity levels, can lead to weight gain, certain types of cancers, cardiovascular diseases, and adiposity (Thorp, Owen, Neuhaus & Dunstan, 2011). An association between increased screen time and depression has been identified in children and adolescence (Rezende, Rodrigues Lopes, Rey-López, Matsudo & Luiz, 2014). Sedentary behaviour and physical inactivity are independent from one another and both need to be considered separately when undertaking a healthy lifestyle (Pate, O'Neill & Lobelo, 2008; Sedentary Behaviour Research Network, 2012; Tremblay et al., 2017).

Having an unhealthy diet is a major risk factor for non-communicable diseases as it can lead to type 2 diabetes, high blood pressure, cholesterol, strokes, heart diseases and reproductive issues (Popkin, 2006; Loef & Walach, 2012). There are official recommended dietary intakes for nutrients, food groups, vitamins and minerals on the New Zealand's Ministry of Health and the Nutrition Foundation websites. However, New Zealanders are now spending more on fast food and restaurant meals rather than spending it on grocery



items and home cooked meals (Eyles et al., 2018). Fast foods are usually high in sodium, saturated fat, and carbohydrates; all of which when consumed in high amounts can be detrimental to health (Bowman, Gortmaker, Ebbeling, Pereira & Ludwig, 2003). Due to the convenience and affordability, fast food consumption has increased over the years (Eyles et al., 2018).

The three factors: nutrition, physical activity and sedentary behaviour, are few of the major risk factors for developing non-communicable diseases. There has been extensive research on primary school children and high school students in terms of the environmental risk factors affecting their health and how certain changes of the schools' environment can decrease the risks; changes such as introducing standing desks, incorporating more sport activities in the curriculum, and educating both students and parents on nutritional guidelines (Veitch, Salmon & Ball, 2010; Hinckson et al, 2013; Salmon et al, 2011). However, there is a limited amount of research conducted on tertiary students, compared to high school and primary school students, in terms of what affects their health and what changes can be made in order to improve it. Tertiary students tend to spend the majority of their time on campus; the environment will tend to influence students' lifestyle in terms of eating choices, engaging in physical activity and leisure activities (Keating, Guan, Piñero & Bridges, 2005). Since tertiary institutes do not integrate physical activity in the curriculum and students have more independence in making their lifestyle decisions, it may lead to unhealthy choices based on external factors. Barriers in and around the campus can be changed to facilitate healthy habits of students. There has been previous research conducted on tertiary students to understand what factors influence their food consumption decision. Price, taste, convenience and weight control were important factors that influenced their choice (Glanz, Basil, Maibach, Goldberg & Snyder, 1998). As for physical activity

engagement, it was found that when students had begun attending university, the number of students' gym memberships had decreased (Deliens, Deforche, De Bourdeaudhuij & Clarys, 2015). Sedentary behaviour had also increased substantially due to increased study periods, screen time and video game usage (Greenwood-Hickman, Renz, & Rosenberg, 2015; Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013). Time was the most important influencer for students partaking in physical activity (Greenwood-Hickman, Renz & Rosenberg, 2015). Most students preferred engaging in sedentary activities during their leisure time due to mental and physical fatigue (Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013). Students who were physically active reported that perceived enjoyment of the activity was one of the important factors in partaking (Deliens, Deforche, De Bourdeaudhuij & Clarys, 2015). Availability and accessibility to the gym and sport equipment were also important influences; this includes the price of the gym membership (Deliens, Deforche, De Bourdeaudhuij & Clarys, 2015; Buckworth & Nigg, 2004). Considering what students themselves perceived to be important factors in their choices can help in altering the environment to improve health choices. This can also help set in healthy habits that people can carry on with as they get older to prevent the onset of non-communicable diseases.

### **Research Question**

The research question: "How does the physical environment of AUT City Campus affect students' physical activity levels, sedentary behaviour and eating behaviours?" was developed to address the lack of research in the solutions, catered to tertiary students, required to overcome environmental barriers to physical activity, sedentary behaviour and healthy eating.

The aim was to generate realistic solutions to overcome the identified perceived barriers in regard to physical activity, sedentary behaviour and healthy eating using the Citizen Science approach. This was done by:

- 1) Asking each participant what they perceived to be the environmental barriers to and facilitators of healthy eating, physical activity and sedentary behaviour via PhotoCap
- 2) Collecting data on their eating and physical activity habits via three online surveys
- 3) Forming an action group to discuss the found barriers and facilitators and using that process to generate realistic solutions and interventions.

### **Thesis Rationale**

This project aimed to explore and understand university students' perception of what they considered the barriers and facilitators to be for physical activity, sedentary behaviour and healthy eating. It used the PhotoCap application which enables users to take pictures of areas and/or items and generate a caption to explain why they consider it a barrier or facilitator. GPS Trip Tracker was also used. This application has a feature that tracks the route and length of the walk during a campus walk.

This study used a case study approach to identify the perceived environmental barriers and facilitators that may affect students. Using a case study design enabled the researcher to have a deeper understanding of participants' personal experiences through various methods as it is a flexible data collection method. Using a participatory action research approach, participants discussed realistic solutions and interventions to overcome the identified barriers in order to improve the campus environment to be a better facilitator of a healthy lifestyle catered to AUT students.

## **Choice of Research Design**

A mixed methods research design was used to answer the research question as it mostly required the experience and opinions of participants rather than objective, close ended questions; as in quantitative study designs. Using a qualitative approach for this research was appropriate because:

- It gave an insight and understanding into the experiences and perceptions of participants regarding their environment
- It allowed the researcher flexibility to ask in depth questions regarding the factors that influence participants' eating, physical activity and sedentary behaviour and patterns.
- Emerged themes from discussions and interviews allowed for an understanding of problems and issues that might not have been foreseen otherwise.

A qualitative study is mainly used for exploratory research as it is used to gain understanding of underlying motivations, reasons, meanings and opinions of participants that may not be fully explored via a quantitative method. Qualitative approach is a method of observation to gather data that is non-numerical and is best for researching and understanding the human experience. The data from this type of research cannot be generalised as the experiences and thoughts of each person may be different and the students of AUT may have different opinions compared to students of other universities. In this research, a qualitative study was used to reflect the participants' opinions on the perceived barriers and enablers of students' wellbeing on campus.

## **Choice of Participants**

This research required the involvement of participants that attend the AUT City campus as students; either postgraduate or undergraduate. Students were recruited from the City

campus. Recruited participants were also required to be able to walk or wheel around the campus freely.

Participants were selected using sample of convenience which is a non-probability sampling technique. This is a technique in which participants are selected due to their accessibility to the researcher. Samples are gathered in a process whereby the individuals in the population do not have equal chances of being selected. A sample of convenience is useful for this research as a limited number of participants are required and limited time was given to obtain the participants (Etikan, Musa & Alkassim, 2016). Informative posters were placed around the campus to recruit participants. The poster was also used on social media to increase awareness. Posters included the purpose and stages of the study, along with the researcher's contact information and ethics approval number.

### **Data Collection Methods**

Surveys, action groups and individual interviews were employed to collect in-depth data in regard to the physical environment of the campus effect on participants' physical activity, sedentary behaviour and diet. Each of these methods were useful in obtaining more information regarding the different stages of the study (see Figure 1 below for summary of study design). Stage One, Part One required the opinions of participants in terms of what they perceived to be barriers and facilitators of healthy eating, physical activity and sedentary behaviour. Data were collected using an application on an iPad that enables the user to take photos and add captions to those photos. Participants were required to state what they perceived to be barriers and facilitators and had to explain their reasons. Stage One, Part Two obtained data on participants' eating and physical activity habits using three surveys: Health Fair Questionnaire, International Physical Activity (Fogelholm et al., 2006) and Health Promoting Lifestyle survey (Pinar, Celik & Bahcecik, 2009). The surveys

included both qualitative and quantitative questions. These surveys were online, which allowed the participants to access them via a link if they required more time than the allocated time of an hour to complete it. Stage Two involved an action group in which participants discussed the barriers identified from Stage One and generated potential solutions catering to students.

### **Choice of Analysis**

Thematic analysis was used to identify key themes and categories from Stages One and Two (Figure 1, page 26). Thematic analysis aids in the recognition of patterns or themes across the data sets that may be important to understand a phenomenon or that can help to answer a research question. It is mainly used in qualitative studies (Clarke & Braun, 2016). Themes were identified through a process of data coding, familiarisation and theme development. One of the advantages is the flexibility that it provides when used in different frameworks to answer different types of research questions (Clarke & Braun, 2016). It assists in the understanding of the meaning of the data from the in-depth data sets and in the interpretation of the perceptions of participants. In this study, thematic analysis enabled the researcher to find common themes amongst participants in regard to their thoughts and opinions.

The findings from the online surveys were mainly quantitative data that were analysed via scoring the three surveys. The mean, maximum and minimum values from each survey are shown to highlight the difference in data between the participants.

The International Physical Activity Questionnaire (IPAQ) was analysed by using the IPAQ scoring system. The amount of time participants spent in low-, moderate- and high intensity activity levels were multiplied by the metabolic equivalent of task (MET) associated with the reported level of activity. The value was then multiplied by the number

of days they reported engaging in those activities. This calculates the amount of a participants' spent energy.

The Health Fair questionnaire captures participants' self-reported eating habits by inquiring about participants' frequency of fruit and vegetables consumption in a daily and weekly basis. This questionnaire was analysed via grouping the most common answers as to how often they eat certain foods with either 'regularly', 'often', 'sometimes' and 'never' as represented by A, B, C and D, respectively, on the survey (see Appendix 4).

To measure health promoting behaviour, in terms of healthy eating habits, the self-reported Health Promoting Lifestyle Survey was used as a tool. The original survey has 52 items that measures a few domains of health promoting behaviour such as: health responsibility, spiritual growth, nutrition, stress management, physical activity and interpersonal relationships. This survey was amended to only include questions relating to nutrition for the purpose of the study. The survey measures the frequency of self-reported behaviours related to eating habits. The data was analysed by calculating the mean of the participants' response to the questions which shows whether the participant has healthy eating habits and behaviours.

### **Uniqueness of the Thesis**

Over the last few years, the prevalence of obesity has been increasing in both children and adults. There are many factors that can lead to this which can further lead to non-communicable diseases. There has been research conducted in preschool, primary and high schools, both locally and internationally, to understand the factors that lead to obesity through qualitative and quantitative research methods. Also, interventions to reduce the prevalence were studied.

However, there are not many published studies related to the health of university students especially in New Zealand; particularly regarding how the university environment affects their physical activity, sedentary behaviour and eating habits. This study is unique as the citizen science approach and participatory research are applied to gather information, understand student perception and identify possible solutions.

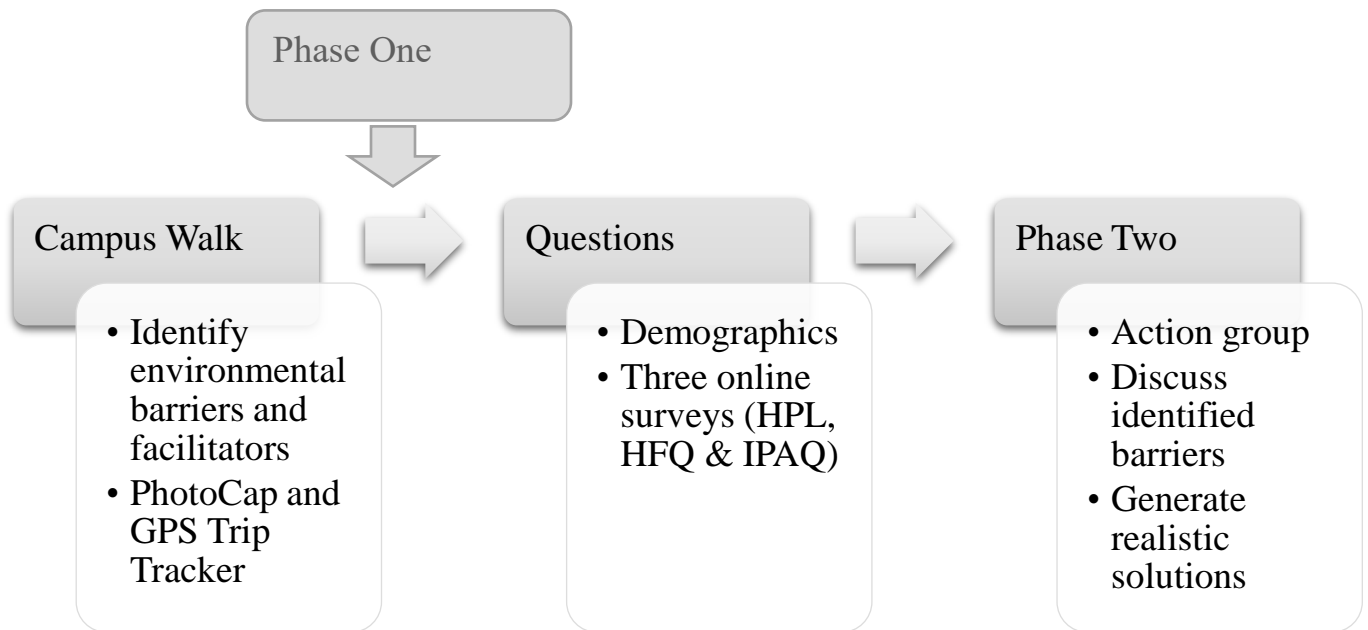
The Citizen Science approach for health equity was particularly important as it identified the needs of the students which may be different from what other populations may perceive as barriers (Bonney et al, 2009). The study also allowed students to be part of solving identified issues through the action group. This approach has a high effectiveness in suggesting solutions for the identified issues as those solutions are catered to students, especially students who attend the City campus (Ottinger, 2010). The action group also allowed participants to highlight other issues that may not have been identified from Stage One (campus walk) and discuss potential interventions to overcome it.

### **Thesis Organisation**

This thesis contains six chapters: Introduction, Literature Review, Methods, Findings and Interpretations, Discussion and Conclusion. The Literature Review critically analyses and reviews various published literatures relating to healthy eating, physical activity and sedentary behaviour findings. These findings are mainly of health outcomes and perceived barriers of each wellbeing factor from other university students. The Methods chapter highlights and justifies the research and data collection methods used. It also outlines the research design, participants' description, data collection and analysis implemented in the study. The Findings and Interpretation chapter states key findings from all two stages. Graphs, figures, tables and thematic networks are also utilised to illustrate the findings. Chapter 5, Discussion, analysed and reflected on the findings. It also related it back to the



Literature Review to compare and contrast key findings from this and previous relevant research. It also contains a subsection for practise recommendations based on findings. The Conclusion chapter summarises the findings and evaluates the study in terms of strengths and limitations.



*Figure 1: Summary of study design and phases*

## **Chapter 2: A Literature Review**

### **Summary**

In this review, the aim was to investigate the influence of the university environment on health outcomes and behaviours such as diet and physical activity in university students and adults in the general population. MEDLINE via PubMed and EBSCO, Wiley and ScienceDirect via Google Scholar with full text databases were used to search for literature and studies from 1995 up to May 2018. The inclusion criteria were studies with: original research which included university students who were at least 17 years of age, full text, English articles, with regards to health outcomes, and reviews of university environment by students. The search identified 37000 articles altogether and 28 were selected for a full review. Out of the 28, only 15 studies were included for a full review as they met all of the inclusion criteria. The review identified a number of studies related to objectively measured physical activity in children and adults. Studies relating to sedentary behaviour were uncommon for the population of tertiary students. The review showed a common theme of university students' level of physical activity declining when starting university and increasing sedentary behaviour and activities instead. Cost, accessibility and availability of nutritious foods on and around campus were major barriers to eating healthier. For physical activity, time and fatigue were barriers as university students tend to spend most of their time studying and are usually too tired to partake in sports and recreation. Students also liked to indulge in sedentary behaviour such as watching television and gaming as they found it relaxing and inexpensive. The theme of cost and limited time was common amongst studies regarding physical activity and inactivity despite the different populations

and study methods. Future research should focus on examining New Zealand universities' environment from students' perspective and performing interventions that would increase intake of healthy foods, physical activity and/or decrease of sedentary behaviour to observe the effectiveness in the global and local context.

### **Introduction**

There has been an increase in the prevalence of non-communicable diseases (NCD) such as obesity, cerebrovascular accident (stroke), some cancers, myocardial infarction, and diabetes in both New Zealand and in other first world countries (WHO, 2018). Non-communicable diseases are preventable, long-term diseases that are not caused by infectious agents and have a slow progression. People of 30 to 70-year olds living in New Zealand have a 11% chance of dying due to a non-communicable disease (WHO, 2014). Preventative measures of NCDs include the reduction of alcohol, physical inactivity, tobacco use and having a healthy diet (WHO, 2018).

University students spend an average of 37.6 hours per week on campus either studying or attending classes (Balslev, 2017). Although studying has a positive effect on students' learning, sitting down for long periods of time can result in increased levels of physical inactivity and sedentary behaviour which can increase the risk of NCD (Saunders, Chaput & Tremblay, 2014; Owen, Salmon, Koohsari, Turrell & Giles-Corti, 2014). The physical indoor and outdoor environment of the university campus can have an influence on the choices of students' health behaviours such as diet, physical activity patterns which are determining factors of NCDs (Lee & Loke, 2005). The topic of health behaviours in university/ tertiary students has been researched globally however there are relatively few studies conducted in New Zealand that provide the local context and understanding of how environment affects students' choices and how these choices can be altered. This chapter

will critically review findings from international and New Zealand studies (Table 1. Page 41.)

The term ‘University students’ refers to students who are enrolled full time at a tertiary institution in either an undergraduate or postgraduate qualification. The terms ‘physical inactivity’ and ‘sedentary behaviour’, are often used interchangeably even though they are used to define different concepts. Physical inactivity refers to people who do not meet the recommended physical activity guideline whereas sedentary behaviour is used to define any waking behaviour that has an energy expenditure of less than 1.5 metabolic equivalent in a sitting, lying or reclining posture (METs) (Robbins, Pis, Pender & Kazanis, 2004; Pate, O'Neill & Lobelo, 2008; Sedentary Behaviour Research Network, 2012; Tremblay et al., 2017). Some studies reviewed do not define their terms, however they are relevant to the thesis as many of these studies do capture physical activity and inactivity behaviours and patterns of tertiary students.

Currently, there are loose or broad definitions for the term ‘highly nutritional’; although most papers use this to classify foods and beverages that have low calories or energy density such as fruits, vegetables, lean meats, fat-free and low-fat dairy products, wholegrains and legumes. For the purpose of this research foods and beverages with a high amount of vitamins and minerals relative to low calories will be referred to as ‘highly nutritional’ or ‘nutritionally dense’ (Drewnowski & Fulgoni, 2008).

Auckland University of Technology’s library database was used find research studies and journal articles for this literature review. Google Scholar and MEDLINE were used as the main sources as they include journal articles in the fields of health sciences and allied health. The keywords used to collect literature were: physical inactivity, sedentary behaviour, eating behaviours, college students, university students, campus and

environment, in different combinations. Fifteen literatures reviews and individual articles from 1995 to 2018 were included from the search. Earlier studies were not included due to outdated data and information. Other sources were used to support the claims and results from the mentioned studies.

This chapter reviews literature and studies of global and local context of nutrition, sedentary behaviour and physical activity in university/college students. It firstly discusses the evidence supporting the association between physical activity, sedentary behaviour, and nutrition with non-communicable diseases and other chronic health conditions. Secondly, the physical activity and sedentary behaviour levels of university students are discussed, drawing attention to the declining rate of physical activity and nutrition after attending secondary school and commencing a tertiary institute. Thirdly, the factors that influence eating patterns and behaviours amongst adults and university students are explored. Lastly, perceived facilitators and barriers of all physical activity, sedentary behaviour and diet are discussed, along with possible recommendations generated from the literature itself to overcome the recognised barriers.

### **Methods**

Searches were conducted using MEDLINE via PubMed and EBSCO, Wiley, Springer Link and ScienceDirect via Google Scholar. Only studies that were from 1995 to 2018 were included for its updated data and information. Any studies or literature reviews that reported on the eating and/or exercise habits, and sedentary behaviour of tertiary students were searched through the databases. Health outcomes of eating, exercise habits and sedentary behaviour were also searched. The key words used to conduct the search were ‘nutrition’, ‘eating habits’, ‘physical activity’, ‘sedentary behaviour’, ‘university/college students’, and ‘health outcomes’. Only full-text, English literatures and articles were used

for the review. Searches were limited to peer reviewed journals, articles written in English and were available in full-text.

### **Study Selection**

All abstracts of all articles generated by the database search were reviewed and selected in terms of what was relevant to the literature review. Studies were excluded from the review if at least one of the following exclusion criteria were met: studies based in high schools and primary schools, participants who were less than 17 years old, and studies that focused on other factors of a healthy lifestyle such as drugs and alcohol. Studies were also excluded if full-texts were not available and if they were written in any languages other than English.

The first step of the search process of study selection had identified 37000 articles. After limiting to articles that were available in English, full-text, from peer reviewed journals and was published after 1995, 10,735 articles had remained. Additional limitations of tertiary students, barriers and facilitators of campus environment, and self-reported answers were applied. The second step of the search process had resulted in the exclusion of 10,707 articles based on the abstracts of these articles. Many articles were excluded as they were duplicates, didn't discuss self-reported results and/or focused on one ethnicity. The 28 remaining articles were selected for a full review and 15 of these texts had met all of the inclusion criteria.

## **Physical Activity**

### **Prevalence of Physical Activity and Inactivity in the Global and Local Context**

The term 'physically inactive' is defined as someone who is not achieving the recommended physical activity guidelines of engaging in moderate to vigorous intensity activities for at least 150 minutes per week (Bauman et al., 2012). Whereas the term 'physically active' is used to describe an individual who meets the recommended guidelines. Out of the 15 studies reviewed, 3 studies assessed the prevalence of physical activity and inactivity as detailed in Table 1, page 41. Around 45-50% of university/college students were physically inactive in a study conducted in America (Keating, Guan, Piñero, & Bridges, 2005). Globally, 23% of adults did not meet the physical activity guidelines (WHO, 2018). In high income countries, 26% of males and 35% of females were physically inactive compared to 12% of males and 24% of females from low income countries (WHO, 2018). Just over half of New Zealand adults (51%) were physically active for at least 30 minutes on 5 days or more per week and it was also reported that men were more likely to be physically active compared to women (55% and 48% respectively) (MOH, 2014). In terms of ethnic differences, Pacific and Asian adults were less likely to be physically active compared to non-Pacific and Asians (MOH, 2014). A large reduction in physical activity occurs in New Zealand adolescents towards the end of secondary school education, when tertiary education begins (Sinclair, Hamlin, & Steel, 2005). There is currently no data on the physical activity level of New Zealand's university students' or the statistics of participation that occurs before, during and/or after university in terms of physical activity. However, a pilot study, with a small, non-representative sample, was conducted in a New Zealand university and found that only 40% of participants complied with the physical



activity guidelines (Sinclair, Hamlin, & Steel, 2005). This statistic cannot be used to generalise the entire tertiary student population as there were only 60 participants involved in the study (Table 1. Page 41).

