Store atmospherics as a prime to nudge shoppers toward healthier food choices

Megan Marie Phillips

A thesis submitted to Auckland University of Technology in fulfilment of the requirements for the degree of Doctor of Philosophy in Marketing.

July 2017

Auckland University of Technology, Marketing, Advertising, Retailing and Sales (MARS) Department

Abstract

The expanding waistlines of New Zealanders are cause for concern. Yet current attempts in-store focused on conscious intentions for health behaviour have been met with limited success (Papies, 2016). The literature suggests that more subtle approaches might be helpful, such as the use of store atmospherics to nudge shoppers toward healthier food choices. This thesis asks which store atmospherics are representative of a healthier store environment. It further explores what store atmospherics can be tailored to create a message of healthfulness, and act as a prime to nudge shoppers toward healthier food choices. The stimulus-organism-response paradigm, nudge priming, dual-processing model, situated inference model, spreading activation theory, and the literature on cue congruency lend support to this investigation, which include field observations and an experimental supermarket trial.

In Study 1, field observations established what store atmospherics are most prevalent among more-healthy versus less-healthy food retailers. Stores (n = 363) across New Zealand at key locations, representative of all socioeconomic deprivation levels, were observed. Findings demonstrated that more-healthy food stores, defined by foods sold, had more natural wholefood scents present, more-healthy wall imagery, and green shelving. In contrast, less-healthy food stores had more processed food scents, images related to less healthy foods or images unrelated to the foods sold.

Study 2, a follow-on experiment, tested findings from the observational study to determine whether more-healthy (versus less-healthy) scent, imagery and colour prime shoppers to make healthier food choices. Following a series of pre-tests to determine health-evoked associations for scent, imagery and colour, a between-subjects experimental design of a 2 (more-healthy scent: herbs versus less-healthy scent: sweet bakery) x 2 (more-healthy colour: green versus less-healthy colour: grey) x 2 (more-healthy imagery: food-related versus less-healthy imagery: food-related) was completed. Participants (n = 220) were recruited from the community to the laboratory and randomly assigned to one of eight experimental conditions (26 to 34 each group) to complete scenario-based grocery-shopping trips through a virtual supermarket simulated on a computer screen.

Findings from Study 2 revealed that participants exposed to herb scent (versus sweet bakery) purchased a healthier basket of goods. Counter to findings from Study 1,

however in part, participants exposed to less-healthy imagery (versus more-healthy imagery) and grey (versus green) shelving purchased healthier baskets of goods.

In conclusion, the two studies in this thesis reveal that store atmospherics could be used to nudge (remind or alert) shoppers toward healthier food choices in a virtual supermarket. The findings extend current literature on store atmospherics in retailing and marketing, and in other domains such as food, nutrition and health. Store atmospheric cues are examined through the lens of nudge priming, the situated inference model, and System 1 heuristic information processing for the first time. The research conveys practical findings to help retailers achieve corporate social responsibility outcomes and increase profits, and to aid policy makers in minimising less healthy food choices and encouraging more healthy food choices. Methodological underpinnings such as the use of a virtual store with scent machines in a laboratory, further provide new ways for collecting store atmospheric data and testing theory.

Table of contents

List of tables

List of figures

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 (except where explicitly defined in the acknowledgments), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning."

Megan Phillips

Acknowledgements

I owe a great deal of thanks to Dr Sommer Kapitan, Professor Elaine Rush, Agnes Naera, the Marketing, Advertising, Retailing, and Sales (MARS) Department, AUT, the Business, Economics and Law Faculty, Professor Roger Marshall, Associate Professor Mark Glynn, my partner Kyle Wiltshire, and mum Catherine Phillips for continued guidance, support and encouragement during my PhD journey. Both Dr Sommer Kapitan and Professor Elaine Rush have gone above and beyond to ensure I succeed in this journey, which I am incredibly grateful for. The clarity and knowledge you both have imparted upon me has been invaluable and has built solid foundations for my career as an academic.

Agnes Naera has continued to push me to do bigger and greater things. Her passion for helping provide opportunities to students is admirable, and I am truly grateful for the relationship we have developed over the years. Introductions to likeminded students, support networks, writing retreats, advice and friendship are all invaluable to me. A thank you to the MARS Department, AUT, and the Business, Economics and Law Faculty for my Vice Chancellors doctoral scholarship, part-time work and on-going financial support. It has made this journey a lot less stressful financially. Thank you to Professor Roger Marshall and Professor Mark Glynn for proof reading my work and offering suggestions for improvement. My Fiancé Kyle Wiltshire, soon to be Husband has probably worn the worst of this journey, but he still wants to marry me, so I guess it has not been all that bad. He keeps me down to earth, listens to my problems and ideas, and has many a time provided a shoulder to cry on. Thanks Kyle for being my best friend and emotional backbone, I could not have done this without you. To my mum for always being there to listen to me, when I need someone to talk too and bounce ideas off. Thank you for being my gym buddy as of late. To ensure my mind, body and soul are aligned. I would not have made it to the end without the help of all of these people. A final thank you is owed to Professor Andrew Parsons for the initial guidance and creative thought in this project.

Ethical approval was granted on the 14th October 2016 by the Auckland University of Technology Ethics Committee (AUTEC) until the 30th May 2019 as shown in Appendix A. The AUTEC ethics application number is 16/177.

Chapter 1: Introduction

1.1 Research problem

The expanding waistlines of New Zealanders are cause for concern. Obese and overweight individuals are at risk of developing health problems such as type 2 diabetes, coronary heart disease and cancer (Centers for Disease Control and Prevention, n.d.). The rapid increase in obesity and other diet-related disease in New Zealand and around the world today is a challenge to health systems. Statistics provided by the Ministry of Health (2013) indicate that 65% of adults in New Zealand are either obese (31%) or overweight (34%), with higher prevalence among Maori (48%) and Pacific Peoples (68%). From 1997 to 2013, obesity has risen among males and females, moving from 17% to 30%, and 21% to 32%, respectively (Ministry of Health, 2013). These figures are worrisome. To make a change to the welfare of the nation, further action is needed.

The food environment has been suggested as a contributing factor to the increasing prevalence of obesity (Bos, Van Der Lans, Van Rijnsoever, Van Trijp, 2013; Glanz, Sallis, Saelens, & Frank, 2005) through increases in promotion and consumption around unhealthy foods (Swinburn, Egger, & Raza, 1999), and wide availability of highly processed, energy-dense, inexpensive, convenient, and good tasting foods (Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008). To improve public health the role played by environmental contexts and conditions in which people make choices — such as in the home, school, work, retail stores and restaurants — need to be considered (Story et al., 2008).

Thus, a promising place to begin to understand and tackle this issue is the retail food environment that is pivotally positioned between New Zealanders and the foods they consume. It has long been recognised that the store environment, when manipulated by retail designers, managers, owners, workers or merchandisers, has the ability to entice shoppers to browse and buy (e.g. Ballantine, Jack, & Parsons, 2010; Fiore, Yah & Yoh, 2000; Kotler, 1973; Nath, 2009). Yet store environments remain one of the least understood influences when it comes to effects on shopper choice around health and nutrition (Glanz et al., 2005; Glanz, Bader, & Iyer, 2012; Gustafson, Hankins, & Jilcott, 2012; Holsten, 2008; Larson & Story, 2009). With the majority of purchasing decisions made in-store (Steinberg & Yalch, 1978), and supermarkets contributing significantly to the diet of most people (Hamilton, Mhurchu, & Priest, 2007), the store environment is viewed by health educators as a promising place for encouraging healthier food choices (Gittelsohn, Franceschini, Rasooly, Ries, Ho, Pavlovich, Santos, Jennings, & Frick 2008). Glanz et al. (2012) suggest that to help prevent obesity, more innovative and targeted marketing strategies and health interventions in-store are necessary.

1.2 Research rationale

Past research has proposed that individual decisions to be healthy are dominated by conscious intentions (Papies, 2016). Yet, recently it has become clearer that individual intentions are guided more by automatic and non-conscious information processing (Papies, 2016). In tempting food environments such as the supermarket, nutritional interventions focused on conscious intentions for influencing shopper food purchasing have been met with limited success (Buttriss, Stanner, McKevith, Nugent, Kelly, Phillips, & Theobald, 2004; Glanz et al., 2012). In-store interventions have improved nutritional knowledge and attitudes but no real behaviour change (Buttriss et al., 2004; Glanz & Yaroch, 2004). For example, Sigurdsson, Larsen, and Gunnarsson (2011) showed that placing healthier food around the store (e.g., bananas) either in combination with an advertisement or not, did not impact purchasing of healthier foods. Positive attitudes toward healthier food choices were voiced and the in-store intervention supported, but no real success in changed behaviours emerged (Sigurdsson et al., 2011).

However, some success in reaching behavioural change was found in a randomised trial in New Zealand supermarkets. Mhurchu, Blakely, Jiang, Eyles, & Rodgers (2010) offered participants price discounts, tailored nutrition education, or a combination of the two. Individuals assigned to receive a price discount purchased a greater number of healthier food products even six months later, in comparison to those who did not receive the price discount, even though there was no significant difference in purchase of less healthy foods between groups. Even though some success was reached, marketing scholars, nutritional researchers, and public policy experts continue to seek ways to achieve (a**)** reductions in less healthy food choices, as well as (b) increases in healthier food choices, to help improve shoppers' health and nutrition.

A major focus in the health and nutrition domain has been on accessibility and availability of products in-store and their relationship to dietary behaviours (see Larson

& Story, 2009 or Story et al., 2008, for a review) or on the relationship between marketing stimuli such as price, product, placement and/or promotion and their influence on food choice behaviour (see Glanz et al., 2012, for a review). However, investigations of store atmospherics in supermarkets as an intervention tool are lacking, and may prove more effective than current measures.

Atmospheric stimuli and their influence on food choices is not a new topic, but has tended to come from environments where consumption is undertaken; for instance, in the laboratory, within the home, and in restaurants (Chambaron, Chisin, Chabanet, Issanchou, & Brand, 2015; Gaillet-Torrent, Sulmont-Rosse, Issanchous, Chabonet, & Chambaron, 2014; Proserpio, De Graaf, Laureati, Pagliarini, & Boesveldt, 2017; see Wansink, 2004 and Stroebele & Castro, 2004, for a review). However, only recently has atmospherics been brought to the retail context to influence food choice (e.g. Biswas, Szocs, Chacko, & Wansink, 2017; Stockli, Stampfli, Messner, & Brunner, 2016). Biswas et al. (2017) demonstrate the effect of ambient lighting on healthier food choices in a consumption context such as a restaurant and the laboratory. Stockli et al. (2016) on the other hand, demonstrate the impact of posters at a vending machine on the healthiness of shopper food choices. While these are informative studies that establish a relationship between store atmospherics and healthier food choices, store atmospherics in the context of supermarket retailing has not yet been fully explored. Investigating shopper choices helps advance current knowledge by extending to a purchase environment where a number of food categories, products and multiple decisions over an extended period of time can be observed.

To nudge shoppers toward healthier food choices, the store atmosphere could be tailored to create a message of healthfulness through the manipulation of different sensory stimuli. Shoppers could be affected non-consciously by the various components of the atmosphere, triggering sensations in the shopper that create or heighten their appetite for certain products (Kotler, 1973) — in this case healthier foods. As Buttiss et al. (2004) mention, nutritional interventions at the point-of-purchase are useful but they need to be delivered in more undemanding, heuristic ways, otherwise such interventions might only benefit those motivated to change. Information should not be overwhelming and should be simplistic (Kalnikaite, Bird, & Rogers, 2013). As Soar (2003) argues, if shoppers have to pay conscious attention to something, it may be perceived as a waste of time, and thus a barrier to purchase.

Furthermore, humans can be lazy and only tend to expend as much effort and cognitive processing as required (Wyer, 2011). Employing store atmospherics as a decision criterion that can be easily and quickly applied makes it more likely to influence shoppers to engage in the prompted behaviour than if conscious intention is required (Buttiss et al., 2004; Wyer, 2011; Kalnikaite et al., 2013). A store atmosphere that communicates the message of health may non-consciously alert or prime shoppers to make more healthful food choices. Therefore, if little conscious effort is required on the part of the shopper, store atmospherics as cues of healthfulness may make it easier and less demanding for shoppers to make healthier food choices.

1.3 Research questions

The purpose of this thesis is to investigate whether store atmospheric primes can nudge (remind or alert) shoppers toward healthier food purchasing in a supermarket context. Thus, this thesis will address the following overarching research question:

What store atmospheric stimuli could be used to influence shoppers to make healthier food choices?

To address the gaps in knowledge, the research program represented in this thesis will answer the following research questions:

RQ1*: Which store atmospheric stimuli represent a healthier store environment?*

RQ2*: What store atmospherics can be tailored to create a message of healthfulness?*

RQ3*: What store atmospheric stimuli could act as a prime to nudge shoppers toward healthier food choices? 3a) do these factors work interactively, 3b) and if so, how?*

1.4 Overview of thesis

To answer the research questions above, the body of work presented in this thesis contains one observational field study (Study 1), then three stimuli pre-tests informed by the observational study, followed by an experimental study (Study 2). This thesis contains six linked chapters outlining a comprehensive body of work that addresses the three research questions. The chapters are briefly summarised below (Figure 1).

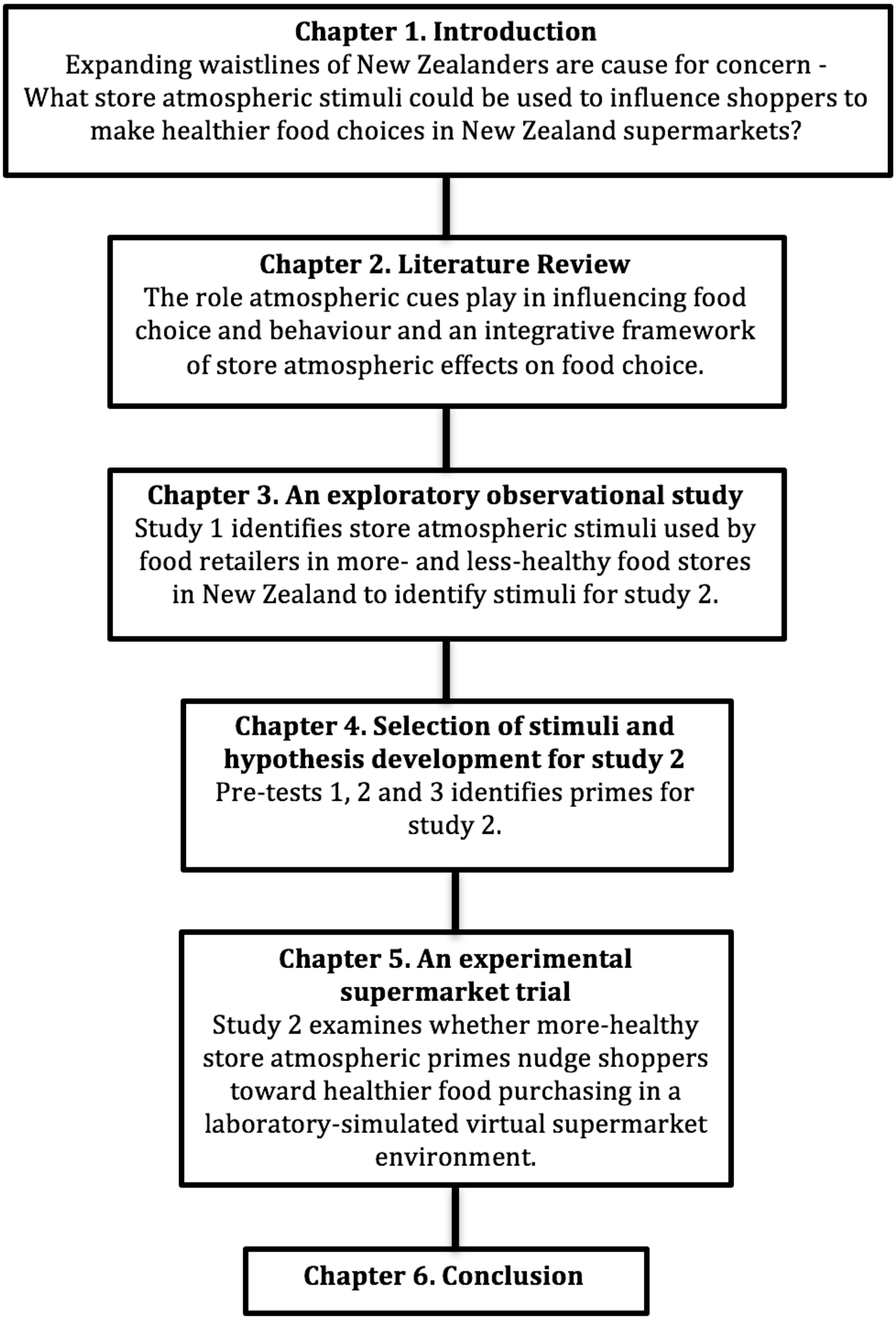


Figure 1. Diagram of overview of the thesis

1.5 Contributions to retail theory and practice

The intent of this thesis is to contribute new knowledge and understanding of the relationship between store atmospheric stimuli in a supermarket context and its impact on shopper food purchasing behaviour. By investigating store atmospherics and how they can be used to influence shopper healthy food choices, this thesis will be useful for public policy makers, nutrition experts, and retailers wanting to address diet-related public health issues. This body of work suggests that uncovering which, if any, store atmospherics lead to increased choice of healthier foods, could act as a competitive advantage and profit generating mechanism for stores. Alongside its role in helping achieve corporate social responsibility, it allows food retailers to display concern for the community. The research in this thesis will examine store atmospherics for the first time through the lens of prime nudging, the situated inference model and System 1 heuristic information processing (i.e. one of two systems people use to cognitively process information, Kahneman, 2003). Also, a better understanding of priming, congruency effects, stimulus-organism-response model, and approach-avoidance in the context of store atmospherics and healthier food purchasing in retail research will be advanced with an integrative framework crafted for this thesis.

1.6 Conclusion

This chapter provides an overview of the rationale for the thesis, and starts to explore the role store atmospheric stimuli could play in encouraging shoppers to make healthier food choices in supermarkets. Specifically, the chapter outlines the research problem, research rationale, gaps in knowledge, overarching research question, potential contribution to theory and practice, and outlines the structure of this thesis. The next chapter presents a review of relevant literature.

Chapter 2: Literature review on the role atmospheric cues play in influencing food choice and purchasing behaviour

This chapter presents an overview of what is already known about the role atmospheric cues play in influencing food choice and food purchasing behaviour. First, the chapter reviews existing store atmospheric frameworks and literature to build context and highlight the effects store atmospheric stimuli have on shopper emotion, cognition, physiological state, and behaviour in retail environments. An integrative framework of store atmospheric effects on food choices is developed and discussed to consider: (1) the potential of store atmospherics to influence purchasing behaviour, (2) the lack of research on store atmospherics and food choice behaviour in particular, and (3) the insights offered by research in the food domain. The chapter outlines potential gaps in the literature and concludes with a number of propositions for further investigation.

2.1 An integrative framework of store atmospheric effects on food purchasing behaviour

An integrative framework of store atmospheric effects on shopper food purchasing has been crafted for this thesis (Figure 2 below) and will act as a guide for the literature review and thesis. The framework helps organise research on store atmospherics, and research in the food, nutrition and health domain considering how external (environmental) and internal (shopper) cues influence shopper-purchasing behaviour. The framework is adapted from a number of sources including Baker's (1986) classification of store environmental factors, Kotler's (1973) dimensions of store atmospherics, Mehrabian and Russell's (1974) model (M-R model), Donovan and Rossiter's (1982) stimulus-organism-response (S-O-R) paradigm, Spence, Puccinelli, Grewal, & Roggeveen's (2014) multi-sensory model of shopping behaviour, Story et al's. (2008) ecological framework of influences on food choices, and Lam's (2001) store environment effects model on shopping behaviour and outcomes. It is important to note that the majority of the research in the following literature review is focused in the context of retail, with marketing, neuroscience, and social, environmental and cognitive psychology, nutrition and health research aiding in parts of the discussion. The framework (Figure 2) also considers priming, nudging, cue congruency, dual-processing, spreading activation theory, situated inference model, and barriers and facilitators to healthy food choice that shape internal shopper responses (namely emotion, cognition, and physiological state).

Using Donovan and Rossiter (1982) as guidance, the framework crafted for this thesis shows how store atmospherics such as olfactory, visual, auditory and tactile stimuli act via nudge priming (Wilson, Buckley, Buckley, & Bogomolova, 2016) as the stimulus on the shopper (the organism) who produces, for the purposes of this thesis, a given set of responses that include purchasing of healthier food. To further explore the resulting integrative framework of store atmospheric effects on food choice, the next section examines the literature on store atmospherics.

2.2 Store atmospherics defined

The first part of the framework in Figure 2 refers to store atmospherics, which fit within the stimulus part of the S-O-R model (Donovan & Rossiter, 1982). These stimuli are within a store environment, are largely designed and controlled by the retailer to engage shopper response (emotional, cognitive and physiological), and act as a cue to prompt purchase (behaviour) (Bitner, 1992; Kotler, 1973; Lam, 2001). Store atmospherics create an atmosphere or ambience within the store environment, are external to the shopper, and are employed by the retailer to indirectly sell to the shopper (Parsons, 2004; Russell & Mehrabian, 1976). The store environment is also made up of other stimuli such as end-of-aisle displays, special tickets, and food sampling, which are employed by retailers in an attempt to directly sell to the shopper by drawing attention to promotional products (Kotler, 1973; Parsons, 2004). Store atmospherics used to indirectly sell to the shopper, however, are of most interest.

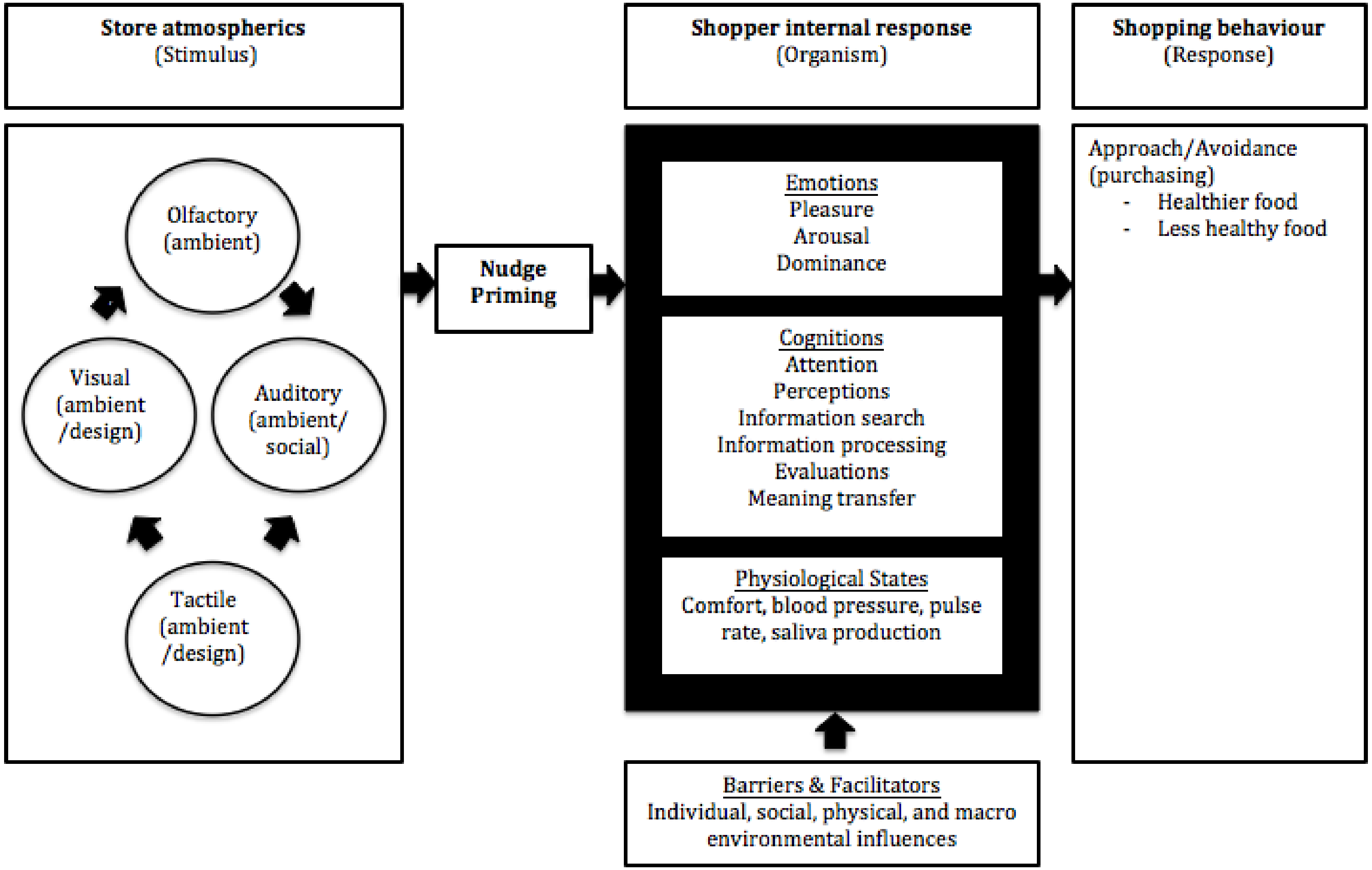


Figure 2. An integrative framework of store atmospherics effects on shopper food purchasing

Source: Adapted from Baker (1986), Kotler (1973), Lam (2001), Mehrabian and Russell (1974), Donovan and Rossiter (1982), Spence et al. (2014), and Story et al. (2008).

Kotler (1973) coined the term "atmospherics" at about the same time Mehrabian and Russell (1974) released their environmental psychology conceptual model (M-R model). The Mehrabian and Russell (1974) model provides a broad overview of the environment and the main variables involved. Mehrabian and Russell (1974) detail three key areas: (1) the environment, where sense modality variables and information rate were included, (2) emotional responses, in the form of pleasure, arousal and dominance, and (3) behavioural responses focusing on one's willingness to approach or avoid the environment. Sense modality variables refer to stimuli that are perceived through the senses such as olfactory, auditory, tactile, visual, and gustatory (Mehrabian & Russell, 1974). Information rate is the degree of novelty or complexity within the store environment, for example, the higher the cognitive load (novel, surprising, unfamiliar), the more aroused a shopper feels (Mehrabian & Russell, 1974). Pleasure refers to the shopper's degree of happiness, joy, good feelings, or satisfaction; arousal is the degree of excitement, stimulation, alertness or activeness, and dominance is the extent to which shoppers feel free to act and are in-control (Donovan & Rossiter, 1982). Behaviours include physically staying in a store (approach) or leaving (avoid), looking around and exploring (approach) or not looking around or exploring (avoid) (Donovan & Rossiter, 1982). In the case of the current framework (Figure 2), a desire to focus on, choose and purchase (approach) healthier foods is the behaviour sought.

Kotler's (1973) and Mehrabian and Russell's (1974) conceptualisation of store atmospherics and the environment helped lay the foundation for current store atmospheric research. The store atmospherics dimensions of Kotler (1973) fit into Mehrabian and Russell's (1974) model as the sense modality variables. Kotler (1973) and Mehrabian and Russell's (1974) conceptualisations both refer to the effect these environmental stimuli have on individuals and their behaviours. Kotler's (1973) adopted a retail perspective and Mehrabian and Russell (1974) an environmental psychology perspective. Both perspectives are integrated and considered in the integrative framework of store atmospheric effects on shopper food purchasing (Figure 2).

Store atmospherics are part of the sense modality variables of an environment and can therefore be defined by sensory qualities, as the stimuli are perceived via the senses (Kotler, 1973) and in a holistic manner (Ballantine et al., 2010). Originally, Kotler (1973) stipulated that only four of the traditional five senses (sight, touch, sound and scent) could be activated during an experience within the store environment, as one cannot taste the atmosphere. As of late, the possibility of the sense of taste as a store atmospheric cue has been established with breathable installations in Europe allowing the taste sensation of alcoholic drinks to become activated when people breath in the air within these spaces (Spence et al., 2014). This is still a very new concept and area of atmospherics, so it will not be included in the current investigation as examples of these installations are still uncommon, worldwide and in New Zealand.

Store atmospherics can be thought of from a Gestalt perspective. Typically, shoppers experience and respond to a combination of store atmospheric cues when making purchasing decisions (Babin, Hardesty, & Suter, 2003; Ballantine et al., 2010; Bava, Jaeger, & Dawon, 2009; Mattalia & Wirtz, 2001). The Gestalt perspective signifies that perceptions can be based on groups of stimuli and that these perceptions are not meaningful when investigating single parts (Lin, 2004). As Massara (2003) stipulates, “the whole is rarely equal to the sum of the single constituent parts” (p. 47). Several studies have manipulated different elements within the store environment to determine their influence on shopper behaviour (see Turley & Milliman, 2000 for a review), however, investigators have only explored the effects of one or two environmental variables on shopper behaviour (Bava et al., 2009; Massara, 2003) with the exception of a few (e.g. Baker, Levy, & Grewal, 1992; Baker, Parasuraman, Grewal, & Voss, 2002; Ballantine et al., 2010; Bava et al., 2009; Mohan, Sivakumaran, & Sharma, 2012; Parsons, 2011).

Investigating singular store atmospheric stimuli, though valuable, lacks a comprehensive understanding of the holistic influences of the store environment on shopper behaviour (Bava et al., 2009; Mattila & Wirtz, 2001). The difficulty associated with manipulating multiple stimuli at once could be the reason why so many researchers have not taken this holistic approach (Massara, 2003). Parsons (2011) manipulated multiple stimuli such as ambient music, ambient temperature, ambient lighting and ambient scent across multiple dimensions (auditory, tactile, visual, and olfactory) and produced significant interaction effects on shopper emotions. Parsons (2011) stipulates that if the interactions are not considered, potentially influential relationships and effects may be missed. Individually the stimuli may not have significant effects, but in combination may greatly influence shoppers (Parsons, 2011). To address this issue, a holistic approach when examining store atmospheric stimuli in this thesis will be undertaken to ensure a comprehensive understanding is gained.

Progressing the seminal works of Kotler (1973) and Mehrabian and Russell (1974), Donovan and Rossiter (1982) tested the stimulus-organism-response (S-O-R) model that was created through descriptions afforded to the M-R model but in a retail context. S-O-R is the basic structure for the integrative framework of store atmospheric effects in Figure 2. Donovan and Rossiter (1982) were the first to validate the relationship between store atmospherics, emotional states, and behavioural intentions within a store-based setting. Later, actual purchasing behaviours were also included (Donovan, Rossiter, Maarcoolyn, and Nesdale, 1994). A shortcoming of Donovan and Rossiter's (1982) work was that it lacked a classification system specific for store atmospherics (Baker et al., 1992). Baker et al. (1992) incorporated Baker's (1986) critical dimensions of store atmospherics: the ambience of the store, the design, and social elements. Baker et al. (1992) successfully integrated two of the three environmental factors (ambient and social) into the M-R model. Even though the design factor was not included, Baker et al. (1992) suggested that it could be easily incorporated and manipulated going forward as it was in Oh, Fiorito, Cho, and Hofacker (2008). With the successful application of the ambient, design, and social factors into the theoretically grounded M-R model and S-O-R paradigm, a classification system was established and is used by many researchers today (e.g., Baker et al., 2002; Lam, 2001; Mohan et al., 2012).

The classification system of ambient, design, and social factors (e.g. Baker, 1986) is incorporated in the current framework under each of the sensory dimensions: olfactory, auditory, tactile and visual. The multi-sensory experience offered by retailers in retail environments and the interaction between store atmospheric variables is demonstrated in the framework by the use of circles and arrows as constructed in Spence et al.'s (2014) framework. Store atmospherics such as olfactory stimuli include ambient scents (ambient factor); auditory stimuli include ambient music (ambient factor), and ambient sounds (ambient and social factors); tactile stimuli include ambient temperature (ambient factor), and textures and materials (design factor); visual stimuli include ambient lighting (ambient factor), prominent environmental colour (design factor), and wall imagery (design factors). Textures and materials also cross over into the visual domain but will be discussed under the tactile dimension for this literature review and thesis. Each of the store atmospheric stimuli (olfactory, auditory, tactile and visual) will be discussed after the importance of priming, nudging and cue congruence is highlighted. Priming effects, nudging and cue congruence are important for determining how shoppers will respond internally to store atmospheric cues (Figure 2).

2.3 Priming, nudging and cue congruence on shopper internal responses

Originally, the study of human judgement and decision-making was based on rational decision-making models (Ajzen, 1996). Individuals were thought to process incoming information consciously, deliberatively and systematically (Bargh & Chartrand, 1999). Evidence drawn from the psychology, marketing and behavioural economics literature over the years, however, has shown that most decisions are far from conscious (Bargh & Chartrand, 1999). Often people's judgements, feelings and behaviours are not guided by extensive conscious consideration and reasoning but are instead driven by seemingly insignificant and irrelevant environmental influences such as cues or primes (Loersch & Payne, 2011).

Priming can be defined as "procedures that stimulate or activate some stored knowledge" (Higgins, 1996, p. 133). For example, Zellner, Geller, Lyons, Pyper, and Riaz (2017) primed patrons with country specific ambient music to stimulate thoughts and choice related to foods from that country. The aural store atmospheric acted as a prime to stimulate thoughts about, and subsequent choice of, a targeted food. As is evident, store atmospherics as a prime or cue is established (e.g. Biswas et al., 2017; North, Sheridan, & Areni, 2016; Stockli et al., 2016), and is represented as a crucial part of influencing food choice purchasing in the integrative framework (Figure 2). Nudging (Thaler & Sustein, 2008), the situated inference model (Loersch & Payne, 2011), dual-processing models (Evans, 2008; Kahneman, 2003), cue congruence (Bone & Ellen, 1990), and spreading activation theory (Collins & Loftus, 1975) further explain how primes influence shopper internal responses and shopping behaviours (Figure 2).

A prime as a nudge can strategically use non-consciously perceived cues within an environment such as physical, verbal or sensory cues to prime health behaviours (Bluementhal-Barby & Burroughs, 2012; Wilson et al., 2016). Store atmospherics as a non-consciously perceived sensory cue could be used in this way to prime health behaviours. Nudging is based on behavioural economic theory, defined by Thaler and Sunstein (2008) as "any aspect of the choice architecture that alters peoples' behaviour in a predictable way without forbidding any options or significantly changing their economic incentives" (p. 6). In the context of supermarket shopping, the environment could be altered to influence shopper behaviour without having to change the availability of products and without price discounts. The use of store atmospherics as a nudge by retailers or retail designers (who are referred to as the choice architect by Thaler & Sunstein, 2008) could guide shopper thoughts by making health-relevant information more salient. This nudge priming could work without forbidding foods or introducing economic incentives. The nudge enables information to act as a reminder to purchase healthier foods. Theorisation around nudge priming indicates that, as the integrative framework (Figure 2) suggests, store atmospheric stimuli can influence the internal responses of a shopper and in turn, subsequent health behaviours (approach response).

The situated inference model outlined by Loersch and Payne (2011) shows how primes operate in different situations. As people navigate through environments, multiple options are encountered where sense making and decisions are needed (Loersch & Payne, 2011). This is the point at which the retailer can influence the shopper by manipulating store atmospheric stimuli (olfactory, auditory, visual or tactile) to prime nudge health behaviours, as in the integrative framework (Figure 2). People's attention is pulled from one object to another, demanding sense making to be achieved on either a conscious or non-conscious level (Loersch & Payne, 2011). In terms of store atmospherics, the stimuli could be perceived either consciously or non-consciously; such perceptions by the shopper depend on the presence, pleasantness and congruence (i.e., cue congruity or fit in the degree with which the stimuli work together to complement one another, Bone & Ellen, 1990) of the stimuli with the store environment. For example, an intense ambient scent could be too strong for the shopper or the music incongruent with the store (i.e., heavy metal played in a fine dining restaurant) and could cause the shopper to pay greater attention to the stimulus. In the case of the integrative framework, if store atmospheric stimuli are to influence shoppers to purchase healthier foods, the stimuli will need to be present, pleasant and congruent to influence shopper purchasing behaviour at a non-conscious level.

To understand conscious and non-conscious effects, dual processing theories help to provide insight (e.g. Chaiken, 1980; Petty, Cacioppo & Schumann, 1983, Shiffrin & Schneider, 1977, Sloman, 1996). Two operating systems, System 1 and System 2, have been conceptualised to represent how people process information (Evans, 2008). System 1 (heuristic processing) operates relatively fast and is less cognitively demanding, automatic, effortless, holistic, and is often driven by emotions and habits (Evans, 2008; Fukawa & Niedrich, 2015; Kahneman, 2003). System 2 (systematic processing), on the other hand, operates relatively slowly and is cognitively demanding, conscious, effortful, governed by rules and requires deliberate intentional control (Fukawa & Niedrich, 2015; Kahneman, 2003). The key difference between the two systems is that System 2 requires working memory (Evans, 2008). System 1 is of interest in this thesis, as people tend to make food decisions relatively fast and with limited consideration of consequences (Cohen & Babey, 2012). Habits are a main driver of System 1 (Evans, 2008) and can be difficult to change when it comes to dietary behaviours, but as Wilson et al. (2016) indicate, environment stimuli can influence these behaviours if processed outside of conscious awareness. Thus, theorising store atmospherics that are processed outside of conscious awareness will help in targeting shoppers' less demanding heuristic system (System 1) nudging shoppers toward healthier food choices, as in the integrative framework (Figure 2).

Largely, previous in-store health interventions have required shoppers to use System 2, systematic and rational processing (e.g. Mhurchu et al., 2010; Milliron, Woolf, & Appelhans, 2012). The success of these interventions has been effective on occasion but generally limited. This could be due to the fact that people struggle to overcome strong appetitive activation when exposed to food cues (Bailey, 2015) such as food displayed in a supermarket. These physiological responses can make it difficult for individuals to make a rational decision, hindering System 2 processing. If the shopper was fully informed with complete information, self-control and unlimited cognitive capabilities, previous health interventions could have changed behaviours (Sunstein & Thaler, 2003). It is therefore proposed that, if little or no conscious effort is required on the part of the shopper, it will make it easier and less demanding for them to make healthier food choices. Thus, the integrative framework (Figure 2) suggests that nudge priming shoppers with store atmospheric stimuli to make health relevant information more accessible will thus allow for the information to be used in an easier and less cognitively depleting manner.