### **The Association between Physical Activity and Inactivity with Health**

#### **Outcomes.**

Physical inactivity is a modifiable risk factor for heart diseases such as coronary disease, myocardial infarction, diabetes mellitus, osteoporosis, blood pressure and depression (Reiner, Niermann, Jekauc, & Woll, 2013; Janssen & LeBlanc, 2010). A systematic, quantitative review of 15 longitudinal studies were assessed by Reiner, Niermann, Jekauc, & Woll for the association between physical activity and inactivity with health outcomes. This is detailed in Table 1, page 37. There is an overall negative relationship between physical activity and weight gain and/or obesity; with a required 45-60 minutes of brisk walking performed daily to maintain weight. Interestingly, a reduced weight gain of 0.25 kg per year for males and 0.53 kg per year for females was observed for every 30-minute walk they engaged in (Reiner, Niermann, Jekauc, & Woll, 2013; Swift, Johannsen, Lavie, Earnest & Church, 2014). People with a higher body fat mass at baseline had shown a greater weight reduction with regular physical activity compared to people with a leaner mass.

Physical activity has been associated with a reduction in the incidence of type 2 diabetes mellitus (T2D) overtime, even after adjusting for BMI. A moderate to vigorous intensity activity was needed to be performed at least once per week to have a positive effect to reduce the risk of type 2 diabetes mellitus (Reiner, Niermann, Jekauc, & Woll, 2013). This is due to the increased muscle contraction which induces the translocation of glucose transporters (GLUT4) to facilitate the diffusion of glucose into adipose and muscle cells. This decreases blood glucose levels and also contributes to improved insulin action and

glucose disposal (Richter & Hargreaves, 2013). Increasing the intensity and frequency of activities with an increasing age was necessary to achieve the same risk reduction. Other risk factors for T2D included obesity and lack of physical fitness (Reiner, Niermann, Jekauc, & Woll, 2013). Physical fitness is defined as the ability to perform occupational, sports and daily activities without undue fatigue (Corbin, Pangrazi, & Franks 2000).

Physically active people have a lower risk of developing cognitive impairment and have a higher cognitive ability (Saxena, Van Ommeren, Tang & Armstrong, 2005; Reiner, Niermann, Jekauc, & Woll, 2013). Activities of low intensity have been found to have a negative association with the incidence of dementia (Saxena, Van Ommeren, Tang & Armstrong, 2005).

### **Determinants and Habits of Physical Activity of University Students**

Social influence impacts on physical activity (Sinclair, Hamlin, & Steel, 2005). It was reported that as peer support increased, frequency of physical activity at university also increased (Sinclair, Hamlin, & Steel, 2005). Four out of the 15 reviewed studies were related to the determinants of physical activity of tertiary students which are detailed in Table 1, page 41. In a New Zealand university, students who were members of a recreation club or gym spent an average of 709 minutes per week on physical activity; whereas non-members spent an average of 401 minutes per week. Unfortunately, memberships to these clubs had decreased by 47% when participants had commenced university (Sinclair, Hamlin, & Steel, 2005). Age was found to be a determinant of physical activity as younger students tended to participate more frequently in vigorous intensity physical activities compared to older students (Buckworth & Nigg, 2004). The older the males, the more regular their exercise participation was whereas the opposite was true for females; the older the females were, there was less participation in moderate to vigorous intensity physical

activity (Buckworth & Nigg, 2004). Even though males reported a higher engagement in physical activity, they also reported spending more time engaged in sedentary activities such as television watching, and computer use. For females, television watching was negatively correlated with physical activity participation although studying was positively correlated (Buckworth & Nigg, 2004).

Perceived enjoyment of participation in physical activity was one of the main factors influencing regular engagement as students were more likely to be physically active if they enjoyed doing so (Deliens, Deforche, De Bourdeaudhuij & Clarys, 2015). Other influencers were availability and accessibility of sport lessons and facilities. In addition to this, cost of membership of sports clubs was an important factor as college students tended to have a tight budget (Deliens, Deforche, De Bourdeaudhuij & Clarys, 2015; Buckworth & Nigg, 2004). Students who lived in the university residence used active transport such as cycling and walking less often compared to when they attended secondary school. During exam or test periods, most students became physically inactive due to studying for long periods of time. Time and convenience were both important factors in physical activity levels as students often had limited free time owing to lectures, studying and working. When they had free time, they preferred to spend it on relaxing activities such as reading or watching television rather than engaging in physical activity of any intensity as that resulted in more physical fatigue, as reported by students (Deliens, Deforche, De Bourdeaudhuij & Clarys, 2015).

### **Perceived Barriers and Facilitators of Physical Activities**

Enablers or facilitators for university students to be active were enjoyment, motivation to lose weight, social support of their peers, social interaction, and availability of safe parks to exercise in (Deliens, Deforche, De Bourdeaudhuij, & Clarys, 2015; Shuval, Hébert, Siddiqi,

Leonard, Lee, & Tiro, 2013; Grubbs & Carter, 2002). Students also reported that they appreciated sports as they enjoyed healthy competitions with different teams. Peer and social support were also enablers as students were more likely to be physically active if their room-mates or friends joined them too and peers also helped them to be accountable to their goals (Deliens, Deforche, De Bourdeaudhuij & Clarys, 2015; Buckworth & Nigg, 2004). Students found that engaging in physical activity would leave them with positive feelings associated with relaxation, improved mood and energy, and being in shape. This motivated them to engage in such activities more regularly (LaCaille, Dauner, Krambeer & Pedersen, 2011). Having facilities on campus that provided free or discounted rates for students was a facilitator for physical activity as it helped students stick to their budget and lead a healthy lifestyle (Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013).

Lack of time was perceived as the biggest barrier to physical activity due to busy class schedule followed by insufficient finances, physical exertion and fatigue, and neighbourhood crimes (Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013; Deliens, Deforche, Deeteame Bourdeaudhuij & Clarys, 2015; Grubbs & Carter, 2002).

Neighbourhood crimes were a factor as a barrier as students sometime may have felt unsafe to go for a run around the block or park (Grubbs & Carter, 2002). In a study mentioned earlier, cost, availability and accessibility of sport clubs and facilities were also major determinants of physical activity. Since students tend to have limited funds, a perceived barrier to physical activity are expensive memberships as students are unwilling or unable to spend a large amount (Deliens, Deforche, De Bourdeaudhuij & Clarys, 2015; Buckworth & Nigg, 2004). Being uninformed about sports events was surprisingly found to be a barrier to physical activity as the free sports events that were offered on campus often went unnoticed as students claimed that they were unaware or not well informed by the

university about free or discounted campus facilities and sport lessons (Deliens, Deforche, De Bourdeaudhuij & Clarys, 2015). Even though there were free or discounted facilities available, some found the crowds in the facilities to be a barrier. Also added cost of group fitness classes and not knowing how to use fitness equipment was seen as a challenge by students, hence their motivation and frequency of participation decreased (Deliens, Deforche, De Bourdeaudhuij & Clarys, 2015; Buckworth & Nigg, 2004). The transition from secondary school to a tertiary institute was found to be challenging as changes in policy and requirements had been seen as a barrier. In secondary school, sports and physical activity were part of the compulsory curriculum whereas in university, there was no obligation to participate in activities so students tended not to (Deliens, Deforche, De Bourdeaudhuij & Clarys, 2015).

| <b>Authors</b>                                      | <b>Main objectives</b>  | <b>Samples</b>   | <b>Methodology and methods</b>   | <b>Summary of outcomes</b>   | <b>Location of study</b> |
|---|---|--|--|--|--------------------------|
| Arzu, Tuzun and Eker, 2006                          | To investigate internal and external barriers of physical activity for inactive university students in Turkey         | 93 inactive undergraduate Turkish university students  | <ul style="list-style-type: none"> <li>• Qualitative method 12 item questionnaires with Likert Type scale used.</li> </ul>   | <ul style="list-style-type: none"> <li>• Lack of energy was the biggest internal barrier</li> <li>• Lack of time was the biggest external barrier</li> <li>• Education was deemed more important than PA</li> </ul>  | Turkey                   |
| Deliens, Deforche, De Bourdeaudhuij, & Clarys, 2015 | To identify determinants of physical activity and sedentary behaviour amongst university students                     | 46 university students<br>17 males and 29 females<br>2 <sup>nd</sup> to 5 <sup>th</sup> year uni students<br>Recruited from one university | <ul style="list-style-type: none"> <li>• Qualitative method Multiple action groups were included as the participatory action research approach was being used</li> </ul>   | <ul style="list-style-type: none"> <li>• Lack of time and enjoyment for physical activity was seen as a barrier</li> <li>• Chose sedentary activities for relaxation</li> <li>• Not enough communication about sport opportunities on campus</li> <li>• Price is a barrier to participate in healthy exercise</li> </ul>                                   | Germany                  |
| Grubbs and Carter, 2002                             | To find a relationship between exercise habits and perceived benefits and barriers of exercise in university students | 147 undergraduate university students<br>18-24 years of age  | <ul style="list-style-type: none"> <li>• Descriptive correlation study</li> <li>• Used Health Promotion model for measuring current exercise beliefs and habits</li> <li>• Exercise Benefits/Barriers Scale (EBBS) to explore perceived barriers and benefits of exercise</li> </ul> | <ul style="list-style-type: none"> <li>• 92% of males and 63% females met criteria of being 'exercisers'</li> <li>• Barriers found were physical exertion, lack of time and lack of effort for hard work</li> <li>• Benefits were mainly the improvement of physical appearance and performance</li> <li>• Participants who exercised regularly</li> </ul> | USA                      |

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| Janet Buckworth and Claudio Nigg, 2004 | To find the correlation of physical activity, exercise and sedentary behaviour with demographics of university students                                | 493 university students from a Midwestern University from various year of studies<br>Both males and females | Qualitative study using questionnaires to measure physical activity, exercise & sedentary behaviours                                    | <p>perceived more benefits than non-exercising.</p> <ul style="list-style-type: none"> <li>• Average of 30 hours per week spent on sedentary activities (mostly studying)</li> <li>• Males reported spending more time watching TV and also engaged in more time either exercising or moderate-vigorous intensity activities than females</li> <li>• Age positively correlated with hours spent on computer use</li> <li>• Age and exercise had a positive correlation for males but negative for females</li> <li>• Men were physically active but simultaneously engaged in more sedentary behaviour compared to females</li> </ul> | USA |
| Driskell, Kim, & Goebel, 2005          | To explore the differences between the demographics of lower and upper level university students in terms of their eating and physical activity habits | 258 university students<br>144 lower level students<br>114 upper level<br>19-25 year olds                   | <ul style="list-style-type: none"> <li>• Qualitative and quantitative mixed method study</li> </ul> <p>Used 2 self-reported surveys</p> | <ul style="list-style-type: none"> <li>• No difference between groups for eating fast foods, at restaurants, or from vending machines</li> <li>• Lower levels eat more at university campus compared to higher level (25.2% and 15.6% respectively)</li> </ul>  | USA |

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| Sinclair, Hamlin, & Steel, 2005 | To find the change of physical activity levels of first-year university students | 60 first-year students from Lincoln University | <ul style="list-style-type: none"> <li>• Qualitative approach</li> <li>• One-year physical activity recall questionnaire was used</li> </ul> | <ul style="list-style-type: none"> <li>• Both groups had the same factors influencing food choices: convenience (53.4%), taste (42.9%), cost (40.3%), health (31.9%), weight control (23.5%) and family/friends (5.7%)</li> <li>• 48.2% of lower level and 36.4% of upper level participated in other aerobic activities more than 31 mins per day</li> <li>• Physical activity locations for both groups are outside (69.4%), on - campus recreation center (54.8%), home (29.1%), work (26.4%), and off-campus fitness center (15.7%).</li> </ul> | New Zealand |
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|--|---|--|---|--|-----|
| Reiner, Niermann, Jekauc, & Woll, 2013 | <ul style="list-style-type: none"> <li>To review the effect of physical activity on weight gain, obesity, CHD, T2D, dementia and Alzheimer's</li> </ul> | <ul style="list-style-type: none"> <li>Age between 18-85</li> <li>Participants were healthy at baseline</li> </ul> | <ul style="list-style-type: none"> <li>Systematic, quantitative review</li> <li>15 longitudinal studies with at least a 5 year follow up</li> </ul> | <p>709 mins per week on physical activity, 401 mins for non-members</p> <ul style="list-style-type: none"> <li>Memberships to these clubs had decreased since they commenced university (47%)</li> <li>Overall negative relationship between physical activity and weight gain/obesity</li> <li>Overall negative association between the emergence of CHD and overall cardiovascular mortality with physical activity</li> <li>Activities with low intensity have a negative association with the incidence of dementia</li> </ul> | USA |
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*Table 1: Summary of all studies included in the review assessing physical activity with health outcomes, prevalence, barriers, and enablers*

## **Sedentary behaviour and activities**

### **The association between sedentary behaviour levels and non-communicable diseases**

As mentioned previously, sedentary behaviour is defined as engaging in activities that do not cause a substantial increase in energy expenditure; only 1.0-1.5 METs. Activities such as laying whilst awake, watching television and sitting are considered to be sedentary (Pate, O'Neill & Lobelo, 2008; Sedentary Behaviour Research Network, 2012; Tremblay et al., 2017). Establishing the difference between physical activity and sedentary behaviour is important as they both have different physiological effects and also have differing barriers and facilitators. It is possible to both engage in regular physical activity and also engage in large amounts of sedentary activity, as they have been found to be largely uncorrelated (Rouse, & Biddle, 2010).

A meta-analysis of 18 cross-sectional and prospective cohort studies highlighted the association of a high sedentary behaviour and health outcomes (Wilmot et al., 2012). The studies included in the meta-analysis used literature that related to the terms 'health outcomes' and 'sedentary behaviour'. All included studies were exclusive of the term 'inactivity'. Studies that assessed the health outcomes, determinants, barriers and facilitators of sedentary behaviour and activities are detailed in Table 2, page 51. The findings revealed that increased hours spent engaging in sedentary behaviour has been linked to an increased risk in health conditions such as obesity, heart diseases, heart disease-related mortality and type 2 diabetes (Wilmot et al., 2012). High sedentary time had the greatest association with diabetes as it could increase the relative risk by 112%, followed by 147% increase in the risk of cardiovascular disease, 90% for cardiovascular mortality and 49% increase of all-cause mortality risk (Wilmot et al., 2012). Even though

cohort studies were included in the meta-analysis, RCTs were also included to support the evidence which increased the strength of this systematic analysis. Since this study only measured sedentary behaviour and was exclusive of physical inactivity, it further emphasised that despite the unknown physical activity levels and exercise measurements of participants, sedentary behaviour does have an overall independent detrimental effect on health and health outcomes.

### **Sedentary patterns and behaviour amongst university/tertiary students**

In the global context, there are many studies covering the topic of sedentary behaviour. However, there are very few studies focusing on sedentary behaviour and habits among university or tertiary students specifically; even more so in New Zealand.

Physical activity, exercise and sedentary behaviour in university students were explored by demographics variables in a study containing 493 participants in the United States of America. The findings showed that participants spent an average amount of 30 hours per week engaged in sedentary activities (Buckworth, & Nigg, 2004). Interestingly, a large portion of that time was spent on studying and attending lectures where they sat for long periods of time. There was also a difference between males and females' sedentary patterns and determinants. Males reported to have spent significantly more hours than females watching television and engaging in computer use (Buckworth, & Nigg, 2004; Rouse & Biddle, 2010). Males had also reported spending more time engaged in sedentary activities overall compared to females even though males had testified to participating in physical activity more frequently (Buckworth, & Nigg, 2004; Rouse & Biddle, 2010). These results corroborate the findings of a great deal of other studies that state sedentary and physically active are mutually independent of each other while also having the possibility of co-existing (Ekelund et al., 2016; Henson et al., 2013). An average of 79.9 minutes per day

was spent on studying, 72.1 minutes on sitting and talking, and 64 minutes on hanging out (Rouse & Biddle, 2010). Interestingly, a positive correlation was found between age and computer use of university students. However, this was not consistent with other sedentary activities such as watching television and studying (Buckworth, & Nigg, 2004). The lack of objective measurement of sedentary activities is a limitation in this study. It is difficult to measure sedentary activities in an unbiased manner and non-subjective ways as it is not cost-effective and requires many devices and tools to do so. Subjective surveys and questionnaires may bring bias towards this study as it is hard to admit to flaws and also there may be misunderstanding of the terms 'sedentary', 'inactive', and 'physically active' by participants which affects the validity of the studies.

### **Determinants of Sedentary behaviour and Activities**

Multiple focus groups of university students have been conducted in Germany to explore and discuss perceived determinants of sedentary behaviour. Discussions amongst students showed an emergence of four major levels of determinants of sedentary behaviour: intrapersonal, interpersonal, physical environment and university characteristics (Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013).

Intrapersonal or individual determinants consists of perceived enjoyment, time and convenience, daily structure, values, norms and beliefs. Participants claimed that it was easy to be engaged in sedentary activities and enjoyed doing so. For example, laying down and watching television (Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013). They were also not self-aware of whether they were sedentary in their day-to-day lives and never questioned themselves on that matter as this was normal to them as per their routine (Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013). Participants had associated sedentary activities with relaxation methods as to reward themselves for studying and

exams. This increases the enjoyment they receive from partaking in sedentary activities which, in turn, further increases the possibility of spending more time being sedentary (Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013).

The social environment (interpersonal) had an influence on students in terms of social support, peer pressure, modelling and lack of parental control. The independence from parental control was a major contributor to the determinants of sedentary behaviour among students that did not live at their parents' house anymore. These students felt that since they were no longer bounded by rules that minimized sedentary activity at home, they could indulge in those activities in their dorms or flats which eventually led to excessive engagement (Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013). They were also influenced by their peers; if their peers were highly sedentary, participants were most likely to be sedentary too (Greenwood-Hickman, Renz, & Rosenberg, 2015; Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013). Students were strongly influenced by their peers who were their roommates. Peers could have a positive influence when they encouraged participants to be more active with them. Having social support in terms of encouraging being more active, increased the likelihood that participants would agree and follow them. This was the same for engaging in sedentary behaviour (Greenwood-Hickman, Renz, & Rosenberg, 2015).

Physical environment was- comprised of cost, availability and accessibility, weather and travel distance. Students responded unanimously that watching television was the cheapest way to spend time as most recreational activities would be unfordable such as gym memberships (Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013). However, interestingly, students living in student residence would not have access to their own televisions which would force them to go outdoors and hence be less sedentary (Shuval,

Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013). Walking was deemed a great way to decrease sedentary behaviour and also travel to destinations on a budget. Travelling long distances would compel students to use private vehicles instead of walking (Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013). This was more apparent during the winter season as students would stay indoors more frequently and engage in sedentary activities, and also would use their vehicles more regularly compared to warmer climates and seasons. Students also mentioned not being aware of on-campus recreational facilities or sports teams and if they were, they found it unaffordable to join (Deliens, Deforche, De Bourdeaudhuij, & Clarys, 2015; Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013).

As for the university characteristics; students tended to spend a large amount of time using computers and studying for exams which contributed to their sedentary behaviour. Attending lectures and workshops also enforced sitting more often (Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013).

These reviewed studies emphasised how individuals interacted with a variety of microenvironments or settings such as schools and homes, which in turn were influenced by the microenvironments such as society and social influence. Engaging students in discussions about determinants may lead them to critically analyse their environments which can aid in generating solutions to overcoming the negative determinants using health promotional interventions.

### **Barriers and Facilitators of Sedentary Behaviour**

The physical indoor and outdoor environment, along with social factors, could encourage or inhibit sedentary behaviour and activities. A study with older, overweight adults showed that having a habit of being engaged in sedentary activities was a large barrier as it was difficult to break old habits (Greenwood-Hickman, Renz & Rosenberg, 2015). Other

barriers included having a chronic illness that made changes to sedentary behaviour challenging, the perceived enjoyment of sedentary activities, environmental factors such as weather and hilly landscapes that lead to physical fatigue (Greenwood-Hickman, Renz & Rosenberg, 2015). A common misconception was that being physically active compensated for participating in long periods of sedentary activities which was also a barrier in reducing sedentary behaviour (Shuval et al., 2013; Greenwood-Hickman, Renz & Rosenberg, 2015). This was associated with the lack of understanding of the definition of sedentary behaviour and its independent physiological effect (Shuval et al., 2013).

Motivators included increased awareness of sedentary behaviour and its impact on health, incorporating easy, adaptable changes in their lifestyle, and the enjoyment of non-sedentary activities such as taking long walks (Greenwood-Hickman, Renz & Rosenberg, 2015). People also enjoyed setting goals in terms of aiming to reduce the amount of time spent on sedentary activities and revealed in the competition with themselves (Greenwood-Hickman, Renz & Rosenberg, 2015).

| <b>Authors</b>                                      | <b>Main objectives</b>  | <b>Samples</b>   | <b>Methodology and methods</b>   | <b>Summary of outcomes</b>  | <b>Location of study</b> |
|---|---|--|--|---|--------------------------|
| Deliens, Deforche, De Bourdeaudhuij, & Clarys, 2015 | To identify determinants of physical activity and sedentary behaviour amongst university students                       | 46 university students<br>17 males and 29 females<br>2 <sup>nd</sup> to 5 <sup>th</sup> year uni students<br>Recruited from one university | <ul style="list-style-type: none"> <li>• Qualitative method</li> </ul> Multiple action groups were included as the participatory action research approach was being used | <ul style="list-style-type: none"> <li>• Lack of time and enjoyment for physical activity was seen as a barrier</li> <li>• Chose sedentary activities for relaxation</li> <li>• Not enough communication about sport opportunities on campus</li> </ul> Price is a barrier to participate in healthy exercise | Germany                  |
| Janet Buckworth and Claudio Nigg, 2004              | To find the correlation of physical activity, exercise and sedentary behaviour with demographics of university students | 493 university students from a Midwestern University from various year of studies<br>Both males and females                                | Qualitative study using questionnaires to measure physical activity, exercise & sedentary behaviours   | <ul style="list-style-type: none"> <li>• Average of 30 hours per week spent on sedentary activities (mostly studying)</li> <li>• Males reported spending more time watching TV and also engaged in more time either exercising or moderate-vigorous intensity activities than females</li> </ul>              | USA                      |



| Authors               | Main objectives  | Samples                | Methodology and methods   | Summary of outcomes  | Location of study |
|-----------------------|--|------------------------|---|--|-------------------|
| Rouse, & Biddle, 2010 | To observe sedentary behaviour patterns of university students | 84 university students | <ul style="list-style-type: none"> <li>Qualitative method Assessment diaries used every 15 mins by participants for two consecutive days</li> </ul> | <ul style="list-style-type: none"> <li>Age positively correlated with hours spent on computer use</li> <li>Age and exercise had a positive correlation for males but negative for females</li> <li>Men were physically active but simultaneously engaged in more sedentary behaviour compared to females</li> <li>Participants reported predominantly studying, watching TV, sitting and hanging out.</li> <li>Video gaming activity higher in males</li> </ul> <p>Sitting and talking higher in females</p> | UK                |

| <b>Authors</b>  | <b>Main objectives</b>   | <b>Samples</b>   | <b>Methodology and methods</b>   | <b>Summary of outcomes</b>  | <b>Location of study</b>  |
|---|--|--|--|---|---|
| Wilmont, Edwardson, Achana, Davies, Gorely and Gary, 2012 | To find a risk factors and relative risks of sedentary behaviour in adults amongst a variety of relative studies | 794,577 participants from various countries >18 years of age | <ul style="list-style-type: none"> <li>• 18 studies, 16 of which was prospective and 2 were cross-sectional</li> <li>• 15 studies were of moderate to high quality</li> <li>• Studies found using the term 'sedentary behaviour'</li> <li>• Studies were exclusive of 'inactivity'</li> <li>• Self-reported studies</li> </ul> | <ul style="list-style-type: none"> <li>• High sedentary time was significantly associated with type 2 diabetes.</li> <li>• Sedentary behaviour are associated with a 112% increase in the RR of diabetes</li> <li>• 147% increase of cardiovascular disease</li> <li>• 90% increase of cardiovascular mortality</li> <li>• 49% increase in the risk of all-cause mortality</li> </ul> | Australia England Canada<br>Germany<br>Japan<br>Scotland<br>USA |

| <b>Authors</b>                            | <b>Main objectives</b>   | <b>Samples</b>  | <b>Methodology and methods</b>           | <b>Summary of outcomes</b>  | <b>Location of study</b> |
|---|--|---|--|---|--------------------------|
| Greenwood-Hickman, Renz & Rosenberg, 2015 | <ul style="list-style-type: none"> <li>To explore social, individual, environmental barriers and impacts of sedentary behaviour reduction</li> </ul> | 24 participants<br>Males and females, 60 years and over | Qualitative study using phone interviews | <ul style="list-style-type: none"> <li>Motivators: increased awareness of SB, healthy choice, easy adaptable change in their lifestyle, goal settings, enjoyment of non-sedentary activities</li> <li>Barriers: illness or chronic health condition that make changes to SB challenging, enjoyment of sedentary activities, environmental factors such as weather, hilly landscapes.</li> </ul> | USA                      |

*Table 2: Summary of all studies included in the review assessing sedentary behaviour and activity with the health outcomes, prevalence, barriers and enablers*

## **Nutrition and Diet**

### **Dietary factors and Health outcomes**

A lifestyle of consuming excess unhealthy foods and beverages can have a negative impact on health and health outcomes such as obesity, coronary heart disease (CHD), stroke, hypertension and some cancers (Kant, 2004; Norat, Bingham & Riboli, 2005; Popkin, 2001). A systematic review was conducted to find an association between dietary factors and coronary heart disease (CHD) (Mente, de Koning, Shannon, & Anand, 2009). CHD, also referred to as ischemic heart disease, is the build-up of plaque in the coronary artery which reduces or blocks the flow of oxygen-rich blood to the cardiac muscle. This can lead to angina or a heart attack (Luepker, 2003). The findings reported a strong association between beverages and foods containing trans fatty acids and high glycaemic index and the prevalence of CHD; making them harmful factors (Mente, de Koning, Shannon, & Anand, 2009). A weak association was made between some saturated fats, polyunsaturated and total fats intake with CHD as they were protective factors (Mente, de Koning, Shannon, & Anand, 2009). Other protective factors included high consumption of vegetables, nuts, wholegrains, monosaturated fatty acids and the Mediterranean diet (Mente, de Koning, Shannon, & Anand, 2009). The systematic review contained 146 cohort studies which is a limitation as causal claims cannot be made from prospective studies; only association and trends can be made. However, 43 randomised controlled trials (RCT)s were also included to support the evidence from the cohort studies which strengthened the association and causality.

Out of the 15 reviewed studies, 6 studies assessed the health outcomes, determinants, barriers and enablers of physical activity, diet and sedentary behaviour as detailed in Table 3, page 62.

Furthermore, a Brazilian study was conducted where they reported evidence supporting the increase in obesity prevalence with a high consumption of ultra-processed foods (Louzada et al., 2015). The cross-sectional study revealed that 29% of the samples' total energy intake was from ultra-processed foods (Louzada et al., 2015). 'Ultra-processed', in this study, was defined as formulations made by food industries mostly from substances extracted from foods with the further processing of food constituents or chemical synthesis with little to no content of whole foods such as ice-cream, cookies, and cakes. It was found that participants' 68.6% of energy intake was from unprocessed or moderately processed foods (Louzada et al., 2015). The most striking result to emerge from these data is that the mean body mass index (BMI) had an increase of 0.94kg/m<sup>2</sup> with a high consumption of ultra-processed foods (Louzada et al., 2015). Ultra-processed foods commonly have less fiber and protein, high added sugar content, and high energy density which overall gives it no nutritional value (Monteiro, 2009). This study only used a 2-day, non-consecutive 24-hour recalls recording food and beverage consumption which does not give an absolute idea of what participants' food behaviours are. The study also did not mention on which days the recall took place, for example whether it was a weekday, weekend or both as this can have an impact on the results as food behaviours tend to differ on weekends. An RCT would not have been suitable for this study as it is not ethical for participants to overfeed on ultra-processed foods; therefore, a cross-sectional study was more appropriate.

### **Habits and determinants of healthy food consumption**

There can be many factors that influence food and beverage consumptions and understanding them can give us solutions to overcome factors that inhibit healthy eating. A study conducted in America used two surveys which measured consumption of fruit and

vegetables and fast foods (Glanz, Basil, Maibach, Goldberg & Snyder, 1998). They also utilised a food diary. This was to examine self-reported importance of factors that influence personal dietary choices. The findings from this study showed that taste, cost, nutrition, convenience and weight-control have an influence on participants' food choices, in that order (Glanz, Basil, Maibach, Goldberg & Snyder, 1998). Taste, nutrition, and weight control was found to be more important determinants for females compared to males (Glanz, Basil, Maibach, Goldberg & Snyder, 1998). Nutrition was an important influence on older respondents and certain ethnic groups but had no relationship with income. Cost was important to younger participants, females, people with lower income and non-Caucasian respondents (Glanz, Basil, Maibach, Goldberg & Snyder, 1998). It was also found that age was predictive of nutrition and weight control in older participants; whereas cost and convenience was associated with the younger age group (Glanz, Basil, Maibach, Goldberg & Snyder, 1998). Younger participants also had the highest consumption of fast foods due to its convenience factor. Not surprisingly, income was predictive of cost and convenience (Glanz, Basil, Maibach, Goldberg & Snyder, 1998). This study included a large sample size of 2967 adult participants which can be used to generalise the results. The use of surveys and food diaries could be used to support each other and give more information about their day-to-day consumption as it was a 7-day food diary.

Food consumption within any group will have common determinants of food consumption as there are many factors that influence their choices and habits. Six focus groups with students from a New Zealand university discussed the psychosocial determinants of fruit and vegetable consumption among university students in particular (Hartman, Wadsworth, Penny, van Assema, & Page, 2013). Reporting from the focus groups revealed that 76% of participants met the recommended guideline of consuming at

least 3 servings of vegetables per day, while 72% met the guidelines for fruit. Interestingly, 79% were aware of the 5+ a day recommendation but only 26% correctly identified the recommendation of 2 servings of fruit and 3 of vegetables per day (Hartman, Wadsworth, Penny, van Assema, & Page, 2013).

The determinants for the motivation of eating fruits and vegetables were taste, health consequences and satiety, in that order (Hartman, Wadsworth, Penny, van Assema, & Page, 2013). A large social influence came from room/flat mates and partners. If they were nutritionally conscience and had apt food behaviours, participants' choice in food consumption were heavily influenced and were more likely to meet the recommended food guidelines (Hartman, Wadsworth, Penny, van Assema, & Page, 2013). Participants were also more susceptible to eating readily convenient fruits and vegetables rather than consuming meals which required preparation of vegetables. Fruits could be seen as snacks, whereas vegetables were only perceived as ingredients in a meal rather than snacks such as carrot and celery sticks (Hartman, Wadsworth, Penny, van Assema, & Page, 2013). In all the focus groups discussions, cost, availability, lack of variety and seasonal influence were seen as barriers to fruit and vegetable consumption. They had also commented on the limited availability, cost and quality of fruit and vegetables on the university campus which they perceived to have decreased their fruit and vegetable intake and hence consuming more affordable ready-to-eat and processed foods instead for satiety (Hartman, Wadsworth, Penny, van Assema, & Page, 2013). It was conveyed that participants who resided in their parents' homes had higher consumption of fruit and vegetables as it was purchased and readily made available by their parents, compared to students who lived in university residence or other rented places (Hartman, Wadsworth, Penny, van Assema, & Page, 2013).

A discussion with students from different demographics showed the lack of understanding of the promotional guidelines of 5+ a day, despite being of a higher education level. Having focus group discussions and interviews rather than taking surveys is a good way to understand groups and their perceived behaviour and knowledge as surveys can miss out a lot of unknown information. It is also a great way to invoke other ideas and discussions that may be related.

Another study was conducted to find and understand the differences in the typical eating habits of undergraduates and postgraduate university students in USA. A survey was used to assess demographics and eating habits (Driskell, Kim & Goebel, 2005). Findings revealed that there were no differences between groups for eating fast foods, at restaurants or from vending machines. However, it was found that undergraduate students ate more at the university campus compared to higher levels (25.2% and 15.6% respectively). Two thirds of both groups typically ate at their houses or dorms at least 6-8 times weekly (Driskell, Kim & Goebel, 2005). Participants who ate in dorm rooms had a stable eating pattern, as meals were provided in student residential, compared to students who rented other places or lived with their parents. Both groups also had the same factors influencing food choices: convenience (53.4%), taste (42.9%), cost (40.3%), health (31.9%), weight control (23.5%) and family/friends influence (5.7%) (Driskell, Kim & Goebel, 2005). Using surveys, as mentioned before, does not give all the information required and related. Using a large sample size (undergraduates n=144 and postgraduates n=114) gives the study more credibility and can use as a generalisation for students in that university. However, it cannot be used to generalise eating habits for students from other universities.



### **Perceived Barriers, Facilitators and Promotion of Healthy Food Consumption**

Barriers, in this thesis, are factors that inhibit or discourage others in consuming nutritionally dense and healthy foods. Facilitators are factors that encourage the consumption. To generate interventions, barriers and facilitators from the target or sample group must be known in order to stage an effective intervention.

A systematic review of barriers and facilitators reported that perceived barriers to healthy food consumption were poor availability of healthy meals at school, overpriced healthy foods and a wide availability of fast and processed foods (Shepherd et al, 2005). To facilitate healthy eating, participants encouraged the ideas of reducing the prices of healthy snacks, better availability of healthy foods at school and removing vending machines from the premises. Participants acknowledge the lack of awareness and understandings of nutritional labels and suggested the provision of information on nutritional content of meals at school and to also have better food labelling which are easier to interpret (Shepherd et al, 2005). From the study reviewed earlier (Hartman, Wadsworth, Penny, van Assema, & Page, 2013), participants suggested using social media to advocate nutrition information to educate themselves and others as social media has an immense outreach to the population and demographics such as young adolescents to adults and even the elderly. Information about where to purchase affordable fruit and vegetables could be promoted on social media to overcome expense. Since students' priority is convenience, this platform could also be used to share quick and easy recipes.

| Authors  | Main objectives  | Samples   | Methodology and methods   | Summary of outcomes  | Location of study |
|--|--|---|---|--|-------------------|
| Glanz, Basil, Maibach, Goldberg & Snyder, 1998 | To examine self-reported importance of factors that influence personal dietary choices   | 2967 participants<br>Over the age of 18<br>From United States of America                  | <ul style="list-style-type: none"> <li>• Qualitative and quantitative</li> <li>• 2 self-reported surveys (cross-sectional)</li> </ul>       | <ul style="list-style-type: none"> <li>• Taste, cost, nutrition, convenience and then weight control influenced diet</li> <li>• Age predicts importance of nutrition and weight control (more evident in older people) as well as cost and convenience (more evident in younger)</li> <li>• Cost was important to younger participants, women and people with lower income and non-white respondents</li> <li>• Taste had no significant relationship with age or income. However, it did show that taste was more important to women and certain ethnic groups</li> </ul> | USA               |
| Driskell, Kim, & Goebel, 2005                  | To explore the differences between the demographics of lower and upper level university students in terms of their eating and physical activity habits | 258 university students<br>144 lower level students<br>114 upper level<br>19-25-year olds | <ul style="list-style-type: none"> <li>• Qualitative and quantitative mixed method study</li> <li>• Used 2 self-reported surveys</li> </ul> | <ul style="list-style-type: none"> <li>• No difference between groups for eating fast foods, at restaurants, or from vending machines</li> <li>• Lower levels eat more at university campus compared to higher level (25.2% and 15.6% respectively)</li> <li>• Both groups had the same factors influencing food choices:</li> </ul>   | USA               |

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|--|---|---|---|---|--------|
| Mente, de Koning, Shannon, & Anand, 2009 | To systematically analyse the association between dietary factors and CHD | 7204 participants altogether from USA, Europe and Asia<br>Mean age of participants were 58 years. | Systematic review included 146 prospective cohorts and 43 randomised controlled trials investigating dietary exposures and coronary heart disease (CHD) | <p>convenience (53.4%), taste (42.9%), cost (40.3%), health (31.9%), weight control (23.5%) and family/friends (5.7%)</p> <ul style="list-style-type: none"> <li>• 48.2% of lower level and 36.4% of upper level participated in other aerobic activities more than 31 mins per day</li> <li>• Physical activity locations for both groups are outside (69.4%), on-campus recreation center (54.8%), home (29.1%), work (26.4%), and off-campus fitness center (15.7%).</li> <li>•</li> <li>• Protective factors include consumption of vegetables, nuts, whole grains, Mediterranean diet, and monounsaturated fatty acids</li> <li>• Harmful factors include foods with high trans fatty acids, content and high glycaemic index.</li> <li>• Weak association of intake of saturated, polyunsaturated and total fat with CHD</li> </ul> | Canada |
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|---|--|--|---|--|----------------------------|
| Shepherd, Harden, Rees, Brunton, Garcia, Oliver, & Oakley, 2008 | <ul style="list-style-type: none"> <li>To review the research in the barriers and facilitators of healthy eating among young people</li> </ul> | Participants from primary and secondary schools were involved<br>Aged 11-16                                      | <ul style="list-style-type: none"> <li>Qualitative systematic analysis</li> <li>7 studies with the inclusion criteria of being focused on healthy eating, about promotion of healthy eating amongst 11-16 year olds, barriers and facilitators</li> </ul> | <ul style="list-style-type: none"> <li>Links were made between fast food and appearance having a negative association rather than intake having a negative effect on their health</li> <li>The rationale for eating foods was based on taste and social environments</li> <li>Factors inhibiting the ability to eat healthier included poor availability of healthy meals at school, healthy foods being expensive, and wide availability of fast foods</li> <li>To facilitate healthy eating, participants encouraged the ideas of reducing price of healthy snacks, better availability of healthy foods at school, take-aways and vending machines.</li> <li>Other ideas included the provision of information on nutritional content of meals at school and better food labelling</li> </ul> | US, UK, Norway and Finland |
| Hartman, Wadsworth, Penny, van Assema, & Page, 2013             | <ul style="list-style-type: none"> <li>To determine the psychosocial factors that influence university students'</li> </ul>                    | 29 Massey University participants<br>Aged 18-24 years<br>From health and non-health related qualification fields | <ul style="list-style-type: none"> <li>Qualitative study</li> <li>Action group discussion to explore different themes</li> </ul>  | <ul style="list-style-type: none"> <li>76% met the recommended levels of vegetable consumption while 72% met the levels for fruit</li> </ul>   | New Zealand                |

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|---|--|---------------------------------------|---|---|--------|
|   | <ul style="list-style-type: none"> <li>consumption of fruit and vegetables</li> <li>To find suggestions for nutrition promotional interventions</li> </ul> |                                       | <ul style="list-style-type: none"> <li>Used participatory action research methods to generate solutions and ideas</li> </ul>        | <ul style="list-style-type: none"> <li>Flatmates and partners had the greatest influence on fruit and vegetable consumption</li> <li>In all interviews, participants commented on the limited availability, cost, quality of fruit and vegetables on campus</li> <li>Cost, availability, lack of variety and seasonal influenced were seen as barriers to fruit and vegetable consumption</li> <li>79% were aware of 5+ day recommendation but only 26% correctly identified the recommendation of 2 servings of fruit and 3 of vegetables</li> <li>Promotional intervention suggestion included using social media to advocate, accessibility to quick and easy recipes, and information about where to purchase affordable fruits and vegetables</li> </ul> |        |
| Louzada, Baraldi, Steele, Martins, Canella & Moubarac, 2015 | <ul style="list-style-type: none"> <li>To evaluate the relationship between consumption of ultra-processed</li> </ul>                                      | 30243 participants over the age of 10 | <ul style="list-style-type: none"> <li>Cross-sectional study</li> <li>2 non-consecutive 24-hour recall diary over a week</li> </ul> | <ul style="list-style-type: none"> <li>41% were overweight and 12% obese</li> <li>68.6% of energy intake was from unprocessed or</li> </ul>   | Brazil |

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foods and obesity  
indicators

- moderately processed  
foods
- 29.6% of energy intake was from ultra-processed foods
  - Mean BMI was 0.94kg/m<sup>2</sup> higher amongst high consumers
- 

*Table 3: Summary of all studies included in the review assessing nutrition with health outcomes, determinants, barriers and enablers*

## **Implications and Recommendations for Future Studies**

The reviewed studies showed how physical activity, sedentary behaviour and nutrition play an important role in maintaining health in university students. Knowledge about the barriers to healthful behaviour can be used to plan interventions according to what university students deem important. This thesis research uses the Citizen Science approach as researchers work alongside participants to have a better understanding of what participants perceive as barriers in their day to day lives. This may even lead to new insights on the matter. There have been studies where university students were asked to suggest interventions to overcome nutrition and healthy eating habits barriers; however, there was a lack of studies that asked students about potential intervention strategies to increase physical and decrease sedentary activities. The reviewed studies enquired about barriers and enablers/facilitators which then can be used to plan interventions but lacked the involvement of students' perceptions of solutions to overcoming identified barriers which would give a better understanding of what may be effective interventions.

There were currently very few studies based in New Zealand universities and other tertiary institutes as to what students perceive as barriers and facilitators. Studies that have been reviewed are mostly from America and Europe which cannot be used to generalise the perception of New Zealand university students as there is a difference in physical, cultural and multi-ethnic environment, legislation and policies. There is also a lack of statistics on tertiary institute students in terms of physical activity and sedentary behaviour whereas it is available for secondary school students and other younger age groups.

## **Limitations**

The findings from studies that involve the environment of universities may not be used to generalise to other universities as they all have differing physical and social components.

Most studies were from America and Europe with the exception of the two studies from New Zealand, where the determinants of physical activity, sedentary behaviour and nutrition were discussed (Sinclair, Hamlin, & Steel, 2005; Hartman, Wadsworth, Penny, van Assema, & Page, 2013).

### **Conclusion**

The reviews have shown that high cost, low accessibility and availability of healthy foods and beverages on campus are a major barrier to having a healthy diet for university students and has prevented them from meeting nutritional guidelines daily. These are also barriers for physical activity as recreational facilities offered on and around campus are unaffordable for students and activities that require little to no energy are cheaper and convenient which leads to an increase in inactivity and sedentary behaviour. In particular, time has been found to be the biggest barrier as students' full schedules do not allow them to engage in physical activity for long periods and when they do have time, they prefer spending it on leisure activities to combat fatigue.

Even though these studies have identified the determinants of physical activity, sedentary behaviour and healthy eating, there was a lack of studies regarding the possible interventions applied to overcome those barriers. This thesis aims to find realistic solutions to overcome identified barriers by exploring the effect of the campus environment on students' physical activity, sedentary and healthy eating habits through students' perspective and experience.



## Chapter 3: Method

### Introduction:

The study in this thesis utilised mixed methods as it incorporated both qualitative and quantitative components. It involved case-study to understand what factors of the university campus influence eating, physical activity habits and sedentary behaviour of AUT students. There were two stages altogether. Stage One required participants to evaluate the campus for barriers to and facilitators of physical activity, nutrition and sedentary behaviour using a combination of photo-voice and online surveys. The surveys measured physical activity, sedentary behaviour and eating habits. Stage Two involved an action group to discuss findings from Stage One to generate ideas for interventions (see Figure 1 on page 26 for a summary of the study design). Participants were recruited by placing informative posters of the study around AUT City campus and through social media advertising. Data from Stage One were analysed via case study and thematic analysis to group and identify key themes. The online surveys' results were analysed using Microsoft Excel and TypeForm to find the percentage response for each answer and the mean for quantitative questions. The action group discussion was also analysed using thematic analysis to find key themes that had emerged from the discussion. An action group was utilised as the discussion revolved around finding solutions and taking action to overcome the identified barriers.

### Design

Mixed methods study design. The qualitative method was used in regard to participants' case studies which involved the campus walk and action group. The online survey that participants were required to complete is the quantitative portion of the study.

## **Participants**

The inclusion criteria for participants were that: (1) They had to be enrolled in AUT City campus as a student and (2) Participants could walk or wheel freely around campus.

Participants also could have been of any gender, ethnicity, qualification or age. The aim of the study was to recruit 8 participants.

Posters were used to recruit participants. Informative posters of the study, along with contact details were displayed all around the AUT City campus in order to reach the target sample group (see Appendix 3 for recruitment poster). A posting of the poster- on social media- was also used as a recruitment method to reach a wider audience. Social media posts about the study potentially have the ability to increase awareness and interest which aids the process of recruitment.

Non-probability sampling was used as a sampling method in this study. Convenience or opportunity sampling was used as it uses people from target population of AUT students who are willing and available to participate. This method has the advantages of simple sampling, and of being the cheapest method to implement (Kam, Wilking & Zechmeister, 2007). It also has a disadvantage as it may not provide a representative sample for the research study. However, the study had been advertised in multiple locations and social media to create a larger outreach to different types of students who may be interested in participating. The snowballing sampling method was also used. This method required asking current participants to refer other students who may also be interested in participating in the study (Noy, 2008). This then also contributed to the larger outreach and also brought awareness to students who may not have social media.

## **Qualitative Research Method**

The qualitative approach is used to facilitate the exploration of a phenomenon in a certain context by using a variety of sources. The phenomenon has to be viewed from multiple views in order to understand the phenomenon as a whole rather than viewing it from one point of view (Baxter & Jack, 2016; Amaratunga, Baldry, Sarshar & Newton, 2002). It seeks to find issues of concern via interviews, observations, and accessing texts and/or voice recordings of participants (Biggerstaff & Thompson, 2008; Baxter & Jack, 2016). This helps to uncover the meaning that already exists in people's experiences in order to understand what can help to improve the issue. In this case, participants were recruited in order to understand what participants perceive to be barriers to and facilitators of physical activity, sedentary behaviour, and healthful eating in the university campus and also what they perceive to be solutions or interventions to overcome barriers. The qualitative approach involves the exploration of human experience. This experience is captured or recorded in words rather than statistics or numbers such as in quantitative studies (Biggerstaff & Thompson). The recorded words or text from Stage One and Two were then analysed as categories or themes that would describe the experience of each participant. This study was about uncovering people's experience with the university campus which gave a range of data from individuals that cannot be generalised to a population and hence cannot be used to make an absolute claim which is one of the limitations of qualitative methods (Amaratunga, Baldry, Sarshar & Newton, 2002). The opinions of AUT students on their campus cannot be used to make generalisations about other universities or other campuses due to the vast difference of their campus environment and student population's experience with their campus. It is very specific to the studied population and hence the response to the results can be only be applied to AUT City

campus. The outcome of a qualitative research approach gives meaning, description and change to ideas and are left open to be analysed by readers that may be interested in that field of topic.