The situated inference model further discusses the use of primes to make related information highly accessible, ready for use in subsequent processing (Loersch & Payne, 2011). For instance, being exposed to an ambient pear or melon scent can prime thoughts about fruits and vegetables and the consumption context of the primed food

(Gaillet, Sulmont-Rosse, Issanchous, Chabanet, & Chambaron, 2013; Gaillet-Torrent et al., 2014). This heightened accessibility is the point at which the prime can act as a bias in altering considered information (Loersch & Payne, 2011). When incoming information from the external environment is misattributed by the individual as part of their own internal response (their own thoughts), this is when the information can be used to inform decisions (Loersch & Payne, 2011). The situated inference model suggests that the misattributed content is used to answer questions afforded by the environment (Loersch & Payne, 2011). Questions in a supermarket environment could include, *should I purchase the healthier option?* (behavioural priming), *that smells delicious, do I want that?* (goal priming), *is this going to be healthy for my family, should I buy this?* (goal priming), and *should I purchase this delicious steak?* (behavioural priming). If the prime is consciously perceived or too obvious, however, the influence of the environmental cue could vanish (Stockli et al., 2016) and misattribution of the incoming information would be less likely (Loersch & Payne, 2011). Therefore, to ensure priming effects are established, the prime must be presented in a way that is not too obvious to the shopper and could be misattributed to his or her own internal response.

To predict how a prime will influence behaviour a greater understanding of shopper knowledge structures is needed. Spreading activation theory suggests that when a concept is primed, a neural network of interconnected nodes is activated in memory (Collins & Loftus, 1975). Previously learnt information from past experiences help to establish the interconnected network of semantic nodes in memory (Anderson, 1983). Once a memory trace is created, it can be strengthened during subsequent activations or diminished if unused (Anderson, 1983). Activation can spread from one concept to another based on the degree and strength of the associative links (Anderson, 1983). The speed with which information can be processed is based on its level of activation (Anderson, 1983). A study by Fukawa & Niedrich (2015) contributes theoretically to the use of stimuli to prime semantically related concepts to activate an associative network of related products and preference for those products. Based on spreading activation theory and previous studies that have used this theory (e.g. North et al., 2016), the use of store atmospherics as a prime to activate health-relevant concepts via a neural network of already established interconnected nodes is plausible, and may lead to a number of priming effects.

A single stimulus can cause a number of priming effects (Loersch & Payne, 2011). Primes can activate different judgments, behaviours and goals depending on the direction of a person's attention toward objects, people or behavioural options within the environment (Loersch & Payne, 2011). As Higgins (1996) suggests, the greater the relationship between stored knowledge and the attended stimulus, the greater the applicability or fit of the stimulus to the individual or environment. Store atmospherics can function as attention, message, and affective-generating mechanisms (Kotler, 1973), which can direct shopper attention toward relevant judgments, goals or behaviours. For example, if shoppers in a supermarket were exposed to wall imagery that was related to the concept of healthfulness (e.g. images of fruits and vegetables, salads, or fresh cooked fish) it could be anticipated that shoppers would either (a) more quickly think about or identify healthier foods (semantic priming), (b) behave in a more health conscious manner by selecting and purchasing healthier foods (behavioural priming), or (c) become motivated to actively seek out an opportunity to purchase healthier foods (goal priming). Any of these priming effects are possible within the current integrative framework (Figure 2) and would be categorised under either shopper internal responses (semantic response, activation of goals) and/or shopping behaviour response (behaviours). Thus, store atmospheric stimuli as a prime can direct shopper attention toward relevant judgements, goals and/or behaviours within the store environment.

Furthermore, to ensure primes influence shopper internal response and purchasing behaviour, the store atmospheric cues need to be congruent with the context, and the target product/s. In the context of store atmospherics, cue congruity or fit is the degree with which the stimuli work together to complement one another (Bone & Ellen, 1990; Krishna, Lwin, & Morrin, 2010; MacInnis & Park, 1991). In the integrative framework (Figure 2), the arrows in the first column labelled store atmospherics (stimulus) also show the need for congruent relationships between the stimuli. From an information processing perspective, Mandler (1982) suggests congruity is the fit between characteristics of a stimulus and a relevant schema that is based on the individuals' past experiences. Both of these definitions are relevant to the current integrative framework (Figure 2). Congruity of the store atmospherics to health relevant concepts, products, and the store environment is important for encouraging health behaviours.

Congruency can result in changes in information processing such as greater accessibility of congruent attitudes, autobiographical memories, and product knowledge (Mitchell, Kahn, & Knasko, 1995) and can lead to greater approach behaviours (Mattila & Wirtz, 2001; Spangenberg, Sprott, Grohmann, & Tracy, 2006). For example, in the integrative framework (Figure 2), shoppers exposed to an ambient food scent such as herbs may purchase food products related to herbs. The ambient scent may bring to mind memories of consuming related foods with the family (autobiographical memories), the delicious taste of the related foods (congruent attitudes), or act as a reminder about where the related foods are located in the supermarket (product-class knowledge). The congruent atmospheric stimulus helps to create and activate positive associations and concepts in memory that can positively influence evaluations and purchase of congruent foods.

The congruency argument is consistent with a fluency explanation (Herrmann, Zidansek, Sprott, & Spangenberg, 2013). Processing fluency refers to the ease with which a piece of information is brought to mind and processed, it is said to drive evaluation and choice (Lee & Labroo, 2004). The fluency of the message is also important to consider when priming shoppers with store atmospherics. If information is more conceptually fluent, people are likely to use this information to make a judgement (Lee & Labroo, 2004; Tversky & Kahneman, 1973). Herrman et al. (2013) suggests that an incongruent ambient scent can potentially interfere with the processing of relevant information, making the shopping task more cognitively demanding, thus inhibiting attitudinal judgments. In the integrative framework (Figure 2), less fluency could mean cognitive resources are depleted and more effort would be needed to make a decision. The process needs to be undemanding and simplistic to motivate the shoppers to change (Buttiss et al., 2004; Kalnikaite et al., 2013). In contrast, Herrman et al. (2013) suggest that when store atmospheric cues are congruent with the product class, judgement may be facilitated by ease of processing. To ensure store atmospheric stimuli influence shopper food choices as predicted, congruence between the stimuli, the environment, the primed concept, and the product is needed to achieve more fluent processing by the shopper.

In sum, congruency between 1) the store atmospheric stimuli and 2) the product categories to create a message of healthfulness is the first important step in the integrative framework (Figure 2). Shoppers exposed to a prime that activates a network of health relevant information such as a semantically related concept might then be successfully misattributed to the shoppers' own internal response. The misattributed information can be used to answer questions afforded by the environment, as outlined in the situational inference model (Loersch & Payne, 2011). A congruent relationship can help ensure high fluency between store atmospherics, health relevant concepts, and healthier foods sold. Basically, if "more-healthy" store atmospheric primes could nudge shoppers to think about and approach healthier foods at a non-conscious level via System 1 processing, this is expected to be most effective at nudging shoppers toward healthier food choices.

Having given a broad overview of how store atmospherics are predicted to influence shopper internal responses and food choice in a supermarket environment, each of the atmospherics stimuli (olfactory, auditory, tactile and visual) will be discussed below. This helps to show the connection between store atmospheric stimuli, shopper internal response and approach behaviours, as in the integrative framework of store atmospheric effects on shopper food purchasing (Figure 2).

2.4 Olfactory dimension

Olfactory stimuli, in this case ambient scents, known for their emotional and memory eliciting powers, encourage participants to act upon the need to satisfy hunger, craving for an item, hedonic goals, short-term pleasures or gratification associated with previous interactions with the scents. Ambient scents will be the focus of the olfactory dimension as these are the stimuli represented in the integrative framework (Figure 2) and are one of the most represented in the literature.

2.4.1 Ambient scent

The use of ambient scent as a marketing tool to influence shopper behaviour has become more attractive for marketers and retailers as they become more aware of its potential (Bradford & Descrochers, 2009). When shoppers are exposed to ambient scents in comparison to other sensory stimuli, little cognitive processing is required (Ehrlichman & Halpern, 1988). This is due to the direct link between the sense of smell and the limbic system (Holland, Hendriks, & Aarts, 2005), the part of the brain that deals with memory and emotions (Douce & Janssens, 2013; Hirsch, 1995). Due to this direct link, behaviours can be influenced without shoppers consciously knowing (Bone & Ellen, 1990; Holland et al., 2005).

Ambient scent has been shown to have a positive influence on shopper purchasing (e.g. Fiore et al., 2000; Hermann et al., 2013; Jacob, Stefan, & Gueguen, 2014), approach behaviour (e.g. Mattila & Wirtz, 2001), food choice (De Wijk & Zijstra, 2012; Fedoroff, Polivy & Herman, 1997; 2003; Gaillet et al., 2013; Gaillet-Torrent et al., 2014), emotions (pleasure and/or arousal) (e.g Mattila & Wirtz, 2001; Douce & Janssen, 2013), satisfaction (e.g. Mattila & Wirtz, 2001; Morrison, Gan, Debelaar, & Oppewal, 2011), intent to revisit the store (e.g. Douce & Janssen, 2013), perception of time spent in-store (e.g. Spangenberg, Crowley, & Henderson, 1996), and evaluations of the store and the products within them (e.g. Douce & Janssen, 2013; Parsons, 2009; Spangenberg et al., 1996; Spangenberg et al., 2006; Ward, Davies, & Kooijman, 2007). As in the integrative framework (Figure 2), these responses represent shopper internal responses or behaviours.

2.4.1.1 Definition of ambient scents

In the store environment, scents can be broken down into two categories: ambient scents and product scents. Ambient scents are smells external to the product/s (Bradford & Desrochers, 2009; Peck & Childers, 2008), are part of the overall environment (Bradford & Desrochers, 2009; Peck & Childers, 2008), and have the potential to influence reactions to all products sold (Gulas & Bolch, 1995). Product scents, however, are specific to the product (Douce & Janssens, 2013) and generally only influence shopper reactions to that product (Gula & Bloch, 1995). Ambient scents are the scents of interest when focusing on store atmospherics.

A scent has three important elements: its presence (or absence), its pleasantness, and its fit or congruity with the object of study (Bone & Ellen, 1990). The presence of a scent is important in terms of its ability to stimulate automatic responses, influence mood and affective states, activate learned associations, and encourage certain behavioural outcomes (Bone & Ellen, 1990). Each of these responses represents emotional, cognitive, physiological or behavioural outcomes by the shopper in the integrative framework (Figure 2). The pleasantness of the ambient scent is important, as it is the person’s first reaction to a scent and usually shows their liking or disliking for it (Ehrlichman & Halpern, 1988). Bone and Ellen (1990) suggest that there are two primary characteristics that a pleasant scent is based upon, its quality (affective tone) and its intensity (concentration). If a scent is too intense, shoppers are likely to perceive it to be unpleasant, whereas when the intensity is lower shoppers may perceive it as more pleasant (Bone & Ellen, 1990). The congruity of the scent is also important due to its ability to either hinder or facilitate cognitive processing (Bone & Ellen, 1990). When an ambient scent does not fit and is incongruent with the environmental context, the consumer's ability to process the situation becomes more difficult, therefore, encouraging retrieval of irrelevant information that interferes with the processing of relevant information (Pomerantz, 1981; Bone & Ellen, 1990). The three important elements of scent, its presence, pleasantness, and congruity will be discussed below to show how primed ambient scents could potentially influence shopper internal responses and behaviours as outlined in the integrative framework (Figure 2).

2.4.1.2 Pleasant ambient scent effects

The presence (versus absence) of a pleasant ambient scent has been shown to positively influence emotions, perceptions, and approach behaviours such as food selection and better moods in the laboratory (Chambaron et al., 2015; Knasko, 1995), actual length of stay in a restaurant (Gueguen & Petr, 2006), perceived length of stay in a retail store (Spangenberg et al., 1996), and purchasing in service settings (Gueguen & Petr, 2006; Hirsch, 1995). Previous insights indicate that when scent intensity reaches a certain threshold (too intense) pleasant scents become unpleasant (Richardson & Zucco, 1989; Bone & Ellen, 1990). Spangenberg et al. (1996) attributes this to the Wundt curve, in which intensity of the pleasant ambient scent follows an inverted U-shape with the scent being pleasant up until a certain point. However, Spangenberg et al. (1996) was unable to find scent intensity effects. The intensity levels of low (15 second diffusion of scent), moderate (30 second diffusion of scent) and high (90 second diffusion of scent; Spangenberg et al., 1996) may not have reached the threshold level to be perceived by participants as too intense. Thus, to ensure approach behaviours toward healthier foods, as suggested by the integrative framework (Figure 2), any primed ambient scent needs to be pleasant and should not reach the threshold level to be perceived as too intense.

In addition, the intensity of the ambient scent can be difficult to determine as people's scent perceptions vary significantly (Leenders, Smidts, & Haji, 2016). Two intensity thresholds devised through extensive pre-testing in Leenders et al. (2016) were established. The threshold level and supra threshold level was determined based on 50% and 70% of people, respectively, identifying the present scent when attention was directed toward the stimulus (Leenders et al., 2016). From Leenders et al.'s (2016) investigation, only the shoppers exposed to the supra threshold level evaluated the merchandise and store more favourably, spent more time shopping, increased the amount spent, made more unplanned purchases (self-reported) and generally had better moods. These findings support the Wundt curve theory, the inverted U-shape of scent pleasantness (Spangenberg et al., 1996) in that, if the intensity of the scent is too low than the scent cannot be perceived as pleasant. Also in line with these effects is recent priming research suggesting that the primed stimulus should not be too obvious to achieve a priming effect (e.g. Loersch & Payne, 2011; Stockli et al., 2016). Thus, to prime healthier food choices, ambient scent intensity should be strong enough to be perceived but not too obvious that a priming effect cannot be achieved.

Furthermore, if a scent is too intense, activation of System 2 processing may encourage greater elaboration by the shopper to try and figure out where the scent is coming from and what is causing it (Leenders et al., 2016). As in information processing theory, when System 2 is activated greater cognitive processing rather than emotional processing may be activated (Kahneman, 2003). Therefore, the subtle nudge from the primed ambient scent on shopper emotions and responses will be ineffective.

2.4.1.3 Ambient scent (in)congruity effects

In the integrative framework of store atmospheric effects (Figure 2), ambient scent needs to fit or be congruent with the products sold to influence healthier food choices. Previous retail studies have demonstrated the positive effect congruent ambient scents can have on thematically congruent product categories (e.g. Douce, Poels, Janssens, & De Backer, 2013; Parsons, 2009; Spangenberg et al., 2006). For example, an ambient scent congruent with gender-based products encourages greater purchasing of those products than when incongruent gender-based scents were present (Spangenberg et al., 2006). Similarly, the presence of an ambient chocolate scent in a bookstore positively influences purchasing of thematically congruent books compared to no scent (Douce et al., 2013). These retail studies show the importance of selecting an ambient scent that is thematically congruent with the target product category.

Studies in the food domain focused on ambient food scent priming show support for the scent-congruency behaviour relationship. A number of studies show that less healthy food scents drive approach behaviours toward less healthy foods (e.g. Chambaron et al., 2015; Fedoroff et al., 1997; 2003; Ferriday & Brunstrom, 2008). For example, exposure to the ambient scent of pizza (e.g. Fedoroff et al., 1997; 2003; Ferriday & Brunstrom, 2008), cookies (e.g. Fedoroff et al., 2003) or ‘pain au chocolate’ (Chambaron et al., 2015) caused consumption of, appetite for (liking, desire to eat and craving), and/or selection of targeted less healthy food items in comparison to no scent. Gaillet-Torrent et al. (2014) and Gaillet et al. (2013) also find that a non-consciously perceived ambient fruit scent (pear or melon) influenced participants to select more of the fruit or vegetable options on a menu, in comparison to those exposed to no scent. These studies show that priming effects are specific to the food cue and provide some evidence that healthier food scents could potentially lead to healthier food choices.

Furthermore, a series of studies failed to find significant congruency effects on in-store purchasing behaviour (e.g. De Wijk & Zijstra, 2012; McGrath, Aronow, & Shotwell, 2016; Schifferstein & Blok, 2002; Ward et al., 2007). The failed scent-congruency-behaviour relationships could be attributed to the lack of an association between the primed concept and the product category (Schifferstein & Blok, 2002). As in spreading activation theory (Collin & Loftus, 1975), these associative links need to be salient to activate behaviour change. For example, Holland and colleagues (2005) showed that mere exposure to an ambient scent of an all-purpose cleaner heightened accessibility of the behavioural concept of cleaning and encouraged actual performance of cleaning. As evident in this example, and as suggested by Schifferstein and Blok (2002), the ambient scent needs to prompt the correct associations and these associations need to trigger shopper desire for the product, if anticipated behaviours are to be achieved. Ambient scent congruency is therefore important for influencing purchasing of thematically congruent products in retail stores, but clear associative links between the primed concept and product category are needed to ensure approach behaviours toward healthier foods are influenced.

The fit between the ambient scent, the store environment and the products sold is also important for encouraging healthier food choice behaviours, as suggested by the integrative framework. If an ambient scent is dispersed into a store such as a supermarket that already has a naturally occurring ambient scent, the new scent needs to work well and fit (be congruent) with the pre-existing scents to elicit positive shopper response (Leenders et al., 2016). Leenders et al. (2016) introduced a melon scent alongside pre-existing scents and managed to increase the amount spent on groceries. A melon scent would not have seemed out of place in a supermarket if perceived by a shopper, as fruits and vegetables are products found within a supermarket. Similarly, shoppers exposed to a lavender scent in a flower shop purchased more than shoppers in the no-scent condition (Jacob et al., 2014). Even though lavender was not available for purchase in the flower shop it was still similar to the products sold and therefore congruent with the store type and product offering. Furthermore, in a normally non-scented store, Parsons (2009) found that shopping behaviour was enhanced when the ambient scent was appropriate to the store and associated with the products sold. When pleasant ambient scents were non-associated, negative effects occurred (Parsons, 2009). From these studies, it is obvious that ambient scent needs to be congruent with the store environment as well as the products sold. A direct relationship between the products sold and the scent type is unnecessary (as lavender was not sold in the flower store), but the ambient scent needs to be appropriate and associated to the products and the store (congruent) in some way.

If the ambient scent does not align with the retail environment and products sold, shopper attention may move again from System 1 processing to System 2. An incongruent ambient scent in a supermarket such as burning rubber could be distracting and confusing for the shopper, pulling their attention away from the task at hand. Exposure to an incongruent scent could encourage shoppers to try and figure out where the information is coming from and what is causing it (Leenders et al., 2016). As in the integrative framework, an ambient scent that is congruent with the supermarket and the products is more likely to influence shopper food purchasing behaviour.

2.4.2 Olfactory summary

Overall, it is clear that an ambient scent needs to be present, pleasant and congruent to its specific context to encourage positive approach behaviours such as increased purchasing and congruent food choice. These three aspects are important for the succeeding investigations. Strong links between the primed concept and the congruent foods are needed to ensure target healthier foods are selected, as highlighted by the integrative framework. The ambient food priming studies in the food domain show potential for a healthier food scent to influence healthier food choices, yet further investigation of the relationship is needed. Overall, no known study has examined the influence of ambient scent on shopper healthy food choices in a supermarket context, but the relationship seems fruitful.

2.5 Auditory dimension

Auditory atmospherics are cues used by people to perceive an environment. In the case of the supermarket, ambient music and ambient sound will be the focus of the auditory atmospheric discussion, as these stimuli have been shown to influence purchasing decisions, food choice and consumption (Spence & Shankar, 2010). Ambient music and ambient sound are the two stimuli represented under auditory store atmospherics in the integrative framework of store atmospheric effects (Figure 2). Auditory atmospherics show potential for influencing shopper internal responses and in turn their food choice. The first stimulus, ambient music will be discussed followed by ambient sound.

2.5.1 Ambient music

Ambient music can be referred to as “commercial” music, music used by a business to either enhance business activities or to generate money (Radocy & Boyle, 2012). Ambient music is a powerful stimulus that surrounds shoppers, requiring no deliberate attention to be paid (Jain & Bagdare, 2011). It enters through the ears in an uncontrollable manner (Jain & Bagdare, 2011) where it can influence affective, attitudinal, perceptual, temporal, and behavioural responses (see Garlin & Owen, 2006 for a meta-analysis review). Ambient music has been shown to influence shoppers even when they are not consciously aware of it (e.g. Milliman, 1982). Due to the ease with which ambient music can be manipulated and at a relatively inexpensive rate (Demoulin, 2011; Vida, Obadia & Kunz, 2007), it has become one of the most investigated atmospheric variables (Demoulin, 2011; see Turley & Milliman, 2000 for a review).

Ambient music is largely used in commercial settings to create a positive experience for the shopper and influence what they spend (Radocy & Boyle, 2012). In past studies, the presence of ambient music has been shown to significantly influence sales (Andersson, Krislenson, Wastlund, & Gustafsson, 2012; Areni & Kim, 1993; Jacob, 2006; Jacob, Gueguen, Boulbry, & Sami, 2009; Knoferle, Spangenberg, Herrmann, & Landwehr, 2012; Milliman, 1982; North, Hargreaves, & McKendrick, 1999), food choices (Yeoh & North, 2010; Zellner et al., 2017), consumption (Stroebele & Castro, 2004; Wilson, 2003), desire to return to the restaurant (North & Hargreaves, 1996), satisfaction (Morrison et al., 2011), pleasure (Sweeny & Wyber, 2002), arousal (Andersson et al., 2012; Sweeny & Wyber, 2002), evaluations (Grewal, Baber, Levy, & Voss, 2003;

Mattila & Wirtz, 2001), perceived wait time (Hui, Dube, & Chebat, 1997), and length of time spent within an environment (Andersson et al., 2012; Caldwell & Hibbert, 2002; Eroglu, Machleit, & Chebat, 2005; Jacob, 2006; Le Guellec, Gueguen, Jacob, & Pascual, 2007; Milliman, 1986; Vida et al., 2007; Yalch & Spangenberg, 2000). The integrative framework shows these are the shopper internal responses and behaviours that ambient music has been shown to effect.

2.5.1.1 Definition of ambient music

In retail environments, there are two types of music, foreground and background. Background music can typically be any type of music so long as it is at a low, unobtrusive volume where it does not actively grab shopper attention but is still loud enough to have a desired effect (Radocy & Boyle, 2012). Background music has been shown to directly influence behaviour (Herrington & Capella, 1994), but it needs to fit with the context of the store, its image and the products sold to encourage favourable responses (Jacob et al., 2009). Foreground music is the opposite of background music, requiring a greater level of attention from the shopper to the task at hand (Yalch & Spangenberg, 1990).

Ambient music may be characterised in terms of its structural components (Herrington & Capella, 1994) or time, pitch and texture (Bruner, 1990), and non-structural (Alpert & Alpert, 1990), affective components (Herrington & Capella, 1994) or preference, familiarity, and style (Jain & Bagdare, 2011). Time includes aspects such as rhythm (patterns of accents given to beats or notes in a song), tempo (speed or rate at which a rhythm progresses) and phrasing (length of time a note sounds) (Bruner, 1990). Pitch consists of melody (succession of notes overtime throughout a song), mode (series of notes, arranged in a scale of ascending pitch) and harmony (notes played simultaneously) (Bruner, 1990). Texture was described in terms of timbre (distinctiveness in tone), orchestration (art of weaving together unique sonic properties of multiple instruments) and volume (loudness) (Bruner, 1990). The non-structural or affective components refer to the meaning the listener assigns to the music (Herrington & Capella, 1994), in relation to their emotions, moods and preferences (Jain & Bagdare, 2011). Music volume, tempo, mode, preference, familiarity and style are the only known components of ambient music that have been studied in retail research. To help show how ambient music influence shopper behaviour, as suggested by the integrative framework (Figure 2), each of the musical components will be discussed.

2.5.1.2 Volume of ambient music effects

Musical loudness, a structural component of ambient music, has been investigated in a number of environments such as supermarkets (e.g., Herrington & Capella, 1996; Smith & Curnow, 1966), laboratories (e.g., Kellaris & Rice, 1993), bars (e.g. Gueguen et al., 2004), and restaurants (e.g., Sullivan, 2002). The results from these studies are mixed. For example, Smith and Curnow (1966) found that shoppers spent less time and money when the music was played at an uncomfortable level in a supermarket, whereas Herrington and Capella (1996) found no influence of soft or loud music on time or money spent in a supermarket. In Herrington and Capella’s (1996) study, the supermarket manager set the volume levels as minimum (soft) and maximum (loud) for what s/he believed to be acceptable for shoppers. The study did not mention the decibel levels but it is unlikely that the loud was uncomfortable, as the volume was set at an acceptable level for the shopper. To minimise avoidance behaviours, ambient music should not be uncomfortable, it should be played at a pleasant comfortable level if healthier food choices are to be influenced.

The volume of the music needs to be appropriate for the store type (congruent) to ensure approach behaviours are established. For example, patrons in two bars purchased more drinks when the music was louder than its usual loudness (Gueguen et al., 2004). On the other hand, Sullivan (2002) found that patrons of a restaurant spent less on food and drink when music was louder versus softer. Also, in a supermarket people spent less time when the music was too loud (Smith & Curnow, 1966). The different environmental contexts (e.g., supermarket, bar, and restaurant) could explain the disparities between these studies. Loud ambient music could add to the atmosphere of the bar, but could detract from the atmosphere of a restaurant or supermarket. Plus, amount spent and more drinks purchased are not the same measure, making it difficult to directly compare results. Taken together, the loudness of ambient music should therefore be at a comfortable level to minimise potential avoidance behaviours by shoppers, and the volume should be appropriate (congruent) with the context to elicit approach behaviours.

The effects of musical loudness differ by sex (Kellaris & Rice, 1993) and age (D’Astous, 2000; Yalch & Spangenberg, 1990) of the listener. For example, females engaged more positively with softer music and males more positively with louder music (Kellaris & Rice, 1993). Younger people (50 years and under) considered foreground music more desirable (Yalch & Spangenberg, 1990) and older people found it displeasing (D'Astous, 2000). Individual differences are important to consider when designing soundscapes. To minimise negative effects in the supermarket environment, lower levels of ambient music should be set, as older shoppers (50 years plus) are part of the key demographic for supermarkets especially in aging populations such as New Zealand. The influence of musical loudness on shopper food choice is currently unknown.

2.5.1.3 Tempo of ambient music

Musical tempo, another structural component of ambient music, has been shown to influence shopper approach and avoidance behaviours across a number of contexts (e.g., Ding & Lin, 2012; Eroglu et al., 2005; Knoferle et al., 2012; Milliman, 1982; 1986). Slow tempo music within a supermarket (Milliman, 1982), a mall (Eroglu et al., 2005), a department store (Knoferle et al., 2012), and a restaurant (Milliman, 1986; Caldwell & Hibbert, 2002) led to higher sales (Milliman, 1982; Caldwell & Hibbert, 2002; Knoferle et al., 2012), extended browse time (Eroglu et al., 2005), additional orders of food and/or drink (Caldwell & Hibbert, 2002; Milliman, 1986), and longer time spent in the environment (Milliman, 1986; Caldwell & Hibbert, 2002). Fast tempo music encouraged lower sales figures (Milliman, 1982; Knoferle et al., 2012), shorter browse time (Eroglu et al., 2005; Knoferle et al., 2012), and shorter visits (Milliman, 1986; Caldwell & Hibbert, 2002). Herrington and Capella (1996) find no significant effect of tempo on purchasing in a supermarket environment. They attribute the effects found to the preference (liking) for the music (Herrington & Capella, 1996). Knoferle et al. (2012) on the other hand, attribute it to mode of the music: a minor mode (an underlying tonal structure; see section 2.5.1.1 for a definition). Structural and non-structural components such as mode and preference should further be considered when investigating ambient music tempo.

To focus on a purchase context relative to healthier purchasing and musical tempo, a study by Ding and Lin (2012) showed that fast tempo background music lead to higher arousal in an online shopping context. The fast tempo music enhanced pleasure and purchase intent, but only for hedonic products such as video games and beer as opposed to utilitarian products such as household appliances and health drinks. The fast tempo music was presumed to hinder choices of utilitarian products and was not recommended in environments that sold utilitarian products (Ding & Lin, 2012). A supermarket is an environment that sells utilitarian products. Healthier products are typically considered more utilitarian (Wansink, Van Ittersum, & Painter, 2004). Therefore, fast music could potentially hinder choices of healthier products. The influence of music tempo in the context of the supermarket and its influence on shopper healthy food choices are currently unknown. With limited insight from previous studies, ambient music in food environments could be further explored by identifying what represents a health-related ambient music tempo and then testing it's impact on healthier food choices. Overall, these studies show that ambient music tempo could influence approach behaviours in-store. This fits well within the suggested framework of Figure 2.

2.5.1.4 Preference and familiarity of ambient music

Two non-structural or affective components of ambient music, preference (liking) and familiarity, were shown to influence affective, cognitive, and approach and avoidance responses (e.g., Caldwell & Hibbert, 2002; Herrington & Capella, 1996; Vida et al., 2007; Yalch & Spangenberg, 2000) such as time spent in-store (Vida et al., 2007; Yalch & Spangenberg, 2000), product evaluations (Kantono, Hamid, Shepherd, Yoo, Grazioli, & Carr, 2016; Yalch & Spangenberg, 2000) and arousal (Yalch & Spangenberg, 2000). For example, shoppers with unlimited shopping time shopped longer when listening to familiar music compared to unfamiliar music, and shoppers reported increased arousal and more favourable product evaluations when music was familiar compared to unfamiliar (Yalch & Spangenberg, 2000). In the context of food choice, Kantono et al. (2016) also found that when music was liked or neutral (versus disliked), pleasantness ratings for chocolate gelati increased (decreased). These studies show the potential of music preference and familiarity to influence shopper internal responses and behaviour. If positive responses are constructed through liking for or familiarity of the music, it could lead to more favourable evaluations of the product and in turn, potentially influence food choice behaviours. Future studies could investigate preference for or familiarity of the music as a moderator or mediator on the relationship between health-related ambient music and healthier food choices. As for studies in this thesis, familiarity and preference of music should be controlled for.

2.5.1.5 Ambient music style (in)congruity

The ambient music style, also referred to as genre or format, has had the greatest influence on retail sales (North et al., 2016) and food choice (e.g. North et al., 1999; Yeoh & North, 2010; Zellner et al., 2017). The fit (congruity) of the music to the store, and the retail image or the product offering can drive purchasing, food choice, and consumption behaviour (e.g., Areni & Kim, 1993; Jacob, 2006; Jacob et al., 2009; Leguellec et al., 2007; North et al., 1999; North, Shilcock, & Hargreaves, 2003; Vida et al., 2007; Wilson, 2003; Yeoh & North, 2010; Zellner et al., 2017). These effects are seen in high-end supermarkets (Vida et al., 2007), in the laboratory (e.g., Yeoh & North, 2010), at a bar (e.g., Jacob, 2006), in a typical supermarket (e.g., North et al., 1999), a wine store (e.g., Areni & Kim, 1993), a flower shop (e.g., Jacob et al., 2009), a candy store (e.g. Leguellec et al., 2007), a dining hall (Zellner et al., 2017), and restaurants (e.g., North et al., 2003; Wilson, 2003). To influence shopper healthy food choices, thus, consideration should be given to the impact of ambient music style.

Auditory priming and spreading activation could explain the above observed effects. Auditory primes may activate concepts (North et al., 2016) and knowledge structures (Spence & Shankar, 2010) across related semantic networks in memory (North et al., 2016), guiding shoppers toward certain products (e.g., Jacob et al., 2009). Past research has assumed the relationship between priming, evoking concepts, spreading activation, and positive shopper behaviours (e.g., Jacob et al., 2006; Jacob et al., 2009; Le Guellec et al., 2007) but had never tested the relationships. For example, Jacob et al. (2009) played love songs and romantic music in a flower shop to prime associations of love and affection, leading shoppers to spend more on flowers. Similarly, Jacob (2006) played drinking songs in a bar to prime positive feelings such as conviviality and festivity to encourage patrons to stay longer and consume more alcohol. In the Le Guellec et al. (2007) study, cartoon songs played in a candy store resulted in significantly more time-spent in-store compared to no music or top-forty's music. These studies help to show that if ambient music primes the concept of healthfulness a semantic network of interconnected nodes could guide shoppers toward healthier foods, as outlined in the integrative framework.

Focusing on auditory food cues (ambient music related to food) and food selection specifically, North et al. (2016) found that country specific ambient music encouraged greater recall and selection of foods from the same country compared to when another country's music was played. North et al. (1999), Yeoh and North (2010) and Zellner et al. (2017) support this finding. French music versus German music played above a wine display in a supermarket led to higher sales of French wine (versus German wine), and vice versa (North et al., 1999). Malay music (versus Indian music) encouraged selection of Malay foods (versus Indian foods) (Yeoh & North, 2010). Italian and Spanish music in a university-dining hall primed students and staff to select foods congruent with the music (Zellner et al., 2017). Ethnic congruency of the music with the food did not influence liking for the food, only choice (Zellner et al., 2017). These studies demonstrate the impact auditory food cue priming has on the selection of congruent foods. These further supports the notion that primed ambient music related to food could evoke the concept of "healthfulness" through spreading activation (Collins & Loftus, 1975). The heightened accessibility could lead to desire for and approach of congruent healthier foods, as per the integrative framework (Figure 2).

The ambient music style also needs to be appropriate for the store type (congruent) to ensure approach behaviours are established. For example, classical music versus top-forty's in a wine store primed shoppers to purchase greater quantities of the congruent, more expensive wines (Areni & Kim, 1993). Similarly, participants exposed to classical music versus easy listening or no music was willing to pay more for congruent products (North et al., 2016). Furthermore, classical music in a restaurant encouraged greater overall purchasing (North et al., 2003). In Wilson's (2003) study, a slightly different result surfaced. Classical music compared to pop or jazz discouraged patrons from remaining in a restaurant until late and decreased the amount spent on alcoholic drinks (Wilson, 2003). These studies show the context dependent nature of ambient music. Classical music may evoke past experiences and encourage customers to infer an upmarket, sophisticated or prestige image (Areni & Kim, 1993; North et al., 2003; North et al., 2016) but if this does not fit (incongruent) with the product category or store environment, as could be the case in the Wilson (2003) study, then desired behaviour may not follow. The congruency of the ambient music style with a supermarket environment is therefore important in encouraging approach behaviours toward healthier foods.

Furthermore, the congruity of the ambient music does not always influence purchasing and food choice. For example, a replicated study of North et al. (1999) in a wine store focusing on French, Spanish, Australian and South African music found no significant effect of music on purchasing behaviour (e.g. Hume, Dodd, & Grigg, 2003). Yeoh and North (2010) suggest that, music congruity effects seem to only work for participants who do not have prior reasoning to favour one option over another. For example, in Yeoh and North (2010), Malay and Indian people seemed to have predetermined preferences for their own foods, as the music did not affect their choices. Chinese people, on the other hand, who might have had no prior reasoning to favour one item over another (Malay or Indian food), were significantly influenced by the congruency of the music (Yeoh & North, 2010). Furthermore, Zellner et al. (2017) suggests that even when pre-existing preferences are evident, music can act as a prime to influence choice — but only when the target food is not completely novel. These contextual and individual differences therefore have the potential to drive inconsistent findings between auditory priming studies and the cue congruency argument. These differences need to be considered when nudging shoppers toward healthier food choices.

2.5.2 Ambient sound

The use of ambient music and its influence on shopper decision-making and food choice is well documented in comparison to ambient sound. Ambient sound was identified by Bitner (1992) as one of the environmental dimensions that could potentially influence behaviour through internal responses (cognitive, affective and physiological), as outlined in the integrative framework of store atmospheric effects (Figure 2).

2.5.2.1 Definition of ambient sound

Ambient sound can be categories into two types, the first being unplanned, incidental, unintended ambient background noise within the store environment (Hynes & Manson, 2016; Raab, Zemke, Hertzman, & Singh, 2013) such as customers talking, checkouts beeping, tills closing, and children crying (Haynes & Manson, 2016). The second type of ambient sound is in the form of soundtracks, such as nature sounds (e.g., bird song) as used in a retail study by Spendrup, Hunter, and Isgren (2016) or the sound of sizzling bacon or farmyard noises as reported in Spence, Shankar, and Blumenthal (2011). The key differentiation between the two is the control retail managers have over the ambient sound. The ambient noise created by people is difficult for retail managers to control (Hynes & Manson, 2016) whereas a soundtrack is easier for the retailer to have control over. The intensity of ambient sound can be measured in decibels, and the effects from the ambient sounds are contextually bound to the atmosphere of the store, similar to ambient music (Raab et al., 2013; Spendrup et al., 2016).

2.5.2.2 Ambient sound effects

Few studies in the retail literature have contemplated the effects of ambient sound on shoppers and their internal behaviours with the exception of Hynes & Manson (2016) and Spendrup et al. (2016). Those studies completed focused on different types of ambient sound and used different methodologies such as a semi-structured intercept interview near the checkouts in two supermarkets with customers, staff and store managers (Hynes & Manson, 2016), and an experiment in a supermarket manipulating a carrot display in the fruit and vegetable department with one of three information signs (e.g., eat more carrots, eat more organic carrots, or eat more climate friendly carrots; Spendrup et al., 2016). Even though the studies differ, some insights into the effects of ambient sound in retail environments are provided.

Hynes and Manson (2016) show that ambient noise can impact upon shopper emotional responses. The majority of shoppers neutrally or negatively reacted to machine noises in conjunction with recorded sounds. An example given by a shopper in the study was that the noises made them feel neither comfortable nor uncomfortable (Hynes & Manson, 2016). Human sounds, on the other hand, only generated negative reactions from shoppers such as irritation, and on the whole, shoppers were unaware of the influence of sound on their mood (Hynes & Manson, 2016). Moreover, Spendrup et al. (2016) find that nature sounds (birdsong soundtrack) did not impact shopper emotional connectedness to nature or influence their moods. The nature sounds did, however, impact willingness to buy sustainable foods (Spendrup et al., 2016). The influence was gender specific, only finding significant results for men's willingness to buy organic foods increased in the presence of nature sounds (Spendrup et al., 2016). These studies do suggest that ambient noise in a supermarket context can impact negatively upon shopper moods in comparison to ambient soundtracks. Further studies are, however, needed to draw conclusions about the influences of ambient sound on purchasing behaviour and food choice in retail environments. The identification of health-related ambient noise need to be considered first before examination of the ambient sound-health behaviour relationship is further explored. Overall, based on these studies, ambient noise should be kept to a minimum during testing in this thesis.

To further the understanding of ambient sound on food choices, soundtracks used in a consumption context are outlined. Spence et al. (2011) reported that soundtracks influenced people's perceptions of food. Two sound tracks were played to forty people while they tasted two scoops of bacon and egg flavoured ice cream (Spence et al., 2009). The first soundtrack played was 'bacon sizzling in a pan' and the second 'clucking sounds of farmyard chickens' (Spence et al., 2011). Participants exposed to the sizzling bacon soundtrack rated the ice cream as tasting more like bacon than the ice cream sample when the clucking sounds of farmyard chickens' soundtrack was playing (Spence et al., 2011). Both scoops of ice cream were identical in flavour. Though this study was in a food consumption context and outside of the retail environment, it shows the ability of background ambient sounds to influence peoples' perceptions toward a food. Positive perceptions can potentially lead to food purchasing, as outlined in the integrative framework. This study in conjunction with Spendrup et al. (2016) shows that there may be some potential for the use of soundtracks in-store to influence behaviour, but further exploration into the appropriate types for a retail store environment are required first.