Finding the “truth” in terms of what is correct in an issue or practice has been ever changing and an open-mindedness is needed by researchers to explore how the truth can change and evolve. The truth for many people can be different based on experience and understanding which is why a qualitative method is appropriate for the study (Amaratunga, Baldry, Sarshar & Newton, 2002). By using interviews and action groups, the researcher understood how the university campus and the surrounding area had an effect on each participant, and as a group of AUT’s students which is why a qualitative research method was appropriate for this study.

It is important for the researcher to have an open-mind to the response from each participant to limit bias from the questions they are asking as a response to the answer. Qualitative researchers inevitably bring their own bias in one way or another but must always reflect on the bias that researchers are bringing in and consider how it will affect the study (Giacomini & Cook, 2000). Biases that may arise from a qualitative study can be biased questions, moderator bias, procedural bias, and sample group bias (Morgan, 2009). Since this was a case study research and the findings will not be used to generalise the population, a small sample size of 8 was appropriate for its method. The questions asked by the researcher, to the participants in the campus walk and action group, have been discussed and approved by the supervisor. A potential bias may be introduced into the process by the questions that are asked spontaneously by the researcher in the action group to either stimulate the discussion or get specific answers. The researcher must seek to ensure that the questions asked aren’t biased or prompting participants to get a certain response (Morgan,

2009). Participants also need to have enough time to complete all stages of the study in order to get data that is truly representative of the participant. To ensure this, participants were given sufficient time to complete all stages by asking them when they are available to complete it. Participants were given 35 minutes, maximum, to complete the campus walk. If they did require more time, the researcher allowed this to obtain relevant data. Participants were also given the choice of completing the survey right after the campus walk or they could have completed it in their own time. This was so that participants didn't feel rushed and took time to understand and answer the questions appropriately.

The action group involved open-ended questions in order for participants to provide an in-depth response to each question. This encourages a discussion amongst the group as participants may have different responses to the question and may also lead to impromptu questions that are relevant to come up by the researcher and/or other participants (Morgan, 2009). This enables the researcher to further explore the deeper interactions of the campus with participants, and understanding their experiences (Morgan, 2009).

### **Research Paradigm**

A paradigm framework is a theory and/or analysis of how a researcher does or should proceed with their method of conduct (Morgan & Smircich, 1980). Most research is based on some underlying philosophical assumptions as to what establishes a valid research study and which research method may be suitable for the study. This study adopted the interpretive paradigm. This involves listening to people and collecting information of felt experience from participants (Scotland, 2012). Researchers interact with participants in a way that will help researchers understand their experience. With the interpretive paradigm, the interview method is usually used to capture the participants' experience and perception (Morgan & Smircich, 1980; Scotland, 2012). It is also founded on the belief that reality is

socially constructed and fluid therefore what is known is affected by cultures, relationships with others and social settings (Scotland, 2012). Stages One and Two involve this paradigm as it required the perception and opinions from participants on their campus based on experience and observation. This was acquired through the action group and the campus walk. It also required participants' suggestions on interventions and strategies to overcome barriers in a way that is effective on the population of AUT students. Each participant had their own perceived truth and reality which needs to be explored by the researcher. There even might be a "shared reality" amongst the participants. Effective communication between the researcher and participant is required to enable the researcher to understand the phenomena in depth; hence qualitative research method is essential.

### **Participatory Action Research Method**

Participatory action research (PAR) is a type of qualitative approach that is usually used when communities are essential to the research question or topic to understand a social context (Wang, 1999; Minkler, 2000). Participants' active involvement in the research helps to reduce inequities which leads to improving the communities' overall health status (Minkler, 2000). In this study, university students' active involvement as participants was essential to the action group as they were acting as co-researchers to generate solutions and interventions to overcome the perceived barriers. Participants were researched with rather than being researched on which was an important aspect with this approach (Leung, Minkler & Yen, 2004). PAR enables participants to bring up issues and solutions by working with researchers to fulfil the needs of the campus which may have not been known by the researcher initially since researchers are usually not part of the community nor are they directly affected by the issues that face the community (Wang, 1999; Minkler, 2000). The action group was where this approach was applied as participants were part of the

discussions regarding improvement of the university campus. Their inputs and opinions were highly appreciated and taken into consideration as their experiences and perception will help voice the change to the Student Council. The outcome and changes made will ultimately affect students of AUT City campus the most. However, this study had a small sample therefore the potential changes, as suggested by participants, should be voted on by the rest of the AUT student population. This to ensure that the student population also has a voice in implementing changes that will affect them. In the future, this approach may encourage other students and community members to be actively involved in change in their local community after witnessing change in response to their opinions.

### **Citizen Science Approach**

The citizen science approach is a qualitative method that empowers participants to collect information about their community and environment (Silvertown, 2009). The citizen science approach can be described as public participation in scientific research (Bonney et al., 2009). This helps the researcher to understand what the participants perceive as the major issues of concern and enables participants to collaborate with researchers to generate practical and effective solutions (Bonney et al., 2009). This is advantageous as solutions to barriers cannot be generalised to different communities and environments, hence this approach allows participants to be involved in various roles such as data collectors, interventionists, and data interpreters to generate solutions that is specific to that environment and its residents (Hinckson et al., 2017; King et al., 2016; King, Winter, Chrisinger, Hua & Banchoff, 2018). This approach relies on participants to produce reliable data. It also enables researchers to conduct research with participants rather than researching on them (Bonney et al., 2009; Silvertown, 2009). Participants are not the

subject. Instead, participants are encouraged to be involved in and to facilitate the research (Cohn, 2008).

This research used the application, PhotoCap, for participants to capture photographic images as to what they perceive to be issues around the campus regarding their wellbeing. The participants themselves had the role of being researchers and data collectors to gather information to emphasise barriers and facilitators. Participants further went on to being collaborators in generating solutions that are practical and effective for that particular population during the action group. This also gave the opportunity for participants to learn more about their environment through the research and encourages them to be actively involved in voicing their opinions regarding their community when changes are needed, in the future.

### **Quantitative Research Method**

For the online survey, a quantitative method was mostly used. Quantitative methods are used in research to figure out risks, predictions of certain variables, to find cause and effects of variables, also to find the strength of relationships between variables (Elo & Kyngäs, 2008). The result or outcome can then be used as a generalised statistic for that certain population; whereas qualitative methods cannot (Elo & Kyngäs, 2008). Compared to a qualitative method, participants do not share experience or opinions but rather provide researchers with self-reported answers. The survey measured eating and exercising habits from the past 7 days by asking a series of questions derived from the International Physical Activity questionnaire and the Health Promoting Lifestyle survey. Some questions in the survey were open-ended to allow any answer from participants and to allow more context to the response. The survey was conducted as a web-based survey. Participants were requested to complete it right after the campus walk. If there was a lack of time, the link to



the survey was emailed to participants and was followed up until they completed the survey. Since this was a case-study of 8 participants, the results from the survey cannot be used to generalise AUT students. Instead it provides an understanding of the common practices of the participants in question in terms of nutrition and physical activity behaviours.

### **Case-study Method**

A case study research approach enables the researcher to produce an in-depth study of a particular situation and to narrow down a broad field of research. This approach is an in-depth investigation of a community, group, event or a single person in relation to a phenomenon. A variety of sources of are typically used to gather data and different methods can be used such as observations and interviews. It also offers flexibility to the researcher as researchers can select methods of data collection and analysis to generate suitable material (Eisenhardt, 1989). A case study is defined by individual cases rather than the methods of inquiry or process used. A case study design should be implemented when either: 1) the focus of the study is to explain the “how” and “why”; 2) the researcher aims to cover contextual conditions of the phenomena; 3) the boundaries between phenomena and context are not clear; or 4) the researcher cannot manipulate the behaviour of participants involved in the study (Seawright & Gerring, 2008; Eisenhardt, 1989; Yin, 1981). This research study aimed to explore the experiences and opinions of different AUT students regarding how the City campus affects their physical activity, healthy eating and sedentary behaviour. A case study design allows the researcher to evaluate the situation from multiple perspectives and within local contexts (Seawright & Gerring, 2008; Eisenhardt, 1989). Smaller sample sizes are usually drawn in a case study research; however, this can reveal a large number of factors in relation to the phenomena with a close

examination of the participants' perception and experience (Seawright & Gerring, 2008; Yin, 1981). This might not be possible with a large sample size with the aim of averaging and generalising. It also allows an observation on aspects of human behaviour and thinking that would be impractical to be studied in other ways. This is due to the in-depth and multi-sided design of case studies (Gerring, 2004). Measurable aspects of human behaviour in unlikely to give descriptive insights to the subjective dimension of experience.

This study was an exploratory case study type as it was used to explore links in real-life interventions that may be too complex for surveys or experimental designs (Gerring, 2004). The explanations found from the cases were used to link the campus effect on participants' behaviours. Exploratory case studies can aid in generating new ideas based on the participants' experience and what they perceive will be an effective solution for issues raised (Ogawa & Malen, 1991). Case study design takes on a constructivism paradigm (Seale, 2002). According to constructivists, the 'truth' and objective reality does not exist but rather, they believe that it is a construct that needs to be learned by researchers in order to understand the idea or perception of the reality that participants have, not the reality itself (Rolfe, 2006). In this study, the researcher learned what participants perceived as their reality in relation to the campus and their health through the different methods of data collection and analysis. Constructivism is related to the interpretivism paradigm as interpretivism addresses shared meanings and understanding, whereas constructivism extends this further with knowledge as being produced and interpreted (Rolfe, 2006).

### **Stages of the Study**

#### **Stage One**

Participants were recruited from AUT and were asked to evaluate the indoor and outdoor spaces of the campus in terms of what they perceive to be barriers and facilitators of

physical activity, sedentary behaviour and healthy eating habits. An app called PhotoCap was used on a provided iPad for participants to use. PhotoCap allows users to take pictures and write accompanying text. Before the perceived evaluation, the participants were given the definition of ‘physical activity’, ‘sedentary behaviour’ and ‘nutritionally dense’ in order to help them understand as participants may not be familiar with the widely recognised definitions (see *Table 4*, page 85). Participants took pictures of perceived barriers and facilitators in and around campus for an average of 15 minutes. The pictures taken included a description of why they perceived that particular area or item to be a barrier or facilitator. Participants were asked to write a given numbered code in the captions of the pictures they had taken in order for the researcher to know which and how many pictures the particular participants had taken. Numbered codes help to keep the participants’ anonymity and privacy (see *Figure 1* for a summary of study stages on page 26).

Right after the campus walk, participants were asked to fill out the three online surveys (HPL, IPAQ and Health Fair questionnaire). The surveys included questions that measured eating and exercise habits over the last 7 days. It takes an average amount of 5 minutes to complete. The survey also includes questions regarding demographic such as age, current qualification, ethnicity, gender, and years attending AUT. Understanding exercise and eating habits of students may help to correlate to their perceived barriers and facilitators.

### **Stage Two**

An action group was conducted with 5 participants in the group which lasted for 50 minutes. Three of the 8 initial participants had decided not to participate in the action group due to scheduling issues. The library group room was booked in the AUT City campus to conduct it. Participants were asked to pair up and discuss their findings from the campus walk amongst each other. Each pair were then asked to share their findings with the group.

Barriers found from participants were discussed to generate solutions and interventions to overcome them. Findings from the action group were analysed using thematic analysis to group key ideas and themes.

## Procedures

Ethics for this study was written and approved on 31<sup>st</sup> October 2017 and 1<sup>st</sup> October 2018. The AUT Ethics Committee reference number is 17/346 (see Appendix 1 for proof of ethics approval, page 148). Information sheets were provided to all participants before being involved in the study (see Appendix 5, page 154). The information sheet included details about the researchers who were included in the study, purpose of the research, and the procedure of agreeing to participate. Details of the different stages were also highlighted in the information sheet and risks and protection of privacy were explained. Incentives for participating and the time required to be involved were explained. The incentives were shopping vouchers valued at \$20. Participants were made sure to be told about the option of withdrawing from the study, along with the withdrawal of their data and contact details. Participants had also received contact details of both the researcher and the supervisor if they had any concerns regarding the conduct of the research or if they had any questions.

After participants had read over the information sheet, they were required to sign two consent forms; one for participants to keep for reference and one for the researcher to document their consent (see Appendix 6, page 159). Information sheets were emailed to participants when they showed interest in the study by sending the researcher emails and messages to participate. One of the requirements to be able to consent was to complete reading the information sheet. This was to ensure that potential participants completely understood the requirements of the study and how they would be involved. Consent forms were required to be signed before the commencement of the campus walk as that was the first time the researcher and participants had met.

After participants had completed Stage One, they joined the action group. The action group was organised according to when most participants were available for a certain time.

### **Tools**

The tool used in this study was an app called PhotoCap; it was used on the provided iPad. PhotoCap is an application that allows users to take pictures and caption them with unlimited characters. Pictures are then saved to the gallery of the device. Unfortunately, PhotoCap does not have tracking or location features, therefore another application had to be installed. GPS Trip Tracker was installed on the iPad so that the researcher could track the route taken by participants. This included a map, duration of the walk, time and the date of when the walk was done. A track or route of participants' walks were necessary to have confirmation that Stage One was indeed completed by all participants (see Appendix 8, page 164).

To run all the applications, an iPad from the university was provided. Participants were given this device to complete Stage One. If there was enough time, participants also used this to complete the online surveys.

The three questionnaires used in this study were the Health Fair questionnaire, Health Promoting Lifestyle (Pinar, Celik & Bahcecik, 2009) and the International Physical Activity Questionnaire (Fogelholm et al., 2006). The Health Fair questionnaire measured habits of healthy eating in terms of just consuming fruits and vegetables. It measured whether or not participants meet the nutritional guideline of consuming 5 portions of fruits and vegetables in a day. The consumption of potatoes was not considered as a vegetable due to its high carbohydrate content; therefore, could not be counted as meeting the guidelines when consumed. This survey had been included to get an understanding of participants' eating habits, particularly university students. Some questions were removed from the original

survey as they promoted unhealthy choices. For example, one of the questions measured how often one consumed fruit juices. This question was removed as fruit juices have a high fructose content and the scoring system would consider this as a healthy choice.

The Health Promoting Lifestyle Profile questionnaire measures health promoting behaviour, perceptions to maintain or enhance the level of wellness, fulfilment and self-actualisation of the individual who fills of the survey (Pinar, Celik & Bahcecik, 2009). Originally, the questionnaire had 52 questions with a 4-point response format. The main domains of the survey were health responsibility, nutrition, spiritual growth, physical activity, stress management and interpersonal relationships. For the purpose of this study, only the questions for nutrition were utilised. Physical activity questions were not used to avoid repetition as the International Physical Activity questionnaire was used instead. The Lifestyle Profile is scored from 1 (never) to 4 (routinely). All responses to the questions related to nutrition were obtained by calculating the mean. A higher mean shows that participants have a perception that their nutritional habits are adequate whilst a lower score shows that it's inadequate and needs to be improved. The survey has a good reliability scale ( $r=0.84$ ) in a study conducted on college students and was observed to be adequate to be utilised in future research (Huang & Chiou, 1996).

The International Physical Activity Questionnaire is an instrument for monitoring physical activity and inactivity in populations (Fogelholm et al., 2006). It consisted of 7 questions which measures low, moderate and vigorous activity levels and patterns over the last 7 days. This also included sedentary behaviour habits. The questions had both open ended and multiple-choice questions. The open-ended questions measured an approximate amount of time spent on physical activity. The response from all participants were calculated as a mean for different groups for comparison reasons. This survey has been

tested for its validity and has been found to have a strong relationship with the activity monitor data for total and vigorous physical activity in a study of 46 participants (Hagströmer, Oja & Sjöström, 2006). However, there was a weaker relationship between moderate physical activity and activity monitor data. Overall, the self-administered questionnaire has acceptable validity for assessing patterns and levels of physical activity in adults (Hagströmer, Oja & Sjöström, 2006).

### **Data Collection**

The purpose of data collecting for this study was to find the habits and patterns of healthy eating, sedentary and physical activity over the past 7 days in university students. This was collected via the three questionnaires. The research question: “What are the effects of the physical environment of AUT City Campus on students’ physical activity and sedentary behaviour levels and eating behaviours?” was answered and explored through the one-on-one campus walk using PhotoCap and through the action group discussion. The action group discussion was audio recorded and later transcribed by the researcher.

### **Campus Walk**

Participants were asked to use the app, PhotoCap, to capture pictures of different areas of the indoor and outdoor spaces of the campus to identify the barriers and facilitators of physical activity, sedentary behaviour and nutrition. The brief captions written by participants explained the reason as to why they perceive those areas to be barriers and enablers which answers the research question. The caption also included the participants’ identification number, statement of whether the area or object of the picture taken was good or bad and a brief statement explaining why participants have that opinion. The statement included what the captured photo consists of and how they affect their wellbeing. Some even included possible solutions and interventions for areas that were found to be barriers.



### **Action Group**

Using the participatory action research method, an action group was held with 5 participants for a duration of 50 minutes in the session. Participants were asked for consent, prior, to record the session using a voice recorder which was used to transcribe the action group discussion for data and thematic analysis. To encourage participants joining the action groups, snacks and drinks were provided in the session. Snacks such as mixed nuts, arrangement of fruits, cheese and crackers, bottled water and drinks with a low sugar content were provided. This also helped make the participants feel more comfortable and at ease, hence helping them to collaborate with other participants more in a relaxed manner.

Questions and structure of the action group were planned by the researcher and supervisor prior to prevent the discussion from deviating into irrelevant subjects and discussion. Open-ended questions were used by the researcher to lead a larger discussion about issues and to stimulate conversations amongst participants to generate ideas and solutions such as: “Why have you taken these pictures?”; “What do you think the issues are?”; “How can we overcome the barriers with realistic solutions and interventions?”. The researcher also asked impromptu questions in between discussions to clarify answers and to help participants think about the questions on a deeper level. The findings of barriers from Stage One (campus walk) were discussed as to what those issues were and why they were perceived as barriers to healthy eating, physical activity and sedentary behaviour. From that discussion, the action group as a whole generated realistic solutions and interventions to overcome barriers in the university campus setting. Brief strategies were planned as to how those solutions will take place.

The voice recorder was used to record the whole discussion. The contents were also used to derive direct quotes from participants for relevant topics. Thematic analysis was used to decipher the conversations and to generate emerged themes from the discussions.

### **Thematic analysis**

For the qualitative portion of this research study, thematic analysis was used to interpret the data. This included Stage One and Stage Two's data from campus walks and action groups. Thematic analysis aims to extract the themes in a text or verbal discussion in different levels to help others understand it more in depth and to use those themes to answer the research question (Braun & Clarke, 2006). It is also a flexible framework that can suit different types of research questions. It mainly suits research questions regarding experiences, views and perceptions of participants 'in a study (Braun & Clarke,2006).

To find the emerged themes, coding and transcribing the text from the two phases was completed. Since the campus walks' data are in text, the text was dissected into manageable and meaningful groups of themes based on common barriers and facilitators perceived by the participants. The action group's data were verbal, stored on a voice recorder and transcribed to be analysed by the researcher. Emerged, basic themes, from both stages, were then refined further into specific themes that were used to summarise texts and related to the main issue or the global theme. Global themes are macro themes that encompass the principal themes in the data as a whole. It shows the main themes in the given context (Attride-Stirling, 2001).

Thematic networks analysis is a method that aims to explore the basis or understanding of a problem or idea (Attride-Stirling, 2001). It is a way of organising the analysis of qualitative data in a visual manner using illustrations as a tool of the emerged themes. The illustration of the network systemises and groups the themes, also it shows the relationship

between the themes and how they affect and relate to each other (Fereday & Muir-Cochrane, 2006). Using this tool as a visual illustration helps to present the qualitative data's summary in a manner that is easily understood. It supports the researcher's interpretation and exploration of the results (Fereday & Muir-Cochrane, 2006; Attride-Stirling, 2001).

| Organising Themes              | Definition   | Categories   | Definition   |
|--------------------------------|--|--------------|--|
| <b>Physical Activity (PA)</b>  | Meeting the recommended physical activity guidelines of engaging in moderate to vigorous intensity activities for at least 150 mins/week | Barriers     | Areas and/or objects that prevent or decrease students' PA level in the AUT City campus                |
|                                |  | Facilitators | Areas and/or objects that encourage and increase students' PA levels in the AUT City campus            |
| <b>Healthy Eating/Drinking</b> | Consuming nutritionally dense meals low in carbs, and drinks with low/no sugar content   | Facilitators | Areas, factors and places that encourage healthy eating habits in AUT City campus<br>Foodie God Mother |
|                                |  | Barriers     | Areas, factors and places that prevent or decrease students consuming healthy alternatives             |

| Organising Themes          | Definition   | Categories   | Definition  |
|----------------------------|--|--------------|---|
| <b>Sedentary Behaviour</b> | Sitting or lying down (awake) for long periods of time | Facilitators | Areas and objects used by students that promotes standing and/or walking rather than sitting or lying down                        |
|                            |  | Barriers     | Areas and objects used by students that may encourage long periods of leisure such as sitting and laying for long periods of time |

*Table 4: Summary of Stage One's (campus walk) definitions*

## **Chapter 4: Findings and Interpretations**

This chapter presents the findings of the campus walk, online surveys and the action group discussion with university students of AUT. It consists of analysing and deciphering the qualitative data using thematic and case study analysis. The qualitative data is represented via thematic networks as a visual tool to understand the main contents discussed and found. It is also presented using a profile for each participant and the data collected from them to understand each case individually. Similarities and differences found amongst the participants have been reported. The interpretation of the graphs, tables and thematic networks of the data is presented along with key ideas and themes that have emerged.

### **Participants**

A total of eight participants from different ethnic groups, current qualification and age range met the inclusion criteria and were involved in the study. The descriptive characteristics of the participants involved are presented in Table 5, page 87.

| <b>Participant</b>         | <b>Age</b> | <b>Gender</b> | <b>Current qualification</b>           | <b>Ethnicity</b> | <b>Years enrolled in AUT</b> | <b>Postcode area</b> |
|----------------------------|------------|---------------|--|------------------|------------------------------|----------------------|
| <b>Participant 1 (104)</b> | 22         | Female        | Undergrad Event Management             | Filipino         | 2                            | East Tamaki          |
| <b>Participant 2 (105)</b> | 27         | Male          | Bachelor of Medical Laboratory Science | Chinese          | 2                            | Glen Innes           |
| <b>Participant 3 (102)</b> | 19         | Male          | Bachelor of Computer Science           | Maori            | 2                            | Westmere             |
| <b>Participant 4 (110)</b> | 20         | Male          | Bachelor of Computer Science           | Indian           | 2.5                          | Auckland City        |
| <b>Participant 5</b>       | 18         | Female        | Bachelor of Communications             | European         | 1                            | Te Atatu             |
| <b>Participant 6 (224)</b> | 39         | Female        | MSc in Transport design                | French           | 1                            | Westmere             |
| <b>Participant 7 (221)</b> | 24         | Female        | Bachelor of Mathematical Sciences      | Tongan           | 3                            | Waimauku             |
| <b>Participant 8 (101)</b> | 33         | Female        | Bachelor of Communications             | European         | 2                            | Arch Hill            |

*Table 5: AUT participants' demographics from online surveys*

The study recruited 8 participants altogether from diverse backgrounds. Three participants were males and 5 were female. The age range was quite large; ranging from 18 to 39. Only one participant was a post-graduate student and the rest were completing their undergraduate courses. None of the students were taking any courses relating to nutrition, physical activity, health or physiology, as those courses are undertaken in the North and South campus. Participant 6 had a health-related background. The participants recruited have spent between 1 to 3 years in the City campus; most participants have spent 2 years

enrolled in AUT. The participants recruited are from different parts of Auckland; only two participants share the same post code.

All 8 participants completed the online survey that contained questions from the Health Fair questionnaire, International Physical Activity and Health Promoting Lifestyle survey. All questionnaires were scored in relation to the scoring system.

### **International Physical Activity Questionnaire (IPAQ) scoring**

To determine the amount of energy each participant spent, the amount of time, in minutes, in low, moderate and vigorous activity levels were multiplied by the number of days participants had engaged in. This was further multiplied by the given value of METs of each activity level (walking = 3.3, moderate activity = 4, vigorous activity = 8). Six participants had scored High on the IPAQ. Those who scored High either engaged:

- In vigorous intensity activity on at least 3 days of the week, achieving a minimum total physical activity of at least 1500 MET minutes per week.
- In 7 or more days having a combination of walking, vigorous or moderate intensity activities achieving a minimum of 3000 MET minutes per week.

Participants who scored High were Participants 2,3,4,5,7, and 8. Two participants had scored Moderate, which means they were engaging in some activity that was more than likely to be equivalent to half an hour of at least moderate intensity physical activity (see Table 6, on page 94 for a summary of all participants' survey response). Those who scored Moderate on the questionnaire engage in either:

- At least 3 days of vigorous intensity activity and/or walking at least 30 minutes a day
- At least 5 days of moderate intensity activity and/or walking at least 30 minutes a day



- At least 5 days of any combination of walking, vigorous or moderate intensity physical activity levels, achieving a minimum of 600 MET minutes per week.

The participants who scored Moderate were Participants 6 and 1. None of the participants scored low on the IPAQ. The highest MET minutes a week was Participant 2, with 9666 METs. The lowest was 678 MET minutes per week which Participant 1 had achieved (see Figure 2 below).

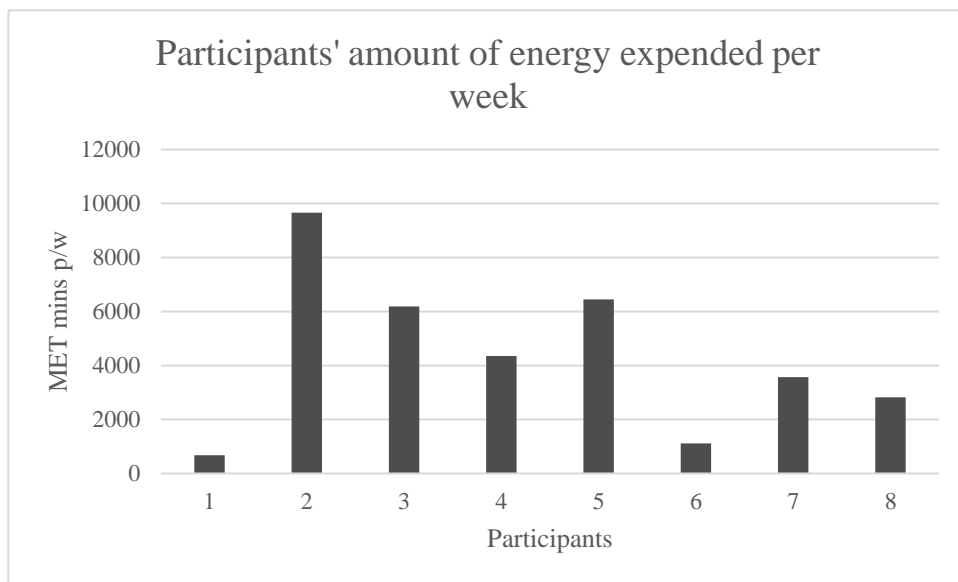


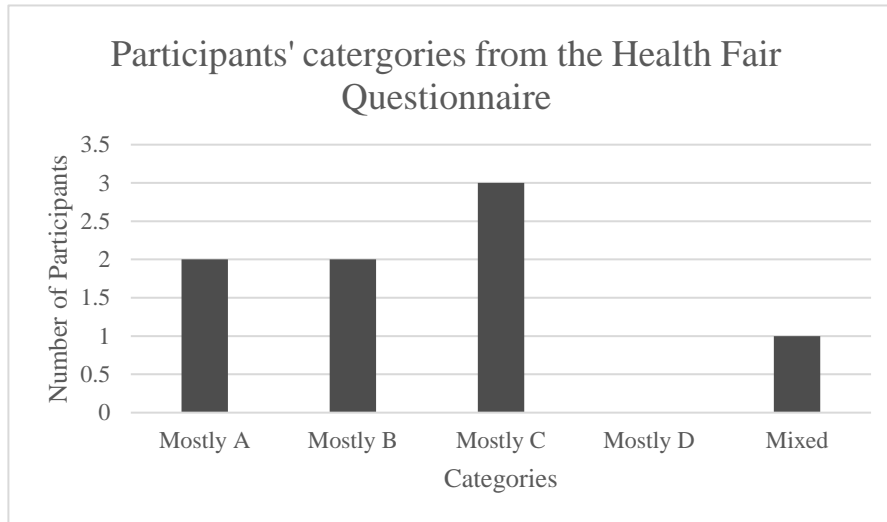
Figure 2: Graph showing the amount of energy spent by each participant over an average week, using the IPAQ scoring system

### Health Fair Questionnaire

The Health Fair questionnaire was used to measure the frequency and eating habits of fruit and vegetable consumption. The questions were answered with ‘regularly’, ‘often’, ‘sometimes’ and ‘never’ as represented by A, B, C and D, respectively. The questionnaire was scored by the frequency of each answer to give an overall measurement. Those who

score Mostly As consume at least 5 portions of fruit and vegetables per day. A score of Mostly Bs may just be meeting the recommended minimum 5 portions of fruit and vegetables most days per week; but need to increase the consumption of it. Mostly Cs score meant that enough fruit and vegetables were not consumed per day and a minimum of 2 serving of fruits and 3 servings of vegetables was recommended. A score of Mostly Ds meant that increased consumption of fruit and vegetables is drastically required and that the recommended consumption is not being met.

Three participants, 1,3 and 7, scored Mostly Cs which showed that they weren't meeting the recommended portions of fruit and vegetables and needed an increase in consumption. Participants 2 and 3 had scored Mostly Bs. They were just meeting the recommended amount but improvement could be made. Participants 5 and 6 scored Mostly As. They consumed at least 5 portions of fruit and vegetables and did not need an increase in portion. Participant 8, however, had a mixed result. She had answered the questions with an equal frequency of A, B, C and Ds (see Figure 3, below). Participant 8's results were inconclusive. The HPL survey would show a better understanding of Participant 8's eating behaviour.

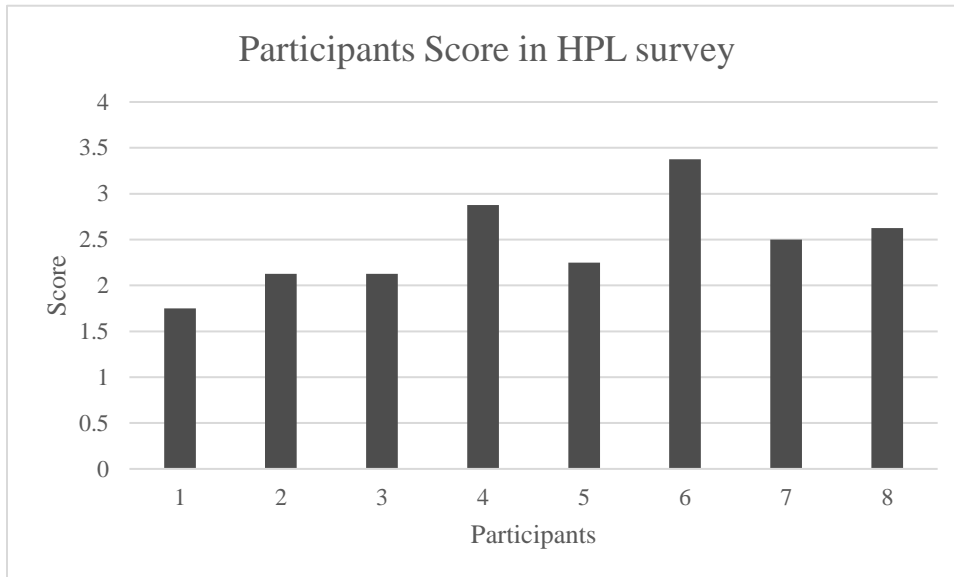


*Figure 3: Graph showing participants' results of the Health Fair Questionnaire*

### **Health-promoting Lifestyle Survey II**

The Health Promoting Lifestyle survey is a tool used to measure health promoting behaviour, conceptualised as a multifactorial pattern of self-perception that serves to enhance or maintain the level of wellness of the individual or participant in question (Pinar, Celik & Bahcecik, 2009). The original 52-item survey uses a 4-point response format to measure the frequency of the health-promoting behaviours in the areas of health responsibility, physical activity, nutrition, spiritual growth, stress management and interpersonal relationships. For this study, only the questions relating to nutrition were utilised.

The questions are answered with 'routinely', 'often', 'sometimes' and 'never' as represented by the numbers 4, 3, 2 and 1 respectively. The scoring is calculated by finding the mean of the participants' response to the 8 questions used (see Figure 4, page 92).



*Figure 4: Graph showing each participants' score in the HPL survey*

A high score, maximum 4, shows that the individual has a knowledgeable selection and consumption of foods which are essential for health, wellbeing, and sustenance. A low score, minimum 1, means that the individual has a lack of knowledge and has an unhealthy eating habit and pattern. The highest score was of Participant 6's with 3.375 and the lowest was Participant 1 with 1.75. The average score for all participants is 2.45. An overall improvement could be made to all participants eating behaviour through their environmental factors to facilitate a better diet.

### **Sedentary Behaviour**

There was a large variation amongst the participants; from 3 to 12 hours a day spent engaged in sedentary activities (see Figure 5, page 93). The average hours spent on sedentary activities of these participants was 6.25 hours per day. However, Participant 1's low MET; from the IPAQ, does not correctly correlate with her perceived low amount of sedentary activity (see Table 6, page 94 for comparison).

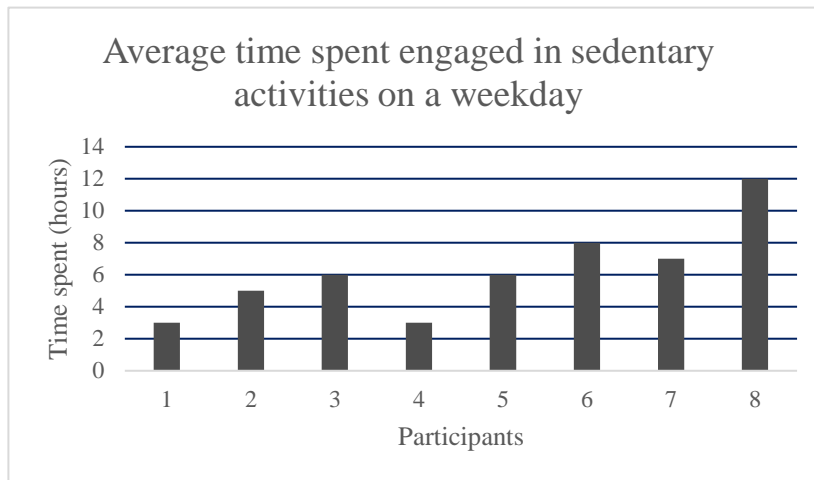


Figure 5: Graph showing the amount of perceived time participants spent on sedentary activities on an average weekday.

### Nutritional Labels

Six out of eight participants did not regularly check or read the nutritional label when choosing what foods and/or beverages to consume. This may be due to the lack of perceived importance to the products' contents and nutritional value or the lack of understanding of a nutritional label (see Figure 6, below).



Figure 6: Graph showing regularity of participants reading the nutritional labels of consumed foods/drinks from the HPL survey

| <b>Participants</b> | <b>IPAQ (MET)</b> | <b>Physical activity levels</b> | <b>Health Fair Questionnaire</b> | <b>HPL survey</b> | <b>Sedentary behaviour engagement (hrs/day)</b> |
|---------------------|-------------------|---------------------------------|----------------------------------|-------------------|---|
| <b>1</b>            | 678               | Moderate                        | Mostly C                         | 1.75              | 3   |
| <b>2</b>            | 9666              | High                            | Mostly B                         | 2.125             | 5   |
| <b>3</b>            | 6186              | High                            | Mostly B                         | 2.125             | 6   |
| <b>4</b>            | 4350              | High                            | Mostly C                         | 2.875             | 3   |
| <b>5</b>            | 6453              | High                            | Mostly A                         | 2.25              | 6   |
| <b>6</b>            | 1116              | Moderate                        | Mostly A                         | 3.375             | 8   |
| <b>7</b>            | 3573              | High                            | Mostly C                         | 2.5               | 7   |
| <b>8</b>            | 2826              | High                            | Mixed                            | 2.625             | 12  |

*Table 6: Summary table showing each participants' survey response*

### **Campus Walk Photos**

The total number of photos taken on the campus walk by participants was 88. Most of the pictures taken by participants related to healthy eating with 49 pictures, followed by physical activity, 31, and lastly sedentary behaviour with only 7 pictures relating to it out of 88 pictures altogether. Three participants, who took pictures relating to sedentary behaviour, identified couches and seats to be facilitators. There have been more facilitators than barriers to all three behaviours found by all except one participant, Participant 6, who found 8 barriers and only one facilitator. Most of the barriers she found were of different aspects of the streets surrounding the campus (Table 7, page 96).

There were 15 pictures altogether relating to vending machines and how they are a barrier to healthy eating due to vending machine contents. Seven pictures were related to the on-campus restaurant called NewsFeed which has a salad bar. Participants perceived it to be nutritionally good; however, it was unaffordable for students as perceived from 5 participants as shown by the pictures and captions they have generated.

Participants found the stairs to be facilitators of physical activity with 6 pictures taken relating to stairs. Three pictures were taken of elevators and escalators around campus to which participants deemed it as barriers. Three pictures were also taken in regard to bike racks being facilitators of physical activity and 4 pictures in regard to the roads surrounding the campus being inappropriate and unsafe for walkers and cyclists. These 4 pictures were taken by Participant 6 who was completing her post-graduate studies which focused on traffic design and planning.

| <b>Participants</b> | <b>Barriers</b> | <b>Facilitators</b> | <b>Barrier/Facilitator</b> | <b>Total no. of pics</b> | <b>Physical Activity</b> | <b>Healthy eating</b> | <b>Sedentary Behaviour</b> |
|---------------------|-----------------|---------------------|----------------------------|--------------------------|--------------------------|-----------------------|----------------------------|
| Participant 1 (104) | 6               | 9                   | 0                          | 15                       | 5                        | 8                     | 2                          |
| Participant 2 (105) | 1               | 11                  | 2                          | 14                       | 6                        | 7                     | 0                          |
| Participant 3 (102) | 3               | 9                   | 0                          | 12                       | 4                        | 6                     | 2                          |
| Participant 4 (110) | 1               | 5                   | 0                          | 6                        | 1                        | 4                     | 1                          |
| Participant 5       | 6               | 7                   | 2                          | 14                       | 2                        | 12                    | 0                          |
| Participant 6 (224) | 8               | 1                   | 1                          | 10                       | 8                        | 2                     | 0                          |
| Participant 7 (221) | 1               | 3                   | 4                          | 8                        | 3                        | 5                     | 0                          |
| Participant 8 (101) | 2               | 7                   | 0                          | 9                        | 2                        | 5                     | 2                          |
| <b>Total</b>        | <b>28</b>       | <b>52</b>           | <b>9</b>                   | <b>88</b>                | <b>31</b>                | <b>49</b>             | <b>7</b>                   |

*Table 7: Number of pictures taken by each participant and grouped according to topic from Stage One (campus walk)*

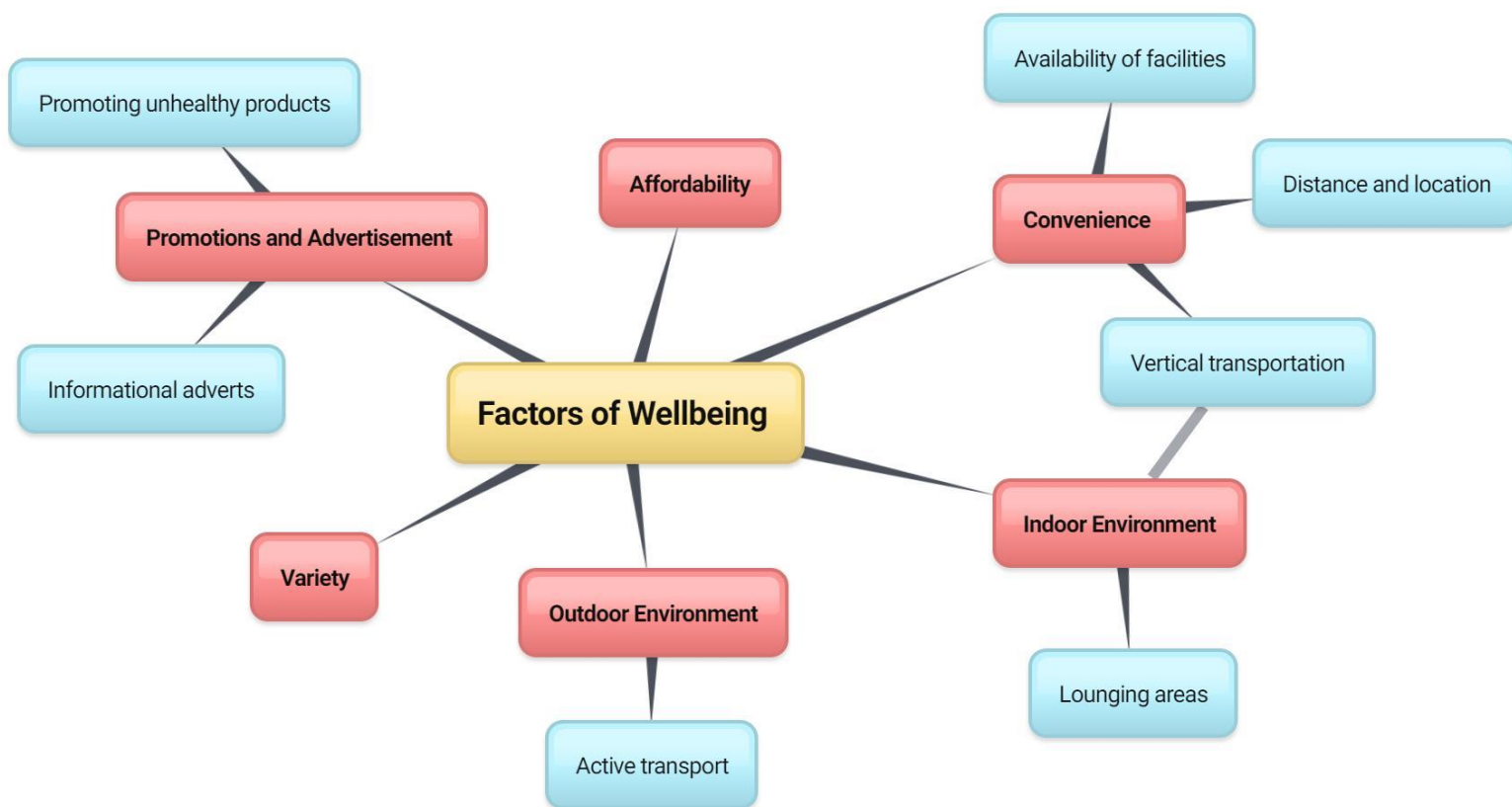


Figure 7 (see below) presents the key-words from the captions on the photos taken by participants during the campus walk. The key-words are the most commonly written words from all the participants. The key-words are grouped by which aspect of wellbeing they relate to: sedentary behaviour, healthy eating and physical activity. It is further grouped into the perceived barriers and facilitators of each factor.



Figure 7: Thematic Network of key words of barriers and facilitators of the campus environment

Themes were identified by using Braun and Clarke's approach to thematic analysis (see Figure 8 below). The key words from Figure 8 were grouped together according to common factors and significant broader patterns of ideas and themes. The grouping of each keyword lead to collective names of themes being assigned to those groups based on the scope and focus of each theme.



*Figure 8: Thematic Network of Stage One findings (campus walk). The red-outlined bubbles represent the major themes derived from Stage One and the Blue-outlined bubbles further breakdown the major themes*

## **Campus Walk Findings**

### **Variety**

There were a few cafes on the campus and these cafes sold fruits for a dollar each or fruit salads. Participants have identified this as a facilitator of healthy eating as it gave students healthy eating options. However, the need for organic fruits was present. Participant 6 said: *“Good to have fruit but they are not organic. AUT could provide organic fruit without making profit.”* Participants also perceived NewsFeed and Refuel, which were restaurants on campus, to have a variety of healthy meals. Refuel had different options of meals every day, for \$6.50 per meal. NewsFeed is a salad bar on campus that had a fixed menu along with some different meal options every day which encourages students to be open to healthier options compared to other places in and around the city campus.

### **Price (affordability)**

Water fountains were available throughout the campus for students. This was identified as a facilitator as students could consume water instead of other beverages which may be high in sugar, also it was free, and there’s no limit of consumption. *“Gives free water to students instead of buying sodas or energy drinks that are unhealthy.”*

NewsFeed, an on-campus salad bar, was perceived to be unaffordable by two participants (Participants 7 and 1). *“Salad bar encourages students to eat healthier options rather than buying junk food. The meals sold are a bit pricy though.”* *“Really nice food and it’s on the main level of the WG building (3) but it’s sometimes high priced and there’s not a lot of options. It’d be nice to have more alternative easy access healthy food places.”* Participants perceived Refuel to be reasonable for its price, hence identifying it as a facilitator of healthy eating; *“Lots of*

vegetables. \$60 for 10 meals. An investment that some people think is worthwhile. Or \$6.50 per meal without a voucher. The restaurant is called Refuel,” (Participant 2).

Piko2Go was a café that was run by AUT students who are in culinary classes. They oversee making different types of foods and products for the café, which is done right next to the café. Participants have identified this as a facilitator of healthy eating due to foods and drinks being made by students, using ingredients that they are aware of. *“The student café sells food made from the other students to provide healthy options for students and allows the food makers to understand what is perfected and what isn’t.”* The prices of these foods were also perceived to be reasonably priced.

Every Tuesday, there was a stall that sold vegan food for \$5. Participants had perceived this as a facilitator of healthy eating due to the meal being vegan, promoting to students that there were other appealing diets, and it was at a reasonable price. *“Pop up stalls like this one offer some change to the students’ typical diet and it’s cheap too!”* The stall was in the plaza and only takes place once per week.

The food choices in the university food court were seen as healthy options by Participant 3; *“In terms of healthy eating the low prices encourages students to eat food at a lower price in order to eat healthy and not spend as much money for food while on campus”*. This caption was on a picture, taken by the participant, that shows a fries and drink combo for \$5 at Kebab King, an on-campus eatery.