2.5.3 Auditory summary

To minimise negative effects of ambient music on shopper behaviour, uncomfortable volumes should be avoided. Research shows that ambient music should be present, pleasant and congruent to influence approach behaviours. Overall, structural (volume, tempo) and non-structural components of ambient music (preference, familiarity and style) warrant further investigation, as they have been shown to influence approach and avoidance behaviours, and have the ability to construct meaning for individuals (Alpert & Alpert, 1990; Herrington & Capella, 1994; Jain & Bagdare, 2011). If positive food perceptions and more favourable product evaluations can be achieved through greater preference and familiarity of the music (e.g., Kantono et al., 2016; Yalch & Spangenberg, 2000) and shoppers can be influenced to select target product categories due to auditory priming and congruent musical style (e.g., Jacob et al., 2009; North et al., 2016; Spence & Shankar, 2010), then shoppers could potentially be primed to make healthier food choices. The influence of ambient music on shopper healthy food choices in a supermarket context is currently unknown.

If ambient music primes a health-relevant concept activating a semantic network of interconnected nodes (i.e., spreading activation theory, Collins & Loftus, 1975), the heightened accessibility will help to nudge shoppers toward healthier foods (i.e., situated inference model, Loersch & Payne, 2011), nudge priming (Wilson et al., 2016) and congruency theory (Bone & Ellen, 1990). The impact of auditory food cue priming to nudge selection of congruent foods is promising. Furthermore, the influence of ambient sound on food choice is largely unknown. However, irritating ambient noise should be minimised to ensure avoidance behaviours do not ensue. Soundtracks — if congruent to the concept of health — may evoke approach behaviours to healthier foods.

2.6 Tactile dimension

Ambient temperature and textures and materials are represented under tactile store atmospherics in the integrative framework (Figure 2). Tactile atmospherics have been shown to influence shoppers and their behaviours. The first stimulus, ambient temperature will be discussed followed by textures and materials.

2.6.1 Ambient temperature

Previous research has conceptualised the influence of ambient temperature on shopper behaviour (Baker et al., 1992; Bitner, 1992; Kotler, 1973, Mehrabian & Russell, 1974), however, it tends to not go beyond thermal comfort, emotions and intent to purchase in a store (D'Astous, 2000, Decre & Pras, 2013). There is little evidence for the impact of ambient temperature on food choice within a retail store, despite ambient temperature being an ever-present atmospheric stimulus (Hadi, 2014). Ambient temperature and its effect on shopper purchasing behaviour remain largely under-researched (Spence et al., 2014).

2.6.1.1 Definition of ambient temperature

An ambient temperature as classified by Kotler (1973) is experienced through the sense of touch. It was categorised under air quality within the ambient section of Baker's (1986) typology, along with humidity and circulation/ventilation. The typology suggests that when ambient temperature exceeds an acceptable range it becomes noticeable by the shopper (Baker et al., 1992). This acceptable range varies from person to person (Humphreys & Hancock, 2007), from male to female (D'Astous, 2000) and appears to be largely reliant on the environments people are regularly exposed to, e.g. climate and/or office environment (De Dear & Brager, 1998).

Some suggestions are provided by the literature as to the thermal comfort level for a store. De Dear and Brager (1998) found that when heating, ventilation, and air conditioning (HVAC) systems were used, occupants of buildings were comfortable between 22°C and 24°C. Anything outside of this temperature was less tolerated, except for in summer and winter when a slightly cooler environment and a slightly warmer temperature, respectively, are usually preferred (De Dear & Brager, 1998). Decre and Pras (2013) on the other hand, suggest the comfortable range for ambient temperatures in a retail store are from 20°C to 23.3°C, moving to 19°C with warm clothing on and 25.5°C with light clothing on. This study focused on perceived warmth not actual warmth. The level of activity within the store could further determine thermal comfort. Supermarket shopping is a relatively low level activity. Cheema and Patrick (2012) suggest that an optimal comfort level is 22.2°C, which allows for more automatic tasks to be completed such as food shopping. Thus, the thermal comfort level for a store is between 19°C and 25.5°C depending on the time of year, the type of clothing worn by the shopper and the level of activity within the store.

2.6.1.2 Ambient temperature effects

A comfortable ambient temperature is needed to ensure emotional and physiological responses remain stable and subsequent approach behaviours are enhanced, as suggested by the integrative framework (Figure 2). A store that is too hot or too cold can create an uncomfortable atmosphere (Heide & Gronhaug, 2006). Women were found to become more irritated then men when the temperature was too hot (D'Astous, 2000). For the shopper, if a temperature becomes too hot or too cold (thermal stress) the body self-regulates internal temperature through automatic physiological responses such as sweating, increased blood flow or shivering (Cheema & Patrick, 2012). Thus, to ensure shoppers are nudged toward purchasing healthier foods, ambient temperature must be comfortable (not too hot or too cold) to minimise activation of physiological responses such as sweating or shivering that could lead to avoidance tendencies within the store.

In addition to thermal comfort, the ambient temperature can be manipulated within acceptable levels to influence behaviours, as in the integrative framework (Figure 2). If a retailer requires a shopper to heuristically (versus systematically) process information, then a warmer (cooler) temperature should be implemented in-store (Cheema & Patrick, 2012). Decre and Pras (2013) also find that environments perceived to be warmer (versus cooler) had more positive reactions from shoppers, as such environments appeared to be more relaxing, stimulating, and a place shoppers would like to spend money. In the food consumption literature, a warm (versus cool) environment was shown to decrease (increase) food consumption (e.g. Stroebele & Castro, 2004; Wansink, 2004). In a cooler environment people feel cool, so they consume more to warm up. Also, when temperatures are warmer, people tend to consume lighter meals such as salads compared to when it is cooler, where warmer foods such as soups tend to be eaten (Roy Morgan Research, 2010). Support from Hadi (2014) shows that more cognitive processing and preference for healthier food was linked to warmer ambient temperatures, whereas more affective based processing and preference for less healthy food was associated with colder ambient temperatures. In the context of a supermarket, a warmer ambient temperature could, thus, lead to greater purchasing of healthier foods. The ambient temperatures for a food store should be observed and recorded first before testing these effects on food choice.

2.6.2 Textures and materials

Textures and materials are design elements categorised within Baker's (1986) typology and can be interpreted as softness and smoothness under the tactile dimension of Kotler's (1973) store atmospherics. Textures and materials within the store environment consist of plush carpets, wooden shelving, glass cabinets, and plastic tables, grass covered displays and so on. There is limited research completed on the impact these textures and materials have on shopper internal responses and behaviours. These design elements, however, can communicate symbolic meaning, create an overall aesthetic impression (Bitner, 1992; Heide & Gronhaug, 2006), influence product evaluations (Meyers-levy, Zhu, & Jiang, 2010), as well as provide functional benefits (Harris, 2015; Parterre flooring system, 2017) for the retailer.

2.6.2.1 Textures and material effects

Textures and materials can communicate symbolic meaning for the shopper. For example, Soar (2009) finds that grass covered displays are associated with the countryside, and Kerfoot, Davis, & Ward (2003) find that wooden flooring and hangers are associated with naturalness and quality. If symbolic meaning is created through textures and materials, this could lead to shoppers inferring an environment to be healthier through the textures and materials utilised. A recommendation by flooring experts to put wooden floors in natural food sections of a store (Parterre flooring systems, 2017) claims that wood flooring is appropriate and associated with naturalness and natural foods. To create meaning, textures and materials can be used that are congruent with the products and the environment.

Furthermore, wooden tables are often used to tempt shoppers to touch items, increasing likelihood of purchase (Soar, 2009). In the Clark et al. (2012) study, wooden shelving attracts shoppers more to displayed clothing as opposed to metal shelving, as wood is a lot warmer, with metal seeming clinical, and rendering the clothing less attractive. The use of different textures and materials to create symbolic meaning could be used to influence shoppers to make healthier food choices, as per the integrative framework (Figure 2). If shoppers perceive the store to be healthier due to the textures and materials used, this could possibly lead to healthier food choices being made, as aided by spreading activation theory (Collins &Loftus, 1975) and congruency theory (Bone & Ellen, 1990). Further investigation into the types of textures and materials is needed.

Furthermore, flooring textures provide functionality such as ease of transportation and cleanliness when the flooring type is hard (Harris, 2015). Vinyl flooring in supermarkets is claimed to allow for resistance against heavy food traffic (Parterre flooring system, 2017). The flooring of the store can also provide comfort for the shopper. Soft flooring as opposed to hard provides a greater level of comfort for shoppers (Meyer-Levy et al., 2010). Aside from the functional benefits of flooring, flooring textures provide subtle messages about the retailing offer (Spence, 2015). For example, Meyer-Levy et al. (2010) found that flooring type can influence shopper bodily sensations and in turn influence reactions to products. Interestingly, these effects were still evident even with participants were wearing shoes. Thus, flooring texture in a supermarket may not only provide functional benefits, but also influence shopper judgments of products through associated bodily sensations. Further investigation into the types of flooring and the effects on shoppers and their behaviours is needed. An observation of current textures and materials used by food retailers would aid in this process.

2.6.3 Tactile summary

In summary, ambient temperature should be comfortable for the shopper — not too hot, not too cold — to ensure approach behaviours are not hindered. Ambient temperature level and the influence on food choice warrant further investigation. In the context of the supermarket, it is difficult to predict whether a cooler or warmer store environment would nudge shoppers to purchase healthier foods. A warmer environment could potentially deplete cognitive resources, leading to greater reliance on System 1 processing (e.g. Cheema & Patrick, 2012). This, in combination with insights from consumption research, which shows that warmer temperatures suppress food intake and influence selection of lighter foods, could transfer to a supermarket environment. Healthier choices made in slightly warmer ambient temperatures are possible. Further investigation of its potential is needed.

Furthermore, textures and materials show functional benefits for the retailer plus provide subtle messages to the shopper. Symbolic meaning such as association to nature, countryside, and healthfulness could be generated through the use of textures and materials, but again further insights need to be generated. The influence of ambient temperature, textures and materials on shopper food choice in a supermarket environment has not yet been investigated.

2.7 Visual dimension

Vision is an important sense that dominates in the retail environment (Hecht & Reiner, 2009). It guides shoppers purchasing decisions and helps them to find what they are searching for. Kotler (1973) refers to visual atmospherics as involving colour, brightness, size and shape within the retail store. Ambient lighting and colour have attracted the most research among retailers and retail researchers (e.g. Areni & Kim, 1993; Babin et al., 2003; Barli, Aktan, Bilgili, & Dane, 2012; Bellizzi, Crowley, & Hasty, 1983; Biswas et al., 2017; Crowley, 1993; Decre & Pras, 2013; Summer & Herbert, 2001) and therefore will be the focus of this discussion. Wall imagery — a relatively under-studied store atmospheric — has been added to the discussion, as the neuroscience, marketing, advertising, and nutrition literature demonstrate possibilities of imagery to influence food choices. Each of these stimuli (ambient lighting, colour and wall imagery) shows potential for influencing shopper internal responses and in turn food choice behaviour, as illustrated by the integrative framework (Figure 2).

2.7.1 Ambient lighting

A wide variety of lighting options are available to retailers when designing store environments (see Rae, 1999 for an extensive list). Ambient lighting is typically installed to facilitate the shopping process and is experienced through the sense of sight (Kotler, 1973). It entices shoppers into the store (Rae, 1999; Summer & Herbert, 2001), enables goods to be easily examined and purchased (Rae, 1999), and adds to the overall ambience of the store environment (Custers, De Kort, Ijsselsteijn, & De Kruiff, 2010; Kotler, 1973). To create ambiance within the store environment, ambient lighting is the prominent form of lighting used (e.g., Areni & Kim, 1993; Park & Farr, 2007; Quartier, Vanrie, & Cleempoel, 2014). Ambient lighting offers a general level of luminance throughout the entire store and is also referred to as general lighting (Rae, 1999). Even though the importance of lighting in the store environment has been generally acknowledged, there is little empirical research to help substantiate these claims (e.g., Custers et al., 2010; Park & Farr, 2007; Quartier et al., 2014; Summer & Hebert, 2001).

2.7.1.1 Definition of ambient lighting

Lighting may be characterised in terms of its luminance level (brightness versus softness) and correlated colour temperature (cool versus warm; Decre & Pras, 2013). When lighting luminance in the store environment is bright, ambient lighting luminance is higher (Decre & Pras, 2013) and when ambient lighting levels are low, lighting luminance is softer. Lighting luminance is expressed in lux (lx) (Decre & Pras, 2013) and ranges from low (30 to 300 lx) to high (500 to 1000 lx) depending on the store image (Rae, 1999). The correlated colour temperature (CCT) refers to the colour appearance of the light and it is measured by degrees (K) (Parr & Farr, 2007). When the light appears orange-yellow this is considered warm (2700 to 3000K), when the light appears white this is considered neutral (3500K to 4000K), and when the light appears blue-white this is considered cool (40000K or higher; Park & Farr, 2007). Different correlated colour temperatures (CCT) are used depending on the target market and store concept (Rae, 1999). For example, low levels of luminance and orange-yellow lighting are usually associated with high-end stores, whereas high levels of luminance and blue-white lighting are usually associated with the low-end mass-merchandising stores (Rae, 1999).

2.7.1.2 Ambient lighting effects

Ambient lighting can influence shopper internal responses and in turn their behaviours, as outlined in the integrative framework of store atmospheric effects (Figure 2). In past studies, bright lighting has been shown to positively influence examination of merchandise (Areni & Kim, 1993; Summer & Herbert, 2001), arousal levels (Park & Farr, 2007), visual clarity (Park & Farr, 2007), approach intentions (Park & Farr, 2007), perceptions of the store (Decre & Pras, 2013), purchase intentions (Decre & Pras, 2013), food choice (Biswas et al., 2017), consumption (Wansink & Van Ittersum, 2012), and also time spent dining (Wansink & van Ittersum, 2012). Soft or dim lighting, on the other hand, has positively influenced purchasing (Barli et al., 2012), amount of time spent in different departments (Barli et al., 2012), perceived merchandise and service quality (Baker et al., 1994), consumer comfort (Wansink, 2004), and store image (Baker et al., 1994; Barli et al., 2012). Dim lighting also decreases consumption of food (e.g., Wansink, 2004), and inhibits examination and handling (e.g., Areni & Kim, 1993). Furthermore, when there is no lighting people consumed more and larger portions than those who could see the food (Scheibehenne, Todd, & Wansink, 2010). These studies demonstrate the variety of effects that can stem from the use of bright or dim lighting in different retail, service, and laboratory environments. To influence approach behaviours and to predict effects, congruity of the ambient light with the store environment and products needs to be considered.

2.7.1.3 Ambient lighting (in)congruity effects

The above studies can be explained by congruency theory (e.g., Bone & Ellen, 1990). Bright, cool lighting is appropriate for stores where products need to be examined and handled, such as electronic stores, bookstores and sporting goods stores (Park & Farr, 2007), whereas warm coloured lighting is more appropriate for gift boutiques, high-end clothing stores and luxury spas (Park & Farr, 2007). Soft, dim lighting in a department store (e.g., Barli et al., 2012) or a wine store (Areni & Kim, 1993) is appropriate for creating an upmarket image but not so appropriate for a hardware store (e.g. Summer & Herbert, 2001), a book store, a furniture store or a jean store (e.g., Decre & Pras, 2013) unless this is the image they are going for. In a fast food restaurant, bright ambient lighting and loud music accelerate food consumption and decrease time spent dining compared to dim lighting and soft music (Wansink & Van Ittersum, 2012). Bright ambient lighting and loud music is appropriate when profit is reliant on faster dining speeds, whereas in a restaurant where consumers go to have a leisurely meal or on a date, dim lighting is more appropriate. Such light makes people feel more comfortable, less self-conscious and less inhibited during consumption (Wansink, 2004). A range of ages view and handle merchandise in a supermarket environment. Older shoppers tend to have difficulty with dimmer lighting levels (Park & Farr, 2007). Therefore, dim lighting for a supermarket is likely to be inappropriate. A supermarket trying to create an upmarket image could have dimmer lighting but not too dim. Ambient lighting can influence approach behaviours, as suggested by the integrative framework (Figure 2), but congruency between the ambient lighting, store environment and products sold is needed.

Furthermore, a pioneering study by Biswas et al. (2017) was the first to examine the link between ambient lighting and food choice for healthy versus unhealthy foods. From five experiments, Biswas et al. (2017) discovered that greater preference for healthier foods is associated with brightly lit environments as found in both the laboratory and at a restaurant. The bright lighting increased mental alertness and nudged consumers toward selecting healthier options and in some cases fewer calories (Biswas et al., 2017). This study helps to show the possibilities of using store atmospheric stimuli to prime shoppers to make healthier food choices in the laboratory and in consumption environments. It is not yet known whether ambient lighting can influence supermarket shoppers at the point of purchase where no consumption takes place. Further investigation of ambient lighting in retail purchasing environments is needed.

2.7.2 Colour

Colour is not only about aesthetics but it also carries meaning (Elliot & Maier, 2012). Colour stimuli can convey two types of meaning — embodied meaning and referential meaning (Labrecque, Patrick & Milne, 2013). Embodied meaning is independent of the context, based on biological responses, and is related to semantic concepts (Labrecque et al., 2013). Biological responses are evident at birth and are important to survival and understanding (Labrecque et al., 2013). Referential meaning is dependent on the context, is based on learned associations, and is related to peoples' semantic associations or real-world concepts attached to the colour stimuli (Labrecque et al., 2013). Over time, people encounter pairings between colour and messages, experiences, and concepts in different situations (Elliot, Maier, Moller, Friedman, & Meinhardt, 2007). Associations created by the pairings become stronger as people are repeatedly exposed to the stimuli (Elliot et al., 2007). For example, someone who frequently visits PAK'nSAVE (a national retail chain in New Zealand) may perceive the prominent yellow colour as being associated with cheap foods and money savings, as this is congruent with the store image and product offering. The colour pairing develops the more the person interacts with that store environment. These colour pairings and associations are of interest to encourage healthier food choices. Activation of colour associations through priming can influence human affect, cognition and behaviour outside of consciousness and via automatic response's (Elliot et al., 2007). This is in line with the integrative framework of store atmospheric effects. Priming a particular colour associated with health-relevant concepts or a schema can lead to affect on shopper cognitions and behaviours, likely at a non-conscious automatic level.

The influence of colour has been widely investigated (Bellizzi et al., 1983), yet a greater deal of focus is needed in the retail context. Currently there are only a handful of studies (e.g., Babin et al., 2003; Barli et al., 2012; Bellizzi et al., 1983; Bellizzi & Hite, 1992; Crowley, 1993) that specifically focus on the effect of colour within store environments. These studies demonstrate the influence of colours on sales (e.g., Barli et al., 2012), purchase intentions (e.g., Babin et al., 2003; Barli et al., 2012; Bellizzi & Hite, 1992), time spent in-store (e.g., Barli et al., 2012), evaluations of the store, the merchandise within it (e.g., Barli et al., 2012; Bellizzi et al., 1983; Crowley, 1993), patronage levels (e.g., Babin et al., 2003), and attention (e.g., Bellizzi et al., 1983). Other studies have demonstrated colour's influence on emotions (e.g., Hemphill, 1996; Kaya & Epps, 2004; Valdez & Mehrabian, 1994) and food choice (Strobele & De Castro, 2004). As in the integrative framework (Figure 2), these are the shopper internal responses and behaviours that colour has been shown to effect.

2.7.2.1 Definition of colour

Colour may be characterised in terms of "hue" (wavelength), "value" (brightness) and "chroma" (saturation; Kaya & Epps, 2004; Valdez & Mehrabian, 1994). Hue is an attribute of a colour that enables distinction from one colour to the next (e.g. blue from green, red from yellow; Kaya & Epps, 2004). There are ten hues in total, five principle hues (red, yellow, green, blue and purple) and five intermediate hues (yellow-red, green-yellow, blue-green, purple-blue and red-purple; Kaya & Epps, 2004). Hues may be ordered from long (red) to short (violet/purple) wavelengths (Crowley, 1993) and are sometimes referred to in terms of temperature, for instance, warm or cool in relation to the dominant wavelength of the colour (Kaya & Epps, 2004). Value is another attribute of colour and refers to the overall intensity of how light or dark the colour is in relation to white or black (Kaya & Epps, 2004). Chroma is also an attribute of colour and refers to the strength of the hue in terms of its degree of purity or vividness (Kaya & Epps, 2004). For example, colours that are less saturated contain a higher amount of grey, making the colour look diluted in comparison to the highly saturated hue, where the colour is pure and solid (Crowley, 1993; Kaya & Epps, 2004).

2.7.2.2 Effects of environmental colour

Environmental colour within a store has been shown to influence shopper emotions, evaluations and approach behaviours, as outlined in the integrative framework (Figure 2). In general, cool coloured environments have been evaluated as more favourable (e.g., Babin et al., 2003; Barli et al., 2012; Bellizzi et al., 1983; Crowley, 1993) in comparison to warm coloured environments (e.g., Babin et al., 2003; Crowley, 1993). For example, Bellizzi et al. (1983), cool coloured environments are generally perceived as pleasant, more attractive, positive and less tense than the warm environments. Despite this, participants are physically more attracted to the warm environments (Bellizzi et al., 1983). Crowley (1993) also indicates that evaluations of the store environment progressively become more positive as the wavelengths move from long (red) to short (blue). Furthermore, Bellizzi and Hite (1992) find that blue (cool) environments encourage greater spending, selection of more expensive goods, greater intentions to shop and more pleasant feelings in comparison to the red (warm) environments where lower average spend, greater avoidance tendencies and smaller selection of the most expensive goods are exhibited. Thus, cool coloured environments are likely to generate more positive emotions, evaluations and approach behaviours in a store environment.

Babin et al. (2003) and Barli et al. (2012) show support for this contention but instead manipulated both colour and lighting. Babin et al. (2003) find that cool coloured interiors (blue) are preferred over warm store interiors (orange), which increase patronage and purchase intentions. However, when the effects of lighting and colour are measured in combination, soft lighting with the environmental colour of orange becomes more favourable along with bright lighting and blue interiors (Babin et al., 2003). Similarly, Barli et al. (2012) finds that green departments (cool colour) significantly influence purchasing of goods, red departments (warm colour) have a negative influence on the time spent in the store, and blue departments (cool colour) allow for more favourable evaluations and higher purchase intentions. Orange and soft lighting have a positive effect on shopper perceptions of pricing, with pricing perceived to be of a higher fairness (Barli et al., 2012). In contrast, Crowley (1993) finds that red or blue colours are perceived as more attractive but do not necessarily influence favourable evaluations of the store or merchandise. As congruency theory suggests the environmental colour needs to fit with the store and the products sold. Further research on the effects of environmental colour on approach behaviours, as well as food choice in retail research, is needed. An observational study to investigate the types of colours used by health-focused retailers could provide initial evidence with a follow-on study to see whether the identified "more-healthy" colour can influence healthier food choices.

2.7.3 Wall imagery

Wall imagery as a store atmospheric cue can provide subtle messages to consumers about the place, the norms, the expectations and the behaviours (Bitner, 1992). Aside from the original incorporation of imagery as an atmospheric element (e.g., Baker & Cameron, 1996; Bitner 1992; Turley & Milliman, 2000), there has been limited research on retail imagery and its influence of shopper purchasing and food choice with the exception of Lee, Moon, Rhee, Cho, & Cho (2016), Papies & Hamstra (2010), and Stockli et al. (2016). The power of visual imagery on brain functioning, physiological responses and behaviours is demonstrated through advertising and marketing research (Fletcher, Pine, Woodbridge, & Nash, 2007; Forwood, Ahern, Hollands, & Ng, 2015; Kemps, Tiggemann, & Hollitt, 2014; Poor, Duhacheck, & Krishnan, 2013), neuroscience (Beaver, Lawrence, Ditzhuijzen, Davis, Woods, & Calder, 2006; Killgore, Young, Femia, Bogorodzki, Rogowska, & Yurgelun-Todd, 2003; Wang, Dong, Todd, Du, Yang, Lu, & Chen, 2016), and nutrition and health research (Buckland, Finlayson, Edge, & Hetherington, 2014; Kemps, Herman, Hollitt, Polivy, Prichard, & Tiggemann, 2016). These studies will be investigated further to outline how wall imagery can be used to influence shoppers' internal responses and behaviours, as outlined in the integrative framework of store atmospheric effects (Figure 2).

2.7.3.1 Wall imagery defined

Imagery is artwork or photographs on the walls (Bitner, 1992), which can attract attention, generate emotions, stimulate the senses or be perceived on a cognitive level (Edell & Staelin, 1983; Fisher, Du Rand, & Erasmus, 2012; Geise & Baden, 2015). Imagery carries messages that viewers decode and react to (Geise & Baden, 2015). Food images in particular include arrangements of aesthetically and artistically presented foods (Fisher et al., 2012). Wall imagery is the artwork of interest.

2.7.3.2 Impact of imagery

Previous research has shown that the use of imagery can influence shopper internal responses and behaviours, including spending (Lee et al., 2016), consumption volume

(Papies & Hamstra, 2010), and choice (Stockli et al., 2006). It is difficult to know whether food imagery or non-food imagery would be more appropriate for influencing food choice behaviour. Stockli et al. (2016) find that non-food health-orientated imagery primed healthier food choices. Similarly, Fishbach, Friedman, & Kruglanski, (2003) find that diet congruent imagery (e.g., magazines) and information, primed healthier food choices but so did unhealthy imagery and foods. The influence of food imagery priming on healthy food purchasing has not yet been demonstrated but shows great potential. Food imagery has been shown to increase accessibility of food related thoughts, heighten activation of areas in the brain, food cravings, hunger, negative affect (guilt), appetitive appeal, and motivation to eat (Bailey, 2015; Beaver et al., 2006; Fletcher et al., 2007; Kemps et al., 2014; Killgore et al., 2003; Nijs, Franken, & Muris, 2008). It is evident from these studies that both food imagery priming and non-food imagery priming show potential for influencing healthier food choices.

The above effects can be influenced by individual differences such as reward drive, restrained eating, being a female, or being overweight or obese (e.g., Beaver et al., 2006; Fletcher et al., 2007; Kemps et al., 2014; Papies & Veling, 2013; Wang et al., 2016). For example, individuals with increased reward drive show heightened activation in areas of the brain that could lead to eating disorders, motivational, and hedonic tendencies (Beaver et al., 2006). In the Wang et al. (2016) study, restrained eaters showed stronger attention bias, positive attitudes and less cognitive control toward high-calorie food images compared to unrestrained eaters. Furthermore, food cravings and negative affect were more prominent amongst dieters in a female-only sample (Fletcher et al., 2007). Also, desire to eat the promoted food increased in overweight and obese individuals compared to a student sample (Kemps et al., 2014). In contrast, Nijs et al. (2008) find that visual processing of imagery were indifferent between normal-weight and obese individuals. Results differ between individuals and need to be considered when investigating imagery. Individual barriers and facilitator to healthier food choices will be further discussed in section 2.9.

2.7.3.3 Imagery (in)congruity effect

To influence healthier food choice, imagery needs to fit or be congruent with the products sold, as the integrative framework shows. Previous studies reveal that congruent imagery as an environmental cue can influence purchasing and choice. For example, French-related visual cues in a bar, such as pictures of the Eiffel tower, French flag and cheese, increased expenditure on congruent wine as opposed to beer and whisky (Lee et al., 2016). Likewise, Fishbach et al. (2003) find that participants primed with exercise and dieting magazines and diet and nutrition flyers select apples over Twix bars more frequently (versus no prime). This prime activated dieting goals in participants, encouraging goal-congruent-behavioural choices (Fishbach et al., 2003). Furthermore, Stockli et al. (2016) show that health-evoking imagery in posters located near vending machines encouraged healthier food choices, and hedonically motivated images encouraged less healthy food choices. Associative links between imagery and diet, body-weight and/or health-relevant concepts drive the selection of healthier foods (Stockli et al., 2016). Imagery congruence is therefore important to prime associative links to health-relevant or diet-relevant concepts, as spreading activation theory suggests, driving purchase of congruent healthier foods.

In summary, imagery exposure has the potential to activate physiological, affective, cognitive, and behavioural tendencies in viewers. In some cases, populations with stronger eating motivations show heightened effects.

2.7.4 Visual summary

The use of bright or dim ambient lighting in retail stores has been shown to trigger a variety of effects. To influence approach behaviours and to predict effects, congruity of the ambient light with the store environment and products needs to be considered. Dim lighting is less appropriate for supermarkets where elderly purchase groceries. If an upmarket image is the objective for the retailer, a dimer light level could be installed but not too dim. In a normal everyday supermarket like PAK'nSAVE or Countdown (national supermarket chains in New Zealand) a brighter level of lighting should be used. The study by Biswas et al. (2017) shows the possibility of using ambient lighting to prime shoppers to make healthier food choices in consumption contexts. It is currently unknown whether ambient lighting can influence supermarket shoppers at the point of purchase, where little to no consumption takes place, but further investigation into health-related lighting levels could be the first step to shed light on this situation.

In terms of colour, engaging shopper referential colour meanings can help to prime colour associations with health-relevant concepts or schema to affect shopper cognition and behaviours, likely at a non-conscious, automatic level. Cool coloured environments in particular are likely to generate more positive emotions, evaluations and approach behaviours in the store environment. As congruency theory suggests, the environmental colour should fit with the store and the products sold. The influence of colour on healthy food choices in a retail environment has not yet been explored. However, further research exploring the types of environmental colours used by health-focused retailers could provide initial insights into this relationship.

Imagery exposure has, furthermore, shown potential to activate physiological, affective, cognitive and behavioural responses in viewers. Food imagery priming and non-food imagery priming both show potential for influencing healthier food choices. Some populations with strong eating motivations show heightened effects toward the food imagery priming. Individual differences should be considered when exploring the effects of imagery. Imagery congruence is important to prime associative links to health-relevant or diet-relevant concepts as spreading activation theory suggests, driving purchase of congruent healthier food. The influence of health-orientated wall imagery on shopper healthy food choices is yet to be established.

2.8 Store atmospheric summary

Overall, ambient scent, ambient music, ambient sound, ambient temperature, textures and materials, ambient lighting, environmental colour, and wall imagery need to be present, pleasant and congruent to the specific context to construct meaning for shoppers and encourage positive approach behaviours such as increased purchasing and congruent food choice. Strong associative links between the primed health-relevant concept and the congruent foods (healthier foods) are needed to ensure the target foods are selected. Nudge priming (Wilson et al., 2016), dual-processing models (Evans, 2008), spreading activation theory (Collins & Loftus, 1975), cue congruence (Bone & Ellen, 1990), the situated inference model (Loersch & Payne, 2011), and S-O-R model (Mehrabian & Russell, 1974) give support to these claims. To ensure store atmospherics influence shopper internal responses as predicted (Figure 2), barriers and facilitators of food choice needs to be aligned.

2.9 Barriers and facilitators of food choice

Barriers and facilitators of food choice fall under the organism part of the integrative framework (see Figure 2), and are key influences that shoppers carry with them. Such barriers and facilitators supersede individual effort to purchase and consume healthy foods. It is well established that food decisions are driven by a multitude of environmental influences (Larson & Story, 2009) and can be categorised as individual, social, physical, and/or macro-level. Individual factors consist of attitudes, preferences, biological make up, and demographic variables. Social factors include interactions with family, friends, peers, and others in the community and may be in the form of role modelling, social support, and social norms. Physical environmental factors consist of multiple settings in which people eat and purchase food, and include the availability and access to food. Macro-level factors consist of income and socioeconomic status, cultural norms and values, food marketing, and agricultural and food policy (Larson & Story, 2009). These factors operate as either barriers or facilitators of food choice. In order for an individual to have an internal response and purchase healthier foods, as proposed by the integrative framework, the barriers and facilitators must be aligned.

2.9.1 Individual barriers to healthier food choices

Individual factors such as a lack in one's own abilities to choose, prepare, and cook healthy foods are perceived as barriers to buying a healthier selection of products (Hollywood, Cuskelly, O-Brien, McConnon, Barnett, Raats, & Dean, 2013). Not knowing what is healthy (Hollywood et al., 2013; Pierre, Receueur, Macaulay, & Montour, 2007), not knowing whether to trust health claims on packaging (Hollywood et al., 2013), having difficulty understanding food labels (Hollywood et al., 2013; Pierre et al., 2007) and generally not knowing enough about healthy eating (Biloukha & Utermohlen, 2001) are all perceived to be barriers to choosing healthier food products. Garcia et al. (2010) find that students rely on fast or convenient foods because they lack the knowledge of what is healthy to purchase and how to prepare it. Parents mentioned that their lack of understanding for how to prepare nutritious meals hindered their children's ability to eat healthily (Pierre et al., 2007). Furthermore, some shoppers perceive their lack of cooking skills (Hollywood et al., 2013; McGee, Johnson, Yadrick, Richardson, Simpson, Gossett, Thornton, Johnson, & Bogle, 2011) or lack of confidence in cooking to be a barrier to conducting a healthful shop (Hollywood et al., 2013). Thus, shopper inability to choose, prepare and cook healthier foods could inhibit purchasing of healthier foods at the point of purchase.

Lack of self-control (e.g. Biloukha & Utermohlen, 2001), lack of will power (e.g. Kearney & McElhone, 1999; Michalidou, Christodoulides, & Toroua, 2012), current eating habits (e.g. Fedoroff et al., 1997; Fedoroff et al., 2003; Michaelidou, Christodoulides, & Torova, 2012), and trying to satisfy the needs of one-self (Hollywood et al., 2013) are shown to be barriers to healthier food choices. For example, shoppers who approached a shopping trip on an empty stomach purchased more impulsively due to wanting to satisfy the need for instant gratification rather than focusing on making healthier food choices (Hollywood et al., 2013). Restraint eaters (people who restrain themselves from eating) have increased sensitivity to food cues (Fedoroff et al., 1997; Fedoroff et al., 2003). An attentional bias toward the primed food hinders healthier food choices, at times (e.g. Fedoroff et al., 1997; Fedoroff et al., 2003). A lack of self-control, lack of will power, current eating habits and trying to satisfy the needs of others can inhibit the shopper from making healthier food choices.

Resistance to change was also perceived to be a barrier to making healthier food choices (Biloukha & Utermohlen, 2001; Kearney & McElhone, 1999). Resistance to change varies among countries and across education levels (Kearney & McElhone, 1999). For example, respondents with lower levels of education (primary-level) were found to mention resistance to change more than those with tertiary-level education (Kearney & McElhone, 1999). Also, respondents living in Ireland, Italy, The Netherlands and the United Kingdom were less likely to select ‘do not want to change’ as a barrier to healthy eating in comparison to those living in Austria, Belgium, Greece, Portugal and Luxembourg (Kearney & McElhone, 1999). However, resistance to change did not vary among genders or age groups, though students were found to be more likely to mention this as a barrier to making healthy food choices (Biloukha & Utermohlen, 2001). Thus, some people with lower education levels, people living in certain countries and students can be more prone to making less healthy food choices due to resistance to change.

Taste is one of the most important factors considered by individuals when purchasing or consuming food (Biloukha & Utermohlen, 2001; Lennernas, Fjellstrom, Becker, Giachetti, Schmitt, De Winter, & Kearney, 1997). Research suggests some consumers are reluctant to abandon preferred foods because healthy foods are boring and tasteless (Kearney & McElhone, 1999; Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007). Individuals who are highly driven by taste were found to have an overall poorer diet quality and lower consumption of fruits and vegetables (Kouroumotis et al., 2016). Taste therefore is a barrier to healthful purchasing. Taste can influence what people are buying in the store and therefore inhibit healthier food choices if healthier foods are perceived as less tasty.

Furthermore, the influence of emotion emerges as a barrier to healthy eating (Furst, Connors, Bisogni, Sobal, & Falk, 1996). Certain foods such as chocolate are chosen due to emotional cues, moods, feeling upset, being depressed or bored (Furst et al., 1996; Stevenson et al., 2007). In particular, mood swings were identified as causing occasional lapses in healthy eating (Furst et al., 1996). Therefore, mood states as a barrier to healthier purchasing should be considered when investigating healthy food choices.

In sum, people's ability to choose, prepare and cook healthy food, their nutritional knowledge, food literacy, self-control, will power, eating habits, satisfying one's needs, resistance to change, emotions, and taste can hinder shoppers from purchasing healthier foods and need to be considered when trying to influence shoppers to make healthier food choices.

2.9.2 Individual facilitators of healthier food choices

Individual intrinsic and extrinsic motivations and psychological factors can facilitate health behaviours. For example, intrinsic motivations such as losing weight, looking good, staying healthy and feeling better, motivated consumers to eat healthier and in some cases, moderate intake of less healthy foods (Glanz, Basil, Mairach, Goldberg, & Snyder, 1998; Michaelidou et al., 2012; Shepherd, Harden, Rees, Brunton, Garcia, Oliver, & Oakley, 2006; Steptoe, Pollard & Wardle, 1995). Extrinsic motivations such as medical issues were also shown to motivate consumers to eat healthier (Michaelidou et al., 2012). Michaelidou et al. (2012) find that intrinsic motivations predominately guide health behaviours. Psychological factors such as will power, eating habits and preference, and nutritional knowledge also motivate healthy eating and increase consumption of healthy foods (Michaelidou et al., 2012; Olsen, Menichelli, Sorheim, Naes, 2012; Yeh, Ickes, Lowenstein, Shuval, Ammerman, Farris, & Katz, 2008). Olsen et al. (2012) find that consumption of healthy convenience meals is shown to be dependent on the consumer's liking of the flavour, odour, texture and appearance of the food (Olsen et al., 2012). Each of these may act as a facilitator of healthier food choices and should be considered when influencing food choice.

2.9.3 Social barriers to healthier food choices

Social factors such as satisfying the needs of others, social pressure, and inconsistent messages from others can be barriers to purchasing healthier foods. Research clearly indicates that different food preferences and demands from family members can make it difficult for the grocery shopper to purchase ingredients for a healthier meal (Hollywood et al., 2013). It has been shown that recommendations from others, their purchasing behaviours, and the use of unhealthy foods in appealing ways has led to barriers to healthier food purchasing (Furst et al., 1996; Michaelidou et al., 2012; Pierre et al., 2007; Stevenson et al., 2007). Grandparents, husbands, other relatives, mothers, and friends were identified as negatively influencing purchasing through suggesting unhealthy foods, purchasing unhealthy foods, or making the purchaser feel guilty for not purchasing the unhealthy food (Pierre et al., 2007). Thus, the importance of others' preferences and social pressure can be barriers to healthier food choices.

In addition, Stevenson et al. (2007) find that teachers, parents, and peers make unhealthy snacks and fast foods socially rewarding. This can be inconsistent and contradictory to eating healthy messages, which can serve as a barrier to healthy food choices (Stevenson et al., 2007). The advice of experts can further confuse people. In two studies, it was identified that experts who keep changing their minds about what is and is not healthy was a barrier to healthy eating (Biloukha & Utermohlen, 2001; Kearney & McElhone, 1999). Inconsistent messaging can become a barrier to healthier food purchasing for some.

How important these social factors are to individuals needs to be considered when influencing people to make healthier food choices.