Unhealthy food and beverage options seemed to be cheaper than healthy items available in the food court, cafes, and vending machines. *“Bad but good value. Encourages unhealthy eating.”* Students are unable to afford the healthy options and opt for the alternative unhealthy option due to its price factor. This was perceived as a barrier as students are drawn towards the cheaper

option despite the products' nutritional value or lack of. *"They have healthy options but they're way more expensive than the sweets,"* (Participant 5). NewsFeed was also perceived as being unaffordable by Participant 4; *"Good nutrition when it comes to food, bad at cost."* Participant 5 said: *"The build you won salad option is very expensive,"* when showed a picture of the salad options' price. A small size is \$6.50, and a large size is \$8.00. Participant 6 observed that affordable options are usually unhealthy; *"Cheap options for eating are nutritionally poor (except when Veda makes lunches)."* Veda is the club responsible for vegan lunches on campus. There have been mixed reviews on Refuel as Participant 7 said: *"Good/bad- Although the food is good, there's not that many healthy options or alternatives that the students can have-at least in the WG building."* Vending machines that were placed around campus did not all have the same prices for the same products. Some are priced higher or lower in different machines. The reason for the variation in price is unknown since the proximity of the vending machines are quite close and are in accessible areas.

Vesbar was a student bar located on campus, right next to the food court. It was open from noon till 7pm. Many participants have found this to be a barrier due to promoting drinking and eating bar foods. Bar foods usually tend to sell unhealthy meals and snacks such as fries, burgers, onion rings, etc. *"...promotes alcoholism and binge eating of junk food."* The drinks served were also found to be affordable which further encourages drinking. The bar, on Wednesday nights, had a discounted special where AUT students are able to buy drinks for a cheaper price.

### **Advertisements and Promotions**

Although the campus gym was an overall facilitator of physical activity, there were many factors of it that participants had identified as barriers. Many participants claimed that they did not know where the campus gym was located due to the lack of signs and posters. The gym was

located in an area that was not easily seen by others. *“It’s good that we have a fitness centre but there’s not much publicity and it’s in a pretty secluded area...doesn’t reach out to the public?”*

(Participant 7).

There were placements of notices on those the vending machines that border a couple of rows of beverages, stating that they were low in sugar and a healthier choice. *“Good and bad, it encourages students to drink water, however only 4 rows are of water,”* (Participant 5). She found that the drinks that are being promoted as “healthy” are deceiving; *“Arguably bad, because it’s selling the fake notion of ‘healthy fizzy’.* This was used as a caption on a picture that Participant 5 took showing the contents of the vending machine with carbonated drinks placed in the section that claims it has low sugar and is a healthy option.

Some participants have found posters and advertisements of unhealthy food products around campus such as advertisements for KitKats. *“...encourages unhealthy eating patterns.”* There were also temporary stalls that gave out unhealthy products to students for free for promotional reasons such as Red bull and chocolate milkshakes. *“Free drink! But it’s chocolate...enough said.”* This was found to be a barrier as participants, in the action group, have claimed that advertisements do have an influence on their eating choices and habits.

### **Outdoor Environment**

The physical environment of AUT City campus had some structures and areas that encouraged their students to meet the guidelines of physical activity. This is: being involved in moderate to vigorous intensity physical activity for at least 150 minutes per week.

One of those areas being the multiple bike stands that were located around the campus, which allows students to park their bikes. There were four bike stands that are in different parts of the campus and are safe to keep bikes as the areas are under surveillance. This encouraged students



to travel via bikes rather than indulging in sedentary behaviour in cars and/or buses. *“Bike stands around campus encourage biking rather than driving etc.”* It contributed to them meeting their physical activity guideline as well as incorporating a method of exercise in their routines.

Participants had also identified a benefit on the environment when using bikes instead of alternative transport methods which can contribute to the greenhouse effect. *“Promotes biking to uni which not only good physically but environmentally as well.”*

Many participants had observed that the basketball court had encouraged many students to play basketball during their free time. Participant 2 states: *“In terms of physical activity the basketball court is a simple way for students to get active and social with other people while enjoying a relaxed game of basketball.”* The AUT student council office also lends out sport equipment for free, such as volleyball nets, and balls, to students. This encouraged students to be involved in different types of sports and games which causes them to be more physically active.

The bike racks were facilitators of physical activity, however, there were a lack of bike lanes around the campus area which may have discouraged bikers. The city area was busy with large buses and cars. The lack of bike lanes posed a safety issue. Participant 6, who was postgraduate student said: *“bad environment for walking and cycling, a lot of use buses and walk between the university and AUT, the environment doesn't support it. The universities should work with the council and AT to retrofit.”* Participant 6 had said this in regard to the lack of bike lanes on Symonds Street and had provided a suggestion for a solution to overcome the barrier which was to work with the council to design and plan better roads for students and/or cyclists.

The only facilitator for sedentary behaviour, identified by participants, were standing tables. Standing tables located outdoors had been identified as a facilitator as it encouraged students

standing more often rather than sitting down for long periods of time. *“More opportunity to be active rather than sedentary.”*

### **Indoor Environment**

AUT had buildings with multiple stories and had many flights of stairs that students could use. Participant 2 states: *“Most buildings on campus have stairs going up to the higher levels and in some cases the escalators don’t go upwards to the top floor so both students and staff would have to climb the stairs to reach the top floor as elevators are mostly unreliable.”* Participants had identified and perceived that stairs in and around the campus had benefits for their health and assisted them to meet their recommended physical activity requirement. *“Students and staff gets a chance to have a bit of exercise when going around the university.”* The stairs also had good accessibility purposes for able-bodied students. *“No elevator so encourages walking for able bodied people.”* This was a caption on a picture of a flight of stairs. There were elevators available for people on wheelchairs and crutches.

Escalators had been found to be a major barrier to participants as it prevented students from walking and incorporating more physical activity into their routine. Instead it promoted an inactive lifestyle when students got used to standing still when using a convenient method of transportation. *“Students can get lazy and ride the escalators instead of taking the stairs which can benefit them physically.”* Elevators also encouraged this. *“Students can get lazy and not take the stairs instead. This won’t give them any physical benefits.”* There were many elevators situated around the campus that should have been used for students and staff that were unable to walk freely. Participants had found this to be a barrier as it limited the opportunity of walking many flights of stairs that could contribute to students’ recommended physical activity. Students

were aware of stairs that they can use, however, they preferred using elevators instead as it is convenient and effortless.

Treehouses had been identified as a beneficial area of the campus by participant 8 who stated, *“Good space sedentary, can relax and destress,”* captioned on a picture of the Treehouses.

Treehouses are covered, comfortable, bed-like seats that students can use to take a nap in, have privacy to study or to just lay on. Participant 8 had identified seats to be a facilitator; *“Good-seats rather than couches that don’t encourage lounging,”* was captioned on a photo of the large number of seats in the library. Participant 3 perceived a lounging area with lots of seats and couches to also be a facilitator; *“The lobby area of level 1 is a casual area that students can come to hang out with their friends, socialise and study without having to be quite like the library”*.

Participants had identified that the large amount of seating areas located indoors and outdoors as a barrier as it promotes sedentary activity. Participant 1 stated that indoor seating areas are *“bad-promotes sedentary behaviour.”* Another participant (Participant 8) agreed and stated: *“Encourages lounging rather than active study”* on a picture of an indoor couch.

### **Convenience**

Participants had also found the gym to be a facilitator of physical activity as it was accessible, and convenient to them since it was located closely. It also allowed students to have a work-out during their breaks, before or after lectures, at their convenience. *“Good as access to the gym facilities encourages students to be more physically fit after classes. Students don’t have to find a gym outside.”* Right next to the gym was group exercise programme which had indoor and outdoor classes, held by trained instructors. The range of classes include Zumba, circuit, box skills, yoga and Pilates. Participants had also identified this as a facilitator of physical activity as

it gave a range of different classes that students can choose from. Since it was a group session, it encouraged students to invite their other friends to join as well, making it more enjoyable and more likely for students to keep joining classes. *“The gym offers the students a cheap method of fitness with various fitness machines which can help out with students looking to get active and also provide a place to socialise with more students,”* (Participant 3).

The student kitchen areas in the campus contained microwaves, sinks with hot water and seating areas. Participant 1 claimed that this area encouraged students from bringing home-cooked meals as they can microwave it on campus. *“Clean up space encourages people to bring cooked meals from home (might be healthier).”* Home-cooked meals may be healthier than buying processed foods, or meals that they aren’t aware of what it contains. However, Participant 1 also perceived that the low numbers of microwaves available may be an issue. *“Limited microwaves for a large campus, might discourage people from bringing home meals.”*

Vending machines that were located all over the campus had found to be perceived as a barrier as participants deem most of the items to be unhealthy. This was due to its high sugar and salt content. *“Vending machines are a cheap option for people to buy snacks from however often. The food products inside are junk food consisting of high sugar and fat levels which is unhealthy for the people who purchase from it.”* The ratio of healthy and unhealthy items were in the favour of unhealthy food items and beverages. The easy accessibility and convenience to those unhealthy products had also been found to be a barrier to healthy eating. *“Although there are healthy foods like nuts and water, majority of the food in the vending machines are unhealthy snack foods and energy drinks. Again, not much of a healthy variety/options compared to unhealthy.”* The placements of vending machines had also been found to be an issue as participants found vending machines sold products high in sugar and saturated fat right in front of the gym.

Unhealthy items were sometimes placed at eye level in some vending machines. However, there were other vending machines that had placed healthy drinks that were low in sugar at eye level. Interestingly, Participant 2 perceived vending machines to be necessary despite the unhealthy snack options; *“Bad but necessary. Unhealthy food rich vending machines very tempting to stressed students.”*

## **Stage Two: Action group Findings**

### **Themes produced by action group discussion**

Five participants were able to take part in the action group discussion. The aim of the discussion was to focus on the barriers identified by participants in the campus walk and to generate potential, realistic solutions to overcome those barriers. The discussion was moderated by the researcher who already had a set of questions prepared to guide the conversation.

The discussed barriers were high use of elevators, inaccessibility to healthy eating and the gym, unhealthy influence of advertisements and the contents of vending machines. Participants collectively generated solutions to those identified barriers that were deemed suitable to them and other AUT students (see Figure 9 below).

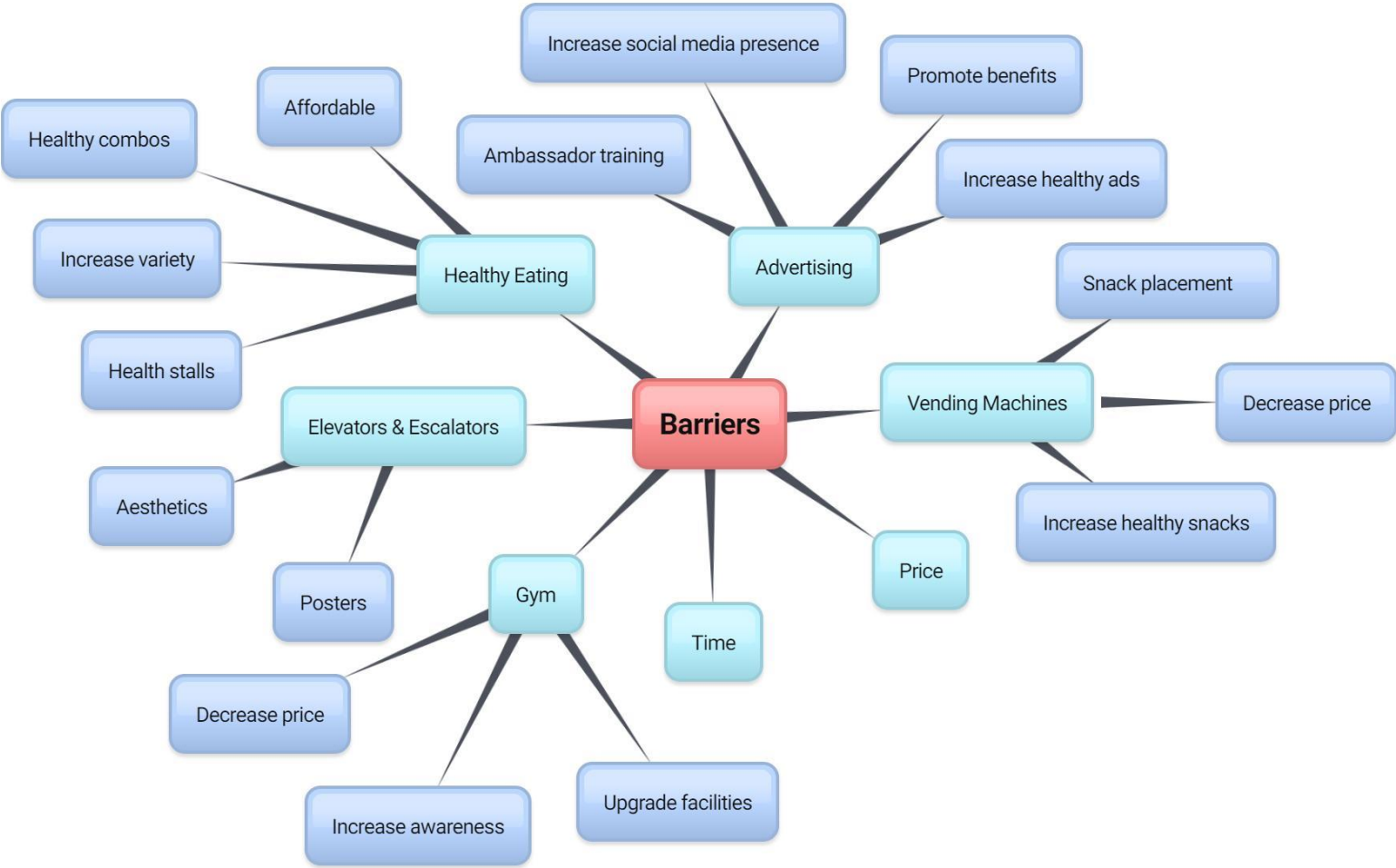


Figure 9: Solutions to identified barriers generated from the action group

### **Elevators and Escalators**

As discussed in the action group and campus walk, elevators and escalators were found to be barriers to physical activity as it prevents and/or decreases the amount of walking done by a person. Participant 3 uses stairs instead of elevators as it can take a while and stairs tend to be faster. *“I have all my classes which are up level 8, level 9 and I’m standing there pressing that button for so long. So, then I just take the stairs.”*

Participants in the action group recommended to encourage using the stairs instead of elevators and escalators by having a few of the stairs around campus turn into musical stairs that are away from classes as to not cause disturbances. Participants said that they would definitely use stairs if that is the case. *“That would be pretty cool. I remember they had a thing at Aotea Square where you walk up the stairs and they had like piano noises.”*

Adding aesthetic items to staircases was also a suggestion such as mosaics to interest students in their environment and to encourage walking. Motivational posters or informative posters about the benefits of choosing to use stairs instead was also a suggestion. Participant 3 suggested: *“We could maybe put up posters and stuff like that. Like posters that has motivational words to walk more and use stairs instead of, say, elevators and escalators.”* Participant 5 agreed and added to the suggestion. *“Yeah, posters that could say the benefits of using stairs instead like using the escalator burns this many calories or something like that so it brings awareness.”* The informative posters could be placed around the area of escalators and near the elevator buttons so frequent users would see the benefits of making a simple choice of increased walking and the impact on their health.



## Vending Machines

The products in the vending machines along with the price of certain items have been found to be barriers from the campus walk. To overcome this, participants recommended to change the placement of healthy products, so the healthy items are more visible to the students who use the machines. *“Yeah, it makes sense, right? Stock the healthy products at the top”* (Participant 3). For the pricing of the vending machine products, participants have noticed an unfairness of cost. Participant 3 said: *“That’s the thing though, they overprice the expensive stuff and the healthy stuff.”* Participant 4 seemed to agree about the unfairness of the products’ price; *“If you’re placing vending machines, they should be more convenient. So, they should have convenient prices.”* High prices of healthy products are found to be a hindrance to their purchase as participants are not willing to spend a high amount on them; *“I don’t really want to pay 5 bucks for small bottle of water or whatever else.”*

Participants have found that convenient stores by the university have more affordable prices for the same products compared to on-campus vending machines. Participants suggested to decrease or subsidise the price of healthy products in order for students to choose the healthier options rather than the junk foods. Participant 5 perceives this as a factor that will skew the students’ choices to healthy ones instead as price is a huge deciding factor. *“Like a little bit cheaper so that people can buy it and then when they see something that’s more healthy, they’ll be like ‘oh might as well just buy water.’”*

Participants have identified the need for a larger variety or options of healthy snacks in the vending machines during the campus walk and action group. *“They have nuts, crackers...they should also add more healthy things cos there’s not much options”* (Participant 3). The only healthy snacks found in the vending machines were nuts and

cheese and crackers, with most of them being junk food consisting of high sodium, sugar and/or other carbohydrates.

### **Campus Gym**

The campus gym was perceived to be both a barrier and a facilitator. It was accessible however it was hidden and was perceived as being unaffordable for students. Participant 4 said: *“It’s good but they’ve hiked the prices up and with that kind of price I’d rather go to another gym than this one,”* and *“It’s 520 bucks per year. Used to be cheaper. The year before it was 390 or something. That was still doable but 520 is just too much.”* The price of a student membership was \$490 per year if paid up front and in full amount for all campuses. It was \$325 for a 6-month membership. Participant 4 also pointed out that he was actually a member of the University of Auckland’s (UA) gym as it was cheaper compared to AUT. The price of a UA student membership was \$319 per year and \$205 for a 6-month membership with an up-front payment. Even with a \$60 one-off payment, for if the payment is done through a debit card, the price of UA student gym membership was drastically cheaper. *“I have the membership there so yes. Also, they have the thing where if you sign up for the first half of the year, so from March to June- I mean April to June they have this deal that if you sign up it’s 200 bucks for the rest of the year”* (Participant 4). He was referring to the prices that were being offered to students at UA which were much more affordable to students compared to the prices AUT has to offer. Participant 5 also agreed that the price was too high and should be decreased further for the students as a solution.

The AUT gym also needs an upgrade or revamp as their facilities were not up to standards as suggested by Participant 3; *“I just know from ours, I’ve only been to the gym a few times, but their facilities kind of need improving. They need an upgrade.”* Participant 1 agreed with this saying: *“True. We need to get more machines and stuff. I don’t think there’s*

*much there because it's quite small.*" Having more variety in facilities at the gym may attract more students to have a membership as the added benefits may appeal to them for the price. This would in turn help students meet their recommended level of physical activity and decrease the likelihood of having a non-communicable disease.

### **Healthy Eating**

From the action group, it was apparent that participants found the cost of the on-campus meals to be unaffordable when asked by the researcher. They claimed they would rather go to places off-campus for a cheap meal. *"For me, I like to go to there's a food court underneath The Warehouse. It's a bit of a walk but I like to kind of go and stretch my legs to get some lunch before or in between my classes. Just because yeah the prices here are kind of too much"* (Participant 3). Participant 3 also prefers to eat off-campus to a place where it is more affordable; *"Yeah like I go to Star Kebabs on Queens street and that's like 5 bucks from Mondays to Friday."*

*"We were also talking about how he brings food from home (participant 3). He doesn't buy food from here. But for me sometimes when I don't bring food, it's close for me, when I'm busy or in a rush, it's accessible so that's the main thing. But we also discussed the price and how it's quite expensive so sometimes we prefer to go outside. For example, to the city or me, I go to St. Pierre's or Subway because it's cheaper;"* (Participant 5).

One of the suggestions to have emerged from the discussion group was that the prices for healthier options should decrease for students to be able to afford it and become more accessible to them as Participant 4 perceived; *"Again, they need to make the healthy stuff cheaper for us."* Another suggestion, by Participant 5, was that each café or restaurant on campus should offer a healthy combo for an inexpensive price to promote healthy eating and to overcome the barrier of price. *"Yeah like maybe each place on campus should like*

*maybe offer a healthy combo for quite cheap. So, like a bottle of water plus a salad for 5 or 6 bucks.”*

Participant 1 agreed and added a suggestion of her own; *“Yeah same like all café’s should have a special deal so more students can afford healthy meals. And I reckon they need to add more healthy meals cos there’s not that many options like on campus...”* Price and a variety of options was needed on campus to promote healthy eating and give students real options when it comes to consuming nutritionally dense food especially if it’s affordable and a wider choice of appealing options is present.

The university sometimes had temporary food stalls that advertised new types of food products and had vegan food stalls once per week. Participant 3 suggested involving stalls that promote and sell products that are healthy to students, so they are aware of other healthy options. *“How about those vegan stalls? Like that I reckon there should be more stalls to like advertise healthy meals so we’re aware of other diets I guess?”* The participant also perceived this to help raise awareness of other diets such as the Vegan stall does, at a cheap price.

### **Advertising**

Often on campus, there were free giveaways such as Red Bull energy drinks to promote products which had been found to be a barrier as it introduced unhealthy items to students. When discussing photos from the campus walk, Participant 3 said this about a picture with free chocolate milk giveaway: *“This one’s the free chocolate drinks. I know that in the square they do a lot of free giveaways. In this case, we were just discussing that it’s cool that they’re giving away free stuff but it’s chocolate milk so that’s not really healthy. I mean I remember recently they were giving away free V’s as well like maybe they should be giving away healthy stuff as well to balance it out.”* The suggestion of promoting healthy products

by giving a sample to students for free can be a solution to overcome the barrier.

Participants perceive advertisement to be an influence on their choices of what to consume; *“Yeah like with the example of KitKat at the gym thing is like you know, I could be coming out after a work out and see a KitKat and I’ll feel like KitKat just because of that advertisement,”* (Participant 3).

A barrier that was not found from the campus walk but rather from the group discussion was that participants were unaware of the many benefits of being a student at AUT, which can be enablers of physical health, and that better advertisement and promotion was needed. Participant 2 had acknowledged this when discussing how students weren’t aware of Refuel and other aspects of the campus: *“... Yeah because you know how you were saying that there’s so many things like free stuff, you can get equipment from AUTSA, not many people know about this.”* She was referring to students being unaware of free hiring of sport equipment from the student council office. Participant 3 agreed with this statement: *“See I know that I, last semester, signed up for the volunteer force for AUTSA and then through them I learnt about different services and stuff. But I was here for a whole year last year and I didn’t know anything about the services.”* Even students who had been enrolled in AUT for a considerably long amount of time aren’t aware of the facilities and services that they are entitled to if required. With regards to Refuel, Participant 4 perceived the location of it to be a barrier as many students weren’t aware of it; *“Like the two main places that are good for students are NewsFeed café at the entrance of WG and then Refuel... Plus it’s hidden unless you really look out for it, if not you’re not going to find it.”* The solution was to overcome the barrier by advertising healthy food places more around campus, so students will be aware. Another solution was to advertise the gym area, free sport equipment hires and other services during orientation through student ambassadors

who give campus tours to new students. However, as pointed out by Participant 4, student ambassadors were unreliable, and the student council was trying to tackle this issue; *“We do but the thing is that the student ambassadors when they give campus tours, they don’t really give a ... Yeah, the ambassadors are like I can’t be bothered. Because in order to get a certificate to show that you can be an ambassador, you need to go on a campus tour and you check a couple of things off the boxes; campus tour is one of them. So, you need to go on one campus tour or one orientation workshop each.”* Participant 4 suggested that students who undertake workshops to become ambassadors should have a test they need to pass in order to qualify and to ensure they are well informed enough to show new students around; *“If they’re relying on someone showing them around...it should be with ambassadors who are fully trained. Maybe they should do a test after workshops to see if they can become ambassadors.”*

Participant 2 suggested the use of social media to raise awareness since there are AUT pages on Facebook which can be used to promote sport events; *“...Yeah cos there’s so many things that can help out, but we just don’t know about it. We can have more of a social media presence to let others know what’s happening like tournaments they can be part of.”*

The university displayed advertisements around campus which were paid for by companies to promote their products. There had been some advertisements of unhealthy products that participants had identified as barriers to healthy eating in Stage One as they can be an influence on eating choices; *“So yeah I’ve seen ads of like KitKats and chocolate milk and stuff around campus so that would like influence students. Like oh yeah, I want some, and there’s vending machines right there so they can get some,”* (Participant 1).