2.9.4 Social facilitators of healthier food choices

The influence of others can also be identified as a facilitator for healthier food choices. Females were seen to be the nutritional gatekeepers for their families with family health important to maintain (Yeh et al., 2008). Concerns about their children's health encouraged many mothers to make healthier purchases (Yeh et al., 2008). Children's preference for healthy products and parental nutritional knowledge enable healthier choices to be made by parents for their children (Pierre et al., 2007). When family members' preferences were for healthy food items such as vegetables, it encouraged purchasing and preparation of these types of foods (McGee et al., 2011). Furthermore, social support through the teaching of food preparation skills and providing healthful recipes and cookbooks was identified by participants in McGee et al. (2011) to motivate consumption of more healthful foods. Also, young people identified supportive parents and family members as helping them to make healthier food choices (Shepherd et al., 2006). Taken together, the role of supportive family members and preferences of others can act as a facilitator of healthier food choices. These are important factors to consider when influencing shoppers' purchasing decisions at the point of purchase.

2.9.5 Physical barriers to healthier food choices

Poor physical accessibility and availability of foods can also impact food choice and purchasing (Biloukha & Utermohlen, 2001; Larson & Story, 2009; Michaelidou et al., 2012; Pierre et al., 2007; Shepherd et al., 2006; Yeh et al., 2008). Research shows that the availability of foods may influence some people more than others when making food choices (Furst et al., 1996). For example, Hispanic immigrants to the USA found fruits and vegetables to be less accessible in comparison to their home country (Yeh et al., 2008). Inaccessibility to supermarkets also hinders consumption of fruits and vegetables for some, as the distance to the supermarket is too far and participants lack the economic resources (Yeh et al., 2008). Furthermore, low income, elderly and rural residents found the distance to the supermarket to be a significant barrier to purchasing healthful foods (McGee et al., 2011). On the other hand, only 7% of a European Union sample indicated access to healthy food to be a problem (Kearney & McElhone, 1999). Thus, the frequency and distance to healthier food stores can impact availability and access to healthier foods for some. If shoppers cannot access the right food it is difficult for them to make healthier food choices. As the integrative framework of store atmospheric effects shows, to influence healthier food choices accessibility of healthier foods needs to be ensured to minimise the barrier of poor availability.

Another barrier to purchasing healthier foods can be within the physical environment in which people shop. In-store promotions are an example of a store environmental barrier. Two-for-one promotions encourage greater purchasing and lead to faster consumption (Chandon & Wansink, 2002). Adding to this, the majority of promoted products in-store is unhealthy (Thornton, Cameron, McNaughton, Worsley, & Crawford, 2012), and when people are trying to save money it can be difficult to achieve a healthy shop (Hollywood et al., 2013). This is further supported by comments from participants of

Garcia et al.'s (2010) study, where advertising and marketing of unhealthy foods was considered a barrier to healthy eating. Shelf management tactics such as positioning foods at the checkouts, using off-locations displays, increased number of facings, and at eye level can create greater consideration and purchase for supermarket items (Bemmaor & Mouchoux, 1991; Chandon, Hutchinson, Bradlow, & Young, 2009; Sigurdsson, Saevarsson, & Foxall, 2009) such as less healthy foods. Furthermore, as mentioned by Drewnowski, Aggarwal, Hurvitz, Monsivais, and Moudon (2012), "healthier choice is not always the affordable choice" (p. 79). Thus, factors within a store environment should be considered when trying to influence healthier food choices. Marketing and advertising in-store focused on the promotion of unhealthy tempting foods should be minimised, especially promotions leading to increased attention of the product and stockpiling.

2.9.6 Physical facilitators of healthier food choices

In contrast to physical barriers, increased availability and accessibility to healthier foods and environments that promote health behaviours will help to facilitate healthier food purchasing. The buyers within a supermarket (the choice architects in nudging theory) determine the types of foods that will be available to the consumers. If a greater selection of healthful foods is available, then the opportunity to purchase healthier food is increased (Furst et al., 1996; Pierre et al., 2007; Shepherd et al., 2006). Accessibility of healthier food stores further facilitates the ability of individuals to be able to make healthier food choices. A study by Fiechtner, Kleinman, Melly, Sharifi, Marshall, Block, Cheng and Taveras (2016) finds that the closer the supermarket to the shopper, the more fruits and vegetables consumed. Having a means of transportation to the supermarket was also a facilitator in this process (Garcia et al., 2010). In terms of inside the physical environment, placement of products around the store (Sigurdsson, Larsen, & Gunnarsson, 2014) and lower pricing of healthier foods (McGee et al., 2011) can help to motive healthier purchasing. The availability and accessibility of healthier foods is important for ensuring healthier food choices are made. Factors within the store environment besides the manipulated store atmospherics need to be held constant to ensure healthier food choices are influenced.

2.9.7 Macro barriers on healthier food choices

Macro-level factors influence food choice more indirectly but are still powerful in dictating what people can eat and purchase (Larson & Story, 2009). Income, socio-economic status, cultural norms and values, agricultural and food policy are the macro-level factors that play a part in influencing food choice (Larson & Story, 2009). The poorer dietary quality and obesity levels associated with lower socio economic groups could be explained by economic barriers and limited time or resources available to purchase and prepare foods (Larson & Story, 2009). In New Zealand, adults and children living in the most deprived areas have the highest rates of obesity compared to other deprivation levels (Ministry of Health, 2013). The minimum adult wage in New Zealand is $4 below the living wage, making it difficult for families to afford the necessities (Mackenzie, 2017). The high cost of healthy foods in conjunction with low wages is one of the key barriers to making healthier decisions in-store (Hollywood et al., 2013; Piche & Garcia, 2001) especially on fruit and vegetable intake (Yeh et al., 2008). Those who can barely afford the basics consider fruit to be an extra (Yeh et al., 2008). Furthermore, people tend to compensate at certain times of the month by purchasing less healthy options to pay other more important household bills (Hollywood et al., 2013). An example of the high cost of healthier foods versus less healthy foods in New Zealand can be seen in the price of bread. Typically, a loaf of white bread costs $1.00 whereas the healthier wholegrain option costs between $3.50-$4.99 (see Countdown, n.d.). It is no wonder it is difficult for some families to make healthier food choices when minimum wages do not allow enough money to be made to cover basic living costs and when food prices are set high by the food industry.

A New Zealand study focusing on Pacific people found that obese (versus healthy weight) students typically came from households where shift work was a common form of employment (Teevale, Thomas, Scragg, Faeamani, & Nosa, 2010). Parents of these low-income large families were absent due to longer work hours (Teevale et al., 2010). Longer work hours or irregular work hours due to job demands make it difficult for individuals to find extra time to conduct a healthful shop and cook a healthy meal (Garcia et al., 2010; Hollywood et al., 2013). Evening meals were rare for these pacific families with obese children, and mothers regularly turned to takeaways after working long hours instead of cooking (Teevale et al., 2010). The impact of time constraint due to longer work hours is a key macro barrier to healthier food choices in New Zealand and should be considered when influencing healthier food choices.

Cultural factors in New Zealand did not drive food habits as much as structural factors, according to Teevele et al. (2010). In New Zealand food plays a massive part in gatherings especially among Pacific People (Toomath, 2016). But as shown in Teevale et al. (2010), cost and affordability are the main barriers for Pacific communities to purchase healthier foods. Practices within the agricultural industry can further impact healthier food choices. Caucasians were generally worried about the health effects of consuming fruit and vegetables that had been sprayed (Yeh et al., 2008). This further hinders consumption of some fruits and vegetables. Furthermore, food marketing such as the use of thin images of attractive individuals to promote unhealthy products can lead to inconsistent and contradictory messages that can lead to barriers to healthier food choices (Stevenson et al., 2007). Cultural, agricultural and food marketing are important to consider as potential barriers for food purchasing.

In sum, macro level factors can be highly influential on shoppers making purchases at the supermarket. The economic barriers such as job demands and minimum wage can create restrictions on time and money for individuals trying to make healthier food choices. Lack of time and money can lead to individuals seeking out quick and convenient foods. Cultural factors, agricultural and food marketing play a further role in influencing New Zealander food choices at the point of purchase. Each of these barriers needs to be considered when influencing shopper food choices.

2.9.8 Macro facilitators of healthier food choice

Controlling food price through increasing the cost of unhealthy foods or decreasing the cost of healthier foods might help in facilitating healthier food choices. Shepherd et al. (2006) finds that if the cost of healthy snacks is reduced, participants indicate this will facilitate healthier food choices. In addition, the introduction of a sugar tax to decrease purchasing and consumption of sugary drinks has shown success so far. The government of Mexico introduced a sugar tax for sodas, flavoured waters, teas, sweetened dairies, energy drinks with added sugar in 2014 (Colchero, Guerrero-Lopez, Molina, & Rivera, 2016). A reduction in sales was shown from the implementation of this sugar sweetened beverage tax, along with a related increase in water sales (Colchero et al., 2016). Furthermore, removing the Goods and Services Tax (GST) from fruits and vegetables led to increases in consumption of fruits and vegetables in a New Zealand study (Mhurchu et al., 2010). If governments implement pricing changes, this could aid in the reduction or increased consumption of less healthy foods and healthy foods respectively. Furthermore, governmental policies that encourage more sustainable work hours for families so that health and wellbeing can be prioritised accordingly also might help facilitate healthier food choices (Teeval et al., 2010) through greater time to prepare and shop for healthier foods. The use of pricing to facilitate healthier food choices shows positive rewards for health behaviours. These strategies are not currently implemented in New Zealand but could potentially lead to healthier food choices. On the whole, macro-level factors are thus clearly important for indirectly influencing health behaviours.

2.9.9 A summary of barriers and facilitators to food choice

In summary, environmental factors such as individual, social, physical and macro-level have been identified as both facilitators and barriers of food choice, which are key influences that shoppers carry with them when making food choice decisions. Each of these factors fit into the integrative framework of store atmospheric effects on food purchasing behaviour (Figure 2). The barriers and facilitators need to align for shoppers to have an internal response and in turn, be positively nudged to approach and purchase healthier foods. Next shopper internal responses are discussed, to demonstrate how they interact with the barriers and facilitators and store atmospheric primes, to produce outcomes in the form of approach behaviours toward healthier foods.

2.10 Shopper internal response

The integrative framework (see Figure 2) shows that internal responses are those responses from the shopper (the organism, in S-O-R) to a combination of externally influencing factors (the stimuli), in this case store atmospheric primes and environmental influences (barriers and facilitators in Figure 2). These internal responses come in the form of emotions, cognitions and physiological states. To positively influence healthier food purchasing behaviour, store atmospheric primes need to be driving shoppers to consider health-relevant concepts and purchasing healthier foods but also, the barriers and facilitators need to align to enable these health behaviours.

Emotional responses in the form of pleasure, arousal and dominance (PAD) can be derived from exposure to a store environment (Donovan & Rossiter, 1982; Kotler, 1973; Mehrabian & Russell, 1974) and can in turn influence behavioural responses such as the shopper's willingness to approach or avoid healthier foods. As mentioned, the influence of emotions can be both a barrier and a facilitator of healthier food choices (Furst et al., 1996; Gardner, Wansink, Kim & Park, 2014). For example, individuals in negative moods prefer indulgent foods as opposed to individuals in positive moods, who prefer healthier foods (Gardner et al., 2014). However, arousal can moderate the effect of the positive mood on resistance to less healthy foods (Fedorikhin & Patrick, 2010). As Fedorikhin and Patrick (2010) find high levels of arousal lead to less healthy food choices when combined with positive moods. Thus, to nudge shoppers toward making healthier food choices, store atmospheric primes can be used to evoke more positive emotions such as pleasure (Eroglu, Machleit & Davis, 2003) at baseline levels of arousal (Fedorikhin & Patrick, 2010), in turn providing shoppers the means to make healthier food choices.

The store environment can also influence shopper cognitive responses including attention, perceptions, categorisation, and information processing (Lam, 2001) and can subsequently influence behavioural responses such as approach behaviours toward healthier foods (Biswas et al., 2017; Stockli et al., 2016). To ensure healthier choices are made, the barriers and facilitators need to align to enable the correct internal response from the shopper. For example, if greater selection of healthful foods were available in the supermarket, shoppers then have the opportunity to pay more attention to these foods when primed by store atmospherics. The opportunity to purchase a healthier food increases (decreases) when the foods are (are not) available (Biloukha & Utermohlen, 2001; Furst et al., 1996; Pierre et al., 2007; Shepherd et al., 2006). As shoppers navigate a store their attention is pulled from one object to the next, demanding sense making of the environment to take place (Loersch & Payne, 2011). The accessibility of health relevant information is achieved when internal responses such as attention are paid to the store atmospheric primes. When incoming information from the external environment is misattributed by the shopper to their own internal response (their own thoughts) this is when the information is more likely to be used to inform decisions and subsequent behaviours (Loersch & Payne, 2011). Therefore, healthier food choices are nudged due to the alignment of accessibility of the food, the more-healthy store atmospheric prime, and internal responses (attention, information processing, perception, evaluation) from the shopper to the stimulus, as an example.

Physiological responses in the form of comfort, blood pressure, pulse rate, and salvia production are also another internal response that shoppers can experience when exposed to store atmospheric stimuli (Lam, 2001; Proserpio et al., 2017). For example, ambient food scents have been shown to prepare the body for intake (e.g. increase saliva production), inducing desires and food cravings for congruent products and categories (Proserpio et al., 2017; Ramaekers, Boesveldt, Lakemond, Van Boekel, & Luning, 2014); this internal response can be hindered by a person's income. If an individual is on low wages, they can still desire or crave the food, but it may not lead to healthier food choices, as low wages have been associated as a key macro barrier to making healthier decisions in-store (Hollywood et al., 2013; Piche & Garcia, 2001). Thus, the barriers and facilitators can dictate whether the effect of the store atmospheric prime will be successful or not. More-healthy store atmospheric primes need to align with barriers and facilitators of food choice, to influence shopper internal responses and in turn healthier food choices.

2.11 Propositions

Based on the foregoing discussion of the literature, it is clear that store atmospheric stimuli can act as cue to prime health-relevant concepts that can nudge shoppers toward healthier food choices via heuristic, System 1 information processing. Exposure to a prime influences shopper judgement, motivation and behaviour (Loersch & Payne, 2011). The priming stimulus needs to be congruent with health-relevant concepts to effectively influence shopper food choices (Stockli et al., 2016). Stronger connections between the cue and concept (based on previous experience and associations built in memory) determine the strength of activation in memory (Dijksterhuis, Aarts, Bargh, & Knippenberg, 2000). As spreading activation theory (e.g. Collins & Loftus, 1975) suggests, a neural network of interconnected nodes becomes activated in memory and can lead to a number of priming effects such the selection of congruent target foods, in this case healthier foods. Therefore, the following propositions to guide the work of this thesis are as follows:

> ***P1**: Exposure to pleasant ambient scent associated with health-relevant concepts will encourage shoppers to make healthier food choices. This*

relationship will be stronger when integrated with other health-oriented store atmospheric stimuli.

***P2**: Exposure to ambient background music associated with health-relevant concepts will encourage shoppers to make healthier food choices. This relationship will be stronger when integrated with other health-oriented store atmospheric stimuli.*

***P3**: Exposure to ambient temperature associated with health-relevant concepts will encourage shoppers to make healthier food choices. This relationship will be stronger when integrated with other health-oriented store atmospheric stimuli.*

***P4**: Exposure to texture or material associated with health-relevant concepts will encourage shoppers to make healthier food choices. This relationship will be stronger when integrated with other health-oriented store atmospheric stimuli.*

***P5**: Exposure to ambient lighting associated with health-relevant concepts will encourage shoppers to make healthier food choices. This relationship will be stronger when integrated with other health-oriented store atmospheric stimuli.*

***P6**: Exposure to prominent environmental colour associated with health relevant concepts will encourage shoppers to select healthier products. This relationship will be stronger when integrated with other health-oriented store atmospheric stimuli.*

***P7**: Exposure to food imagery associated with health relevant concepts will encourage shoppers to make healthier food choices. This relationship will be stronger when integrated with other health-oriented store atmospheric stimuli.*

2.12 Conclusion

An integrative framework of store atmospheric effects on food choice was developed and discussed in this chapter to consider (1) the potential of store atmospherics to influence purchasing behaviour, (2) the lack of research on store atmospherics and food choice behaviour in particular, and (3) potential insights offered by food, nutrition, marketing, and retail literature. The chapter outlined the gaps in the literature and provides some overarching propositions to guide the studies in this thesis. Further refinement of the propositions will be detailed in Chapter four (hypothesis development) once exploratory research (Chapter three) has been completed.

The integrative framework of store atmospheric effects on shopper food purchasing (Figure 2) detailed in this chapter guided the discussion of literature and will enact the same guidance throughout the thesis. The framework helped organise research on store atmospherics (olfactory, auditory, tactile and visual stimuli), cognitive psychology, environmental psychology, social psychology, neuroscience, marketing, advertising, and research in the nutrition, health and the food domain, considering how external (environmental) and internal (shopper) cues influence shopper food purchasing behaviour. The framework established store atmospherics as a sensory cue that could be used to nudge shoppers toward healthier food choices at the non-conscious level.

The previous success of nudge priming to change health behaviours highlights the potential of nudge priming store atmospheric to influence healthier food choices. The nudge acts as a prime, a cue, or a reminder for the shopper making health relevant information more salient without providing other incentives such as price discounting. It also can increase appetite or feelings of pleasure and arousal. Targeting shoppers via System 1 (the less demanding heuristic system) will help in nudging shoppers toward healthier foods. Thus, the integrative framework (Figure 2) suggests that nudge priming shoppers with store atmospheric stimuli to make health relevant information more accessible will allow for information to be used in an easier and less cognitively depleting manner.

To ensure priming effects are established, previous literature suggests that the prime must be present in a way that is not too obvious to the shopper and will be misattributed to his or her own internal response, as per the situated inference model (Loersch & Payne, 2011). The use of store atmospherics as primes to activate health-relevant concepts via an activated neural network of already established interconnected nodes is plausible, as per spreading activation theory (Collins & Loftus, 1975), and may lead to a number of priming effects. Store atmospherics as a prime might therefore direct shopper attention toward relevant judgements, goals or behaviours within the store environment.

Congruity is an important aspect of the relationship needed to influence health behaviours. Congruity of the store atmospherics to health-relevant concepts, products and the store is important for encouraging healthier food choices. The congruent atmospheric stimulus helps to create and activate positive associations and concepts in memory that can positively influence evaluations and purchase of congruent foods. To ensure store atmospheric stimuli influence shopper food choices as predicted, congruence between the stimuli, the environment, the primed concept, and the product is needed to achieve more fluent processing by the shopper. In sum, store atmospherics that are present, pleasant and congruent will help with ensuring the priming is successful in nudging behaviour change in supermarkets.

Store atmospheric stimuli such as ambient scent, ambient music, ambient sound, ambient temperature, textures and materials, ambient lighting, colours and wall imagery all show potential for influencing healthier food choices in a supermarket context. The impact of store atmospherics on healthier food choices in a supermarket context is currently unknown, but if healthier store atmospheric primes could nudge shoppers to think about and approach healthier foods at the non-conscious level via System 1, this might prove to be more effective than current methods. Further exploration into each of the stimuli is needed to determine the most appropriate for influencing food choice behaviour. To establish appropriate stimuli for testing in a laboratory experiment (Chapter five), an exploratory observational study into the differences between store atmospheric stimuli used in healthier and less healthy store environments will be undertaken in the next chapter (Chapter three).

Chapter 3: An exploratory observational study of store atmospheric stimuli used by food retailers in New Zealand

3.1 Introduction

While the previous chapter provided a theoretical background and a framework of the relationship between atmospheric stimuli and food choice behaviour, this chapter presents Study 1 to further explore how retailers currently employ store atmospheric stimuli. The exploratory observational work in Study 1 sets out to identify the atmospheric stimuli present in more- versus less-healthy food retailers. Details and ethical consideration of the field observation in Study 1 are provided, followed by a justification for the selection of the methods and measures, and insights into the study's research procedure. The chapter concludes with research findings, discussion, and a critique of the strengths and limitations of Study 1.

3.2 Research question and objective

The following research question guides the selection of the method and measures, and the presentation and discussion of findings for Study 1.

RQ1: Which store atmospherics represent a healthier store environment?

In Study 1, aimed to identify differences between store atmospheric stimuli that are currently present in New Zealand food retailers and are associated with more- versus less-healthy food environments. Further research questions will be addressed in subsequent chapters.

3.3 Research design and justification

From the literature review (Chapter 2), it is evident that there is a lack of theoretical guidance around store atmospheric stimuli and how retailers might use these to encourage healthier food choices. To better understand this relationship, an important initial step is to observe what is currently employed within the marketplace. This is key, as store atmospheric stimuli have communicative power. They can construct and communicate meaning for the shopper, as highlighted in the literature review (Chapter 2). If store atmospheric cues have the ability to communicate different meaning, store atmospherics in a health-orientated store should, therefore, communicate meanings related to health. As Ward et al. (1992) highlights, “consumers rely on external and internal environmental cues to categorize (and thus make inferences about) the products and services offered by retailers” (p. 195). Thus, it is assumed that more-healthy food stores would have different store atmospheric stimuli (e.g. internal and external environmental cues) from less-healthy food stores. The observation of more-healthy and less-healthy food store environments in Study 1 thus allows for the development of a comprehensive set of atmospheric stimuli that represent both more- and less-healthy food stores within New Zealand.

Physically observing store atmospheric stimuli in retail stores is not a new method of investigation; Parsons (2011) successfully implemented this method to gain insights into sensory stimuli components that were being used to create store atmospheres. Though Parsons (2011) did not use this method to distinguish between more- versus less-healthy food store environments, the method provides insights into different sensory stimuli components appropriate for this investigation.

Study 1 employs a semi-structured observational approach utilising both subjective human senses and objective measurement devices in natural settings. Before selecting a semi-structured approach, unstructured and structured approaches were taken into consideration. Boote and Mathews (1999) suggested that unstructured observation is typically used in the earlier stages of research (prior to hypothesis development). The current study research question emerges at the early stages of work in the retail literature, but not so early that there is no guidance in the literature. For instance, a pre-existing classification of store atmospherics (e.g., olfactory, auditory, tactile and visual, Kotler, 1973) was identified in the previous chapter enabling guidance to satisfy the research objective. Completely unstructured observations are thus unwarranted with this pre-existing classification. If purely structured observation were utilised, a strictly defined classification system would have been implemented to dictate what to observe, record, and analyse (Gilbert & Churchill, 1999). A drawback of structured observation, however, is that new and additional information cannot be added. Important information might have been missed. A semi-structured approach thereby incorporates the best of both structured and unstructured methodologies. Biases are reduced and reliability increased via the structured approach (Gilbert & Churchill, 1999) and a higher level of validity achieved from the unstructured approach, with new and relevant information added where necessary (Gilbert & Churchill, 1999).

After selecting a semi-structured approach, disguised observation was considered, but rejected. Disguising oneself is generally employed to ensure the observed behaviour is naturalistic (Dodd, Clarke, & Kirkup, 1998). The focal point of this observational study was not shopper behaviour or staff action, however, but the presence and the level of store atmospheric stimuli (Parsons, 2011). Observations in a natural setting can enable realistic data to be collected, as opposed to a contrived or isolated setting. A contrived setting such as the laboratory does not meet Study 1's objectives to investigate store atmospherics employed in physical stores within the New Zealand marketplace.

To ensure carrying out observations of the retail environments were the correct method to apply, the following six criteria adapted from Boote and Mathews (1999) and McDaniel and Gates (2010) needs to be met:

(1) The phenomenon under investigation needs to be easily observable.

(2) The phenomenon under investigation needs to occur at a subconscious level.

(3) The consumers under investigation needs to be either unable or unwilling to communicate directly with the researcher.

(4) The phenomenon under investigation needs to be a social process or a mass activity.

(5) The phenomenon under investigation needs to be repetitive, frequent, or in some manner predictable.

(6) The phenomenon under investigation needs to be of a relatively short duration.

Store atmospheric stimuli (the phenomenon) were easily observable (criteria 1). Even though store atmospherics are known for their non-conscious influence on shoppers (e.g. Knoferle et al., 2012; North et al., 2016; Yalch & Spangenberg, 2000) (criteria 2), they are not "non-conscious" themselves and can still be directly observed and measured (Parsons, 2011) (criteria 1). Store atmospheric stimuli are designed to be sensed (Parsons, 2011) and can be consciously processed, if required (criteria 1). Store atmospherics are unable to be verbally communicated (criteria 3) but can be measured. Retail environments do not operate without store atmospherics and therefore a pattern of activity can be investigated across the environments, and at scale (criteria 4). Instead of waiting for an event to happen, stores can be visited anytime during opening hours and the stimuli observed; this predictability and frequency allows the researcher ample time to observe and record the atmospheric stimuli (criteria 5). Due to the relatively small size of retail food environments in New Zealand, it would take no longer than an hour to navigate a store when no purchasing decisions are involved. This amount of time is fairly short, making observational data collection practical (criteria 6). Having met the criterion for observations, it seems practical and applicable that this method should be used to help answer the research question of which store atmospherics are representative of a healthier store environment.

3.4 Ethical considerations

Observations undertaken in Study 1 were concentrated on the store environment only. Information was not personally identifying. Shoppers, staff or anyone else in the store was not part of the investigation and therefore ethics approval was not required (personal communication, AUTEC). Management within stores granted consent verbally to undertake the manual, video and audio-recorded observations.

3.5 Research procedure and justification

3.5.1 Store selection criteria

Before field observations in Study 1 could begin, the researcher constructed five criteria to assist with store selection (Parsons, 2011). First, the stores needed to be representative of either a more- or less-healthy food store environment (*criteria one*), a food retailing store or food and beverage service as defined by the Australian and New Zealand Standard Industrial Classification (Statistics New Zealand, 2006) (*criteria two*), located in diverse areas within New Zealand as defined by The New Zealand Deprivation Index (NZDep) (Atkinson, Salmond, & Crampton, 2014) (*criteria three*), permission needed to be granted from store management to conduct the observations (*criteria four*), and if the same stimuli were continually being identified, a range of store environments were sought to produce further insights (*criteria five*).

To classify a store as more- or less-healthy, criteria for the tick system developed by the New Zealand Heart Foundation was adopted (e.g. Heart Foundation Tick, 2016). The tick programme helps New Zealanders make healthier food choices at the point of purchase (Heart Foundation Tick, 2016). Each product in the programme receives a tick by meeting the nutrient criteria set out by the Foundation (Heart Foundation Tick, 2016). The programme is regularly reviewed by an independent group of food, nutrition and health experts and aims to reduce consumption of unhealthy fats, salt, energy, and sugar, and to increase consumption of fibre, calcium, and nutritious key ingredients (Heart Foundation Tick, 2016). There are two categories of ticks within the programme, two-ticks and one-tick (Heart Foundation Tick, 2016). The ticks are normally only applied to manufacturer's products where the manufacturer pays for the tick. The two-tick category, which is the healthier category, includes more whole foods such as fruit and vegetables, whole grain breads and cereals, low and reduced-fat milk and milk products, legumes, nuts, seeds, fish and other lean poultry and meat (Heart Foundation Tick, 2016). The one-tick category, which is still healthy but not the healthiest, includes food groups such as fruits and vegetables, cereal products, meat and meat alternatives, legumes, nuts and seeds, dairy and alternatives, ready-made meals, fats & oils and condiments (Heart Foundation Tick, 2016). The tick groups are outlined in Appendix B. The tick criteria were applied to all products within the observed stores.

Using the two categories developed by the New Zealand Heart Foundation, the level of health promotion in-store, and a third food category, the no-tick category, a continuum was developed to categorise stores based on their environmental healthiness (Figure 3). The third food category (no-tick category) encompassed the items that did not fit into either of the tick categories. These were high calorie, low nutrient and/or energy dense foods. For a store to be classified as the healthiest (health level 1) its main function was to promote healthier goods and/or stock relatively more nutritious foods. In this case, the majority of the products (70% or more) needed to come from the two-tick category (e.g. Heart Foundation, 2016). Stores were categorised within the least healthy food environment (health level 4) if they focused on promoting and stocking high calorie, low nutrient and/or energy dense foods. Seventy percent or more of the products needed to be no tick, as this was the most prominent type of food stocked in this category. Stores that display a combination of healthier and less healthy foods and a mixture of promotions were divided into two further groups on the health continuum. One was positioned on the healthier side (health level 2) whilst the other was positioned on the less healthy side (health level 3). Stores that were slightly healthier mainly stocked two-tick and one-tick products and focused on promoting these (health level 2). In combination, 70% of the products needed to come from these two categories. Stores that were situated on the less healthy side stocked a combination of mostly one tick and no tick products (in combination 70% or more) (health level 3). Promotions were generally focused on these groups too.

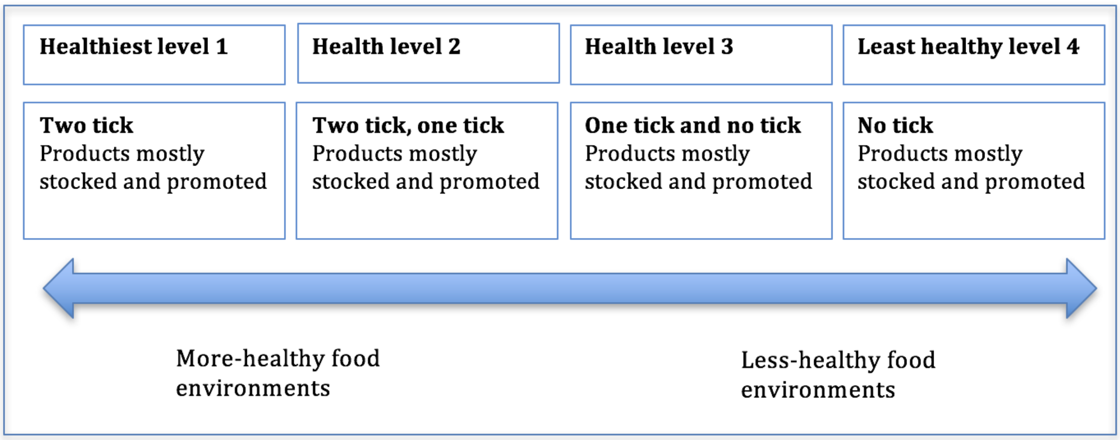


Figure 3. Healthiness of store environment continuum

Based on the Heart Foundation Tick (2016)

To ensure all types of food retailers were included in the observations, two categories from the Australian and New Zealand Standard Industrial Classification, food retailing (Division G, Subdivision 41) and food and beverage services (Division H, Subdivision 45) were chosen. It was important that diverse ranges of food outlets are explored in Study 1. Food retailing includes categories such as supermarket and grocery stores (411) and specialised food retailing (412) and food and beverage services included cafes, restaurants, and takeaway food services (451). Specialised food retailing includes fresh meat, fish and poultry retailing (4121), fruit and vegetable retailing (4122), liquor retailing (4123) and other specialised food retailing (4129). Definitions from Statistics New Zealand (2006) have been used to help define food retailers, and can be found in Appendix C.

Another important criterion to include was the New Zealand deprivation index (NZDep) (see Atkinson et al., 2014, for details), for its ability to segment areas within New Zealand from the most socioeconomically deprived NZDep scores (the highest index) to the least socioeconomically deprived NZDep scores (the lowest index). Store atmospherics and the level of sophistication of the target market are important to retailers when differentiating and designing their stores (Baker, Grewal, & Parasuraman, 1994; Spence et al., 2014; Vieira, 2013). Therefore, different target markets require different store environments. If retail environments vary depending on the target market, observing a spectrum of stores would help to establish diversity in the atmospheric elements required. The NZDep scores help provide that diversity. The NZDep scores are based on lack of income, employment, communication, transport, support, qualifications, owned home, and living space (Atkinson et al., 2014). The scores are more encompassing and representative of the socioeconomic position of geographical areas within New Zealand than merely taking census data on income and qualifications of the residents. The NZDep scale was simplistic to apply and is easily used in a variety of contexts (Atkinson et al., 2014). It was developed specifically to support applications for funding, health research and advocacy (Atkinson et al., 2014). The NZDep2013 was constructed from data from the 2013 Census of Population and Dwellings, Statistics New Zealand (Atkinson et al., 2014). For the purpose of this thesis, the NZ deprivation index has been a useful tool to ensure stores from a cross section of geographical areas of relative socioeconomic deprivation were included.

3.5.2 Store selection procedure

To ensure a range of stores was selected in Study 1, judgement sampling was used. This sampling method was deemed appropriate by Gilbert and Churchill (1999) as it is early on in the investigation where new ideas and insights were being sought. Stores were selected through an internet search based on first three criteria, the healthiness of the store environment, whether it met the definition of food retailing, and was located across a range of geographical areas of deprivation in New Zealand. Key terms such as healthy, unhealthy, less healthy, healthier, food retailing, supermarkets, grocery stores, specialised food retailing, fruit and vegetables stores, liquor retailing, fresh meat, fish and poultry retailing, butcheries, other specialised food retailing and New Zealand were used to help identify stores in online store searches. When exploring different areas of socioeconomic deprivation, names such as Gisborne, Hawkes Bay, Bay of Plenty, Auckland (Remuera, Ponsonby, Henderson), and Christchurch (Shirley) were used. Even though it was difficult to determine stores' healthfulness over the Internet, none of the stores were excluded based on this criterion. All stores ranging from more-healthy to less-healthy were included for observation. Judgements of the healthfulness of the environment were made at the physical location. Once a diverse list of stores had been compiled, each store was visited. Each store was approached and permission from management gained when taking photos or videos in the stores.

3.5.3 Exploration of food retail environments

When exploring retail environments for Study 1, the majority of atmospheric stimuli were captured via video and audio recordings. This allowed the researcher to minimise loss of contextual detail and information (Lee & Broderick, 2007). Video recordings helped to provide a visual record that was useful for uncovering patterns and revealing insights (Basil, 2011). Video and audio recordings were captured via Samsung Note 3 (mobile phone) and began and finished just outside the entrance and exit of the stores. Stimuli that were unobservable via video were manually recorded onto an observational form that was prepared prior to data collection (Appendix D). The observational form was used to record information about the store including its name, location, store type, store atmospheric elements (e.g., scent, temperature, lux levels), and any additional information that was relevant. Scent was sometimes difficult to identify so second opinions were sought either from a companion shopper or shop assistant. Temperature and lux levels were measured through the free temperature and light meter applications for Android mobile phone. These measurements were used to help with validity and reliability of observations. Ambient temperatures were grouped into low (below 17.5°C), medium (17.5-26°C) and high (above 26°C). Lux levels were grouped into dim (below 300 lux), standard (301 to 749 lux), bright (750-1500 lux) and very bright (above 1500 lux). These groupings were adapted from Decre and Pras (2013) and Rae (1999).

The collection of video and audio recordings helped to ensure information could be reviewed at a later date. Viewing the video recordings at a later date also allowed for a less distracting environment (Parsons, 2011), enabling all stimuli and combinations of stimuli to be identified accordingly. Belk, Wallendorf and Sherry (1989) used a similar method in which photos were used to supplement field notes. The visual information acted as a reminder and an external check of the field data. The use of videos to supplement field notes is typical (Basil, 2011). Therefore, when uncertainty existed in the coding of the observations, video recordings were utilised to double check information and gain second opinions if necessary. The observational forms and video footage were revisited frequently when coding data and entering data into Excel and/or SPSS to ensure information was entered correctly. If important details were missing, revisits to stores were undertaken. Table 1 below shows each of the store atmospheric stimuli investigated, data collection tools, and measures.

Table 1. Summary of store atmospheric variables examined and techniques of measurement.

Store atmospheric dimensions	Data collection tools	Measure
Olfactory	*Observational form*	
Ambient scent presence	Researcher’s olfactory system	Nominal
Ambient scent pleasantness	Researcher, companion and/or staff	Nominal
Ambient scent type	Researcher, companion and/or staff	Nominal
Auditory	*Observational form*	
Ambient music presence	Audio recordings, researcher’s auditory system	Nominal
Ambient music volume	Audio recordings, researcher’s auditory system	Ordinal
Ambient music tempo	Audio recordings, researcher’s auditory system	Ordinal
Ambient musical style	Audio recordings, Shazam, researcher auditory system	Nominal
Ambient noise type	Audio recordings/researcher’s auditory system	Nominal
Tactile	*Observational form*	
Ambient temperature	Free temperature app for Andriod	Ordinal
Flooring texture	Video recordings, researcher’s visual system	Nominal
Shelving material	Video recordings, researcher’s visual system	Nominal
Visual	*Observational form*	
Ambient lighting	Light meter app for Andriod	Ordinal
Wall colour	Video recordings, researcher’s visual system	Nominal
Shelving colour	Video recordings, researcher’s visual system	Nominal
Wall Imagery Type	Video recordings, researcher’s visual system	Nominal

After store visits, video and audio recordings were watched, observational forms completed and coded, and data was entered into Excel and/or SPSS. This helped with accuracy of data entry, as memories were still fresh and it enabled further cognitive processing of what was observed that day. After visiting stores in the more deprived areas such as Bay of Plenty, Hawke’s Bay, Gisborne and Waikato, it become evident that observations in Northland stores (an area of New Zealand with higher deprivation scores) did not need to be pursued; the point of saturation had been achieved for food retailers in more socioeconomically deprived areas. The same sorts of stimuli and combinations of stimuli were being observed, hence further observations into these areas were considered unnecessary. Investigations into the least deprived areas followed instead. These areas offered different types and combinations of stimuli that had not yet been largely explored. Data collection of the least-deprived areas again ended once a level of saturation was achieved. McCormick & Livett (2012) indicate that the point of saturation occurs when no new insights are being predicted and an in-depth understanding of the phenomena has been achieved. For this study, the point of saturation occurred when the same stimuli and combination of stimuli kept presenting themselves, time and time again.

3.6 Method of analysis

For each of the stores, olfactory, auditory, tactile and visual store atmospheric dimensions were considered. Ambient scent presence, pleasantness and type were analysed for the olfactory dimension; ambient music presence, volume, tempo, style and ambient noise were analysed for the auditory dimension; ambient temperature, flooring textures and shelving materials were analysed for the tactile dimension and ambient lighting level, wall and shelving colour, and wall imagery were analysed for the visual dimension.

As a diverse range of stores were observed across a continuum of discrete categories (the four store environmental healthiness categories, see Figure 3, section 3.5.1), it was necessary to reduce the categories down into two manageable groups to ensure differences between more- versus less-healthy stores were identified. Such classifications were important for the selection of store atmospheric stimuli for Study 2 (Chapter five). Health level one (the healthiest) and health level two categories were grouped together to create the "more-healthy food stores" category and health level three and health level four (least healthy) were grouped together to create the "less-healthy food stores" category. More- versus less-healthy stores were compared and contrasted, followed by an independent analysis of more- versus less-healthy supermarket and grocery stores. These analyses helped to show differences between the environments.

To investigate the relationship between categorical variables (store environmental type versus store atmospheric stimuli), Pearson's Chi Square statistics were calculated. Pearson's Chi Square tests were chosen due to the categorical nature of the data. During field observation, continuous data was recorded but coded into ordinal variables for lux and temperature levels. All variables were coded as either present (1) or absent (0, nominal) or low (1), medium (2), high (3), and very high (4) for ambient lighting level (ordinal) or slow (1), average (2), fast (3), mixture (4) for ambient music tempo (ordinal, Table 1). Only one coder was used due to limited resources such as time and money. The coding of measures such as scent pleasantness, was somewhat subjective but more ridged exploration of this construct is undertaken in Study 2's experiment and pre-testing. The assumptions of Pearson's Chi-Square test were met (Field, 2005). The information was independent, meaning each store fit independently into each of the cells of the contingency table. The expected frequencies were generally greater than five. When this assumption was violated, Fisher's Exact Test was applied, as suggested by Field (2005).

3.7 Findings

3.7.1 Sample characteristics

In Study 1, a total of 363 stores were observed throughout New Zealand between the periods of 18th November 2014 to 27th August 2015. Canterbury had the largest number of stores visited (n = 148, 40.8%), with Auckland close behind (n =117, 32.2%). The other areas sampled included the Hawke's Bay (n = 26, 7.2%), Bay of Plenty (n = 25, 6.9%), Waikato (n = 24, 6.6%), Gisborne (n =18, 5.0%), and Otago (n = 5, 1.4%). Fewer stores were visited in these regions due to time constraints and the sparse geographical location of stores. The researcher commuted between Auckland and Christchurch weekly, making Canterbury and Auckland regions more accessible. A diverse range of stores by deprivation and environmental healthiness were observed (Table 2).

Table 2. Number of food stores observed by deprivation index and store environmental healthiness

	Deprivation Index Deciles x Location	**More-healthy stores (health level 1 & 2)**	**Less-healthy stores (health level 3 & 4)**	**Total stores**
Less Deprived	*Least deprived*	*18 (46.2%)*	*21 (53.8%)*	*39 (100%)*
	Auckland	2 (16.7%)	10 (83.3%)	12 (100%)
	Canterbury	16 (64%)	9 (36%)	25 (100%)
	Hawke's Bay	0 (0%)	1 (100%)	1 (100%)
	Otago	0 (0%)	1 (100%)	1 (100%)
	Decile 2	*3 (23%)*	*10 (77%)*	*13 (100%)*
	Auckland	2 (33.3%)	4 (66.7%)	6 (100%)
	Canterbury	0 (0%)	1 (100%)	1 (100%)
	Bay of Plenty	0 (0%)	1 (100%)	1 (100%)
	Hawke's Bay	1 (100%)	0 (0%)	1 (100%)
	Waikato	0 (0%)	4 (100%)	4 (100%)
	Decile 3	*27 (46.5%)*	*31 (53.5%)*	*58 (100%)*
	Auckland	13 (42%)	18 (58%)	31 (100%)
	Canterbury	11 (57.9%)	8 (42.1%)	19 (100%)
	Bay of Plenty	0 (0%)	2 (100%)	2 (100%)
	Hawke's Bay	3 (75%)	1 (25%)	4 (100%)
	Otago	0 (0%)	2 (100%)	2 (100%)
	Decile 4	*8 (34.4%)*	*15 (65.6%)*	*23 (100%)*
	Auckland	5 (41.7%)	7 (58.3%)	12 (100%)
	Canterbury	3 (50%)	3 (50%)	6 (100%)
	Hawke's Bay	0 (0%)	3 (100%)	3 (100%)
	Otago	0 (0%)	2 (100%)	2 (100%)
	Decile 5	*3 (37.5%)*	*5 (62.5%)*	*8 (100%)*
	Auckland	3 (75%)	1 (25%)	4 (100%)
	Canterbury	0 (0%)	3 (100%)	3 (100%)
	Hawke's Bay	0 (0%)	1 (100%)	1 (100%)
	Total less deprived	59 (41.8%)	82 (58.2%)	141 (100%)

	Deprivation Index Deciles	More-healthy stores (health level 1 & 2)	Less-healthy stores (health level 3 & 4)	Total stores
More deprived	*Decile 6*	*6 (21.5%)*	*22 (78.5%)*	*28 (100%)*
	Auckland	4 (28.5%)	10 (71.5%)	14 (100%)
	Canterbury	2 (18.2%)	9 (81.8%)	11 (100%)
	Bay of Plenty	0 (0%)	1 (100%)	1 (100%)
	Hawke's Bay	0 (0%)	2 (100%)	2 (100%)
	Decile 7	*7 (19.5%)*	*29 (80.5%)*	*36 (100%)*
	Auckland	0 (0%)	3 (100%)	3 (100%)
	Canterbury	5 (17.2%)	24 (82.8%)	29 (100%)
	Hawke's Bay	2 (50%)	2 (50%)	4 (100%)
	Decile 8	*20 (33.3%)*	*40 (66.7%)*	*60 (100%)*
	Auckland	3 (17.6%)	14 (82.4%)	17 (100%)
	Canterbury	17 (40.5%)	25 (59.5%)	42 (100%)
	Hawke's Bay	0 (0%)	1 (100%)	1 (100%)
	Decile 9	*25 (41.6%)*	*35 (58.4%)*	*60 (100%)*
	Auckland	3 (42.9%)	4 (57.1%)	7 (100%)
	Canterbury	8 (66.6%)	4 (33.4%)	12 (100%)
	Bay of Plenty	7 (46.7%)	8 (53.3%)	15 (100%)
	Hawke's Bay	0 (0%)	2 (100%)	2 (100%)
	Gisborne	1 (10%)	9 (90%)	10 (100%)
	Waikato	6 (42.8%)	8 (57.2%)	14 (100%)
	Most deprived	*3 (7.9%)*	35 (92.1%)	38 (100%)
	Auckland	1 (9.1%)	10 (90.8%)	11 (100%)
	Bay of Plenty	0 (0%)	6 (100%)	6 (100%)
	Hawke's Bay	0 (0%)	7 (100%)	7 (100%)
	Gisborne	0 (0%)	8 (100%)	8 (100%)
	Waikato	2 (33.4%)	4 (66.6%)	6 (100%)
Total more deprived		61 (27.5%)	161 (72.5%)	222 (100%)
Total		120 (33%)	243 (67%)	363 (100%)

Stores were generally well represented across store environmental health levels (Table 3). The presence of liquor retailing and lack of fruit and vegetable retailing were two categories of stores that could not meet all health classification criteria. Liquor retailing, for example, predominately sells and promotes liquor, a less healthy product, making it difficult for liquor retailers to be categorised into the healthier category. Supermarket and grocery stores were not observed as often in the healthier category (Table 3) as supermarket and grocery stores tend to sell and promote a mixture of healthier and less healthy products, retailing fresh vegetables and meat as well as beer and lollies.

Table 3. Number of food stores observed by store type and store environmental healthiness

Store Type	More-healthy stores (health level 1 & 2)	Less-healthy stores (health level 3 & 4)	Total stores
Supermarket & Grocery	5 (13.2%)	33 (86.8%)	38 (100%)
Fresh Meat, Fish & Poultry	37 (97.4%)	1 (2.6%)	38 (100%)
Fruit & Vegetable	27 (100%)	0 (0%)	27 (100%)
Liquor Retailing	0 (0%)	13 (100%)	13 (100%)
Café and Restaurants	5 (7.8%)	59 (92.2%)	64 (100%)
Takeaway Food Service	21 (24.1%)	66 (75.8%)	87 (100%)
Other Specialised Food Retailing	25 (26.1%)	71 (73.9%)	97 (100%)
Total	120 (33.1%)	243 (66.9%)	363 (100%)

Cafés and restaurants, and takeaway food services were excluded from the final analysis. Initially it was thought these environments would add value, as store atmospherics were assumed to vary dependent on the products retailed and the promotions communicated. Upon further examination, this was not the case. These stores masked the prominence of atmospheric stimuli employed by more-healthy food retailers because they encouraged consumption of food away from home. Food away from home has been linked to poorer dietary quality and rising obesity rates (Mancino, Todd, & Lin, 2009). Therefore, exclusion of these stores provided greater insights into retail stores that promoted consumption at home. The original data set was reduced from 363 stores to 212.

Those retailers that imitate departments within a supermarket and encourage shoppers to prepare and consume foods at home remained in the analysis such as supermarket and grocery stores, fresh meat, fish and poultry retailers, fruit and vegetable retailers, liquor retailing, and other specialised food retailing. Each of the departments within a typical New Zealand supermarket was represented by these stores such as the butchery, seafood, grocery, liquor, the bakery, chilled and frozen, delicatessen and bulk foods. Narrowly focusing on these 212 stores allowed a deeper examination of product categories that help to construct the supermarket environment and promote consumption of food at home.

3.7.2 Summary of findings

To demonstrate the differences detected in store atmospheric stimuli in more- and less-healthy food environments, Table 4 presents a summary of the findings. The stimuli representative of a more-healthy store environment spanned all sensory dimensions (Table 4). More-healthy stores typically had more whole food scents or scents related to nature, more relaxed ambient music, outdoor noises, high ambient temperatures (outside the comfort zone), raw and natural flooring with the absence of wooden shelving, cool environmental colour, very bright ambient lighting and more-healthy food-related wall imagery present more often than less-healthy food stores. In comparison, less-healthy food stores had more processed food ambient scents, comfortable ambient temperatures (17.5 to 26°C), exclusive upmarket type floors, glass and plastic shelving, warm environmental colours, and less-healthy food-related or non-food related wall imagery present more often than more-healthy food retailers. Overall, food stores differed due to the presence of certain types of store atmospheric stimuli rather than the mere presence or pleasantness of the stimuli (Table 4). For example, the ambient scent type (e.g., fresh fruit) was representative of a more-healthy store environment rather than the presence of the scent, or its pleasantness. These findings will be explored in a greater level of detail in the following paragraphs. The olfactory dimension findings are addressed first, followed by auditory, tactile and visual.

Table 4. Differences detected between store atmospheric stimuli in more versus less healthy food store environments

Food store type	More-healthy n = 94	Less-healthy n = 118
Ambient scent type	**Raw meat**** **Flowers*** **Fresh seafood and/or fish**** **Vegetables*** **Fresh fruit***	**Sweet bakery***** **Hot bread*** **Lollies*** Chocolate
Ambient musical style	**R&B and/or soul***	Top forty's
Ambient noise type	**Outside***	
Ambient temperature	High (above 26)	**Medium (17.5-26)**
Flooring textures	**Painted concrete***** **Plain concrete**** **Tar seal****	**Wooden**** Polished concrete
Shelving material	**Wooden (absent)****	**Glass**** **Plastic***
Ambient lighting	Very bright (above 1500 lux)	
Wall colour		**Red*** **Brown***
Shelving colour	**Green*****	**Pink*** Maroon Black (absent)
Wall imagery	**Healthier food-related*****	**Less healthy food-related***** **Non-food related****

Note: no star = marginally significant $p < 0.10$, * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

3.7.3 Olfactory dimension

3.7.3.1 Ambient scent presence

Ambient scent was either present or absent from food stores (Table 5). A Pearson Chi-Square between store environmental healthiness (more- versus less-healthy) and scent presence showed a non-significant association, χ^2 (1) = 1.654, $p > 0.05$, $V = 0.08$. Ambient scents were present in 63.8% of more-healthy food stores (48% within total for scent present, $Z = 0.6$) in comparison to 55.1% of less-healthy food stores (52% within total for scent present, $Z = -0.5$; Table 5). These results indicate that store environmental healthiness (more-healthy versus less-healthy) was not associated with the presence or absence of scent. Scents were either present or absent in both more- and less-healthy food stores. An independent analysis of supermarket and grocery stores did not yield any further insights (Appendix E).

Table 5. Frequency of ambient scent presence detected in more- and less-healthy food store environments

Store type	**Ambient scent presence**		
	Absent	**Present**	**Total stores**
More-healthy food store	34 (36.2%)	60 (63.8%)	94 (100%)
Less-healthy food store	53 (44.9%)	65 (55.1%)	118 (100%)
Total	87 (41%)	125 (59%)	212 (100%)

Note: Chi Square 1.654, $p > .05$, $V = 0.08$.

3.7.3.2 Scent pleasantness

If an ambient scent was present, it was generally considered pleasant (Table 6). A Pearson Chi-Square between store environmental healthiness (more- versus less-healthy) and the pleasantness of the scent found no significant association, χ^2 (2) = 1.112, $p > 0.05$, $V = 0.11$. Of the stores with ambient scents, 58.5% of more-healthy stores had pleasant ambient scents (47.4% within pleasant scent, $Z = 0.5$) compared with 51.7% of less-healthy stores (52.6% within pleasant scent, $Z = -0.4$) (Table 6). Low levels of unpleasant ambient scents and a mixture of both pleasant and unpleasant ambient scents were observed (Table 6). It can be concluded that store environmental healthiness (more- versus less-healthy) does not influence scent pleasantness. Thus, ambient scents were generally pleasant when present in both types of stores (more- versus less-healthy stores). An independent analysis of supermarket and grocery stores did not yield any further insights (Appendix E).

Table 6. Frequency of ambient scent pleasantness detected in more- and less-healthy food store environments

Store type	**Pleasantness of scent**				
	No scent present	**Pleasant**	**Unpleasant**	**Mixture**	**Total**
More-healthy food store	34 (36.2%	55 (58.5%)	4 (4.3%)	1 (1.1%)	94 (100%)
Less-healthy food store	53 (44.9%)	61 (51.7%)	2 (1.7%)	2 (1.7%)	118 (100%)
Total	87 (41%)	116 (54.7%)	6 (2.8%)	3 (1.4%)	212 (100%)

Note: Chi Square 1.112, $p > 0.05$, $V = 0.11$.

3.7.3.3 Ambient scent type

The summary of findings for ambient scent types detected in more- and less-healthy food stores (Table 7) shows that ambient scent types represent the products sold within the stores. The marginally significant and significant *p*-values are outlined further below.

A Pearson's Chi Square test illustrated a significant association between store environmental healthiness (more- versus less-healthy food stores) and the presence of a raw meat scent, χ^2 (1) =16.168, $p < 0.001$, $V = 0.28$. In 90.1% of the stores, a raw meat ambient scent was absent, leaving 9.9% of stores with the ambient scent present. Of the stores with the ambient scent present, 19.1% were within more-healthy food stores (85.7% within raw meat scent) in comparison to 2.5% within less-healthy store (14.3% within raw meat scent; Table 7). The standardised residuals demonstrate that there were significantly more stores than expected with the ambient scent present in more-healthy environments (Z = 2.7), and significantly less stores than expected with the scent present in the less-healthy store environments (Z = -2.5). Thus, a raw meat scent was generally absent in stores, but when present, it was more frequent in more-healthy food stores.

There was also a significant association between store environmental healthiness (more- versus less-healthy food stores) and whether or not a fresh fruit scent was present, χ^2 = 4.457, $p > 0.04$. Based on Cramer's V, the association was small at 0.15. The fresh fruit scent was absent from 93.4% of stores. Of the stores with the scent, 71.4% were within more-healthy food stores (10.6% within store type) and 28.6% within less-healthy food stores (3.4% within store type; Table 7). Investigation into the standardised residuals showed that more-healthy stores had more stores than expected with the fresh fruit scent (Z = 1.5) in comparison to less-healthy stores (Z = -1.4). In sum, stores generally lacked the presence of fresh fruit ambient scents. When present, however, fresh fruit ambient scents were more often observed in the more-healthy food stores.

Table 7. Frequency of ambient scent types detected in more- and less-healthy food store environments

Food store type	**More-healthy n=94**		**Less-healthy n=118**					
Scent type	**Absent**	**Present**	**Absent**	**Present**	**df**	χ^2	***p*-Value**	**Cramer's *V***
Raw meat	**76 (80.9%)**	**18 (19.1%)**	**115 (97.5%)**	**3 (2.5%)**	**1**	**16.168**	**0.001**	**0.28****
Flowers	**89 (94.7%)**	**5 (5.3%)**	**118 (100%)**	**0 (0%)**			**0.016**	**0.17***
Fresh seafood and/or fish	**88 (93.6%)**	**6 (6.4%)**	**118 (100%)**	**0 (0%)**			**0.007**	**0.19****
Vegetables	**89 (94.7%)**	**5 (5.3%)**	**118 (100%)**	**0 (0%)**			**0.016**	**0.17***
Fresh fruit	**84 (89.4%)**	**10 (10.6%)**	**114 (96.6%)**	**4 (3.4%)**	**1**	**4.457**	**0.035**	**0.15***
Cleaning products	93 (98.9%)	1 (1.1%)	117 (99.2%)	1 (0.8%)			1.000	0.01
Nature	88 (93.6%)	6 (6.4%)	116 (98.3%)	2 (1.7%)			0.143	0.12
Dried cured meats	92 (97.9%)	2 (2.1%)	117 (99.2%)	1 (0.8%)			0.586	0.05
Marinated foods	93 (98.9%)	1 (1.1%)	118 (100%)	0 (0%)			0.443	0.08
Smoked foods	93 (98.9%)	1 (1.1%)	118 (100%)	0 (0%)			0.443	0.08
Cheese	93 (98.9%)	1 (1.1%)	117 (99.2%)	1 (0.8%)			1.000	0.01
Fecal Matter	93 (98.6%)	1 (1.1%)	118 (100%)	0 (0%)			0.443	0.08
Sweet bakery	**93 (98.9%)**	**1 (1.1%)**	**99 (83.9%)**	**16 (16.1%)**	**1**	**13.848**	**0.001**	**0.26*****
Hot bread	**93 (98.9%)**	**1 (1.1%)**	**108 (91.5%)**	**10 (8.5%)**			**0.025**	**0.16***
Lollies	**94 (100%)**	**0 (0%)**	**112 (94.9%)**	**6 (5.1%)**			**0.035**	**0.15***
Chocolate	94 (100%)	0 (0%)	113 (95.8%)	5 (4.2%)			0.068	0.14
Café hot food	90 (95.7%)	4 (4.3%)	106 (89.8%)	12 (10.2%)			0.123	0.11
Coffee	93 (98.9%)	1 (1.1%)	116 (98.3%)	2 (1.7%)			1.000	0.03
Deep fried foods	93 (98.9%)	1 (1.1%)	117 (99.2%)	1 (1.1%)			1.000	0.01

Food store type	More-healthy n=94		Less-healthy n=118					
Scent type	**Absent**	**Present**	**Absent**	**Present**	**df**	**χ^2**	***p*-Value**	**Cramer's *V***
Rotten foods	94 (100%)	0 (0%)	117 (99.2%)	1 (0.8%)			1.000	0.06
Herbs and spices	88 (93.6%)	6 (6.4%)	108 (91.5%)	10 (8.5%)	1	0.328	0.612	0.04
Pastry	94 (100%)	0 (0%)	117 (99.2%)	1 (0.8%)			1.000	0.06

Note: * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

A Fisher's Exact Test (2-sided) showed a significant difference between store environmental healthiness (more- versus less-healthy food stores) and the ambient scent of flowers (p = 0.016, V = 0.17). In total, 97.6% of stores had a flower ambient scent absent. When present, it was located in more-healthy stores only (a total of 5 stores) (Table 7). More-healthy stores had significantly more flower ambient scents present than expected (Z = 1.9) compared with less-healthy stores (Z = -1.7). This shows that the ambient scent of flowers was not typically present in food stores. If present, though, it was present in more-healthy stores.

A Fisher's Exact Test (2-sided) between store environmental healthiness (more- versus less-healthy) and the ambient scent of fresh seafood and/or fish showed a significant association (p = 0.007, V = 0.19). Only 6 (6.4%) more-healthy food stores had fresh seafood and/or fish ambient scent present compared with none of the less-healthy food stores (Table 7). These results were supported by significant Z-statistics. Significantly more, more-healthy food stores than expected had fresh seafood and/or fish ambient scents present (Z = 2.0) in comparison to the less-healthy food stores (Z = -1.8). Fresh seafood and/or fish ambient scents were absent from the majority of stores, though when present the scent was more likely to be found in more-healthy food environments.

A Fisher's Exact Test (2-sided) also revealed a significant association between scent environmental healthiness (more- versus less-healthy food stores) and the ambient scent of vegetables, p = 0.016, V = 0.17 (Table 7). The ambient scent of vegetables was only discovered in 5 (5.3%) of the more-healthy food stores. When present it was more likely to be within more-healthy store environments (Z = 1.9) than less-healthy (Z = -1.7). In general, vegetable ambient scents were absent from stores. More-healthy stores were the only stores to have a vegetable ambient scent present.

A Pearson Chi Square test helped reveal a significant association between store environmental healthiness and whether or not a sweet bakery ambient scent was present, χ^2 (1) = 13.848, p < 0.001 (Table 7). This result was driven by less-healthy store environments and supported by a moderate association of 0.26 (Cramer's V). In total, 192 stores (90.6% of the total) did not have a sweet bakery ambient scent present, but 20 of the stores (9.4% of the total) did. Of the 20 stores, 19 of these (95% of the total within sweet bakery present, Z = 2.4) were within less-healthy store environments and only 1 (5% of the total within sweet bakery present, Z = -2.6) was within a more-healthy store. The standardised residuals show that less-healthy stores had significantly more stores than expected with a sweet bakery ambient scent and less stores than expected in the more-healthy store category had a sweet bakery ambient scent present. In summary, stores typically did not have a sweet bakery scent present, but when present, it occurred significantly more often in less-healthy stores.

Expected cell counts were less than five for stores with ambient hot bread scents present. Fisher's Exact Test (2-sided) showed a significant value of $p < 0.03$ for store environmental healthiness (more- versus less-healthy) and whether or not hot bread scent was present. Based on Cramer's V, a small association of 0.16 was found. The majority of the stores (n = 201) did not have a hot bread scent present. The significant result was attributed to less-healthy stores having a hot bread scent present more often than more-healthy stores. Of the stores with a hot bread scent present, 90.9% were within less-healthy food stores (8.5% within store type, $Z = 1.6$) in comparison to 9.1% within the more-healthy food stores (1.1% within store type, $Z = -1.8$; Table 7). These results indicate that the presence of ambient hot bread scent was not typically found in stores, but when present, it was more likely to be found in less-healthy stores.

Expected cell counts were less than five for stores with ambient lolly scents. Fisher's Exact Test (2-sided) showed a significant association between store environmental healthiness (more- versus less-healthy food stores) and ambient scent of lollies ($p = 0.035$, $V = 0.015$). The majority of more-healthy (100% within store type) and less-healthy stores (94.9% within store type) typically did not have an ambient lolly scent present (Table 7). If present, the ambient scent only existed in 6 (5.1%) of the less-healthy food stores ($Z = 1.5$), but not in more-healthy store environments (0%, $Z = -1.6$). This result indicates that stores typically did not have lolly scents present, but when present, it was significantly more likely to occur in less-healthy food stores than more-healthy.

Expected cell counts were less than five for stores with ambient chocolate scents. Fisher's Exact Test (2-sided) showed a marginally significant association between store environmental healthiness (more- versus less-healthy food stores) and ambient scent of chocolate ($p = 0.068$, $V = 0.14$). Of the 212 stores, only 5 had ambient chocolate scent present (Table 7). These stores were less-healthy stores (4.2% of less-healthy stores, 100% within ambient chocolate scent total, $Z = 1.3$). Thus, stores typically do not have an ambient scent of chocolate present, but when present, it was found marginally more within less-healthy food stores.

A further independent analysis of supermarket and grocery stores showed a significant result (Appendix E). A Fisher's Exact Test (2-sided) between the ambient scent of herbs and spices and store environmental healthiness (more- versus less-healthy supermarket and grocery stores) showed a significant association ($p < 0.001$). Based on Cramer's V, the association was large (0.77). The significant finding was reflected in the fact that 80% of more-healthy supermarket and grocery stores had ambient herbs and spices scents present ($Z = 4$), and 20% did not ($Z = 1.6$; Table 4, Appendix E). Only 3.1% of less-healthy supermarket and grocery stores had the ambient scent of herb and spices present ($Z = 1.6$), and 96.9% did not ($Z = 0.6$). More-healthy supermarket and grocery stores had a greater number of stores with ambient herbs and spices scents present. Therefore, the healthiness of the supermarket and grocery store significantly influenced the scent type presence for herbs and spices.

3.7.4 Auditory dimension

3.7.4.1 Ambient music presence

Ambient music was either present or absent from food stores (Table 8). A Pearson Chi-Square test showed no significant association between the store environmental healthiness (more- versus less-healthy food stores) and whether ambient music was present or not, χ^2 (1) = 0.440, $p > 0.05$, $V = 0.04$. Of the observed more-healthy food stores, 61.7% had ambient music present (27.4% within total for music present) compared with 66.1% of less-healthy food stores (36.8% within total for music present; Table 8). These results indicate that store environmental healthiness (more- versus less-healthy) did not determine ambient music presence. The presence or absence of music across stores was considered normal. An independent analysis of supermarket and grocery stores did not yield any further insights (Appendix E).

Table 8. Frequency of ambient music presence detected in more- and less-healthy food store environments

Store type	Music Presence		
	Absent	Present	Total stores
More-healthy food store	36 (38.3%)	58 (61.7%)	94 (100%)
Less-healthy food store	40 (33.9%)	78 (66.1%)	118 (100%)
Total	76 (35.8%)	136 (64.2%)	212 (100%)

Note: Chi Square 0.440, $p > 0.05$, $V = 0.04$.

3.7.4.2 Ambient music volume

If ambient music was present, it was generally played at the background level (Table 9). A Pearson Chi-Square showed no significant association between store environmental healthiness (more- versus less-healthy food stores) and ambient music volume (foreground versus background), χ^2 (2) = 1.183, $p > 0.05$, $V = 0.075$. Both more- and less-healthy stores that played ambient music played it at background level, 61.7% (27.4% of the total) and 65.3% (36.3% of the total), respectively. The remaining stores that had ambient music played it at foreground level. This accounted for 0.8% within less-healthy stores only. The volume of music was not associated with the healthiness of the store environment. If music was present, it was typically at the background level. An independent analysis of supermarket and grocery stores did not yield any further insights (Appendix E).

Table 9. Frequency of ambient music volume detected in more- and less-healthy food store environments

Store type	Ambient music volume			
	No Music	Background	Foreground	Total stores
More-healthy food store	36 (38.3%)	58 (61.7%)	0 (0%)	94 (100%)
Less-healthy food store	40 (33.9%)	77 (65.3%)	1 (100%)	118 (100%)
Total	76 (35.8%)	135 (63.7%)	1 (100%)	212 (100%)

Note: Chi Square 1.183, $p > 0.05$, $V = 0.075$.

3.7.4.3 Ambient music tempo

If ambient music was present, it was generally played at a slow tempo (Table 10). A Pearson Chi-Square showed no significant association between store environmental healthiness (more- versus less-healthy food stores) and ambient music tempo, χ^2 (4) = 4.253, $p > 0.05$, $V = 0.14$. If music was present, more- and less-healthy stores typically had slow tempo ambient music present (Table 10). Slow tempo ambient music was present in 40.4% of the more-healthy stores (40% within slow tempo, $Z = -0.6$), and in 48.3% of the less-healthy stores (60% within slow tempo, $Z = 0.6$). Fast tempo, average tempo and a mixture of ambient musical tempos were present in fewer stores. The results show that ambient music tempo did not differ between more- and less-healthy stores. Typically, when ambient music was present, it was slow in tempo. An independent analysis of supermarket and grocery stores did not yield any further insights (Appendix E).

Table 10. Frequency of ambient music tempo detected in more- and less-healthy food store environments

Store type	Ambient music tempo					
	No Music	**Slow**	**Average**	**Fast**	**Mixture**	**Total stores**
More-healthy food store	36 (38.3%)	38 (40.4%)	16 (17%)	4 (4.3%)	0 (0%)	94 (100%)
Less-healthy food store	40 (33.9%)	57 (48.3%)	12 (10.2%)	8 (6.7%)	1 (0.8%)	118 (100%)
Total	76 (35.8%)	95 (44.8%)	28 (13.2%)	12 (5.7%)	1 (0.5%)	212 (100%)

Note: Chi Square 4.253, $p > 0.05$, $V = 0.14$.

3.7.4.4 Musical style

More- and less-healthy food retailers employed a range of musical styles (Table 11). Radio and top forty's seemed to be the most common types played in stores. Ambient musical style differentiated more-healthy stores from less-healthy stores with the presence of ambient rhythm and blues and/or soul music. Top forty's music showed marginal significance for its presence in less-healthy food stores compared to more-healthy food stores. Both of these will be discussed.

A Fisher's Exact Test (2 sided) showed a significant association between music type, R&B and/or soul music, and store environmental healthiness ($p = 0.025$, $V = 0.16$). More-healthy food stores had rhythm and blues (R&B) and/or soul music present more than less-healthy stores (Table 11). Of the 10 stores with rhythm and blues (R&B) and/or soul music, 8 (8.5%) were within more-healthy stores (80% within R&B and/or soul music, $Z = 1.7$) and 2 (1.7%) were within less-healthy food stores (20% within R&B and/or soul music, $Z = -1.5$). The standardised residuals provided directional insights for more-healthy food stores having R&B and/or soul music ($Z = 1.7$). Thus, ambient R&B and/or soul music were uncommon in-stores, but when present, they were in more-healthy stores versus less-healthy stores.

Lastly, a Pearson Chi Square test showed a marginally significant association between top forty's music and store environmental healthiness, χ^2 (1) = 3.803, p = 0.051, V = 0.13. Of the 19.8% of stores with top-forty music, 24.6% were within less-healthy food stores (69% within top forty's, Z = 1.2) and 13.8% were within more-healthy foods stores (31% within top forty's, Z = -1.3; Table 11). The standardised residuals provided directional insights for less-healthy stores being more likely to have top forty's music compared to more-healthy stores. Thus, top forty's music was uncommon in stores, but when present it was generally played in less-healthy food stores. An independent analysis of supermarket and grocery stores did not yield any further insights (Appendix E).

Table 11. Frequency of ambient music styles detected in more- and less-healthy food store environments

Food store type	**More-healthy n=94**		**Less-healthy n=118**					
Musical style	**Absent**	**Present**	**Absent**	**Present**	**df**	**χ^2**	***p*-Value**	**Cramer's *V***
R&B and/or soul	**86 (91.5%)**	**8 (8.5%)**	**116 (98.3%)**	**2 (1.7%)**			**0.025**	**0.16***
Classic hits	86 (91.5%)	8 (8.5%)	110 (93.2%)	8 (6.8%)	1	0.225	0.636	0.03
Radio	70 (74.5%)	24 (25.5%)	97 (82.2%)	21 (17.8%)	1	1.872	0.171	0.09
Electronic	91 (44.2%)	3 (3.2%)	115 (97.5%)	3 (2.5%)			1.000	0.01
Rock	92 (97.9%)	2 (2.1%)	117 (99.2%)	1 (0.8%)			0.586	0.054
Top forty's	81 (86.2%)	13 (13.8%)	89 (75.4%)	29 (24.6%)	1	3.803	0.051	0.13
Pop	93 (98.9%)	1 (1.1%)	117 (99.2%)	1 (0.8%)			1.000	0.01
Instrumental and/or café style	91 (96.8%)	3 (3.2%)	112 (94.9%)	6 (5.1%)			0.734	0.05
Ethnic	92 (97.9%)	2 (2.1%)	112 (94.9%)	6 (5.1%)			0.305	0.08
Christmas	93 (98.9%)	1 (1.1%)	114 (96.6%)	4 (3.4%)			0.385	0.08
1920s – 1950s	93 (98.9%)	1 (1.1%)	114 (96.6%)	4 (3.4%)			0.385	0.08
Folk	94 (100%)	0 (0%)	117 (99.2%)	1 (0.8%)			1.000	0.06
Alternative	92 (97.9%)	2 (2.1%)	114 (96.6%)	4 (3.4%)			0.695	0.04

Note: * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

3.7.4.5 Ambient noise

Ambient noises such as equipment and human noise were detected in more- and less-healthy food stores, with ambient outside noise observed more often within more-healthy stores (Table 12). Ambient noise only varied significantly across store environmental healthiness (more- versus less-healthy) in terms of the presence of outside noise. A Pearson Chi-Square between store environmental healthiness (more- versus less-healthy food stores) and outside noises was significantly associated, χ^2 (1) = 4.569, p < 0.05, V = 0.15. Outside noises were heard more in 37.2% of more-healthy food stores (55.6% within outside noise present, Z = 1.3) compared with 23.7% of less-healthy food stores (44.4% within outside noise present, Z = -1.2; Table 12). Thus, outside noises were more prevalent in more-healthy food stores. An independent analysis of supermarket and grocery stores further supports outside noises being more prominent in more-healthy food stores compared to less-healthy food stores (Appendix E).

Table 12. Frequency of ambient noise detected in more- and less-healthy food store environments

Food store type	**More-healthy n=94**		**Less-healthy n=118**					
Ambient noise type	**Absent**	**Present**	**Absent**	**Present**	**df**	**χ^2**	***p*-Value**	**Cramer's *V***
Outside	**59 (62.8%)**	**35 (37.2%)**	**90 (76.3%)**	**28 (44.4%)**	**1**	**4.569**	**0.033**	**0.15***
Human	12 (12.8%)	82 (87.2%)	17 (14.4%)	101 (85.6%)	1	0.119	0.730	0.02
Equipment	24 (25.5%)	70 (74.5%)	27 (22.9%)	91 (77.1%)	1	0.201	0.654	0.03

Note: * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

3.7.5 Tactile dimension

3.7.5.1 Ambient temperature

Ambient temperature varied from low to high, with less-healthy stores having a medium temperature significantly more often than more-healthy stores. More-healthy stores had higher temperatures marginally more- than less-healthy stores (Table 13). A Pearson Chi-Square with store environmental healthiness (more- versus less-healthy food stores) and a medium ambient temperature showed a significant association, χ^2 (1) = 6.234, $p <$ 0.02, V = 0.17. Of the less-healthy stores, 66.9% had a medium ambient temperature (62.7% within temperature medium) compared with 50% of the more-healthy stores (37.3% within temperature medium; Table 13); this association was very small (V = 0.17). The standardised residuals helped to show that a larger number of less-healthy food stores than expected had a medium ambient temperature present (Z = 1.1) as opposed to more-healthy food stores (Z = -1.2). Thus, less-healthy food stores had medium ambient temperatures more than more-healthy stores. An independent analysis of supermarket and grocery stores further supports medium temperatures in less-healthy food stores rather than more-healthy food stores (Appendix E).

A marginally significant finding between store environmental healthiness (more- versus less-healthy food stores) and higher temperature was found with a Pearson Chi -Square, χ^2 (1) = 1.650, $p < 0.08$, V = 0.12. More-healthy food stores (30.9% within healthier stores, 54.7% within higher temperatures, Z = 1.1) had higher temperatures present compared with less-healthy stores (20.3% within less-healthy stores, 45.3% within high temperature, Z = -1.0; Table 13) The standardised residuals helped to show that more-healthy food stores had more stores than expected with higher temperatures than less-healthy stores. Typically, food stores did not have a high ambient temperature present (Table 13). When present it was marginally associated with more-healthy food stores. An independent analysis of supermarket and grocery stores shows contradictory evidence, in that, more-healthy supermarket and grocery stores have marginally more stores with a lower ambient temperature compared to less-healthy supermarket and grocery stores (Appendix E).

Table 13. Frequency of ambient temperature detected in more- and less-healthy food store environments

Food store type	**More-healthy n=94**		**Less-healthy n=118**					
Ambient temperature	**Absent**	**Present**	**Absent**	**Present**	**df**	χ^2	***p*-Value**	**Cramer's *V***
High (above 26)	65 (69.1%)	29 (30.9%)	94 (79.7%)	24 (20.3%)	1	3.084	0.079	0.12
Low (below 17.5)	76 (80.9%)	18 (19.1%)	103 (87.3%)	15 (12.7%)	1	1.650	0.199	0.09
Medium (17.5-26)	**47 (50%)**	**47 (50%)**	**39 (33.1%)**	**79 (66.9%)**	**1**	**6.234**	**0.002**	**0.17****

Note: * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

3.7.5.2 Flooring texture

Flooring textures varied in more- and less-healthy stores with plain and painted concrete and tar seal more often observed in more-healthy stores. Wooden flooring and mats were observed significantly more in less-healthy stores. The results from Pearson Chi-Square and Fisher's Exact Test (2-sided) comparing more- versus less-healthy food stores and the different types of flooring texture are presented in the Table 14 below. Only significant results are explored. A Pearson Chi-Square between store environmental healthiness (more- versus less-healthy food stores) and painted concrete showed a highly significant association, χ^2 (1) = 11.799, p < 0.001, V = 0.24. Even though painted concrete floors were atypical in stores (only 4.2% of stores had painted concrete floors; Table 14), more-healthy food stores were significantly more likely to have painted concrete floors (100% within painted concrete floors, Z = 2.5) in comparison to less-healthy food stores (0%, Z = -2.2). In general, painted concrete floors were absent from the observed retail environments. When present, more-healthy food stores employed this flooring material more than less-healthy stores.

A Pearson Chi-Square of store environmental healthiness (more- versus less-healthy food stores) and plain concrete flooring showed similar highly significant results, χ^2 (1) = 7.563, p = 0.006, V = 0.19. More-healthy food stores had 26.6% of stores with plain concrete floors (64.1% within plain concrete floors present, Z = 1.9) compared with 11.9% of less-healthy food stores (35.9% within plain concrete floors present, Z = -1.7; Table 14). In general, plain concrete floors were absent from the observed retail environments. When present, more-healthy food stores employed this flooring material more than less-healthy stores.

A Pearson Chi-Square exemplified a significant association between store environmental healthiness (more- versus less-healthy food stores) and whether or not tar seal flooring material was present, χ^2 (1) = 9.916, p < 0.05, V = 0.22 (Table 14). Of the 12.3% of stores with tar seal flooring material present, 20.2% were within more-healthy food stores (73.1% within tar seal flooring, Z = 2.2) and 5.9% were within less-healthy food stores (26.9% within tar seal flooring, Z = -2.0). Typically stores lacked the presence of tar seal flooring, but when present, it was more likely to be found in more-healthy food stores.