Participant recommended to lower or subsidise the price of advertising for companies that have healthy food or drink products that they would like to promote; *“So basically, I guess*

*it'll be charging a higher rate for people for paid advertisements for unhealthy stuff and subsidizing companies who want to promote healthier stuff. Like for a fact that we are sponsored by a company that provides menstrual cups, like they stock stuff in Foodie God Mother. So, anyone can just go and grab them."* Foodie God Mother is a space in the student council office that was stocked with non-perishable items and supplies such as tampons, toilet paper, toothbrushes etc. Students were able to take anything they need for free as long as they have their AUT student IDs with them. With a low rate for advertising offered to companies that are deemed healthy, it is likely that it will encourage other health companies to promote their products or messages on campus through the university magazine, posters and/or stall.

### **Other Barriers**

The lack of time had been perceived to be a hindrance to participants in terms of physical activity. This was because with the available time that they do have, they prioritised studying rather than engaging in physical activity. *"For me it does but it's because I'm busy. Even though I want to walk more, exercise more, it's because I have things that I value more such as studying. So, I guess it's just time,"* (Participant 5). The rest of the participants in the action group agreed that time is an issue for them as well.

Price of food in general is a barrier as the food on campus is unaffordable for some students as acknowledged by the participants; *"Like I know for a fact that people who literally survive on coffee and energy drinks for the whole day and then they go back home and that when they eat their first proper meal. Which is dinner... There are people who do that because when they're studying they don't really feel like eating and the options available aren't suitable enough for their wallets and their appetites,"* (Participant 4).

Skipping meals is essentially healthier compared to eating junk foods as it can cause a

negative effect physiologically. Appeal for the type of food is also a factor in influencing their choice of consumption, regardless of nutritional value; *“Like if I see a fruit for a dollar and a muffin for a dollar, I’m going to pick the muffin,”* (Participant 4).



| <b>Barriers</b>          | <b>Suggested Solutions and Interventions</b>  |
|--------------------------|---|
| Elevators and escalators | Motivational and informational posters about choosing to walk<br>Aesthetically pleasing stairs eg musical stairs  |
| Vending machines         | Increased healthy foods and snacks<br>Cheaper healthy snacks<br>Healthy foods placed at eye level   |
| Gym                      | Decrease of membership price<br>Increase awareness about gym, sport equipment, sports teams<br>Upgrade gym facilities   |
| Healthy eating           | Healthy food should be affordable<br>Offer more variety<br>Have healthy stalls<br>Offer cheap, healthy combos   |
| Advertising              | Healthy food product advertisements<br>Promote university benefits such as gym, sport equipment, Foodie Godmother<br>Train university ambassadors better<br>Increase social media influence |

*Table 8: Summary of barriers and its solutions generated in the action group discussion*

## Chapter 5: Discussion

### Stage One Interpretation

Findings from the campus walk had similar results to previous literatures in that participants identified cost, lack of promotion and information about physical activity, such as clubs and sports teams, to be barriers to physical activity and facilitators to sedentary behaviour (Greenwood-Hickman, Renz, & Rosenberg, 2015; Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013).

Perceptions and opinions of the gym were mixed in regard to affordability and attraction to join as a member. Participants all had identified the gym as a strong facilitator of physical activity due to the gym having equipment for working out and having a gym on campus. However, price and lack of information about location of the gym prevented participants from becoming members. Cost, availability and accessibility of sport facilities and clubs have been found to be major determinants of physical activity in previous literature as well as tertiary students tend to have limited funds, where an unaffordable gym membership isn't prioritised (Shuval, Hébert, Siddiqi, Leonard, Lee, & Tiro, 2013; (Deliens, Deforche, De Bourdeaudhuij & Clarys, 2015; Grubbs & Carter, 2002). Previous studies also mentioned time and physical exertion to be barriers. Engaging in social settings such as team sports or fitness classes also encouraged students to participate as having friends encouraged them to partake often (Deliens, Deforche, De Bourdeaudhuij & Clarys, 2015; Buckworth & Nigg, 2004). AUT gym does provide fitness classes which is included in the membership price at no extra cost.

Overall, there were more facilitators than barriers found and most of the pictures and captions taken were related to healthy eating, followed by physical activity and then sedentary behaviour. Most of the barriers found were related to vending machines, elevators/escalators and the unaffordable price of healthy eating. Most perceived facilitators were related to stairs, student kitchen areas, basketball court and bike racks. There were some barriers found that were already being resolved by the university. For example, some participants identified couches and seats as an enabler of sedentary behaviour, however in the City Campus, there are outdoor and indoor standing tables as a solution to overcome the issue and to promote standing. Some of the participants had identified this. If the research had a larger sample size, perhaps more participants may have noticed this. Another example was the perceived barrier of advertising unhealthy drinks and food by handing out free samples. There have been other companies that give out free samples to students of which the products have been substantially healthier such as vegan foods. Participants also failed to identify this, but this may be due to the products being given out only on certain, rare days.

### **Survey Interpretation**

All participants reported having either a moderate or high energy expenditure from the International Physical Activity Questionnaire, achieving a minimum of 600 MET minutes per week. These participants include at least 150 minutes per week of moderate intensity activity and/or 3 days of vigorous intensity activity. New Zealand's Ministry of Health recommends at least 2 ½ hours of moderate or 1 ¼ hours of vigorous physical activity throughout the week for adults. None of the participants failed to meet the recommended guidelines, hence they were all deemed to be physically active. The activity levels of this sample are higher than the previous study conducted by Sinclair, Hamlin and Steel. This

was a pilot study, which was conducted in a New Zealand university, where only 40% of participants met the recommended guidelines (Sinclair, Hamlin, & Steel, 2005). However, this research had a sample size of 8; a larger sample size may have yielded similar results as the pilot study. This study did not collect information from participants with reported low-physical activity. If the sample had a variety of physical activity levels, the collected information from the campus walk and action group may have been different.

The Health Fair questionnaire completed by participants showed that only 2 participants met the recommended guidelines of consuming a minimum of 5 portions of fruit and vegetables. Five of the other participants' responses to the survey showed the need to increase their portion consumption to meet the recommended guideline. Participant 8, however, had mixed results as her response was of equal numbers of A, B, C and Ds; therefore, her results were inconclusive. The previous study conducted in New Zealand with university students showed that 76% met the guideline, which is substantially higher than this research's group of participants (Hartman, Wadsworth, Penny, van Assema, & Page, 2013).

The Health Promotion survey, however, yielded different results from the Health Fair questionnaire. According to the HPL survey, all but one participant, has perceived to be well educated in their choice of food consumption and had limited unhealthy options in their diet for their wellbeing. This includes limiting added sugars, saturated fat and consuming the recommended portions of fruit and vegetables. The survey was scored from 1 to 4 with the average score for all participants being 2.45. Overall, participants have perceived to have decent diets with considerably healthy eating behaviours. One of the questions from the HPL survey asked for the regularity of reading the nutritional labels on foods and beverages. Only one participant, Participant 6, consulted the nutritional label

when deciding to consume the products' contents. There are many possibilities as to why these participants do not regularly check the labels of products. One of which may be that they simply don't understand or can interpret the labels. Other reasons may be that participants do not contemplate nutritional value of products and foods to be an important factor or influence on food choices, hence they don't take labels into consideration. Participants from this research claim that cost, taste and convenience are mainly the determining factors when deciding where and what to consume when on campus. This is similar to previous findings from literatures where determinants of food choices were discussed; taste, cost, nutrition, convenience and weight-control had been found to be major influences on participants' food choices (Glanz, Basil, Maibach, Goldberg & Snyder, 1998; Shepherd et al, 2005).

One of the questions from the survey measured participants' sedentary behaviour and the average amount was 6.25 hours on a typical weekday. This is higher than previous studies where the reported amount was 4.27 hours per day or 30 hours per week. (Buckworth, & Nigg, 2004; Rouse & Biddle, 2010). Those participants were also from tertiary institutes; however, the study was based in America.

Males, from this research, on average spent less time on sedentary activities compared to all females except one, Participant 1. However, Participant 1 had inconclusive results as her low MET minutes per day did not align with her low amount of time spent engaged in sedentary activities (see Table 6, page 94). Buckworth and Nigg had reported that males had spent significantly more hours engaged in sedentary activities compared to females despite males reporting to participating in physical activity more frequently (Buckworth, & Nigg, 2004; Rouse & Biddle, 2010). Comparing this research to Buckworth and Nigg's study, the data for males regarding sedentary behaviour does not correlate. However, this

may have been different if this research contained a larger sample size as it would provide more accurate and comprehensive data that would be appropriate for comparative reasons.

### **Stage Two Discussion (action group)**

This stage required the collaboration of participants to generate realistic and practical solutions to overcome the barriers that were identified from the campus walk. Affordability, low awareness and lack of variety were some of the main barriers that needed solutions catered for students.

#### **Affordability**

Prices of healthy foods, snacks and gym membership were decided by participants to be lowered as it hindered them from being able to afford to consume healthier options and affording a membership. From previous relevant studies, participants from a high school had encouraged the ideas of reducing the prices of healthy foods and snacks to facilitate healthy eating for students (Shepherd et al, 2005). They had even proposed the idea of eliminating vending machines altogether (Shepherd et al, 2005). In this action group, participants prioritised lowering the price of healthy snacks rather than removing vending machines as they do find vending machines convenient for their needs. As one of the participants had stated in the action group: “*Vending machines are unhealthy but necessary for university students*”. This statement also emphasises the increasing need for health and wellbeing education as this statement shows disregard for the negative health impacts of unhealthy snack consumption and shows the perceived importance of convenience. Labelling vending machines as being “necessary” despite its contents may reflect on students unhealthy reliance on it. Swapping the products for nutritionally dense/r products can change this into a healthy reliance whilst also maintaining the convenience factor.

Healthy foods in the campus tend to be overpriced, while unhealthy and junk foods were more affordable which attracted students' attention. This can eventually lead to an increase in unhealthy food consumption which can then form an unhealthy eating pattern and habit which can be detrimental to their health in the future (Garcia, Sykes, Matthews, Martin, & Leipert, 2010).

To overcome the barrier of overpriced healthy foods, participants had suggested that every eating place on campus must have at least one healthy meal option or combo deal. For example, a salad with a bottle of water for \$5. Having a cheap and healthy alternative at every café and restaurant for students may encourage them to eat healthier without having price as a barrier. A previous study conducted in America showed that an average of an additional \$29 per week was needed for tertiary students to adhere to the national health guidelines (Clark et al, 2019). It would be convenient having healthy options on campus, which may lead them to consume healthy meals more regularly. This also gives students a wider range and variety of healthy meals to integrate into their diets if all cafés and restaurants are willing to comply. This solution utilises the themes, affordability and convenience, to overcome the barrier of overpriced, healthy options. This also overcomes the lack of variety by introducing healthy options through multiple eateries on campus.

Participants found the price of the gym membership to be unreasonable and compared the facilities and price of University of Auckland's (UOA) gym. The price of the membership was suggested to be decreased substantially as participants found it to be unreasonable due to the lack of variety and facilities when compared to UOA. One of the participants confessed to having a student membership at UOA due to their cheaper price and the gym being 3 floors high with many different facilities. Most importantly, participants found the price to be unreasonable due to the low amount of machineries

available and thought they were over-paying even with a student discount. Decreasing the price of the student gym membership price would encourage students to join as it would eliminate the barrier of unaffordability and would prove to be a better cost-to-goods ratio as perceived by students if the facilities aren't upgraded. An increase in student memberships would increase students' and facilitate meeting the recommended physical activity levels.

### **Promotion and Advertising**

From the action group and campus walk, it was apparent that participants were unaware of campus facilities and benefits such as the location of the gym, sport equipment rental from AUTSA, and team sport opportunities. To overcome this barrier of lack of awareness, participants proposed improving the training of ambassadors. AUT ambassadors have the role of showing new students around campus during orientation week and informing them about campus features and facilities such as the nurses' office, counselling, dentist, equipment hires and student services. Participants have suggested adding a test that ambassadors are required to pass after undertaking training, so trainers are confident that ambassadors are well equipped and educated about their campus. A well-educated ambassador would be likely to fully inform other new students about the campus if they are well equipped and informed themselves. If new students were aware of such facilities, there would be a higher chance of joining the gym and being involved in team sports which would enable students to meet the recommended physical activity guidelines.

Using social media to promote campus features and facilities was also suggested. However, AUTSA have already begun expanding their social media outreach to increase awareness on events and student services using Facebook groups and pages. Using social media for promotion and advertising is useful as it has a wider reach to students. It can also enable students to interact with each other and AUTSA if there are any questions, concerns



with their respective campus, or if they would like to promote events or search to be a part of one. Social media utilises the themes, convenience, promotions and advertisements, to overcome the barrier of lack of awareness. This is convenient as social media is easily available and accessible to all students to gather information about their campus. It can also facilitate students and AUTSA to promote events and to post health-related information for educational purposes.

Multiple posters are placed around campus to promote products. Participants had observed that these posters advertised unhealthy products. When asked if they perceive advertisements to be an influence on their food choices, participants had responded “yes” which makes advertising of unhealthy products a barrier to healthy eating. To overcome this barrier, participants had suggested charging a higher rate to companies who would like to advertise unhealthy products and offering a subsidy or discount to companies who would like to promote healthy products or restaurants. This includes advertisements in the Debate magazine. This would encourage healthy food companies to advertise more and to bring awareness to their products. It would also influence students’ consumption choices via promotion and may cause an improvement in their diets and eating habits when they are exposed to alternative healthy food options. Advertisements of nutritious foods has been found to promote positive attitudes concerning healthy foods; therefore, this intervention may be effective in altering food behaviours and habits in students (Dixon, Scully, Wakefield, White & Crawford, 2007).

Temporary stalls that promote food and/or drink products by giving out free samples have been found to be a barrier to healthful eating due to most of the samples being unhealthy. Free samples of products have been proven to be an effective method of advertising to increase sales; therefore, participants had suggested giving away healthy

products as well (Bawa & Shoemaker, 2004). Again, this may cause an improvement to students' diet if they are exposed to and given an opportunity to try healthier products at no cost. If participants are only given free samples of unhealthy products, they are likely to consume more of it in the future. Giving students an opportunity to sample healthy products for free overcomes the barrier of unaffordability and lack of awareness; facilitating a potential healthier diet for students.

To decrease the use of elevators and escalators to increase physical activity, the use of motivational and informational posters was proposed. Motivational posters would promote and encourage students and staff to use stairs instead of escalators. This is an effective method that has been proven to increase stair use significantly when placing posters at a choice point between stairs and escalators (Mutrie & Blamey, 2000; Eckhardt, Kerr & Taylor, 2015). Examples of motivational quotes are: "Raise your fitness level one step at a time", "Take a break, take a lap" and "Race the elevator". Motivational posters have been extensively used in hospitals and work places to inspire people to increase their physical activity levels. Informational posters placed around the campus would also be helpful as it would enlighten students as to why they should aim to meet the physical activity guidelines and how increasing it would be beneficial to their health. The AUT City campus does not undertake much health science or health related classes, hence there are less students who understand the need for physical activity to prevent non-communicable diseases. Unless, they are personally interested in the topic. To help students understand the physiological and mental benefits of increased physical activities, informational posters would be a good tool as it would motivate them to choose stairs instead of escalators and elevators.

Another suggestion to increase stair use was to make staircases aesthetically pleasing to students. Examples of added aesthetics from participants were art mosaics or a piano

staircase. Volkswagen had executed original Piano Staircase project in Sweden as a social experiment. This experiment aimed to redesign common, everyday items to encourage people to change their lifestyle and behaviour for the better (Peeters, Megens, van den Hoven, Hummels, & Brombacher, 2013). The project also aimed to encourage the members of the public to use the piano stairs instead of escalators. An installation of the piano stairs in a subway, succeeded in attracting 66% of pedestrians to use stairs in preference of escalators. The Piano Staircase project showed the potential of how effective technology can be utilised to persuade people to change a behaviour through social and environmental influence. Aesthetics such as mosaics art would increase staircase foot traffic as it would intrigue students to view and appreciate the art, hence altering their behaviour to choose stairs over elevators and escalators. This would facilitate students to meet their recommended physical activity guideline.

### **Variety and Options**

Lack of variation has also been a hindrance to students' health. Participants have identified the need for a larger variety in healthy food and drink products in order to have more options when it comes to choosing nutritionally valuable meals. Currently, there are substantially more options of junk foods on and around campus that students have easy access to. The vending machines also has a high proportion of no or low nutritionally valued snacks compared to snacks that are considered healthy. Vending machines that typically have energy dense and nutritionally poor snacks and beverages make the unhealthy choice, the easier choice. An increase in healthy snacks would give the students more options and it may lead to a higher chance of students choosing a healthier option. Interventions where vending machine snacks have eliminated all energy dense snacks and beverages with added sugar and increased the prices of high calorie snacks, has been found

to be successful in the work and school environment. It stimulated healthier choices and was found to be accepted highly by participants as the number of products vended did not reduce nor have a negative financial impact (Bos, van der Lans, van Kleef & van Trijp, 2018; Grivois-Shah et al., 2017). Having nutritionally dense or valued contents in vending machines would effectively facilitate students having a healthier diet by altering their eating habits through environmental influence.

The campus gym has been compared to the UA campus gym several times in the action group. Another comparison was the variety in fitness machines and the large space of the UA gym. Suggestions have been made to improve the AUT campus gym by upgrading the facilities and increasing the number of machineries. Improving the facilities would encourage students to obtain a membership and would also justify the unaffordable membership price to the students as currently students perceive the price to be unjust and unreasonable. Giving students more work-out options would help them to focus on different muscles, therefore, offering them a variety in their workout routines. By keeping their interest in the facilities of the gym, student membership may increase, hence increasing their physical activity levels.

## **Chapter 6: Conclusion**

The findings from this study suggested that further improvement to the AUT City campus could be instrumental for facilitating healthful behavioural choices among the student body. The study identified several actions that could be taken by the university, including changes to vending machines, advertising of healthy products, lower gym membership prices and educating the students more on their choices. Barriers such as fatigue and lack of time may be difficult to overcome by the university and are something that students may need to prioritise themselves through self-motivation. Educating them through motivational and informational posters for physical activity and explaining the importance of scheduling or incorporating it into their routine may encourage students to prioritise sitting less and moving more (Russell, Dzewaltowski, & Ryan, 1999).

Tertiary students tend to be too physically and mentally fatigued to focus on improving their lifestyle. Having a campus, that they spend majority of their time in, that makes it easier by catering for their needs would make a significant difference to their health and behaviour. The facilities that the university provides to the students for free or at a discounted price that do promote a healthy lifestyle often go unnoticed and need to be promoted more throughout the university and social media. Educating the students on their lifestyle choices and health effects in a simplified manner may prevent unhealthy behaviour becoming a habit in the long run.

### **Future Research and Practise Recommendations**

For future studies, it would be worthwhile to investigate this study on a larger scale with more participants to understand the eating and physical activity habits in a population level. It would also be useful to understand in more detail what sedentary activities students

engage in and the periods of time that they do so as this study did not involve a survey that focuses solely on sedentary behaviour. This would help in the planning and implementation of interventions that aid in reducing the time spent on those activities; specifically, in the university setting.

It would also be interesting to conduct research on interventions such as implementing one or more of the solutions suggested to test its success, validity and acceptance on the students and by taking the financial effects to the university in consideration. This may help tertiary institutes with similar environments to see the effects of the interventions enough if they chose to implement it.

### **Limitations of Study**

Having one coder to transcribe and analyse the theme from the action group was a limitation as there is a possibility of biases. There is a higher chance of subjectivity involved in analysing the themes when there is only one coder. This would bring in the limitation of the coder failing to recognise possible themes from another perspective (Olson, McAllister, Grinnell, Gehrke & Appunn, 2016). However, visiting the data multiple times during a period of times may give the coder different insights and perhaps lessen the bias, which was done during this study (Olson, McAllister, Grinnell, Gehrke & Appunn, 2016).

Misunderstanding of the term 'sedentary behaviour' and 'sedentary activity' from participants was a limitation. Being unaware of these terms may be the effect of being uneducated about different aspects, impact and importance of health and wellbeing. During the campus walk, a couple of participants perceived the Treehouses and lounging seats as being an advantage in terms of sedentary behaviour. Where, in fact, it is the opposite as these areas and items promote prolonged sitting which can be detrimental to health.

Participants were all given the definitions and examples of the terms ‘physically active’, ‘sedentary behaviour’, and ‘nutritionally valued foods’ prior to the commencement of the campus walk (see *Table 4*, page 83). However, based on the photos taken and captions generated by participants, sedentary behaviour was not comprehended. This term may not be common knowledge as research on it has begun fairly recently. There are also currently no guidelines relating to sedentary behaviour in New Zealand’s Ministry of Health guidelines; other than reducing screen time to two hours to minimise sitting. Promotion and education on sedentary activity is needed in the City campus as misinformation may lead to ignorance and a lifestyle that doesn’t account for a crucial factor that heavily impacts health and wellbeing.

Having a small sample size was a limitation to this research as it does not allow for generalisations of quantitative data to other tertiary students. It also reduces the power of the study and increases the margin of error. The data from the online surveys cannot be reflective on the population of AUT City campus students and hence cannot be used to draw conclusions on their eating and physical activity habits. Having more participants would have generated more data and may have brought more issues into light in the campus walk and would also highlight the successes of what the campus has to offer in terms of improving and maintaining a healthy wellbeing. The current data from the online surveys helped the researcher understand the eating and physical habits of participants and also helped participants think about their lifestyle in depth if they hadn’t heeded to it before. However, having a small sample size for qualitative studies, such as for the campus walk and action group, is ideal as it allows the researcher to ask all participants in depth questions in a limited amount of time.

Having two stages may have also been a limitation as it was time consuming for participants to commit throughout the entire study. The campus walk, online survey and action group had an estimated accumulated time of 1 hour and 10 minutes. Some participants took the campus walk during their breaks and had limited time to fully explore the campus. This may have prevented a higher amount of data and issues being identified. However, if participants were running out of time to complete the surveys with the researcher's supervision, they were sent links to the online survey which they could do at home in their spare time in order to answer all questions with thought and honesty, which had provided a better reflection of their behaviours and habits. There were also scheduling issues when deciding the time for the action group as many participants' available time did not coincide with others or they didn't have sufficient time to partake which decreased the number of participants to 5 in the action group.