Table 14. Frequency of flooring textures detected in more- and less-healthy food store environments

Food store type	**More-healthy n=94**		**Less-healthy n=118**					
Flooring textures	**Absent**	**Present**	**Absent**	**Present**	**df**	χ^2	***p*-Value**	**Cramer's *V***
Painted concrete	**85 (90.4%)**	**9 (9.6%)**	**118 (100%)**	**0 (0%)**	**1**	**11.799**	**0.001**	**0.24*****
Plain concrete	**69 (73.4%)**	**25 (26.6%)**	**104 (88.1%)**	**14 (11.9%)**	**1**	**7.563**	**0.006**	**0.19****
Tar seal	**75 (79.8%)**	**19 (20.2%)**	**111 (94.1%)**	**7 (5.9%)**	**1**	**9.916**	**0.002**	**0.22****
Bricks/Pavers	93 (98.9%)	1 (1.1%)	117 (99.2%)	1 (0.8%)			1.000	0.01
Glass	93 (98.9%)	1 (1.1%)	117 (99.2%)	1 (0.8%)			1.000	0.01
Metal	93 (98.9%)	1 (1.1%)	117 (99.2%)	1 (0.8%)			1.000	0.01
Asphalt/Grass	92 (97.9%)	2 (2.1%)	118 (100%)	0 (0%)			0.195	0.11
Wooden	**83 (88.3%)**	**11 (11.7%)**	**83 (70.3%)**	**35 (29.7%)**	**1**	**9.932**	**0.002**	**0.22****
Polished concrete	84 (89.4%)	10 (10.6%)	94 (79.7%)	24 (20.3%)	1	3.656	0.056	0.13
Carpets	92 (97.6%)	2 (2.1%)	110 (93.2%)	8 (6.8%)			0.191	0.11
Tiles	81 (86.2%)	13 (13.8%)	102 (86.4%)	16 (13.6%)	1	0.003	0.955	0.04
Lino/Vinyl	70 (74.5%)	24 (25.5%)	86 (72.9%)	32 (27.1%)	1	0.068	0.795	0.02
Rubber	94 (100%)	0 (0%)	116 (98.3%)	2 (1.7%)			0.504	0.09

Note: * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

Wooden floors were present in 21.7% of store environments. A Pearson Chi-Square between store environmental healthiness (more- versus less-healthy food stores) and the presence of wooden floors was significantly associated, χ^2 (1) = 9.932, p < 0.002, V = 0.22. Less-healthy stores had wooden floors present in 29.7% of stores (76.1% within wooden floors present, Z = 1.9) compared with more-healthy food stores (23.9% within wooden floors present, Z = -2.1; Table 14). The standardised residuals showed less-healthy stores were significantly more likely than expected to have wooden floors present (Z = 1.9) then more-healthy food stores (Z = -2.1). The presence of wooden floors in retail food environments was relatively small but when present less-healthy food stores adopted this type of flooring more so than more-healthy food retailers. An independent analysis of supermarket and grocery stores did not yield any further insights (Appendix E).

3.7.5.3 Shelving material

Metal shelving was used most by retailers, followed by wood. Less-healthy stores were differentiated from more-healthy stores through the use of plastic and glass shelving material. More-healthy stores had wooden shelving absent more than present, and less-healthy stores in comparison had more stores with wooden shelving. The results from Pearson Chi-Square and Fisher's Exact Test (2-sided) comparing more- versus less-healthy food stores and the different types of shelving material are presented in Table 15 below. Only significant results are explored.

Table 15. Frequency of shelving material detected in more- and less-healthy food store environments

Food store type	**More-healthy n=94**		**Less-healthy n=118**					
Shelving material	**Absent**	**Present**	**Absent**	**Present**	**df**	**χ^2**	***p*-Value**	**Cramer's *V***
Wooden (absent)	**39 (41.5%)**	**55 (58.5%)**	**28 (23.7%)**	**90 (76.3%)**	**1**	**7.635**	**0.006**	**0.19****
Metal	33 (35.1%)	61 (64.9%)	44 (37.3%)	74 (62.7%)	1	0.108	0.743	0.023
Glass	**88 (93.6%)**	**6 (6.4%)**	**92 (78%)**	**26 (22%)**	**1**	**10.000**	**0.002**	**0.22****
Plastic	**94 (100%)**	**0 (0%)**	**112 (94.9%)**	**6 (5.1%)**			**0.035**	**0.15***
Brass	94 (100%)	0 (0%)	117 (99.2%)	1 (0.8%)	1	0.800	0.371	0.06

Note: * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

A comparison of more- versus less-healthy stores helped to show that less-healthy store environments had wooden shelving present more than more-healthy stores χ^2 (1) = 7.635, $p < 0.006$, $V = 0.19$. Wooden shelving was present within 76.3% of less-healthy food stores (62.1% within wooden shelving present, $Z = 1.0$) compared to 58.5% of more-healthy food stores (37.9% within wooden shelving present, $Z = -1.2$; Table 15). In total, 145 out of 212 stores had wooden shelving present. The standardised residuals show that significantly greater number of the more-healthy stores than expected had wooden shelving absent ($Z = 1.7$) compared with present ($Z = -1.2$). Thus, more-healthy stores had directionally more stores than expected without wooden shelving.

Glass shelving material was present in 15.1% of store environments. A Pearson Chi-Square between store environmental healthiness (more- versus less-healthy food stores) and the presence of glass shelving material was significantly associated, χ^2 (1) = 10.000, $p = 0.002$, $V = 0.22$. Less-healthy stores had glass shelving present in 22% of stores (81.3% within glass shelving present, $Z = 1.9$) compared with more-healthy food stores (18.8% within glass shelving present, $Z = -2.2$; Table 15). The standardised residuals showed less-healthy stores were significantly more likely than expected to have glass shelving present ($Z = 1.9$) and more-healthy stores were significantly less likely than expected to have glass shelving present ($Z = -2.2$). The presence of glass shelving in retail food environments was relatively small, but when present, less-healthy food stores adopted this type of shelving more than more-healthy food retailers.

Plastic shelving was present in 2.8% of store environments. A Fisher's Exact Test between store environmental healthiness (more- versus less-healthy food stores) and the presence of plastic shelving material was significantly associated, $p = 0.035$, $V = 0.15$. Less-healthy stores had plastic shelving present in 6 (5.1%) stores (100% within glass shelving present, $Z = 1.5$) compared with more-healthy stores (0% within glass shelving present, $Z = -1.6$; Table 15). The presence of glass shelving in retail food environments was relatively small, but when present, less-healthy food stores adopted this type of shelving more than more-healthy food retailers. An independent analysis of supermarket and grocery stores did not yield any further insights (Appendix E).

3.7.6 Visual dimension

3.7.6.1 Ambient lighting level

Ambient lighting level varied from dim to very bright, with marginally more more-healthy food stores having very bright light compared to less-healthy stores (Table 16). Dim lighting and standard lighting were two prominent ambient lighting levels within more- and less-healthy food stores. A summary of findings for store environmental healthiness and ambient lighting level are displayed in Table 16 below. Significant findings are explored further. A Pearson Chi-Square between store environmental healthiness (more- versus less-healthy food stores) and very bright lighting showed a marginally significant association, χ^2 (1) = 2.816, p = 0.093. The majority of stores did not have very bright lighting (Table 16). When present, 16% of more-healthy food stores had very bright lighting (60% within bright lighting, Z = 1.2) compared with 8.5% of less-healthy food stores (40% within bright lighting, Z = -1.0; Table 16); the standardised residuals helped to show this association. Thus, more-healthy stores had very bright lighting marginally more than less-healthy stores. An independent analysis of supermarket and grocery stores did not yield any further insights (Appendix E).

Table 16. Frequency of ambient lighting level detected in more- and less-healthy food store environments

Food store type	**More-healthy n=94**		**Less-healthy n=118**					
Ambient lighting level	**Absent**	**Present**	**Absent**	**Present**	**df**	χ^2	***p*-Value**	**Cramer's *V***
Standard (301-749 lux)	54 (57.4%)	40 (42.6%)	70 (59.3%)	48 (40.7%)	1	0.076	0.783	0.019
Very bright (above 1500 lux)	79 (84%)	15 (16%)	108 (91.5%)	10 (8.5%)	1	2.816	0.093	0.115
Dim (below 300 lux)	65 (69.1%)	29 (30.9%)	74 (62.7%)	44 (37.3%)	1	0.960	0.327	0.067
Bright (750-1500 lux)	79 (84%)	15 (16%)	108 (91.5%)	10 (8.5%)	1	0.415	0.519	0.044

Note: * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

3.7.6.2 Colour

3.7.6.2.1 Wall colour

Creamy white wall colour was observed the most across more- versus less-healthy food stores (Table 17). Less-healthy food stores had significantly more stores with red and brown walls compared to more-healthy food stores. A Pearson Chi-Square discovered a significant association between red wall colour and store environmental healthiness (more- versus less-healthy stores), $\chi^2(1) = 3.875$, $p < 0.05$, $V = 0.13$. Of the total stores, 7.1% had red coloured walls (Table 17). Of these, 80% were within less-healthy food stores (10.2% within less-healthy stores, $Z = 1.3$) compared to 20% within more-healthy stores (3.2% within more-healthy stores, $Z = -1.4$). The standardised residuals helped to show that more red coloured walls than expected were in less-healthy stores and less than expected were in more-healthy stores. Red walls in less-healthy stores were thus observed more than in more-healthy stores.

The only other wall colour to be significantly associated with store environmental healthiness (more- versus less-healthy stores) was brown. A Pearson Chi-Square showed a significant association, $\chi^2(1) = 3.947$, $p < 0.05$, $V = 0.14$. Of the 5.7% of stores that had brown coloured walls, 83.3% were within less-healthy food stores (8.5% of the total less-healthy food stores, $Z = 1.3$) and 16.7% within more-healthy food stores (2.1% of the total more-healthy food stores, Table 17). Thus, if brown wall colour was present, it was observed more in less-healthy food stores. An independent analysis of supermarket and grocery stores did not yield any further insights (Appendix E).

Table 17. Frequency of wall colour detected in more- and less-healthy food store environments

Food store type	**More-healthy n=94**		**Less-healthy n=118**					
Wall colour	**Absent**	**Present**	**Absent**	**Present**	**df**	χ^2	***p*-Value**	**Cramer's *V***
Creamy white	27 (28.7%)	67 (71.3%)	35 (29.7%)	83 (70.3%)	1	0.022	0.881	0.01
Green	81 (86.2%)	13 (13.8%)	105 (89%)	13 (11%)	1	0.385	0.535	0.04
Yellow	87 (92.6%)	7 (7.4%)	113 (95.8%)	5 (4.2%)	1	1.009	0.315	0.07
Blue	89 (94.7%)	5 (5.3%)	116 (98.3%)	2 (1.7%)	1	2.152	0.142	0.10
Maroon	93 (98.9%)	1 (1.1%)	117 (99.2%)	1 (0.8%)	1	0.026	0.871	0.01
Red	**91 (96.8%)**	**3 (3.2%)**	**106 (89.9%)**	**12 (10.2%)**	**1**	**3.875**	**0.049**	**0.13***
Brown	**92 (97.9%)**	**2 (16.7%)**	**108 (91.5%)**	**10 (83.3%)**	**1**	**3.947**	**0.047**	**0.14***
Grey	92 (97.9%)	2 (2.1%)	111 (94.1%)	7 (5.9%)	1	1.863	0.172	0.09
Beige	93 (98.9%)	1 (1.1%)	113 (95.8%)	5 (4.2%)	1	1.916	0.166	0.09
Black	87 (92.6%)	7 (7.4%)	109 (92.4%)	9 (7.6%)	1	0.002	0.961	0.00
Pink	93 (98.9%)	1 (1.1%)	113 (95.8%)	5 (4.2%)	1	1.916	0.166	0.09
White	92 (97.9%)	2 (2.1%)	115 (97.5%)	3 (2.5%)	1	0.039	0.843	0.01
Orange	91 (96.8%)	3 (3.2%)	112 (94.9%)	6 (5.1%)	1	0.461	0.497	0.05
Turquoise	94 (100%)	0 (0%)	117 (99.2%)	1 (0.8%)	1	0.800	0.371	0.06
Purple	93 (98.9%)	1 (1.1%)	116 (98.3%)	2 (1.7%)	1	0.149	0.699	0.03

Note: * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

3.7.6.2.2 Shelving colour

Creamy white, brown, black and silver shelving colours were observed most across more- and less-healthy food stores (Table 18). Prominent shelving colour only varied significantly across more- and less-healthy store environments in terms of green shelving and pink shelving. The other observed shelving colours such as creamy white, black, red, yellow, purple, orange, mustard, white, blue, brown, cooper, grey, gold, beige, turquoise and maroon were not found to significantly differ. The significant *p*-values of 0.5 are discussed.

A Pearson Chi-Square test for the difference between store environmental healthiness (more- versus less-healthy food stores) and whether or not green shelving was present showed a significant difference, χ^2 (1) = 19.830, $p < 0.001$. This result was based on a moderate association of 0.31 (Cramer's *V*). In total 39.6% of stores had green shelving present (Table 18). Of these, 63.1% were within more-healthy food store environments (56.4% of more-healthy food stores, $Z = 2.6$) and 36.9% were within less-healthy store environments (26.3% of less-healthy food stores, $Z = -2.3$). The standardised residuals indicated that more-healthy stores had significantly more stores than expected with green shelving compared with the less-healthy stores. Thus, stores did not typically have green shelving, but when present, it was more often observed in more-healthy stores.

A Pearson Chi-Square showed a significant difference between store environmental healthiness (more- versus less-healthy food stores) and whether or not pink shelving was present, χ^2 (1) = 4.919, $p < 0.05$. A small association of 0.15 (Cramer's *V*) was produced. Of the 212 stores, only 6 had pink coloured shelving present (Table 18). These results showed that the majority of stores did not have pink shelving present. When present, less-healthy stores were the only stores to showcase this coloured shelving.

Table 18. Frequency of shelving colour detected in more- and less-healthy food store environments

Food store type	**More-healthy n=94**		**Less-healthy n=118**					
Shelving colour	**Absent**	**Present**	**Absent**	**Present**	**df**	**χ^2**	***p*-Value**	**Cramer's *V***
Green	**41 (43.6%)**	**53 (56.4%)**	**87 (73.7%)**	**31 (26.3%)**	**1**	**19.830**	**0.001**	**0.31*** **
Creamy white	22 (23.4%)	72 (76.6%)	28 (23.7%)	90 (76.3%)	1	0.003	0.956	0.00
Red	54 (57.4%)	40 (42.6%)	69 (58.5%)	49 (41.5%)	1	0.023	0.880	0.01
Yellow	75 (79.8%)	19 (20.2%)	96 (81.4%)	22 (18.6%)	1	0.083	0.774	0.02
Purple	85 (90.4%)	9 (9.6%)	112 (94.9%)	6 (5.1%)	1	1.604	0.205	0.09
Orange	84 (89.4%)	10 (10.6%)	107 (90.7%)	11 (9.3%)	1	0.102	0.750	0.02
Mustard	93 (98.9%)	1 (1.1%)	118 (55.9%)	0 (0%)			0.443	0.08
White	67 (71.3%)	27 (28.7%)	91 (77.1%)	27 (22.9%)			0.346	0.07
Pink	**94 (100%)**	**0 (0%)**	**112 (94.9%)**	**6 (5.1%)**			**0.035**	**0.15***
Black (absent)	24 (25.5%)	70 (74.5%)	45 (38.1%)	73 (61.9%)	1	3.786	0.052	0.13
Maroon	94 (100%)	0 (0%)	113 (95.8%)	5 (4.2%)			0.068	0.14
Blue	61 (64.9%)	33 (35.1%)	69 (58.5%)	49 (41.5%)	1	0.909	0.340	0.06
Brown	25 (26.6%)	69 (73.4%)	30 (25.4%)	88 (74.6%)	1	0.037	0.847	0.01
Cooper	94 (100%)	0 (0%)	117 (99.2%)	1 (0.8%)			1.000	0.06
Grey	45 (47.9%)	49 (52.1%)	52 (44.1%)	66 (55.9%)	1	0.305	0.581	0.04
Gold	94 (100%)	0 (0%)	116 (98.3%)	2 (1.7%)			0.504	0.09
Beige	94 (100%)	0 (0%)	116 (98.3%)	2 (1.7%)			0.504	0.09
Turquoise	94 (100%)	0 (0%)	114 (96.6%)	4 (3.4%)			0.131	0.12

Note: * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

A Pearson Chi-Square between store environmental healthiness (more- versus less-healthy food stores) and black coloured shelving showed a marginally significant association, χ^2 (1) = 3.786, p = 0.052, V = 0.13. The standardised residuals helped to reveal that less of the more-healthy stores than expected had black shelving absent (Z = -1.2) and more of the less-healthy stores than expected had black shelving absent (Z = 1.1). Black shelving was present in 67.5% of food stores (Table 18). Of those stores, 49% were within more-healthy food stores (72.5% of more-healthy food stores, Z = 0.8) and 51% were within less-healthy food stores (61.9% of less-healthy food stores, Z = -0.7). Typically, both more- and less-healthy stores had black shelving present. Less (versus more) healthy stores had directionally more (less) stores than expected with black shelving absent.

A Fisher's Exact test between store environmental healthiness (more- versus less-healthy food stores) and maroon coloured shelving showed a marginally significant association, p = 0.068, V = 0.14. Of the 212 stores, only 5 had maroon coloured shelving present (Table 18). These results showed that, the majority of stores did not have maroon shelving but when present, less-healthy stores were the only ones to showcase these colours. An independent analysis of supermarket and grocery stores did not yield any further insights except that black and grey shelving were largely absent from more-healthy supermarket and grocery stores compared to less-healthy supermarket and grocery stores (Appendix E).

3.7.6.3 Wall imagery

Only three types of wall imagery were observed in more- and less-healthy store environments. More-healthy food-related imagery was observed significantly more in more-healthy food stores, while non-food-related imagery and less-healthy food-related imagery were observed significantly more in less-healthy food stores. In Table 19 below, a summary of the findings for wall imagery are presented. Wall imagery significantly varied across store environmental healthiness in terms of more-healthy imagery, less-healthy imagery and non-food-related imagery. The significant findings are explored further.

A Pearson Chi-Square between store environmental healthiness (more- versus less-healthy food stores) and imagery related to healthier foods showed a highly significant association, χ^2 (1) = 60.74, p < 0.001, V = 0.54 (Table 19). Of the 212 stores, 28.3% had wall imagery related to healthier foods. Of those stores, 86.7% were within more-healthy food stores (55.3% of more-healthy food stores) and 6.8% within less-healthy food stores (13.3% of less-healthy food stores). More-healthy food stores had significantly more stores than expected with wall imagery related to healthier foods (Z = 4.9) than without (Z = -3.1). Less-healthy stores had significantly more stores than expected without (Z = 2.8) than with (Z = -4.4). Imagery related to healthier foods was placed significantly more frequently within more- (versus less) healthy food stores.

A Pearson Chi-Square between store environmental healthiness (more- versus less-healthy food stores) and less-healthy food-related imagery showed a significant result, χ^2 (1) = 20.697, $p < 0.05$, $V = 0.31$. Of the 16% of stores that had less-healthy food-related imagery, 90.9% of those were within less-healthy food stores (25.4% of less-healthy food stores) and 9.1% within more-healthy food stores (9.1% within more-healthy food stores; Table 19). The standardised residuals confirmed that significantly fewer more-healthy food stores than expected had less-healthy food-related imagery present (Z = -3.0) whereas less-healthy food stores had significantly more stores than expected with less-healthy food-related imagery (Z = 2.7). Less-healthy food-related wall imagery was scarce across store environments. When employed, less-healthy stores engaged more with the less-healthy food-related imagery.

A Pearson Chi-Square revealed a significant association between store environmental healthiness (more- versus less-healthy food stores) and non-food related imagery, χ^2 (1) = 9.168, $p < 0.05$, $V = 0.21$. In total, 13.2% of stores had non-food related imagery (Table 19). Of those stores, 82.8% were within less-healthy food stores (20.3% of less-healthy food stores) and 17.2% within more-healthy food stores (5.3% of more-healthy food stores). The standardised residuals outlined the association as being connected to more-healthy food stores having less stores than expected with non-food related imagery present (Z = -2.2) and less-healthy stores having more stores than expected with non-food-related imagery present (Z = 1.9). Typically, non-food-related imagery was absent from stores. When present, less-healthy food stores had more stores with the imagery type present than did more-healthy food stores. An independent analysis of supermarket and grocery stores did not yield any further insights (Appendix E).

Table 19. Frequency of wall imagery type detected in more- and less-healthy food store environments

Food store type	**More-healthy n=94**		**Less-healthy n=118**					
Wall imagery presence	**Absent**	**Present**	**Absent**	**Present**	**df**	χ^2	***p*-Value**	**Cramer's *V***
More-healthy food-related	**42 (44.7%)**	**52 (55.3%)**	**110 (93.2%)**	**8 (13.3%)**	**1**	**60.749**	**0.001**	**0.53*******
Less-healthy food-related	**91 (96.8%)**	**3 (3.2%)**	**87 (73.7%)**	**31 (26.3%)**	**1**	**20.697**	**0.001**	**0.31*******
Non-food related	**89 (94.7%)**	**5 (5.3%)**	**95 (80.5%)**	**23 (19.5%)**	**1**	**9.168**	**0.002**	**0.21****

Note: * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

3.8 Discussion of findings

In Study 1, the aim was to explore differences between store atmospheric stimuli currently present within more- and less-healthy food stores in the New Zealand marketplace. The exploratory observation study in this chapter asked the question, "Which store atmospheric represent a healthier store environment?" The observation study was necessary to advance understanding of health-related store atmospheric cues as it enabled real world information to be collected and a more grounded basis for the experiment in Study 2 (Chapter 5). This novel investigation helped aid in new significant findings that otherwise may not have been discovered.

It was found that food stores differed due to the presence of certain types of store atmospheric stimuli rather than the mere presence or pleasantness of the stimuli. This finding implies that retailers or retail designers try to ensure (to a degree) store atmospherics are congruent with the store and the product offering, as has been suggested is important by Douce et al. (2013) and Bone & Ellen (1990).

3.8.1 Ambient scent

The presence of a congruent ambient scent in both more-healthy and less-healthy stores stems in part from the merchandising of products allowing natural scent to emit from the foods or from artificial scents being pumped through air conditioning units or scent machines in-store. Pumping scents into food stores is not new. Spence (2015) reported that artificial scent was pumped into Net Cost supermarket in Brooklyn, New York. The three scent-category combinations used by the supermarket were chocolate near the candy, fruit near the produce section and rosemary focaccia near the bakery section. This example gives further support to the importance of ambient scent being congruent with the products in the store. Though it is unlikely that many food stores in New Zealand pump artificial scents into their stores, it is a possibility for some stores. Regardless of the source of the scent, however, ambient scents were congruent to the store environments and to the products sold. Natural whole food ambient scents were representative of a more-healthy store environment and more processed food ambient scents of a less-healthy store environment. Ambient scent can act as a communicator of what is being sold within the store (Goldkuhl & Styven, 2007). The communicative power of scent types can be used to differentiate stores and potentially cue healthfulness.

3.8.2 Ambient music

The choice of ambient music played by retailers differed across more-healthy and less-healthy food stores. More-healthy food retailers selected rhythm and blues and/or soul music more often than less-healthy food stores. This could be due to the ability to differentiate from other stores and be congruent with the products sold. As Sweeney and Wyber (2002) point out, musical style is important for retailers to differentiate themselves from competitors. It also helps to create a distinctive store image and position in the marketplace (Herrington & Capella, 1996).

Rhythm and blues and/or soul music for more-healthy food retailers can provide a more relaxed and calming atmosphere to reflect the nature of the products sold and connect shoppers to the relaxing qualities of nature. This aligns with findings in congruency theory (Bone & Ellen, 1990; Mandler, 1982). In contrast, the less-healthy food stores had marginally more stores with upbeat top forty's music compared to more-healthy food stores. Top forty's music typically appeals to a broader range of people, allowing less-healthy food stores to target a greater range of shoppers. The arousing qualities and favourable product evaluations offered through the use of more familiar music (Yalch & Spangenberg, 2000) could be a key reason for less-healthy food retailers to select this music style, yet this is unknown, as retailers were not directly asked. It seems that the top forty's music playing in less-healthy food stores reflects the hedonic nature of the products sold and creates a pleasant and familiar atmosphere for the shopper. Congruency between the music, the store type, and the products sold is important (Areni & Kim, 1993; North et al., 1999; North et al., 2016) and is demonstrated through the differences in music played between more-healthy and less-healthy stores. More-healthy stores were represented by more relaxed tunes compared to more upbeat tunes in less-healthy stores. Ambient music style thus can be used to differentiate stores and potentially cue healthfulness.

3.8.3 Ambient noise

The presence of outside noise differentiated more-healthy stores from less-healthy stores. The design of more-healthy food storefronts enabled ambient outside noise to protrude into the environment more than within less-healthy food stores. Food was displayed in plastic crates or cardboard boxes outside the more-healthy food stores to denote more of a marketplace feel in which food is fresh and straight from the producer.

This open storefront links the ambient outside noise with healthier foods and the outdoors. In contrast, a greater number of less-healthy food stores had closed storefronts inhibiting outside noise from being heard in-store. This could be a positive for retailers wanting to have greater control over the auditory environment. As Hynes and Manson (2016) mention, outside noise can negatively impact shoppers and staff. A closed storefront has the added benefit of blocking out unwanted noise. Outside noises were thus present more within more-healthy stores' than less-healthy stores communicating more of a fresh market feel.

3.8.4 Ambient temperature

The less healthy stores had temperatures set at the thermal comfort level (between 17.5-26°C), as suggested by Cheema and Patrick (2012), De Dear and Brager (1998) and Decre and Pras (2013). This suggests retailers are trying to regulate temperature to keep shoppers comfortable in-store, as feeling too hot or too cold can create an uncomfortable atmosphere (Cheema & Patrick, 2012; Heide & Gronhaug, 2006). The focus here is on pleasantness of the store environment rather than congruency. The lack of retail research on ambient temperature could be reason for these findings. Retailers may be unsure about the benefits of setting different ambient temperatures. More-healthy food stores had higher temperatures (above 26°C) present marginally more than the less-healthy food stores. This reflects a less-than-optimal temperature in terms of comfort as well as food safety and wastage. Rising food temperatures from environments that are too hot can lead to lowered food quality, food-borne illness or unnecessary food waste. More-healthy stores where fresh foods are displayed need to carefully monitor temperatures to ensure they do not exceed safe levels.

The higher temperatures in more-healthy stores could also be due to the cost of air conditioning systems or storeowners being too frugal in spending money on factors that do not show immediate return on investment. This is probably also reason for neither more-healthy nor less-healthy stores being represented by a cooler ambient temperature (below 17.5°C). Cooler food stores in New Zealand seem to signal more luxury food environments rather than healthiness of the food. The more-healthy supermarket and grocery stores did, however, show marginally more stores with lower ambient temperatures.

3.8.5 Textures and materials

Some retailers seem to have gone beyond functional and aesthetic benefits in selecting flooring textures and shelving materials that resonate with the healthiness of the store. As suggested by Spence (2015), materials and textures can provide subtle messages to the shopper about the retailing offer. The textures and materials observed in the food stores provide these subtle messages about the retail offering. More-healthy food retailers had plain or painted concrete floors or set up stalls on tar seal more often than less-healthy stores. The concrete floors showed connections to the farm potentially communicating the naturalness, honesty and rawness of the retailer, as well as aligning with the naturalness of the products. The tar seal flooring represented the greater number of more-healthy stores at farmer's markets and those trading past storefront doors. The congruity between the products sold, the textures and material, and the retailer is thus important for retailers to showcases their healthful position within the marketplace.

In general, less-healthy food stores seemed to be more staged environments with wooden and polished concrete floors, and glass and plastic shelving used more frequently compared to more-healthy food stores. It would seem that more-healthy food stores would have wooden floors present more often because of the associations with natural foods (Parterre flooring systems, 2016). However, wooden floors and shelves lacked presence in the observed more-healthy stores. With the clean eating movement and consumers seeking healthier options (Smale, Keown, & Brendish, 2015), less-healthy food retailers are forced to portray a healthier image. On the other hand, less-healthy food stores such as liquor stores and other speciality food retailers used wood potentially for its ability to communicate exclusivity (Kerfoot et al., 2003), and maybe in some cases because it was the easiest to install and maintain in spaces such as shipping containers. Furthermore, concrete and tar seal were more congruent with more-healthy stores and wood, polished concrete, glass and plastic with less-healthy food stores.

3.8.6 Ambient lighting

Lack of retailer investment and understanding of the effects of store lighting (Summers & Herbert, 2001; Quartier et al., 2014; Spence et al., 2014) may explain the diversity of findings for lighting levels in food stores observed in Study 1. Retail store owners either invested heavily into lighting solutions or dedicated little money or effort, as is evident in other contexts (Spence et al., 2014; Quartier, 2011). Lighting levels varied marginally for more-healthy stores with very bright lighting present more often than in less-healthy stores. This was largely attributed to outdoor lighting at farmers markets. Retailers could differentiate stores further by matching lighting level with product sold. The lighting level can suggest inferences to shoppers about the quality of store type and the merchandise offered (Baker et al., 1994; Rae, 1999). No link between the lighting level and the healthiness of the retailer were thus found.

3.8.7 Colour

The selection of colours by more- and less-healthy food stores seems to relate to the nature of the products, the store type, and the created meaning. Colour is not only about aesthetics, but also carries meaning (Elliot & Maier, 2012). The highly established connection between green and nature may have prompted the choice of the green shelving colour by more-healthy food retailers, as well as the produce arriving to store in shelf-ready green plastic crates. Cool coloured environments such as using green in-store has created more pleasant, attractive, positive, and less tense atmospheres in the past compared to warm environments (Bellizzi et al., 1983). These favourable evaluations not only help to create the intended atmosphere for retailers but also potentially communicate with the shopper about the healthiness of the products. Green shelving in more-healthy stores included green plastic crates used to display produce, green metal shelving, data stripping and/or wooden shelving painted green. The green shelving could therefore be used to create a pleasant, attractive and relaxing environment but also act as a communicator of healthfulness.

The literature on warm colour presence in-stores mainly expresses the negative nature of such colours on spending, avoidance tendencies, a smaller selection of the most expensive goods (Bellizzi & Hite, 1992), and reduced time spent (Barli et al., 2012). Study 1, however, shows the presence of warmer colours in less-healthy stores — perhaps to denote lower prices and bargains (Esbjerg & Bech-Larsen, 2009) rather than the healthiness of the store. Warm colours have arousing capabilities (Bellizzi et al., 1983) and could have been selected by less-healthy retailers to reflect the hedonic nature of the products. The selection of warm colours such as red can further help to weaken resistance against tempting, less healthy foods through the arousing qualities of the colour (Fedorikhin & Patrick, 2010). These are desirable outcomes for retailers and may be reason for the selection of warmer colours. In terms of brown wall colour, Kontukoski, Paakki, Thureson, Uimonen, and Hopia (2016) reasoned that brown was generally associated with soil, dirt, decomposition, and spoilage. This may be the reason for the lack of prominence in more-healthy stores, as the thought of dirt and soil in salads is not desirable (Kontukoski et al., 2016). The presence of warm colour in less-healthy stores could purely be for its arousing properties to reflect the hedonic nature of the products sold.

The differences in colour across more- and less-healthy food stores showcases the potential of colour to construct and communicate diverse meanings across stores.

3.8.8 Imagery

The presence of artwork in food retail outlets is an understudied area, with Study 1 findings providing insight into the different types of images used by more-healthy and less-healthy food retailers, or food retailers in general. The images presented in food stores were generally arrangements of aesthetically and artistically presented foods, as defined by Fisher et al. (2012). The food store images were more closely related to the products sold. This seems appropriate as consumers typically use store environmental cues to make inferences about the products and services sold (Ward et al., 1992). More-healthy (less-healthy) food retailers displayed more-healthy (less-healthy) food-related wall imagery more often. It is suggested that this enables retailers to showcase the products sold and create a more visually appealing environment in which shoppers would like to shop. In some cases, less-healthy food stores had non-food related imagery present. This seems to align more with the retailer trying to create a pleasant atmosphere rather than informing the shopper of the products sold.

3.9 Strengths and limitations of the study

The observational study discussed here is the first known exploration of New Zealand food retailers, providing insights into the current store atmospheric stimuli used by retailers in more- versus less-healthy food stores. Subjective measures such as the pleasantness of ambient scent, scent type, tempo of the music, and music type were predominately determined by the researcher, though sometimes others' (companion shoppers or staff) opinions were solicited. This is one of the limitations of observational studies. Objective measures were used where possible; for instance the temperature and lux levels were measured using the same applications throughout the observations. Future research could include more than one researcher and more measurement tools such as a decibel meter to measure ambient music and sound levels with more thorough calibration of tools.

Diversity of store atmospherics across socioeconomic deprivation levels were not analysed in Study 1 but is an area of investigation for future research. Effects of the observed store atmospherics on shopper behaviours were not observed in Study 1 either, but will be further explored in the next study, and in future research projects. The olfactory and visual stimuli, ambient scent, colour, and wall imagery showed the greatest potential for further testing. The lack of strength between musical style and more- versus less-healthy food environments, and between ambient temperature and more-healthy stores is cause to discontinue further testing for this thesis. As the environmental healthiness of the store only observed the type of shelving for less healthy stores, shelving material also emerges as a less pressing atmospheric to test in the short-term. The methodology in Study 1 provides real world associations and concepts to be selected that were attached to real world retail environments. The scent of herbs as a communicator of health would not have been the first, second or third choice if the literature had been explored to determine the ambient scent to create a message of healthfulness. Taking to the real world to inform laboratory research aided in new significant findings that may not have otherwise been discovered.

3.10 Conclusion

Study 1 was the first investigation of its type observing store atmospheric stimuli currently used by New Zealand food retailers. New significant findings that may not have otherwise been discovered provide direction for the next (Study 2) and future studies. The findings of Study 1 lend support for the use of store atmospheric stimuli as cues of healthfulness. The store atmospherics present in more-healthy food stores differed significantly from those in less-healthy food stores. More-healthy stores seem to be more focused on the products and communicating the healthfulness of those products whereas the less-healthy food stores seem to be slightly more focused on providing a comfortable and pleasant experience rather than drawing attention to the products sold, as much. Natural and whole food ambient scents, green coloured shelving and more-healthy food-related imagery had larger effect sizes across all sensory dimension. These stimuli that emerge in Study 1 as representative of a healthier store environment warrant further testing.

In general, food retail stores varied considerably in terms of the atmospheric stimuli employed. The main insight from this exploration is that food stores differed due to the presence of certain types of store atmospheric stimuli rather than the mere presence or pleasantness of the stimuli. Field observations in Study 1 showed that more-healthy stores had more natural whole food scents, more relaxed ambient music, ambient outdoor noises, higher ambient temperatures, raw and natural flooring materials (e.g. painted and plain concrete, tar seal), cooler environmental colours (e.g. green shelving), very bright ambient lighting and more-healthy food-related wall imagery present more often than less-healthy stores. In comparison, less-healthy food stores had ambient processed food scents, more upbeat tunes, comfortable ambient temperatures (17.5°C to 26°C), exclusive upmarket type floors (e.g. wooden and polished concrete floors), glass and plastic shelving, warm environmental colours (e.g. red and brown walls, pink shelving), and less-healthy food-related or non-food related wall imagery present more often than more-healthy stores. Of these findings, whole food ambient scents, green coloured shelving and more-healthy imagery will be further investigated for their larger association to more-healthy food stores in comparison to the other store atmospheric stimuli.

Taken together, findings from the field observations in Study 1 lend support for understanding which store atmospheric stimuli are representative of a healthier store environment.

Chapter 4: Selection of stimuli and hypothesis development for the experimental supermarket trial

The purpose of Study 1, the observational study presented in Chapter three, was to establish store atmospheric differences between more- and less-healthy food stores in New Zealand and to identify which store atmospheric stimuli represent a healthier store environment. This chapter next explores whether the identified store atmospherics from Study 1 (e.g., ambient natural and whole food scents, green shelving and more-healthy food-related imagery) can be used to create a message of healthfulness.

A series of pre-tests are outlined to determine how scent, wall imagery, and shelving colours might be manipulated to determine differing messages of healthfulness. Such quantitative pre-testing builds on the results of Study 1's observations and is necessary to develop stimuli for a full experimental supermarket trial, planned for Study 2 (detailed in Chapter five). Four hypotheses are then advanced from previously developed propositions and observational findings, and pre-testing in this chapter. First, this chapter examines the research question and objective, followed by an explanation of the pre-testing undertaken for each store atmospheric manipulation and the resulting hypotheses development for each of the store atmospheric stimuli (scent, colour, and imagery). The chapter concludes by providing a guide for the establishment of stimuli for Study 2's experimental supermarket method.

4.1 Research question and objective

Study 1's exploratory observational study identified atmospheric stimuli that represent a more- and less-healthy store environment. This chapter further builds on the observational findings to seek an answer to the following research question:

RQ2: *Which store atmospheric stimuli can be tailored to create a message of healthfulness?*

The aim of this chapter is to test whether the selected olfactory and visual atmospheric stimuli, viz. ambient natural and whole food scent, green shelving and more-healthy imagery, are associated with healthfulness through a series of pre-tests and development of hypotheses. Another purpose of this stage of the research is to justify in what way stimuli should be presented for testing in an experimental design (Study 2). To do so, three key pre-tests are undertaken: A pre-test of ambient scent stimuli (pre-test 1), a pre-test of visual imagery for shelving colour (pre-test 2), and a pre-test of visual imagery for wall art (pre-test 3).

4.2 Pre-test 1: Ambient scents

Two ambient and contrasting scents were sought for manipulation in an experiment, one representing a more-healthy store environment and another representing a less-healthy store environment. In Study 1, more-healthy food stores were found to be associated with multiple natural and whole food ambient scents such as raw meat, fresh fruit, flowers, fresh seafood, fish, vegetables, and herbs and spices within the exploratory observational Study 1. Raw meat, fresh seafood, fish or vegetable scents will not be tested due to lack of supply of these scents by Reima Air concepts the supplier of the scent machines. In Study 1, the observed scent of herbs and spices were typical of more-healthy supermarket and grocery stores (Appendix E) but were only found in 70% of the stores. Field (2005) specifies that no expected frequencies should be below 100% to avoid a type 1 error. No further data to increase sample size were collected at the time due to time constraints. Nonetheless, given the exploratory nature of the observations, the impact of herbs and spices will be pre-tested first to explore its usability in an experimental design, intended in Study 2.

Fresh fruit and flower scents were also associated with more-healthy food stores in Study 1, but associations were notably smaller than the herbs and spices scent. Previous literature shows support for the effects of fresh fruit scents on selecting more of the fruit or vegetable options on a menu (e.g., Gaillet et al., 2013; Gaillet-Torrent et al., 2014). Thus, fresh fruit scents were selected over floral scents for further testing. Thus, herbs and spices and fresh fruit scents were tested for their ability to create a message of healthfulness. Both scent types were pretested to inform hypotheses development.

The goal of pre-test 1 is to assess whether a more-healthy ambient scent (e.g. herbs and spices and/or fresh fruit) representative of a more-healthy store environment can create a message of healthfulness for individuals by activating associations to health-related concepts and related product categories

4.2.1 Participants and method

Fifteen individuals (four males, eleven females, aged 18 to over 65 years old) were recruited from the community to evaluate nine fruit scents (lemon, mandarin, apple, lime, orange, banana, kiwifruit, apricot, and pineapple) and one herb and spices scent in quiet home or office spaces. The herb and spices scent is described as "an aromatic and appetizing mix of herbs and spices" and named "herbs" by Reima Air Concepts (2016). When tested in groups, participants were instructed not to interact with one another. Scents were presented in vials, as in past pre-tests (e.g., Maric & Jacquot, 2013; Morrin & Ratneshwar, 2000; Schifferstein & Blok, 2002; Spangenberg et al., 1996) and were evaluated in a random order (as done in Poon & Grohmann, 2014) determined by an online random number generator. The REIMAROM® fragrances were supplied by Reima Air Concepts of Germany.

Each vial was filled with 2 drops of the odorant. Fenko, Schifferstein, Huang, and Hekkert (2009) suggest equal amounts of the fragrance helps to keep intensity of scents equal. The vials were labelled from 1 to 10 with no other descriptions to ensure participant evaluations were blinded (Spangenberg, Grohmann, & Sprott, 2005). The researcher was not blinded to the scents. Opaque vials helped to eliminate the influence of colour on colour-scent associations (Maric & Jacquot, 2013; Spangenberg et al., 1996). For each odorant, participants were asked to hold the vial 6 cm from their noses for a period of 30 seconds. This method was adapted from Diego, Jones, Field, Hernandez-Reif, Schanberg, Kuhn, McAdam, Galamaga, & Galamaga (1998). Participants were instructed to breathe normally with their eyes closed (Diego et al., 1998); most individuals sniffed as well. The distance the vial was held from the nose was to help minimise unpleasantness of any stronger scents. If difficulty smelling the scent occurred, subtle movements of the vial up toward the nose were suggested until participants could smell the scents. Participants were able to smell the vial as many times as they required to form judgement. As Yeshurun and Sobel (2010) indicated, repeated exposure to a scent can help with scent identification.

Between scent exposures, coffee beans provided nasal palate cleansing for participants. The coffee beans are a technique used by Krishna et al. (2010) and Maric and Jacquot (2013) to help clear nasal passages and refresh nasal scent palates. This is a practice used by the fragrance industry and helped minimise contamination between scents

(Krishna et al., 2010). After each scent, participants completed a set of questions (see Appendix F for the exact stimuli and question wording). Unaided recall (e.g., "what kind of scent can you smell?") and subsequent associations (e.g., "do you associate the scent with anything? Does the scent bring back any memories or thoughts?"), were collected to help produce organic product-related associations and concept-evoking ability (Schifferstein & Blok, 2002). The properties of the scent, scent pleasantness, scent familiarity, scent stimulation, and scent healthfulness were further measured with a 7-point Likert-type scale (1 = very unpleasant, very unfamiliar, very calming or very unhealthy to 7 = very pleasant, very familiar, very stimulating or very healthy). An aided recognition measure (e.g. do you think the scent represents any of the following scents? List of scents provided) at the end of the pre-test helped participants to identify each scent, as it is often difficult for humans to describe and name scents (Yeshurun & Sobel, 2010).

4.2.2 Analysis and findings

Analysis of frequency of verbatim participant responses revealed that the scent of herbs (versus individual fruits) evoked the greatest spontaneous associations (herbs: 17 out of 32, mandarin: 16 out of 32, lemon: 11 out of 39, apples: 4 out of 26, as examples) to a diverse range of health-related concepts and an assortment of healthy foods from multiple departments within a supermarket (see verbatim responses Appendix G). The scent of herbs reminded participants of herbs and spices, cooking, the kitchen, meat, stuffing, dressing and seasoning. When smelling the herbs vial, participants largely thought about cooked dinners, casseroles, weekend dinners, summer cooking, roasts, and restaurant cuisines. The herb scent also had fewer associations to less healthy foods or other non-food related concepts compared to fresh fruit scents (see verbatim responses Appendix G). Fruit scents largely reminded participants of household, personal hygiene and/or cleaning products, less healthy foods such as lolly, chocolate, desserts and alcoholic beverages. Other associations included nature (e.g. trees, plants, flowers, gardens), outdoors (summer), childhood memories, places, sickness, relaxation, the fruit itself (predominately citrus fruit), juice, breakfast, lunches and picnics.

The herb scent and citrus fruit scents were the easiest to identify, as assessed by a Pearson's Chi Square test and aided recognition frequency scores (Table 20).

Table 20. Participants (n = 15) unaided recall and aided recognition of pre-tested scent types

Scent Type	**Unaided Recall**			**Aided Recognition**
	Correct	*Incorrect*	*Recognised*	*Unrecognised*
Mandarin	73.3%	26.7%	93.3% citrus (53.3% mandarin, 33% grapefruit, 6.7% lemon)	6.7% none
Lemon	66.7%	33.3%	93.3% citrus (53.3% lemon, 20% mandarin, 6.7% grapefruit, 6.7% orange, 6.7% lime)	6.7% none
Apple	20%	80%	0% Apple	93.3% citrus (53.3% lemon, 20% mandarin, 6.7% grapefruit, 6.7% orange, 6.7% lime), 6.7% none
Herbs	53.3%	46.7%	86.7% herbs (60% herbs, 26.7% rosemary)	13.3% none
Lime	66.7%	33.3%	93.3% citrus (66.7% lime, 26.7% lemon)	6.7% herbs
Orange	80%	20%	93.3% citrus (80% orange, 6.7% mandarin, 6.7% lemon)	6.7% apricot
Banana	26.7%	73.3%	73.3% Bananas	13.3% pineapple, 6.7% grapefruit, 6.7% kiwi
Pineapple	0%	100%	20% pineapple	33.3% none, 13.3% banana, 6.7% apple, 6.7% grapefruit, 6.7% kiwi, 6.7% herbs, 6.7% rosemary
Apricot	0%	100%	46.7% Apricot	20% none, 6.7% apple, 6.7% mandarin, 6.7% orange, 6.7% banana, 6.7% pineapple
Kiwi	13.3%	86.7%	20% Kiwi	20% none, 13.3% apple, 13.3% grapefruit, 13.3% pineapple, 6.7% apricot, 6.7% banana, 6.7% lime

Note: None = participants perceived the scent to be different from the provided list of scents

The means show that none of the scents were regarded as unhealthy, unfamiliar, or unpleasant (Table 21). However, some of the scents are perceived to be more pleasant, stimulating, and familiar than others. Due to scent intensity in a vial differing from that of an ambient scent dispersed through a scent machine, further testing of the pleasantness, stimulation and familiarity will be undertaking in Study 2 to ensure any extraneous elements are eliminated.

Table 21. Participants (n = 15) perceptions of different scent types ranked from one to seven for perceived healthiness, pleasantness, appropriateness and stimulation

	Perception of scent			
Scent	**Healthiness Mean(SD)**	**Pleasantness Mean(SD)**	**Stimulation Mean(SD)**	**Familiarity Mean(SD)**
Mandarin	5.40(1.50)	5.27(2.05)	3.47(1.64)	5.00(1.93)
Orange	4.87(1.73)	4.67(2.02)	3.8 (1.66)	4.33(2.09)
Apricot	4.87(1.60)	4.93(2.19)	4.00(1.46)	5.60(1.68)
Lime	4.73(1.53)	5.53(1.51)	3.53(1.68)	5.73(1.34)
Lemon	4.53(2.03)	5.00(1.65)	3.53(1.13)	5.00(1.60)
Apple	4.53(1.19)	4.47(1.36)	4.40(1.30)	4.73(2.34)
Kiwi	4.27(1.03)	5.27(1.62)	3.87(1.30)	5.20(1.74)
Banana	4.00(1.60)	4.53(2.39)	4.00(2.24)	5.27(2.31)
Pineapple	3.67(1.11)	4.13(1.73)	4.33(1.39)	4.27(1.87)
Herbs	3.87(1.60)	3.80(1.57)	4.93(1.58)	4.93(1.91)

Note: 7-point likert type scale (1 = least, 7 = most).

The fruit scents, especially citrus scents, were shown to more narrowly focus shoppers on the fruit and vegetable section of a supermarket or unwanted product categories such as cleaning, beauty, chilled and frozen, and confectionary. Foods closer to their natural state such as fresh vegetables and fruit, raw nuts, fish, chicken, meat, frozen fruits and vegetables, legumes and beans have been linked to outcomes involving better health and less heart disease and stroke (Mancino et al., 2009; Ministry of Health, 2015). The use of wholesome, natural foods to create home cooked meals is thus healthier than highly processed, convenience or takeaway foods (Ministry of Health, 2015). The herb (versus fruit) scent is thus selected for Study 2, as a manipulation to allow for greater search activation of wholefoods such as ingredients for a home cooked meal as opposed to a narrower range of activated foods for the fruit scents. The herb scent was selected to represent the more-healthy ambient scent to create a message of healthfulness by activating associations to health-relevant concepts and related product categories.

In Study 1, the ambient scent associated most with less-healthy food stores was sweet bakery in comparison to lolly and hot bread scents. This result, in combination with evidence from previous studies (e.g., Douce et al., 2013; Chambaron et al., 2015) supports the appropriateness of testing sweet bakery scent as the less-healthy manipulation scent over lolly scent and hot bread scent. In the past, sweet scents have been found to influence approach behaviours, sales and selection of thematically congruent products (Douce et al., 2013; Chambaron et al., 2015). For example, Douce et al. (2013) showed in a bookstore that a pleasant ambient chocolate scent encouraged more thematically congruent product purchasing of chocolate related books. Also, Chambaron et al. (2015) discovered that when participants were exposed to a pleasant ambient pain au chocolate scent, they were more likely to select less healthy options from a menu. Similarly, an ambient sweet bakery scent could potentially influence shoppers to purchase thematically congruent less healthy products within the supermarket environment. The link between sweet bakery scent and food choice was selected for the less-healthy environment in the experimental supermarket trial in Study 2 (Chapter five).

4.2.3 Discussion and hypothesis development

Exposure to a non-consciously perceived ambient herb (versus sweet bakery) scent prime might influence the health profile of shopper food baskets in a supermarket. Previous findings of atmospheric influences on food choice suggest that exposure to an ambient food scent increased choice and appetite for associated foods (Chambaron et al., 2015; Douce et al., 2013; Gaillet-Torrent et al., 2014; Ramaekers et al., 2014). For example, Ramaekers et al. (2014) discovered in a laboratory environment that compared to non-food scents and sweet ambient scents, appetite toward savoury foods increased and appetite toward sweet foods decreased when exposed to a savoury ambient scent, and vice versa for the ambient sweet food scent. As these authors conclude, “once the body is prepared for intake of a certain food with a particular macronutrient composition, it is unfavourable to consume foods that are very different from the cued food” (Ramaekers et al., 2014, p. 650). Thus, a savoury ambient scent can influence appetite toward thematically congruent foods and suppress appetite for incongruent foods.

In conjunction with the pre-test results and previous theorising (Chapter two), it is therefore expected that exposure to an ambient herb scent (versus ambient sweet bakery scent) prime will nudge shoppers to purchase healthier (less healthy) baskets of goods. This relationship is anticipated for three reasons (1) the health-orientated prime activates knowledge structures that makes health-relevant information highly accessible, guiding subsequent processing (Loersch & Paynee, 2011) and behaviour, as per spreading activation theory (Collins & Loftus, 1975), (2) the non-conscious nature of the store atmospheric cues will act as a reminder or prompt for shoppers to engage in health behaviours, as per nudging theory (Thaler & Sustein, 2008), and (3) shoppers can misattribute the incoming information to their own internal response in turn guiding behaviour, as per the situated inference model (Loersch & Payne, 2011) (see Section 2.3 for a discussion of these relationships and an outline in the integrative framework of store atmospheric effects on food purchasing behaviour). It is plausible that an ambient herb scent will be negatively related to the health composition of shopper food baskets for the reason that the food scent may increase appetite in general (Ramaekers et al., 2014) and lead to greater selection of unhealthy foods, or it may only impact the amount spent (e.g. Leenders et al., 2016) rather than the healthiness of the food. However, the preponderance of evidence and strong theoretical arguments support the positive relationship. Thus, it is formally proposed that:

> ***H1**: Shoppers exposed to an ambient herb scent (priming stimulus) will purchase more thematically congruent baskets of food (healthier foods) than shoppers exposed to an ambient sweet bakery scent (priming stimulus).*

4.3 Pre-test 2: Shelving colour

Two colour store atmospheric stimuli manipulations are also sought for use in Study 2's experimental supermarket design. Green shelving, as observed in more-healthy food stores in Study 1, provides one stimulus. A less-healthy food store colour will represent the other.

In Study 1's observations, pink shelving or warmer colours were identified as representing a less-healthy food store. Associations of pink shelving to less-healthy food stores were small, however, and could seem out of place in a supermarket context (Appendix E). Furthermore, the warm colours identified as being more prominent in less-healthy food stores could potentially create problems for the investigator and the retailer. As retail studies suggest, red can both have positive and negative outcomes for less-healthy food retailers. Bright, colourful, tense environments encouraged shoppers to reduce time spent in store, to increase decision-making speeds and increase impulse purchasing to escape a more unpleasant environment (Bellizzi et al., 1983). Warmer colours could thus hinder profit margins. The increase in impulse purchasing and weaker resistance to temptations due to the arousing properties of red (Bellizzi et al., 1983; Fedorikhin & Patrick, 2010) is attractive to retailers wanting to increase the likelihood of less-healthy food purchases through diminished self-control. However, red can also reduce the chances of consumers selecting healthier options due to colour pairings with danger and traffic light signals (Reutner et al., 2015). Therefore, red was not further investigated.

With no additional insights from the less-healthy food stores in Study 1, further findings from the independently analysed supermarket and grocery stores in the observational study were sought instead. Black and grey shelving were significantly absent from more-healthy supermarket and grocery stores (Appendix E). Of the less healthy supermarket and grocery stores, 96.3% had grey shelving and 93.3% had black shelving. With the marginal association of less-healthy stores having directionally more stores than expected with black shelving absent (section 3.7.6.2.2), grey shelving was selected to represent the less healthy store environment. Associations with both green and grey colours, thus, will be pretested.

4.3.1 Participants and method

Pre-test 2 examines if green (versus grey) shelving is representative of a more-healthy (versus less-healthy) store environment and might create a message of healthfulness for individuals by activating associations to health-related concepts and related product categories.

For pre-test 2, 52 participants were invited via social media and email to complete an online questionnaire generated through survey design software Qualtrics (Appendix H). Participants were exposed to both colour (green and grey) stimuli in a repeated measures design in which the colours were presented as colour blocks. As participants independently viewed the colour blocks they were asked to reveal any association they had with the colour, and if the colours brought back any memories or thoughts. On a separate online page, participants were asked to rate the properties of the colour based on its healthfulness, pleasantness, familiarity, stimulation (Appendix H) and the appropriateness of the colour for supermarket shelving on 7-point Likert-type scales (1 = very unhealthy, very unpleasant, very unfamiliar, very calming or extremely inappropriate to 7 = very healthy, very pleasant, very familiar, very stimulating or extremely appropriate).

4.3.2 Analysis and findings

As a result of a paired samples *t* test, analysis of participants' responses of the colour's healthiness revealed that participants perceived green to be significantly more-healthy (M = 5.58, SE = 0.187) than grey (M = 3.15, SE = 0.185; t (51) = 8.6, p < 0.001, r = 0.76).

Analysis of participants' responses to colour pleasantness and stimulation also showed that participants perceived green to be significantly more pleasant (M = 4.89, SE = .154) than grey (M = 3.79, SE = 0.154; *t*-test, t (51) = 3.55, p < 0.002, r = 0.44), and significantly more stimulating (M = 4.33, SE 0.242) than grey (M = 3.08, SE = 0.176; t (51) = 3.808, p < 0.001, r = .022). In contrast, participants rated grey to be significantly more appropriate for supermarket shelving (M = 4.68, SE = 0.159) than green (M = 3.98, SE 0.159; t (51) = -2.17, p < 0.04, r = 0.28). To ensure spurious variables such as pleasantness and stimulation of the colour are controlled for, Study 2 will further test these constructs.

Analysis of frequency of verbatim responses (Appendix I) shows that green was predominately (54%) associated with verbatim responses of nature and outdoors, and also reminded participants of healthy products and foods, sports, relaxing, summer, happiness, calmness and picnics. Other associations, including confectionary, traffic lights, correction, green for go and motorway signs, were revealed.

Grey was predominately associated with the rain, bad weather, cloudy days, concrete or cement, blandness, sadness, and buildings. No food-related associations were generated for grey in pre-test 2. Thus, these findings support the assumption that green (versus grey) shelving could create a message of healthfulness. Since colour was tested outside of the supermarket environment and as colour blocks (versus store shelving), this may be one reason for a lack of associations between the colour green or grey and healthier or less healthy foods.

Research also shows that green packaging causes shoppers to associate the products inside as being healthier (Schuldt, 2013; Van Rompay, Deterink, & Fenko, 2016). Based on this evidence, green shelving could potentially impact associations to products in the store. Green and grey shelving were thus selected as contrasting stimuli in terms of healthiness for further testing.

4.3.3 Discussion and hypothesis development

Exposure to a non-consciously perceived green (versus grey) shelving prime is anticipated to influence the health composition of shopper food baskets in the experimental supermarket study. A positive relationship between the green shelving prime and healthier food choices is expected for three reasons (1) the health-orientated prime activates knowledge structures that makes health-relevant information highly accessible, guiding subsequent processing (Loersch & Paynee, 2011) and behaviour, as supported by spreading activation theory (Collins & Loftus, 1975), (2) the non-conscious nature of the store atmospheric cues will act as a reminder or prompt for shoppers to engage in health behaviours, supported by nudging theory (Thaler & Sustein, 2008), and (3) shoppers might misattribute incoming information to their own internal response, in turn guiding behaviour, as supported by the situated inference model of behaviour (Loersch & Payne, 2011) (see Section 2.3 for a discussion of these relationships as well as an outline in the integrative framework).

Previous evidence shows that green colours or cool colours in-store affect product purchasing (Barli et al., 2012), and help with decision-making during the shopping process (Bellizzi et al., 1983). As green shelving was most frequently observed in more-healthy food retail environments in New Zealand in Study 1, the colour green provides an opportunity for learned colour meanings from these stores to be transferred to the supermarket context, as will be tested in Study 2's experimental supermarket design (Chapter five). Shoppers hold expectations and associative links between healthier stores, healthier foods and the colour green. This was also shown in Kontukoski et al. (2016), where green (referred to as kiwi) was associated with an imaginary salad restaurant, and was perceived to be more congruent with a salad dish. As these authors note, expectations partially arise from previous experiences (Kontukoski et al., 2016) and should make learned colour green meanings more easily accessible for shoppers when exposed to the colour (Labrecque et al., 2013).

Conversely it is also plausible that a green shelving prime would be negatively related to the health basket composition of shopper food baskets for the reason that a misleading health halo could be created (via an assimilation effect; Chandon & Wansink, 2007; Wansink & Chandon, 2006) or an appetitive cue may be activated, signalling an open and safe environment to consume foods or a green for "go" in terms of green colour pairings with the traffic light system (Elliot & Maier, 2012). However, previously associated evidence with the colour green and healthiness, and the strong theoretical arguments support, on balance, a positive relationship. The following hypothesis is therefore proposed for the next study (Study 2) in this body of work:

> ***H2**: Shoppers exposed to green shelving (priming stimulus) will purchase more thematically congruent baskets of food (healthier foods) than shoppers exposed grey shelving (priming stimulus).*

4.4 Pre-test 3: Visual imagery for walls

Two sets of wall imagery are also sought for use as manipulations in Study 2. More-healthy imagery observed in more-healthy food stores in Study 1 provides one stimulus, while the less-healthy imagery will represent the other manipulated stimulus. Less-healthy imagery such as pictures of bagels, chocolate slices, alcohol, and cakes was largely associated with less-healthy food stores in Study 1. Non-food-related imagery such as photographs of famous people, decorative wall decals, and paintings of landscapes was less associated with less-healthy foods in Study 1 in terms of effect size. Therefore, the former was selected to represent the less-healthy store environment in pre-test 3. The imagery types were pre-tested to assess perceived healthfulness of the images individually and as two groups. To be used as manipulations in the experimental design in Study 2, the more-healthy imagery group should be perceived as being significantly healthier than the less-healthy imagery group.

4.4.1 Participants and method

Pre-test 3 assessed how more-healthy (versus less-healthy) wall imagery representative of a more-healthy (versus less-healthy) store environment could create a message of healthfulness for individuals by activating associations to health-related concepts and related product categories.

Participants were 105 shoppers invited via social media and email to complete an online questionnaire generated through Qualtrics (Appendix H). Nineteen images were evaluated across four questionnaires to minimise response fatigue (Gilbert & Churchill, 1999). Participants evaluated either one image (Appendix K) or several images (Appendix L; Table 22). As participants viewed each image they were asked to reveal the first thing that came to their minds, and if they associated the image with anything (example questions in Appendix H). On a separate online page, participants were next asked to rate the properties of the image based on its healthfulness, pleasantness, familiarity, stimulation (Appendix H) and the appropriateness of the image for a supermarket environment on 7-point Likert-type scales (1 = very unhealthy, very unpleasant, very unfamiliar, very calming or extremely inappropriate to 7 = very healthy, very pleasant, very familiar, very stimulating or extremely appropriate). Participants were also asked whether the imagery encouraged them to want to purchase from sections within the supermarket such as dairy, bakery, frozen, butchery, confectionary, fruit and vegetable, grocery, seafood, delicatessen, or other (Appendix M).

Table 22. Number of participants exposed to imagery stimuli.

Questionnaire	**Imagery Type**	**Participants**
1	Bagels, chicken, cheese, lollies, fresh seafood, meat on a platter, fresh fruit and vegetables, white bread	24
2	Brown bread, cows in meadow, coffee & biscuits, cooked fish, bakery items, salad, chopped cow, winery, pie	27
3	Dessert Image	30
4	Jam scones with cream	24
	Total	105

4.4.2 Analysis and findings

All of the imagery was scored for pleasant, appropriate and stimulation, as per the mean scores (Table 23). Analysis of participant responses to the healthfulness of the image revealed that they felt, overall, that fruit and vegetables, scallop salad, fresh seafood, cooked fish, chickens in a meadow, meat on a platter, cows in a meadow, and brown bread images ranked as the healthiest (means > 4.8). However, winery, jam scones with cream, pie, bagel, coffee and biscuits, dessert, bakery and lollies images were rated the least healthy (means < 4.5; Table 23).

Table 23. Participants (n = 24-30) perceptions of different imagery types ranked from one to seven for perceived healthiness, pleasantness, appropriateness and stimulation

Imagery Type	**Healthiness Mean(SD)**	**Pleasantness Mean(SD)**	**Appropriateness Mean(SD)**	**Stimulation Mean(SD)**
Fruit & vegetables	6.88(0.60)	6.60(0.82)	6.48(1.42)	4.68(2.15)
Scallop salad	6.70(0.54)	6.33(0.78)	6.00(1.41)	5.04(1.79)
Fresh seafood	6.28(1.49)	4.96(1.95)	6.08(1.22)	4.76(1.36)
Cooked fish	6.11(1.19)	5.15(2.23)	5.44(1.42)	4.67(1.44)
Chickens in meadow	5.60(1.55)	5.80(1.44)	4.28(1.77)	3.88(1.76)
Meat on a platter	5.60(1.55)	5.32(1.55)	5.84(1.37)	5.16(1.46)
Cows in meadow	5.41(1.55)	5.44(1.40)	4.41(1.78)	4.07(1.84)
Brown bread	4.85(1.63)	5.89(1.34)	6.04(1.34)	4.04(1.34)
Cow Chopped	4.48(1.50)	4.07(1.62)	4.74(1.91)	4.52(1.19)
Cheese	4.12(1.30)	5.64(1.68)	5.68(1.38)	4.84(1.43)
White bread	4.08(1.71)	5.68(1.44)	6.16(0.90)	4.08(2.00)
Winery	3.67(1.54)	5.93(1.27)	4.85(1.46)	4.29(1.97)
Jam scones cream	3.04(1.30)	5.67(1.49)	4.75(1.85)	4.67(1.68)
Pie	2.85(1.41)	5.00(1.30)	5.19(1.11)	4.33(1.36)
Bagel	2.76(1.56)	4.80(1.63)	4.64(1.75)	4.36(1.60)
Coffee and biscuits	2.26(1.40)	6.26(0.98)	5.52(1.40)	3.44(1.91)
Dessert	1.80(1.00)	5.97(1.25)	4.67(1.67)	5.17(1.46)
Bakery	1.70(1.10)	5.52(1.81)	5.15(1.68)	4.59(1.76)
Lollies	1.24(0.66)	4.20(2.02)	3.68(1.97)	5.28(1.59)

Note: 7-point likert type scale (1 = least, 7 = most).

This is further supported by a paired samples *t*-test in which the more-healthy and less-healthy images were grouped together to reveal that, on average, the more-healthy imagery condition was perceived to be significantly more-healthy (M = 5.91, SE = 0.075) than the less-healthy imagery condition (M = 2.37, SE = 0.075), t (207) = 23.652, p < 0.001, r = 0.073. Analysis of frequency of participant verbatim responses revealed that more-healthy imagery had strong associations (49%) to healthier foods such as vegetables, fruit, seafood, salads, meat, and consuming healthier foods, and being healthier (Appendix M and N). In contrast, less-healthy food-related imagery was associated (52%) with less healthy foods such as confectionary, desserts, bakery foods, and consuming less healthy foods, and being unhealthy.

Thus, these findings support the hypothesis that more-healthy (versus less-healthy) imagery created a message of healthfulness for individuals by activating associations to health-related concepts and related product categories. More-healthy imagery was perceived to be healthier than the less-healthy imagery. The imagery of fruit and vegetables, scallop salad, fresh seafood, cooked fish, chickens in meadow, meat on a platter, cows in meadow and brown bread were chosen to represent the more-healthy imagery in Study 2. The imagery of winery, jam scones with cream, pie, bagel, coffee and biscuits, dessert, bakery and lollies were chosen to represent the less healthy imagery in Study 2.

4.4.3 Discussion and hypothesis development

Exposure to a non-consciously perceived more-healthy imagery (versus less-healthy imagery) prime might influence the health composition of shopper food baskets. A positive relationship is expected between the more-healthy imagery and healthier food choices for three reasons (1) the health-orientated prime activates knowledge structures that makes health-relevant information highly accessible, guiding subsequent processing (Loersch & Paynee, 2011) and behaviour, as per spreading activation theory (Collins & Loftus, 1975), (2) the non-conscious nature of store atmospheric cues can act as a reminder or prompt for shoppers to engage in health behaviours, as per nudging theory (Thaler & Sustein, 2008), and (3) shoppers might misattribute incoming information to their own internal response in turn guiding behaviour, as per the situated inference model (Loersch & Payne, 2011) (Section 2.3).

Imagery has health-evoking ability in motivating consumers to purchase healthier foods. Stockli et al. (2016) suggest that associations between the environmental cue (healthier imagery) and diet, body-weight and/or health relevant concepts could potentially moderate the relationship. In addition, studies have shown that visual food images can activate food cravings, appetitive appeal, health goals, reward drive, and motivation for consumption of the presented foods (Beaver et al., 2006; Forwood et al., 2015; Kemps et al., 2016; Killgore et al., 2003). More-healthy imagery (versus less-healthy imagery) could therefore prompt associations to health-relevant concepts, heightening one’s appetite for and choice of particular products.

It is also plausible that more-healthy imagery prime could be negatively related to the health basket composition of shopper food baskets for the reasons that a misleading health halo could be created (via an assimilation effect) (Chandon & Wansink, 2007; Wansink & Chandon, 2006) or the activation of self-regulation goals and avoidance tendencies due to guilt, self-presentation, weight management, and health may come into play (Fletcher et al., 2007; Killgore et al., 2003; Stroebe et al., 2008). However, the previously associated evidence with more-healthy imagery and healthier food choices and the strong theoretical arguments support, on balance, a positive relationship. The following hypothesis is therefore proposed:

> *H3: Shoppers exposed to more-healthy wall imagery (priming stimulus) will purchase more thematically congruent baskets of food (healthier foods) than shoppers exposed to less healthy food-related wall imagery (priming stimulus).*

4.5 Interaction of store atmospheric stimuli

The relationship between exposure to ambient more-healthy scent (e.g. herbs), green shelving and/or more-healthy wall imagery, and purchase of more thematically congruent foods is anticipated to be stronger when the store atmospheric stimuli are integrated together to communicate one message of healthfulness. A positive relationship between the "more-healthy" primes and healthier food choices is expected for two reasons: (1) shoppers experience and respond to a combination of store atmospheric cues when making purchasing decisions (Babin et al., 2003; Ballantine et al., 2010; Bava et al., 2009; Mattalia & Wirtz, 2001), and (2) perception can be based on groups of stimuli that together are more meaningful rather than the single parts (Lin, 2004) (Section 2.2).

Previous evidence shows that by investigating multiple store atmospherics, a more comprehensive understanding of the holistic influence of the store environment on shopper behaviour is achieved (Bava et al., 2009; Mattila & Wirtz, 2001). Investigating interaction effects between the herb scent, green shelving, and more-healthy wall imagery provides an opportunity to understand whether in combination the "more-healthy" stimuli in a retail setting have a stronger influence on healthier food choices. Conversely, it is also plausible that interaction effects between the store atmospheric stimuli would not emerge due to the stimuli not communicating the same message. However, pre-test results indicate this should minimise the possibility of the prior occurring. Thus, it is formally proposed that:

***H4**: Shoppers exposed to "more-healthy" store atmospherics (e.g. herb scent, green shelving, and more-healthy food-related wall imagery) will purchase more thematically congruent baskets of food (healthier foods) than shoppers exposed to "less healthy" store atmospherics.*

4.6 Hypothesis summary

As per the discussion above, a summary of the hypotheses developed for testing in Study 2 are outlined below (Table 24).

Table 24. Summary of hypotheses for the experimental supermarket trail, Study 2

Hypotheses	**Path**
H1	Herb (versus sweet bakery) scent → healthier basket food
H2	Green (versus grey) shelving → healthier basket food
H3	More-healthy (versus less-healthy) imagery → healthier basket food
H4	Herb scent, green shelving, and/or more-healthy imagery (versus sweet bakery, grey shelving and/or less healthy imagery) → healthier basket food

4.7 Conclusion

Based on initial assessment via observation in Study 1, this chapter further explored the ability of ambient scent, colour, and imagery to create an atmosphere associated with healthfulness. A series of pre-tests identified three combinations of store atmospherics (more-healthy versus less-healthy ambient scent, colour and imagery) for testing as manipulations in Study 2.

The more-healthy store atmospherics, ambient herb scent, green shelving, and more-healthy wall imagery were identified as cues of healthfulness compared to the less-healthy store atmospherics, ambient sweet bakery scent, grey shelving, and less-healthy wall imagery. From these insights and in combination with former theorising, four main hypotheses were developed to guide the investigation in Study 2. Shoppers exposed to more-healthy store atmospherics (priming stimulus) were anticipated to purchase more thematically congruent baskets of foods (healthier foods) in comparison to the contrasting less-healthy store atmospherics. For example, shoppers exposed to an ambient herb scent (priming stimulus) are expected to purchase more thematically congruent baskets of food (healthier foods) than shoppers exposed to an ambient sweet bakery scent (priming stimulus). The relationships for all hypotheses were postulated as being stronger when integrated with the other identified more-healthy stimuli.

This chapter has therefore provided better understanding for the store atmospherics that can be used to create a message of healthfulness. The hypotheses provide guidance for the establishment of store atmospheric stimuli for the resulting Study 2.

Chapter 5: An experimental supermarket trial of store atmospherics as a prime to nudge shoppers toward healthier food choices

The purpose of the previous chapter was to provide guidance for the selection of store atmospheric stimuli for Study 2's experimental supermarket method, as presented in this chapter. The aim of Study 2 is to examine whether more-healthy store atmospheric primes as shown in Study 1 and pre-tests 1-3 (e.g. ambient herb scent, green shelving, and/or more-healthy wall imagery) can nudge shoppers toward healthier food choices in a laboratory-simulated virtual supermarket environment. The research question and objective, and four hypotheses for testing in Study 2 are highlighted first, followed by details of the experimental design and ethical considerations necessary in the experiment. Justification for the selection of the method and measures and insight into the study's research procedure follows. The chapter concludes with research findings, discussion, and critique of the strengths and limitations of this experimental trial.

5.1 Research question and objective

Building on Study 1's findings and the pre-test insights, Study 2 seeks to answer the following research question:

***RQ3**: What store atmospheric stimuli could act as a prime to nudge shoppers toward healthier food choices? 3a) do these factors work interactively, 3b) and if so, how?*

Study 2 aimed to test whether olfactory and visual store atmospherics (healthier ambient scent, colour and imagery) could influence shoppers to purchase healthier foods. This relationship is largely supported by consumer food research and consumer psychology (e.g., Elliot et al., 2007; Gaillet et al., 2013; Gaillet-Torrent et al., 2014; Stockli et al., 2016). The following four guiding hypotheses developed in Chapter four will be tested in Study 2. They are as follows:

> ***H1**: Shoppers exposed to an ambient herb scent (priming stimulus) will purchase more thematically congruent baskets of food (healthier foods) than shoppers exposed to an ambient sweet bakery scent (priming stimulus).*

***H2**: Shoppers exposed to green shelving (priming stimulus) will purchase more thematically congruent baskets of food (healthier foods) than shoppers exposed grey shelving (priming stimulus).*

***H3**: Shoppers exposed to more-healthy food-related wall imagery (priming stimulus) will purchase more thematically congruent baskets of food (healthier foods) than shoppers exposed to less healthy food-related wall imagery (priming stimulus).*

***H4**: Shoppers exposed to "more-healthy" store atmospherics (e.g. herb scent, green shelving, and more-healthy food-related wall imagery) will purchase more thematically congruent baskets of food (healthier foods) than shoppers exposed to "less healthy" store atmospherics.*

5.2 Research design and justification

In order to seek answers to the research question and objectives outlined above, and to test the four hypotheses, a 2 (more-healthy scent: herbs x less-healthy scent: sweet bakery) x 2 (more-healthy imagery x less-healthy wall imagery) x 2 (more-healthy colour: green x less-healthy colour: grey) between subject factorial design was executed. This design was chosen for its ability to establish a causal relationship (Gilbert & Churchill, 1999). The "less-healthy" store atmospheric stimuli act as a comparison for "more-healthy" store atmospheric stimuli. A typical New Zealand supermarket owned by Progressive Enterprises or Foodstuffs Limited sits within the less-healthy end of the spectrum (as in Study 1). Shoppers in New Zealand may be conditioned to viewing these stores as the norm, therefore, comparing less-healthy stimuli to more-healthy store stimuli are suited to the New Zealand context. A control condition could be included at a later stage in future studies. Based on the experimental design, the eight experimental conditions were as follows:

Condition 1: Scent (more-healthy), image (more-healthy), shelving colour (more-healthy)

Condition 2: Scent (more-healthy), image (more-healthy), shelving colour (less-healthy)

Condition 3: Scent (more-healthy), image (less-healthy), shelving colour (more-healthy)

Condition 4: Scent (more-healthy), image (less-healthy), shelving colour (less-healthy)

Condition 5: Scent (less-healthy), image (more-healthy), shelving colour (more-healthy)

Condition 6: Scent (less-healthy), image (more-healthy), shelving colour (less-healthy)

Condition 7: Scent (less-healthy), image (less-healthy), shelving colour (more-healthy)

Condition 8: Scent (less-healthy), image (less-healthy), shelving colour (less-healthy)

5.2.1 The laboratory

In Study 2, the laboratory was selected over the field due to the newness of the phenomenon and the costs associated with conducting a field experiment. The AUT laboratory consisted of a room with neutral colours and a blind pulled down over the window in the Marketing, Advertising, Retailing and Sales (MARS) department. The circumference of the room was set up with eight individual stations with computers and chairs. To begin, the laboratory was considered more appropriate for understanding if there was a relationship between more-healthy stimuli and healthier food choices. As Andersson et al. (2012) indicates, when there is a level of doubt, testing should be undertaken within the laboratory first, to generate a better understanding of the hypothesised phenomenon prior to entering a real-life business context. As the proposed relationships had not yet been established in a supermarket context, it made sense to test expectations in the laboratory before collaborating with New Zealand supermarket chains. With research outcomes largely unknown, negative effects to supermarket daily operations may have transpired if adverse atmospheric stimuli were tested in the field without prior knowledge of isolate effects.

Furthermore, the laboratory environment offers a higher degree of control (Burke, Harlam, Kahn, & Lodish, 1992; Falk & Heckman, 2009) and internal validity (Bryman & Bell, 2007) compared to the field. It also helps to produce a greater understanding of the phenomenon that might otherwise be difficult to achieve in the field (Chebat et al., 1993; Countryman & Jang, 2006; Orth & Bourrain, 2008). By controlling for the influence of other shoppers, salespeople, crowding, advertising, special prices, and in-store food sampling, the researcher can become more confident that the observed effects are attributed to the manipulated variables and not to other extraneous factors. A better understanding of the isolated phenomenon can thus be achieved.

5.2.2 The virtual supermarket

A virtual supermarket, already developed by SURFsara and the Vrije Universiteit Amsterdam were leased to aid in data collection in the AUT laboratory. Wilma Waterlander, a nutrition researcher from the University of Auckland, enabled access to the supermarket. The virtual supermarket is an immersive, three-dimensional, virtual supermarket (computer gaming technology) that simulated a supermarket shopping experience (Waterlander, Jiang, Steenhuis, Mhurchu, 2015). A validation study by Waterlander et al. (2015) confirmed that the virtual supermarket is comparable to shopping behaviours in real life and valid for food choice experimental research. The virtual supermarket has been used for similar purposes as Study 2. For example, Waterlander, Scarpa, Lentz, and Steenhuis (2011), Waterlander, Steenhuis, De Boer, Schuit, and Seidell (2012), Waterlander, Mhurchu, and Steenhuis (2014), and Waterlander, Blakely, Nghiem, Cleghorn, Eyles, Genc, Wilson, Jiang, Swinburn, Jacobi, Michie, and Mhurchu (2016) have conducted a number of experimental studies in health research focusing on food choice using a similar store design as in Study 2.

The use of a virtual supermarket overcomes limitations of earlier store atmospheric studies by not restricting shoppers to pre-determined pathways or areas. Previous store atmospheric research limited participants to photographs (Decre & Pras, 2013; Kent & Kirby, 2009), written descriptions (e.g. Babin et al., 2003; Gardner & Siomkos, 1985) or video run-throughs of the store environment (Baker et al., 1992; Baker et al., 2002; Parsons, 2009; Sweeney & Wyber, 2002). At the time of planning and development, the virtual supermarket was the closest possible alternative for simulating real world supermarkets and behaviours, aside from using mini mock supermarkets created in laboratory settings (as achieved by Quartier et al., 2014) or virtual stores using virtual reality technology.

The virtual supermarket also allows for data to be collected in an unobtrusive manner. The virtual store helps to minimise socially desirable responses from participants (Gilbert & Churchill, 1999). As when researching food, people tend to underestimate calories of food eaten (Macdiarmid & Blundell, 1998; O’Loughlin, Cullen, McGoldrick, O’Conner, Blain, O’Malley, and Warrington, 2013) and under or over report less healthy food consumption (Macdiarmind & Blundell, 1998). Instead of relying on participant memory in reporting (Gilbert & Churchill, 1999), the virtual supermarket software records shopper behaviour such as products purchased, nutrient panel information checked, the order and quantities of products selected and deleted, and time spent shopping. Furthermore, individuals seem to think computers will provide greater anonymity (Gilbert & Churchill, 1999), important for any who are self-conscious about their weight or body image, who may feel uncomfortable disclosing information about what they purchase. For example, obese individuals tend to under-report energy intake (Lutomski, Van Den Broeck, Harrington, Shiely, & Perry, 2010). The unobtrusiveness of the virtual supermarket's data collection method helps make people feel more comfortable and minimises socially desirable responses.