The discussion at the action group did tend to talk about other topics that may not have been a direct answer to the questions asked. A stricter moderation of the discussion would have helped the discussion to stay on track and leave more time to discuss ideas on solutions to overcome issues. Nevertheless, the veered off discussion was still relevant to the study and did highlight other barriers such as lack of time to be involved in physical activity and how price of meals is a huge determinant of consumption.

An objective tool to measure the participants' physical activity and sedentary behaviour, such as a pedometer or accelerometer, would have been useful as the surveys relied on participants' perception of their measure which some have been proven to be inaccurate. This would've been useful to understand participants' sedentary behaviour and walking habits more accurately to see where an improvement could be made and also would have



been interesting for the participants to know how active they think they are and how active they actually are.

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## **Appendices**



## Appendix 1: Ethics Approval

9 April 2018

Erica Hinckson  
Faculty of Health and Environmental Sciences

Dear Erica

Re: Ethics Application: **17/346 Student voices: The influence of the University Campus environment on physical activity and healthy eating habits**

Thank you for your advice of the additional personnel for the above study, which has been noted.

I remind you of the Standard Conditions of Approval.

1. A progress report is due annually on the anniversary of the approval date, using form EA2, which is available online through <http://www.aut.ac.nz/researchethics>.
2. A final report is due at the expiration of the approval period, or, upon completion of project, using form EA3, which is available online through <http://www.aut.ac.nz/researchethics>.
3. Any amendments to the project must be approved by AUTEK prior to being implemented. Amendments can be requested using the EA2 form: <http://www.aut.ac.nz/researchethics>.
4. Any serious or unexpected adverse events must be reported to AUTEK Secretariat as a matter of priority.
5. Any unforeseen events that might affect continued ethical acceptability of the project should also be reported to the AUTEK Secretariat as a matter of priority.

Please quote the application number and title on all future correspondence related to this project.

AUTEK grants ethical approval only. If you require management approval for access for your research from another institution or organisation then you are responsible for obtaining it. If the research is undertaken outside New Zealand, you need to meet all locality legal and ethical obligations and requirements.

For any enquiries please contact [ethics@aut.ac.nz](mailto:ethics@aut.ac.nz)

Yours sincerely,



Kate O'Connor  
Executive Manager  
Auckland University of Technology Ethics Committee

## Appendix 2: Ethics Amendment Approval

1 October 2018

Erica Hinckson  
Faculty of Health and Environmental Sciences

Dear Erica

Re: Ethics Application: **17/346 Student voices: The influence of the University Campus environment on physical activity and healthy eating habits**

Thank you for your request for approval of amendments to your ethics application.]

The minor amendments to the study documentation (Information Sheet and Consent Form) and the inclusion of master's student is approved.

I remind you of the **Standard Conditions of Approval**.

1. A progress report is due annually on the anniversary of the approval date, using form EA2, which is available online through <http://www.aut.ac.nz/research/researchethics>.
2. A final report is due at the expiration of the approval period, or, upon completion of project, using form EA3, which is available online through <http://www.aut.ac.nz/research/researchethics>.
3. Any amendments to the project must be approved by AUTEK prior to being implemented. Amendments can be requested using the EA2 form: <http://www.aut.ac.nz/research/researchethics>.
4. Any serious or unexpected adverse events must be reported to AUTEK Secretariat as a matter of priority.
5. Any unforeseen events that might affect continued ethical acceptability of the project should also be reported to the AUTEK Secretariat as a matter of priority.

Please quote the application number and title on all future correspondence related to this project.

AUTEK grants ethical approval only. If you require management approval for access for your research from another institution or organisation then you are responsible for obtaining it. If the research is undertaken outside New Zealand, you need to meet all locality legal and ethical obligations and requirements.

For any enquiries please contact [ethics@aut.ac.nz](mailto:ethics@aut.ac.nz)

Yours sincerely,



Kate O'Connor  
Executive Manager  
Auckland University of Technology Ethics Committee

## Appendix 3: Recruitment Advertisements



### **Student Voices: The influence of the University Campus environment on physical activity and healthy eating habits**

I, Nehal Natasha, am inviting students to have a chance at contributing towards a healthy and active campus environment as part of my Masters thesis.

This study involves:

- A 15-20-minute walk evaluating the AUT campus in terms of barriers and facilitators of physical activity and healthy eating
- 5-minute online survey regarding your eating and physical activity habits
  - Focus group to discuss solutions and interventions

**To be part of this opportunity, contact the researcher:**  
*Nehal Natasha, [nehal.natasha@gmail.com](mailto:nehal.natasha@gmail.com)*

You need to be a student at AUT and be able to walk or wheel freely across campus.

**Approved by the Auckland University of Technology Ethics Committee on 1/10/2018**  
**AUTEC Reference number 17/346** Student Voices: The influence of the university campus environment on the physical activity and healthy eating habits.

## Appendix 4: Survey Questions and Questionnaires

### Student Voice Questionnaire

The following survey questions ask about your physical activity behaviour and levels in the last 7 days. Please respond honestly; your response is anonymous.

#### Participant profile

Age: \_\_\_\_\_

Number of year(s) attending AUT City campus: \_\_\_\_\_

Highest completed education level: \_\_\_\_\_

Current qualification: \_\_\_\_\_

Gender: \_\_\_\_\_

Ethnicity: \_\_\_\_\_

Zip code: \_\_\_\_\_

#### Physical Activity Questionnaire

1. During the last 7 days, on how many days did you do vigorous physical activities?

\_\_\_\_\_ Days per week       Don't know/Not sure       Refused

2. How much time did you usually spend doing vigorous physical activities on one of those days?

\_\_\_\_\_ Hours per day       Don't know/Not sure  
 \_\_\_\_\_ Minutes per day       Refused

3. During the last 7 days, on how many days did you do moderate physical activities?

\_\_\_\_\_ Days per week       Don't know/Not sure       Refused

4. How much time did you usually spend doing moderate physical activities on one of those days?

\_\_\_\_\_ Hours per day  
 \_\_\_\_\_ Minutes per day  
 Don't know/Not sure       Refused

---

5. During the last 7 days, on how many days did you **walk** for at least 10 minutes at a time?

\_\_\_\_\_ Days per week     Don't know/Not sure  
    Refused

---

6. How much time did you usually spend **walking** on one of those days?

\_\_\_\_\_ Hours per day    \_\_\_\_\_ Minutes per day     Don't know/Not sure     Refused

---

7. During the last 7 days, how much time did you usually spend **sitting** on a **weekday**? This includes lying down (awake).

\_\_\_\_\_ Hours per weekday

\_\_\_\_\_ Minutes per weekday

Don't know/Not sure  
 Refused

1. For the following questions, place a tick against the option that best describes how often you eat these foods. Then add up the number of As, Bs, Cs and Ds in the last column.

How often do you eat...

| Fruit?  | Drink fruit juices/<br>smoothies?                          | Salad vegetables (e.g.<br>tomato, cucumber)<br>/other raw vegetables? | Cooked<br>vegetables?   | Total numbers<br>of As, Bs, Cs<br>and D's? |
|---|--|---|---|--|
| A <input type="checkbox"/><br>2 or more<br>portions per day   | A <input type="checkbox"/><br>1 or more glasses<br>per day | A <input type="checkbox"/><br>3 or more portions<br>per day           | A <input type="checkbox"/><br>3 or more<br>portions per day   | As <input type="text"/>                    |
| B <input type="checkbox"/><br>1 or 2 portions<br>on most days | B <input type="checkbox"/><br>1 glass on<br>most days      | B <input type="checkbox"/><br>1 or 2 portions on<br>most days         | B <input type="checkbox"/><br>1 or 2 portions<br>on most days | Bs <input type="text"/>                    |
| C <input type="checkbox"/><br>2 or 3 portions<br>per week     | C <input type="checkbox"/><br>2 or 3 glasses<br>per week   | C <input type="checkbox"/><br>2 or 3 portions<br>per week             | C <input type="checkbox"/><br>2 or 3 portions<br>per week     | Cs <input type="text"/>                    |
| D <input type="checkbox"/><br>Once a week<br>or less          | D <input type="checkbox"/><br>Once a week<br>or less       | D <input type="checkbox"/><br>Once a week or less                     | D <input type="checkbox"/><br>Once a week<br>or less          | Ds <input type="text"/>                    |

1. How often do you have fruit as a snack or as part of your meals? Mark the boxes with either (A) regularly, (B) often, (C) sometimes or (D) never.

- Fruit as a snack                       Fruit as part of lunch or dinner (eg with a sandwich)  
 Fruit with breakfast                 Fruit in a dessert

2. How often do you have vegetables as part of your meals? Mark the boxes with either (A) regularly, (B) often, (C) sometimes or (D) never.

- Vegetables as a snack                 Portions of vegetables with main meals (not including potatoes)  
 A side salad with main meals        A vegetables-based meal

### Health-promoting lifestyle profile

This questionnaire contains statements about your present way of life or personal habits. Please respond to each item as accurately as possible, and try not to skip any item. Indicate the frequency with which you engage in each behavior by ticking the appropriate box. **N** for never, **S** for sometimes, **O** for often, or **R** for routinely

Choose a diet low in fat, saturated fat, and cholesterol.

N  S  O  R

---

Limit use of sugars and food containing sugar (sweets)

N  S  O  R

Limit consumption of bread, cereal, rice and pasta

N  S  O  R

Eat 2-4 servings of fruit each day

N  S  O  R

---

Eat 3-5 servings of vegetables each day.

N  S  O  R

Eat 2-3 servings of milk, yogurt or cheese each day

N  S  O  R

Eat only 2-3 servings from the meat, poultry, fish, dried beans, eggs, and nuts group each day

N  S  O  R

Read labels to identify nutrients, fats, and sodium content in packaged food

N  S  O  R

Eat breakfast

N  S  O  R

## Appendix 5: Participant Information Sheet

### Date Information Sheet Produced:

29-09-2017

### Project Title

*The influence of the environment on physical activity and healthy eating habits on students at Auckland University of Technology*

Dear participant,

My name is Erica Hinckson and I am a professor at AUT. Our research team would like to talk with students who might like to take part in the project title *‘The influence of the environment on physical activity and healthy eating habits on students at Auckland University of Technology’*. The information sheet provides details about the project so that you make an informed decision regarding your participation. Your participation is voluntary.

You have received this information sheet after first contact with the researcher. Please read the information below to make sure you familiarise yourself with the project. If you have any questions, please talk to a member of the research team. Our details can be found at the bottom of this document.

### What is the purpose of this research?

We would like to find out what the students think of the physical activity and nutrition environments of the campus. What motivate you or does not to be physically active or eat healthily. We would like to know your opinion about these aspects on campus so that we can improve health and wellbeing of students on the 4 campuses.

### How was I identified and why am I being invited to participate in this research?

*‘The influence of the environment on physical activity and healthy eating habits on students at Auckland University of Technology’* project is looking for students who are enrolled at the AUT.

### How do I agree to participate in this research?

You will need to sign the consent form. The consent form will be provided by the researcher team after contact. Signing the consent form indicates that you agree to join *‘The influence of the environment on physical activity and healthy eating habits on students at Auckland University of Technology’* study and that you have not been forced or coerced to join. If you have any questions talk to a member of the research team, they are there to help.



Your participation in this research is voluntary (it is your choice) and whether or not you choose to participate will neither advantage nor disadvantage you. You are able to withdraw from the study at any time. If you choose to withdraw from the study, then you will be offered the choice between having any data that is identifiable as belonging to you removed or allowing it to continue to be used. However, once the findings have been produced, removal of your data may not be possible.

### **Inclusion & Exclusion criteria**

You can take part in the study if you are able to walk or wheel freely on campus. And if you are enrolled at AUT. If any of these two inclusion criteria can't be matched you will be excluded from the study.

What will happen in this research?

Overall, as part of the study you will be asked to:

- Walk across campus with the researcher to collect environment data
- You will be asked as you walk to take pictures (through an app provided to you) of the things that motivate you or don't motivate you to be physically active and eat healthy.
- After the walk you will be asked to have a seat with the researcher and answer a couple of questions.
- You will be asked to participate in a meeting to talk about the results and see what you can do to better the campus if there is a need to.

### **How will the research be measured?**

The research will be measured partly by the use of an app called The Stanford Neighbourhood Discovery Tool. With this app you can take pictures of your surroundings and things that motivate or demotivate you about the environment. Only pictures of the environment will be used in the project, so there will be no photos of the participants. And in the unlikely event or the participant standing in the picture, the researcher will make sure the participants face will not be on the picture. This for the privacy of the participant. If you have more information about the measuring tool, you can read the following text.

*The 'Stanford Healthy Neighbourhood Discovery Tool'*. This is an app on a smartphone which is made by the Stanford University in California – USA to measure aspects of someone's environmental neighbourhood.

*If you want more information about the tool, visit this website:*

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3601583/>

The Discovery Tool data and your survey responses will be shared with researchers at Stanford University. The data will not be connected to your identity. They will be stored on a secure server, and are being saved so that researchers can compare Discovery Tool *data from communities across the world. The results of this work may be presented at scientific or professional meetings or published in scientific journals, but your identity will not be shared.*

### **What are the discomforts and risks?**

Everybody is different, but here is a list of the things that could happen. When you are going on a walk with the researcher it's possible that you may trip and fall. This is a possibility that you may encounter anytime you go for a walk, but if you fall during the walk and you hurt yourself we will provide you with help through the Interprofessional Health Clinic and of course if minor with a First Aid Kit.

Furthermore, like any conversation with someone you don't really know you may feel uncomfortable or embarrassed in talking with the researcher. The researcher involved in this project will act professionally. The researcher will always try to help you with the research and will not treat you any differently based on your cultural background or gender. If you don't feel comfortable around the researcher, you may notify the project supervisor and they will provide you with another researcher. Feel free to ask any questions about this, because we want to be clear before we start the research.

### **How will these discomforts and risks be alleviated?**

In the unlikely event of emotional triggering as a result of participating in this study, you have access to the counselling service of the university. You can make an appointment there free of charge. You can find information about the counselling below.

AUT Health Counselling and Wellbeing is able to offer three free sessions of confidential counselling support for adult participants in an AUT research project. These sessions are only available for issues that have arisen directly as a result of participation in the research and are not for other general counselling needs. To access these services, you will need to:

- drop into our centres at WB219 or AS104 or phone 921 9992 City Campus or 921 9998 North Shore campus to make an appointment. Appointments for South Campus can be made by calling 921 9992
- let the receptionist know that you are a research participant, and provide the title of my research and my name and contact details as given in this Information Sheet

You can find out more information about AUT counsellors and counselling on <http://www.aut.ac.nz/being-a-student/current-postgraduates/your-health-and-wellbeing/counselling>.

### **What are the benefits?**

You will receive a copy of your results section. The benefit to you is that you have the chance to really make the campus you study a better place with healthier and happy students! Also

after the last meeting, you will receive a gift (e.g. a voucher with a value of 10 – 20 \$). Also there will be food and drinks available for consumption at the last meeting.

**What compensation is available for injury or negligence?**

In the unlikely event of a physical injury as a result of your participation in this study, rehabilitation and compensation for injury by accident may be available from the Accident Compensation Corporation, providing the incident details satisfy the requirements of the law and the Corporation's regulations.

**How will my privacy be protected?**

Privacy will be protected due to the changing of the participants names into codes. This will be done by the researcher, who has no benefit in any way in knowing which information belongs to which participant. The codes will be shared with the project supervisor, who is a professor at AUT. But the professor will not know which code which participant is.

**What are the costs of participating in this research?**

The time it will take the participants is a maximum of 4 hours divided over 3 meetings.

**What opportunity do I have to consider this invitation?**

You will have until the first meeting. Which is set on March to April.

**Will I receive feedback on the results of this research?**

If you want, you will receive your own results and a summary of the project results through email.

**What do I do if I have concerns about this research?**

If you have concerns or anything you would like the research team to know. Please contact one of them. They are there to help you.

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor,

- Professor Erica Hinckson, [erica.hinckson@aut.ac.nz](mailto:erica.hinckson@aut.ac.nz), or AUT 921 9999 ext 7224, M 021 960 887
- Assistant Investigator Nehal Natasha, [nehal.natasha@gmail.com](mailto:nehal.natasha@gmail.com) 0211383811.

If you wish to withdraw your participation in this study, contact one of the researchers. Your data and contact information will not be used anymore.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEK, Kate O'Connor, [ethics@aut.ac.nz](mailto:ethics@aut.ac.nz) , 921 9999 ext 6038.

## **Whom do I contact for further information about this research?**

Please keep this Information Sheet and a copy of the Consent Form for your future reference. You are also able to contact the research team as follows:

### **Researcher Contact Details:**

Assistant Investigator contact details:

#### **Nehal Natasha**

Assistant Investigator

AUT University, North Shore Campus

90 Akoranga Drive, Northcote 0627

Auckland 1142, NZ

T: 0211383811

[nehal.natasha@gmail.com](mailto:nehal.natasha@gmail.com)

### **Project Supervisor Contact Details:**

#### **Dr Erica Hinckson**

Professor

Centre for Child Health Research

Human Potential Centre

Faculty of Health Sciences

AUT University, North Shore Campus

90 Akoranga Drive, Northcote 0627

Auckland 1142, NZ

T : 921 9999 ext 7224

M : 021 960 887

[Erica.hinckson@aut.ac.nz](mailto:Erica.hinckson@aut.ac.nz)

**Approved by the Auckland University of Technology Ethics Committee on *31/10/17 & 1/10/18*,**

**AUTEC Reference number *17/346***

## Appendix 6: Consent and Release Form

**Project title:** *The influence of the environment on physical activity and healthy eating habits on students at Auckland University of Technology.*

**Project Supervisor:** Erica Hinckson

**Researcher:** Nehal Natasha

- I have read and understood the information provided about this research project in the Information Sheet dated 29-09-2017.
- I have had an opportunity to ask questions and to have them answered.
- I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without being disadvantaged in any way.
- I understand that if I withdraw from the study then I will be offered the choice between having any data that is identifiable as belonging to me removed or allowing it to continue to be used. However, once the findings have been produced, removal of my data may not be possible.
- I understand that the photographs will not be published in any form outside of this project without my written permission.
- I understand that any copyright material created by the photographic sessions is deemed to be owned by the researcher and that I do not own copyright of any of the photographs.
- I understand that the information about the project is confidential and will not share sensitive information with third parties.
- (Optional) I want to be identified in the research results.
- I agree to take part in this research.

Participant's signature : .....

Participant's name: .....

Participant's Contact Details (if appropriate):

.....

.....

.....

.....

Date:

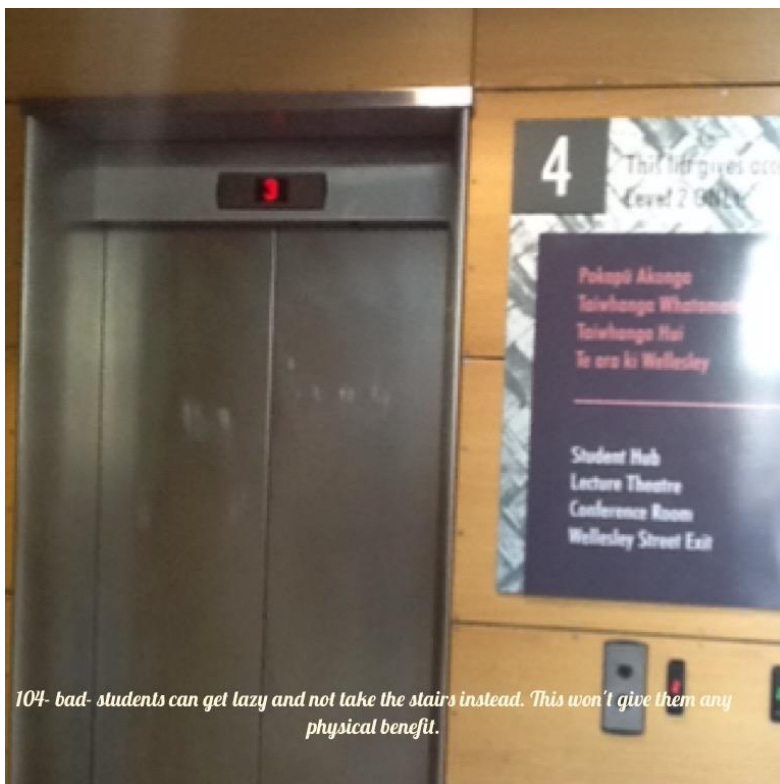
**Approved by the Auckland University of Technology Ethics Committee on 31/10/2017 & 1/10/2018 AUTEK Reference number 17/346 Student Voices: The influence of the university campus environment on the physical activity and healthy eating habits.**

*Note: The Participant should retain a copy of this form.*

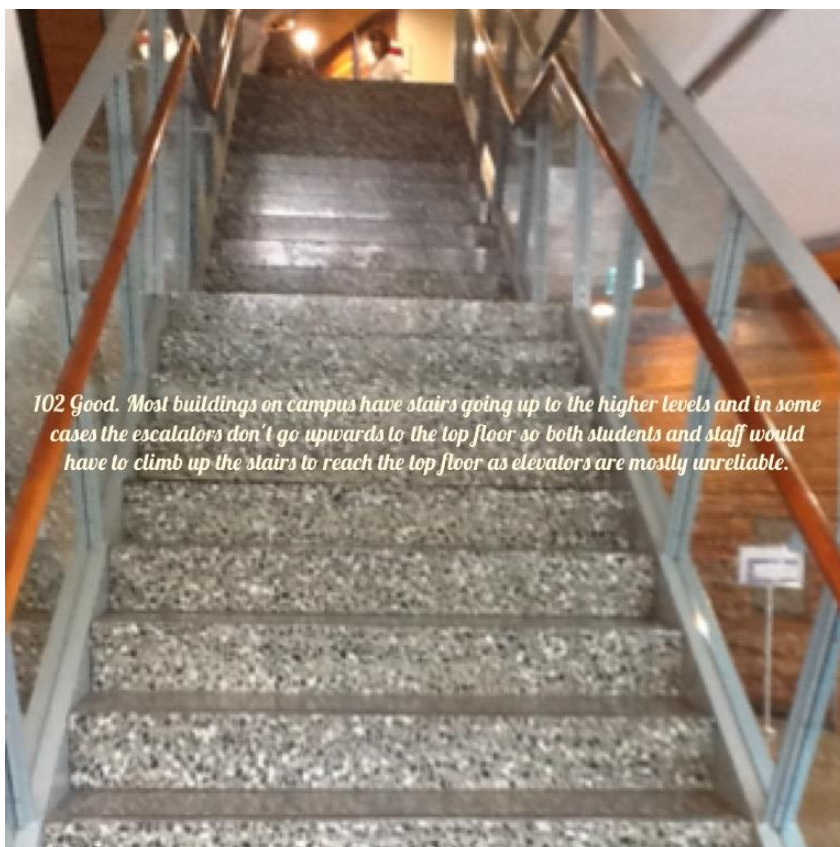
**Appendix 7: Examples of data from the campus walk**



*101 bad - encourages lounging rather than active study*



*104- bad- students can get lazy and not take the stairs instead. This won't give them any physical benefit.*





**Appendix 8: Examples of GPS Trip Tracker routes**