In addition, the information provided by the virtual store is useful for determining differences between experimental groups exposed to different virtual store scenarios (Waterlander et al., 2012). If shoppers were asked directly whether store atmospherics influenced their food purchasing behaviour, most individuals would probably be unsure or disagree. As Yeoh and North (2010) find, participants do not mention music as a reason for their food choices, even though musical effects were significant. People often do not have conscious reasons for why certain shopping behaviours occur (Boote & Mathews, 1999) and have little ability to report accurately on how influential stimuli influenced their responses (Nisbett & Wilson, 1977). The ability of store atmospheric cues to be perceived non-consciously (e.g., Milliman, 1982) may prove difficult to participants identifying these stimuli as potential persuaders of choice. Therefore, the use of the virtual supermarket to collect data helped to uncover not otherwise realised relations.

5.2.2.1 The virtual supermarket scenario

The virtual supermarket was designed to simulate purchasing as in real life and was modelled on an Auckland, New Zealand, supermarket with all prices and products obtained through a field survey of online and in-store pricing (Waterlander et al., 2015; Waterlander et al., 2016). There were 1,412 products available in the store from 18 food groups across 91 categories (see Waterlander et al., 2015 for an explanation). Familiar New Zealand brands were available such as Edmonds, Masterfoods, Lipton, Griffins, Kellogg's, McCains, and Coca Cola. The products were displayed by real product images on the supermarket shelving (Waterlander et al., 2016). To navigate the store, participants pushed shopping carts around the store with the keyboard arrows, selecting products off the shelf with the click of a mouse. Nutritional information for each product could be checked and was displayed directly underneath the product on the shelf (see Waterlander et al., 2016 for detail regarding the database used for nutritional information). The shopping list option allowed participants to check products previously selected, view pricing and also delete unwanted items. The shopping trip finished with participants taking their carts through the checkouts. Payment was not required and shoppers did not receive the selected items at the end of their shop (same procedure as Waterlander et al., 2014).

In the virtual supermarket scenario, the store atmospherics did not represent any of the well-known supermarkets and grocery stores in New Zealand. Using an unknown store environment has been deemed necessary to eliminate possible confounds (Broekemier, Marquardt, & Gentry, 2008; Sweeney & Weber, 2002). There were no "other" shoppers or staff within the store, except for behind the checkouts. This was important for isolating the effects of store atmospheric stimuli and minimising social effects from others (Baker et al., 1992). The supermarket scene comes standard with background noise, small blue category signage and blue employee shirts. The ambient background noise consisted of a staff member voice-over and ambient music to add realism to the supermarket scene. As Bateson and Hui (1992) stipulate, it is important to create realistic settings when undertaking laboratory experiments. The presence of ambient noise and music encountered in supermarket and grocery stores was also realistic, as supported by the field observations in Study 1 (Appendix E).

For Study 2, the shelving colour was changed and wall imagery added to the already developed supermarket scene (Appendix O). Combinations of green or grey shelving and more-healthy or less-healthy wall imagery were presented to participants in the virtual supermarket (Appendix O). Eight different versions of the supermarket scene were developed by a software developer in the Netherlands to match the experimental conditions. The combinations of the supermarket scenes and experimental conditions were as follows:

AA: Scent (herb), image (more-healthy), shelving colour (green)

BB: Scent (herb), image (more-healthy), shelving colour (grey)

CC: Scent (herb), image (less-healthy), shelving colour (green)

DD: Scent (herb), image (less-healthy), shelving colour (grey)

EE: Scent (sweet bakery), image (more-healthy), shelving colour (green)

FF: Scent (sweet bakery), image (more-healthy), shelving colour (grey)

GG: Scent (sweet bakery), image (less-healthy), shelving colour (green)

HH: Scent (sweet bakery), image (less-healthy), shelving colour (grey)

5.2.3 The scent machines

Scent machines were chosen to create an ambient scent within the laboratory. Scent was diffused through two AromaStreamer® 300 scent machines supplied by Reima Air Concepts, Germany. The scent machines heat the liquid scent so it evaporates, and a fan distributes the scent. Scent machines allow for greater dispersion and control of the ambient scent (Gueguen & Petr, 2006; Leenders et al., 2016). This is opposed to limitations from other studies, which include use of a hidden bucket on the floor (Holland et al., 2005), hiding pieces of baked 'pains au chocolat' around the room (e.g Chambaron et al., 2015), baking food in an oven hidden in the room (e.g. Fedoroff et al., 2003), spraying a scent around a room before the experiment starts (e.g. Spangenberg et al., 2005), or use of hidden perfume blotters (e.g. Knasko, 1995).

A stringent odorisation procedure was defined by trial runs within the laboratory to ensure the optimal scent intensity level was consistent between conditions. Testing of the scent in the laboratory was recommended by Schifferstein & Blok (2002) to ensure consistency with the actual testing environment. As Leenders et al. (2016) point out, scent intensity matters. Ambient scents that are too intense can be perceived as unpleasant and scents at low perceptual thresholds may not render significant positive effects on approach behaviours (Leenders et al., 2016). Therefore, a stringent odorisation procedure was determined and followed to ensure scent was adequately manipulated during testing in Study 2.

In trial runs of scent manipulation, a number of staff and graduate students were brought into the laboratory and verbally asked whether they noticed anything different or unusual about the laboratory. This procedure was adapted from Gaillet-Torrent et al. (2014). Participants were initially unaware of the scent but once the researcher focused their attention on it, participants were able to detect the scent. To achieve effects in a lab setting, a scent needs to be detectable (Schifferstein & Blok, 2002) but not explicitly noticed (Chambaron et al., 2015). Leenders et al. (2016) suggested that 70% of respondents should be aware of the scent for more positive evaluations and approach behaviours to be experienced. Explicitly noticed scents are deemed too intense (Douce et al., 2013). Intensity of the scents was lowered until the scents were no longer spontaneously noticed, a procedure undertaken by Douce et al., (2013). It took a few adjustments with the fan and heating levels of the scent machine as well as researcher time to determine the optimal level of intensity for the laboratory environment.

To ensure homogeneous distribution every time and at the right intensity, the odourisation procedure for the sweet bakery scent required that: the fan and heating were set to low for 15 minutes and then turned off, and the room remained closed until 1-8 participants entered the room. Only one hidden scent machine was used throughout the data collection periods. The scent machine was turned on again when the participants were completing their shop, and off again when the last participant completed their shop. This was not obvious to the participants as they had headphones on, were concentrating on their shopping tasks, and none of the participants were near the switch the researcher was using to turn on the scent machine. For the herb scent, the two scent machines were turned on low for 1 hour and the room remained closed until the group of participant for the experimental session had entered the room. The two scent machines remained on for the whole day. Different procedures were required for each of the scents as scent intensities differed for the scent types.

5.3 Ethical considerations

Ethics approval from the Health Research Council accredited AUT ethics committee (AUTEC) was granted (see Appendix A).

5.4 Research procedure

5.4.1 Participants

Participants were recruited via a convenience sample from the ethnically diverse population of Auckland, New Zealand. Participant recruitment from the general population helps lend external validity to the laboratory study (Brewer & Crano, 2000). Participants were recruited through a number of organisations and social media platforms such as Auckland University of Technology, Facebook, Linkedin and

Instagram. Noticeboards, messenger, online paid advertising, and face-to-face communications were used to promote to potential participants. Three classes at Auckland University of Technology were approached as well, both undergraduate and graduate marketing students. Advertisements were approved by AUTEC (Appendix P). During the recruitment process, individuals were screened and excluded from the research if allergies, sensitivity to scents, or asthma were specified. Participants were included if 18 years and over, a purchaser of groceries and able to come into the Marketing, Advertising, Retailing and Sales department laboratory to participate in the study.

5.4.2 Method

Before beginning the study, an a prior G*power analysis was completed. A minimum of 24 per cell is required to achieve power of 0.8 (Nunnally, 1978), effect size medium 0.3. The effect size of store atmospherics on the dependent variable health composition of shopping basket is expected to be modest to small, as observed across many variables in shopper behaviour.

Prior to participation individuals were provided with the written and verbal information to make informed decisions. A copy of the participant information sheet (Appendix Q) and consent form (Appendix R) was sent to participants in advance. Participants were instructed not to wear perfume on the day of the experiment and not to have any meal, coffee or smoke 30 minutes before the session (Maric & Jacquot, 2013). To rule out selection bias, random assignment of participants to conditions was undertaken. Randomly allocating participants to multiple conditions helped to make the groups probabilistically more similar to each other on the average (Shadish, Cook, & Campbell, 2002). With this method, when differences appear between the groups it can be more likely attributed to the treatment levels rather than individual difference (Shadish et al., 2002) so long as the sample size is sufficiently large (Wilson, Aronson, & Carlsmith, 2010). Random assignment further helps to reduce the likeliness of alternative explanations for the differences observed (Shadish et al., 2002). Recruitment ended when 25 participants for each of the 8 conditions had been reached.

Before participants arrived to the laboratory, it was prepared for the experimental condition. A computer, grey pen, information pack and headphones were placed at each of the eight individual stations. An identification number (ID) was allocated to the information pack and entered into the virtual supermarket screen and online questionnaire. For each of the scent conditions, the deodorisation procedure previously presented (Section 5.2.3) was followed. For the first two weeks of data collection the herb scent was run in the laboratory, followed by sweet bakery scent for the remaining two weeks.

On arrival to the laboratory, participants (n = 1-8) waited in a waiting area outside the laboratory. Participants were invited in and seated at individual stations once all participants had arrived. To begin, participants were verbally briefed on the purpose of the study and equipment to be used. No explicit detail regarding experimental manipulations were exchanged as participants may change their behaviours even subconsciously to fit perceptions of the experimental purpose (Kirk, 2013). The researcher gave a general overview of the study, and explained that an understanding of store environment influences on shopper behaviours was sought. Consent forms were signed and any questions answered.

Before beginning the virtual supermarket shop, a short questionnaire was completed (Appendix S), followed by a navigational task in the virtual supermarket. This questionnaire, in conjunction with the post-experimental questionnaire, was pre-tested with a group of postgraduate students (n = 5) for clarity of questions and length of questionnaire before dispersing among participants. The questionnaires were designed and delivered to participants through a link to Qualtrics, provided by Qualtrics.com. The questionnaire provided insight into type of grocery shopper, typical budget spent on groceries and hunger, mood and thirst states. Participants were asked to estimate how much they spend over a three-day period (two week days and one weekend day) on groceries (including all supermarket categories). Instead of hindering what participants would normally spend on groceries, this question determined participant budget for the experimental task to come. Participant hunger and thirst was assessed with 7-point Likert-type scales (1 = not at all hungry or not at all thirsty to 7 = very hungry or very thirsty). Participant moods were assessed with four items from the mood short form index (e.g. Peterson & Suber, 1983, as cited in Bearden, Netemeyer, & Haws, 2011). The item was constructed of Likert-type statements scored on 7-point formats (1 = strongly disagree to 7 = strongly agree).

For the navigational task, participants were required to select six pre-determined products from around the store and proceed to the checkout. The navigational task helped to familiarise participants with the store (Wu, Ju, Kim, Damminga, Kim, & Johnson, 2013), to ensure no discomfort or lack of confidence in using the program transpired, and to help minimise any erroneous data such as repetitive clicking or unnecessary exploring of the interface (Desmet et al., 2013) once the experiment began. Participants learnt how to navigate the store, select items, check prices, review product information and make a purchase.

Once the participants were familiar with the operational side of the virtual supermarket, instructions were given regarding the experimental shopping task. Instructions were physically displayed next to participants on an A4 piece of paper, reinforced visually on the computer screen, and further reinforce verbally by the researcher to ensure instructions were processed and understood (Appendix T). Participants were asked to shop for food and beverages for three days (two weekdays and one weekend day, Gibson, 2005) whilst sticking to the self-reported budget they had previously indicated. Three days of shopping were selected over a major shop (one week) to minimise participant burden and time. As Gibson (2005) argues, shorter periods ranging from 2-5 days are often used to minimise respondent burden. Both weekdays and a weekend day were included in the scenario to minimise weekend effects (Gibson, 2005) and to minimise day of the week effects. Data was collected across all weekdays to ensure a range of purchasing across different days was obtained (Gibson, 2005). The scenario for three days of shopping (versus two days) was further selected to help minimise within-subject variation. Gibson (2005) proposes that increasing the number of days better estimates usual intake for an individual. Participants were instructed to complete the shop as they would in real-life.

After completing the virtual supermarket shop, participants were asked to complete a second online questionnaire (Appendix U). The post-experimental questionnaire measured store environment affect, individual differences and checked for awareness of experimental conditions. Participant perceived positiveness of store environmental quality were assessed with twelve semantic differential items (e.g. colourful-drab, negative-positive, attractive-unattractive) from Fisher's (1974) judgments of environmental quality scale. Item scores were summed to form an index. This measure was crucial for determining differences across experimental conditions. To determine colour blindness among participants, a colour test (Ishihara, 1960) was completed. The simplified version was adopted where only six plates (No 1, 2, 4, 8, 10 and 14) were included. The test provided a quick and accurate way of assessing colour vision deficiency (Ishihara, 1960). Self-reported demographic information was collected for gender, age, ethnicity, income, education and employment status. Demographic information was important to include as it may influence the way participants answered the questions (Brangule-Vlagsma, Pieters, & Wedel, 2002).

To assess if participants were aware of the purpose of the experimental design and the priming stimuli, participants were asked to indicate their views of the purpose of the experiment, and the hypotheses (questions) being tested. These open-ended responses were evaluated to determine if participants could correctly identify the purpose and hypotheses being tested. At the end of the questionnaire, participants were further asked whether they noticed any scents, sounds, background music, images or colours within the virtual store and laboratory. The placement of these questions was designed to avoid demand effects. Mattila and Wirtz (2001) indicate that demand effects can occur "when answering questions related to the dependent measure" (p. 280). Hence, the manipulation-relevant questions were positioned at the end of the study.

During each experimental condition and between experimental groups, room temperature, lighting, colour, outside noise and intensity of the scent were monitored to ensure any observed effects were attributable only to the colour, imagery, and scent manipulations, and no other sensory stimuli. The music and other sounds were administered through headphones and were played at the same volume for all conditions, a volume of 5 (out of maximum 100) on the computers. The laboratory consisted of neutral colours throughout the testing period. The researcher wore no coloured clothing or make up, and there was no coloured stationary in the laboratory. Bellizzi et al. (1983) explain that care with other colours aside from the experimental colour need to be contemplated. The experiment ran for approximately 1 hour, sometimes longer (max 1 hour 15 minutes) or shorter (minimum 25 minutes) depending on how long it took participants to conduct their shop and complete the post-experiment questionnaire.

Once completed, participants were debriefed. Full disclosure of information to participants was not necessary until the end of the study to avoid demand effects and to ensure real behaviours were captured. If participants were informed of the main purpose of the study, behaviours may have been changed. Also, atmospheric stimuli have been proven to have significant effects on shopper behaviour and often at the non-conscious level (Thompson, Cummins, Brown, & Kyle, 2013). For it to remain a non-conscious effect participant attention should not be drawn to the atmospherics of interest; otherwise true effects might not be obtained. In the debriefing session, participants were informed of the true purpose of the study and an explanation of why it was important not to fully disclose all information at the beginning was provided. Participants were given $10 koha as a token of appreciation.

At the end of each day, the laboratory was ventilated and cleaned, as in Spangenberg et al. (2005). The room did not have its own ventilation system. To change scent conditions, the researcher ensured a space of three days to ventilate the room. Some researchers left a day between scent conditions (e.g., Hermann et al., 2013; Fiore et al., 2000) or overnight (e.g., Spangenberg et al., 1996), yet this did not seem reliable for the current study as the scent initially lingered. The laboratory did not have its own ventilation system to remove lingering scent, as did Spangenberg et al. (1996). Hence, two fans were set up, with the door left open to ventilate the laboratory room in the interim. Three days helped ensure the scent had dissipated from the room and prevented cross-contamination (Poon & Grohmann, 2014). Two researchers completed a "sniff-test" before further conditions were conducted, following the procedure set out by Spangenberg et al. (1996).

5.4.3 Dependent measures

A list of purchased items was generated at the end of participant shopping trips. To measure the healthiness of purchases and approach-avoidance responses, four indices were constructed using cost and number of items in participants' virtual shopping lists (Table 25). Each basket of goods was rated based on nutrient profile scores (DV1: healthiness diversity cost, DV2: healthiness diversity number) or a score was constructed based on the number of healthy items purchased from whole food and less processed food categories (DV3: wholefoods cost, DV4: wholefoods number). Shopping baskets were weighted by total spend (DV1: healthiness diversity cost, DV3: wholefoods cost) or number of items purchased (DV2: healthiness diversity number, DV4: wholefoods number) to create an equal measure for comparison across scores, regardless of total amount spent or number of items selected in individual participant shopping baskets. These dependent variables represent the health value of the food baskets and were used to determine whether participants approached or avoided the targeted foods (more-healthy versus less-healthy).

Table 25. The dependent measure name, calculation and industry developer or guidelines

DV #	Dependent Measure Name	Health basket calculation	Based on/Developed by
1	Healthiness diversity cost	Total basket score/ Total spent	Nutrient Profile Scoring/FSANZ
2	Healthiness diversity number	Total basket score/ Total # items	Nutrient Profile Scoring/FSANZ
3	Wholefoods cost	Total # wholefoods/ Total spent	Eating & activity guidelines/MOH
4	Wholefoods number	Total # wholefoods/ Total # items	Eating & activity guidelines/MOH

Note: FSANZ = Food Standards Australian New Zealand, MOH = Ministry of Health

5.4.3.1 Nutrient profile health basket scores

Two indices: healthiness diversity cost (DV1) and healthiness diversity number (DV2) are calculated based on nutrient profiling scoring (Table 25). Healthiness diversity represents the healthiness of the score based on nutrient profiling and diversity. A negative (positive) score represents a healthier (less healthy) basket.

Healthiness diversity represents the healthiness of the score based on nutrient profiling and diversity. Nutrient profile scoring is based on the nutrient profiling scoring criterion (NPSC) initially developed by the Food Standards Australia New Zealand (FSANZ) for the regulation of health claims (Food Standards Australia New Zealand, 2013). Nutrient profile scoring enables classification of healthier and less healthy foods based on nutritional content (Food Standards Australia New Zealand, 2013; Mhurchu, Brown, Jiang, Eyles, Dunford & Neal, 2016). It analyses products based on energy, saturated fat, sodium, sugar, fruit, and vegetables, dietary fibre and protein. It requires the nutritional composition of the product to be entered to an online calculator (Appendix V) based on 100g or 100ml of the product.

There are three categories a food can belong to: (1) beverages, (2) foods that do not fit into category 1 or 3, and (3) cheese, edible oils, margarine, butter. First, products are categorised, then baseline points allocated based on energy, saturated fat, sugar and sodium in 100g or 100ml. Modifying points are scored for fruits and vegetables (non-concentrated and/or concentrated), nuts and legumes, protein and dietary fibre. To calculate the final score, modifying points are subtracted from baseline points. For companies to be able to make a health claim, category one foods should score less than 1, category 2 must be less than 4 and category 3 must be less than 28. The lower the score, the healthier the product (short guide for industry to the nutrient profiling scoring criterion (NPSC) in standard 1.2.7 – Nutrition, Health and Related Claims, 2013).

All products purchased by the participants were given a nutrient profile score (e.g. Nutrient Profiling Scoring Calculator of Standard 1.2.7, 2015). To be able to enter the required information into the online calculator, evidence from the nutrient panel on the reverse side of the products, the NZ food composition database and ingredient listings were sought. Where a product did not specify the accurate percentage of fruits, vegetables, nuts and legumes, assumptions were made using the following decision rules:

1) The order in which the fruit, vegetable, nut, seed or legume were placed on the ingredient list was accounted for and a percentage allocated. For example, if a fruit was placed in the first position, it earned a greater percentage allocation than if placed in fourth or last position.
2) When accurate percentages were identified for similar products in the category, these percentages were used in conjunction with point 1 to estimate the percentage allocation for the new product.

After each product was allocated a score, a total for the basket was calculated (total NPSC basket score). See Appendix W for an example of scoring. Those baskets with a negative score represented healthier basket of goods and those with a positive score represented less healthy basket of goods. Because each shopper purchased a different number of goods, the basket scores were weighted by number of items purchased to compare between subjects. Thus, dependent variable one and two were formed.

The dependent variables healthiness diversity cost and healthiness diversity number (DV1 and DV2, Table 25) help to show whether the basket composition is healthier or less healthy based on the nutrient profile score.

5.4.3.2 Whole food product purchases

Two indices — wholefoods cost (DV3) and wholefoods number (DV4) — are calculated based on the number of healthier items purchased from wholefoods and less processed food categories (see Table 25). The higher the score, the greater the number of wholefoods and less processed foods purchased.

The Ministry of Health (2015) outlines eating and activity guidelines for New Zealand adults. In this guide, there is reference to New Zealanders consuming mostly "whole" and less processed foods; these include foods which are low in refined grains, added fat, salt and/or sugar (Ministry of Health, 2015). These "whole" foods are linked to outcomes involving better health and less heart disease and stroke (Ministry of Health, 2015). The "whole" foods set out by the Ministry of Health (2015) include products closest to their natural state such as fresh vegetables and fruit, raw nuts, fish, chicken and meat. The less processed foods are the foods that have some processing but still retain most of their physical and nutritional properties (Ministry of Health, 2015). These foods include frozen fruits and vegetables, and canned products that are low in sugar or salt such as legumes, beans, and tomatoes. Using this information, a score was constructed to help calculate two additional dependent measures. Products categorised within the fruit and vegetable, fruit and vegetable other, meat and seafood, and egg categories within the virtual supermarket were included in the scoring. The number of items purchased in each of these categories were tallied and weighted by either total spend (wholefoods cost) or total number of items purchased (wholefoods number). These weightings were important as all participants purchased different quantities.

The dependent variables wholefoods cost and wholefoods number (DV3 and DV4, Table 25) help to show the health composition of the shopping basket based on number of wholefoods and less processed foods purchased.

5.5 Method of data analysis and justification

Statistical analyses were performed using IBM SPSS statistics version 24. All variables were examined for normal distribution and group sizes were greater than or equal to 26. A factorial analysis of covariance (ANCOVA) was used to measure the independent factorial design. Before carrying out analysis of covariance, similarity of regression slopes between the conditions, e.g. herb versus sweet bakery, was verified by examining the significance of the interaction between the covariate(s) and the condition variable.

To reduce the number of outcome measures, healthiness diversity number (DV2 in Table 25) and wholefoods cost (DV3 in Table 25) were selected as primary outcome measures. Including a nutrient profiling measure and a wholefoods measure allows the analyses to compensate for different perspectives of health on food purchasing outcomes.

With several independent variables (scent, colour and imagery primes), and a between-subject design, a factorial ANOVA can deal with these multiple independent variables (Field, 2005). An ANCOVA specifically has the ability to control for known influences on the dependent variable (Field, 2005). In the analysis, hunger was included as a covariate because people's hunger is expected to influence healthiness of the product selected when shopping. People who are hungry choose higher-calorie products (Tal & Wansink, 2015). Mood was also included as a covariate because mood states were expected to influence the healthiness of products selected. People who are in a negative (positive) mood prefer indulgent (healthier) foods (Gardner et al., 2014). Mood and hunger were considered the most important covariates to control for. An ANCOVA can adjust for these known influences, and a more accurate assessment of the effect of the independent variable (i.e., the manipulated store atmospheric stimuli) can be assessed (Field, 2009). It helps remove biases (Field, 2005).

In addition, an ANOVA analysed store environmental affect to determine differences between experimental conditions. A Bonferroni correction p value of < 0.05 was considered significant.

5.6 Preliminary data preparation

5.6.1 Awareness checks

The experimental purpose and hypotheses were well disguised, as no participants correctly identified the purpose and only one participant guessed one of the hypotheses. This participant's responses were excluded from analysis to control for potential demand effects (Figure 4). Twelve people (5.6% of the total) identified scent as being part of the experiment but were unsure in what capacity, and the same was evident for colour but with only three people mentioning it (1.4% of the total). These people remained in the sample. No participants mentioned imagery as part of the experiment. At the end of the session, the 220 participants were asked whether they noticed a scent within the laboratory. When participant attention was turned toward the stimuli, scent awareness increased from 5.6% to 64.1% (n = 141/220), colour awareness increased from 1.4% to 55% (n = 121/220), and imagery increased from 0% to 39.5% (n = 87/220).

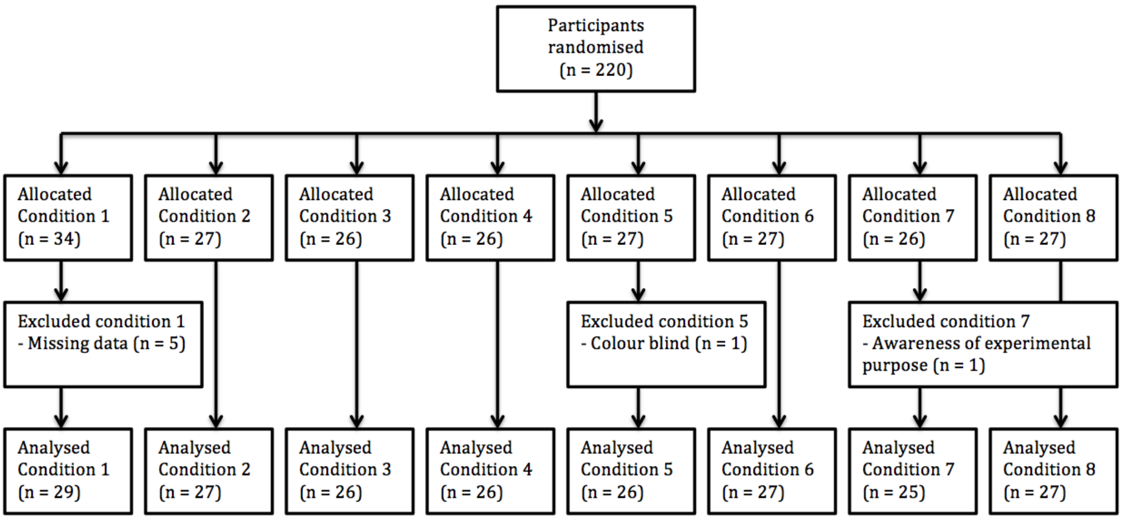


Figure 4. Participant allocation to experimental conditions and exclusions

5.6.2 Colour blindness check

Participant colour-blindness scores were analysed. One person identified plate two as reading three instead of eight. This could potentially mean the person has red-green deficiencies (Ishihara, 1960). Ishihara (1960) mentions that correctly identifying all of the six plates is normal; if there are any discrepancies the full range of plates should be used. Since this indicated a potential for colour blindness and the person was within the green shelving condition, the participant's data was excluded from analysis (Figure 4).

5.6.3 Store environmental affect

The reliability coefficient (Cronbach's alpha) was at an acceptable level for store environment affect (0.93). Environmental quality was perceived as positive across all the experimental conditions (mean > 4 on scale of 1-7, Table 26) and was not different between conditions, F (7, 212) = 1.595, $p > 0.05$. This scale includes measures such as pleasantness, stimulation, colourfulness, and attractiveness (refer to Appendix U) to ensure manipulations are valid and free from extraneous factors. An independent t-test for scent pleasantness also showed no significant differences between the two scent conditions, t (132) = 0.246, $p > 0.05$.

Table 26. Store environmental affect across experimental condition

Experimental Conditions (n)	**Store Atmospheric Stimuli (Primes)**	**Mean (SD)**
Condition 1 (34)	Herbs scent, more-healthy imagery, green shelving	4.9 (1.3)
Condition 2 (27)	Herb scent, more-healthy imagery, grey shelving	4.6 (1.1)
Condition 3 (26)	Herb scent, less-healthy imagery, green shelving	4.1 (1.1)
Condition 4 (26)	Herb scent, less-healthy imagery, grey shelving	4.8 (1.1)
Condition 5 (27)	Sweet bakery scent, more-healthy imagery, green shelving	4.4 (1.2)
Condition 6 (27)	Sweet bakery scent, more-healthy imagery, grey shelving	4.5 (1.0)
Condition 7 (26)	Sweet bakery scent, less-healthy imagery, green shelving	4.8 (0.9)
Condition 8 (26)	Sweet bakery scent, less-healthy imagery, grey shelving	4.3 (1.1)

Note: Store affect assessed with twelve semantic differential items on scales 1-7 to form an index.

5.7 Findings

5.7.1 Sample characteristics

Data collection commenced on the 8th January 2017 and ended on the 7th February 2017 between the hours of 6.30am and 9pm daily. Data was not collected in December to ensure the festive season and food purchasing for Christmas did not influence behaviours in the virtual supermarket. The literature shows that holidays and special events can influence demand (Areni & Kim, 1993). The eight cells of the factorial design had 26 - 34 participants per cell, for a total sample size of 220 (Table 27). A disproportionate number of females (71.8%) partook in the study (Table 27). The proportion of males in each experimental condition was not different and neither were the ages of participants.

Table 27. Combination of store atmospheric stimuli for each of 8 experimental conditions, number, sex and age of participants exposed to each condition.

Experimental Conditions	Store Atmospheric Stimuli (Primes)	Participants n(%)	Male n(%)	Female n(%)
Condition 1	Herbs scent, more-healthy imagery, green shelving	34 (15.5%)	8 (23.5%)	26 (76.5%)
Condition 2	Herb scent, more-healthy imagery, grey shelving	27 (12.3%)	8 (29.6%)	19 (70.4%)
Condition 3	Herb scent, less-healthy imagery, green shelving	26 (11.8%)	4 (15.4%)	22 (84.6%)
Condition 4	Herb scent, less-healthy imagery, grey shelving	26 (11.8%)	9 (34.6%)	17 (65.4%)
Condition 5	Sweet bakery scent, more-healthy imagery, green shelving	27 (12.3%)	7 (25.9%)	20 (74.1%)
Condition 6	Sweet bakery scent, more-healthy imagery, grey shelving	27 (12.3%)	8 (29.6%)	19 (70.4%)
Condition 7	Sweet bakery scent, less-healthy imagery, green shelving	26 (11.8%)	11 (42.3%)	15 (57.7%)
Condition 8	Sweet bakery scent, less-healthy imagery, grey shelving	27 (12.3%)	7 (25.9%)	20 (74.1%)
	Total	220 (100%)	62 (28.2%)	158 (71.8%)

Overall, the experimental sample was similar to the major ethnic groups within New Zealand. In 2013, 74% of the population of New Zealand identified with being European (Statistics New Zealand, 2013). In the current study, 68.9% identified as New Zealander or European. A greater number of Asians participated in this study (22.7%), than were identified in the census (12%). This higher number may be reflective of the increasing levels of Asian migrants to New Zealand, especially within Auckland where the study was conducted. For example, the percentage of Asian immigrants to New Zealand increased 33% from 2006 to 2013 (Statistics New Zealand, 2013). A group that was slightly less representative in the study sample was Maori; 11.4% of people identified as being Maori in the current study. In the census data, 15% of people nationwide identified as being Maori. Pacific people were largely under-represented in the study. In the census, 7% of people identified as being a Pacific person (Statistics New Zealand, 2013) and in the current study, 2.8% of participants identified as being a Pacific person. In this study, a slightly greater number of people, 4.1%, identified with being Middle Eastern, Latin American and African, as opposed to the 1% reported by Statistics New Zealand.

Table 28. Ethnicity of sampled participants in comparison to Statistics New Zealand (2013) major ethnic groups New Zealand

Variable	**Sample data 2017**	**Population data 2013**
Ethnicity		*Major ethnic groups NZ*
European	40 (18.2%)	74%
European/Indian	1 (0.5%)	-
New Zealander	75 (34.1%)	-
NZ/Indian	3 (1.4%)	-
NZ/Asian	5 (2.3%)	-
NZ/African	6 (2.3%)	-
Asian	50 (22.7%)	12%
Maori	5 (2.3%)	15%
NZ/Maori	16 (7.3%)	-
NZ/Maori/Pacific person	4 (1.8%)	-
Pacific person	4 (1.8%)	7%
European/Pacific	1 (0.5%)	-
NZ/European/Pacific	1 (0.5%)	-
Middle Eastern, Latin American, African	9 (4.1%)	1%
Total	220 (100%)	

Participant ages ranged from 18 to 65 years old, mean 33 years, median 28 years, with the majority (75.5%) ranging between the ages of 19 and 36 years old. The largest group of participants (45.1%) had incomes between $40,000-$79,000. Above $80,000 was represented by 20.6% of the sample. Under $40,000 represented 34.4% of the sample. The sample was highly educated, with 34.4% having a bachelor's degree and a further 28.8% also having a postgraduate degree. The remaining participants had high school qualifications (23.3%), diplomas (8.4%), or other qualifications (5.2%). More than 66.5% of people were in full time employment, with 20% in part-time and 13.5% unemployed. Of the 220 people, seven people were excluded from the original sample due to reasons around awareness of experimental purpose (n=1), colour-blindness (n=1) and incomplete data (n=5) (Figure 4). The original sample set was reduced from 220 to 213.

5.7.2 Hypotheses testing

5.7.2.1 Hypothesis 1

H1 predicts that shoppers exposed to an ambient herb scent (priming stimulus) will purchase more thematically congruent baskets of food (healthier foods) than shoppers exposed to an ambient sweet bakery scent (priming stimulus), taking into account hunger and mood.

An ANCOVA with scent as the independent variable, mood and hunger as covariates, and healthiness diversity number as the dependent variable showed a marginally significant difference in the health composition of participant shopping baskets (F (1, 209) = 3.813, p = 0.052, *partial* n^2 = 0.018). Participants exposed to the scent of herbs purchased healthier baskets of food (M = -0.381, SE = 0.329) versus those exposed to the sweet bakery scent, where less healthy foods were purchased (M = 0.538, SE = 0.333). In other words, if a shopper purchased a total of 12 items, exposure to the scent of herbs versus sweet bakery would increase the average health value of the shopping basket to -4.572 and 6.456, respectively. If this score (-4.572) was for 100g of an individual product it could qualify for a health claim, as it is less than -4. The covariate mood was also marginally significant (F (1, 209) = 3.107, p = 0.079, *partial* n^2 = 0.015). In other words, as shopper moods improved, the healthiness of their baskets improved (b = -0.464).

An ANCOVA with scent as the independent variable, mood and hunger as covariates, and wholefoods cost as the dependent variable also showed a significant difference in the health composition of participants' shopping baskets (F (1, 209) = 5.165, p = 0.024, *partial* n^2 = 0.024). Participants exposed to the scent of herbs purchased a greater number of wholefoods (M = 0.135, SE = 0.006) versus those exposed to the sweet bakery scent, where fewer wholefoods were purchased (M = 0.115, SE = 0.006). In other words, if a shopper spent $155, exposure to the scent of herb versus sweet bakery would increase number of wholefoods purchased by 3. This is equivalent to 20.925 wholefood items purchased during exposure to the scent of herbs, and 17.825 wholefood items purchased during exposure to sweet bakery scent. In sum, participants exposed to the scent of herbs purchased significantly healthier baskets of goods in comparison to those exposed to sweet bakery scent.

5.7.2.2 Hypothesis 2

H2 predicts that the shoppers exposed to green shelving (priming stimulus) will purchase more thematically congruent baskets of food (healthier foods) than shoppers exposed to grey shelving (priming stimulus), taking into account hunger and mood.

An ANCOVA with colour as the independent variable, mood and hunger as covariates, and healthiness diversity number as the dependent variable, showed a significant difference in the health composition of participants' shopping baskets (F (1, 209) = 6.348, p = 0.013, *partial* n^2 = 0.029). Participants exposed to green shelving purchased less healthy foods (M = 0.661, SE = 0.329) compared to grey shelving (M = -0.513, SE = 0.328). In other words, if a shopper purchased a total of 12 items, exposure to green shelving versus grey shelving would decrease the healthiness of the basket to 7.932 and increase the healthiness of the basket to -6.156, respectively. If this score (-6.156) was for 100g of an individual product it could qualify for a health claim, as it is less than -4. The covariate mood was also significant (F (1, 209) = 4.906, p = 0.028, *partial* n^2 = 0.029). In other words, as shopper moods improved, the healthiness of their baskets improved (b = -0.582).

However, an ANCOVA with colour condition as the independent variable, mood and hunger as covariates and wholefoods cost as the dependent variable showed no significant difference in the health composition of participants' shopping baskets (F (1, 209) = 0.160, p > 0.05, *partial* n^2 = 0.001). Exposure to green shelving (M = 0.123, SE = 0.006) and grey shelving (M = 0.127, SE = 0.006) encouraged similar purchasing from participants in terms of basket healthiness. In other words, if $155 were spent on groceries, 19.065 wholefood items would be purchased in the presence of green shelving, and 19.685 in the presence of grey shelving. There was no main effect of colour on wholefoods cost. Thus, participants exposed to green shelving made a similar amount of healthy food choices compared to shoppers exposed to grey shelving. Number of wholefood items purchased remained relatively the same.

Contradictory to the findings in Study 1, H2 was not supported. Findings are inconsistent. Testing with healthiness diversity number as the dependent variable yielded significant and opposing results to H2, such that grey shelving (versus green shelving) significantly increased the healthiness of shopping baskets. Yet, wholefoods cost yielded highly non-significant results with a low effect size, indicating that neither shelving condition had an influence on health basket composition.

5.7.2.3 Hypothesis 3

H3 anticipates that shoppers exposed to more-healthy wall imagery (priming stimulus) will purchase more thematically congruent baskets of food (healthier foods) than shoppers exposed to less-healthy wall imagery (priming stimulus), taking into account hunger and mood.

An ANCOVA with imagery as the independent variable, mood and hunger as the covariate, and healthiness diversity number as the dependent variable showed no significant difference in health composition of participants' shopping basket (F (1, 209) = 0.189, $p > 0.05$, *partial* $n^2 = 0.001$). Exposure to more-healthy imagery ($M = 0.173$, $SE = 0.331$) and less-healthy imagery ($M = -0.035$, $SE = 0.339$) encouraged similar purchasing from participants in terms of basket healthiness. In other words, if a shopper purchased a total of 12 items, exposure to more-healthy imagery versus less-healthy imagery slightly decreases the healthiness of the basket to 2.076 and slightly increases the healthiness of the basket to -0.420, respectively. However, these results were non-significant, therefore, hard to interpret.

An ANCOVA with imagery condition as the independent variable, mood and hunger as covariates, and wholefoods cost as the dependent variable, however, showed a significant difference in health composition of participants shopping baskets (F (1, 209) = 5.530, $p = 0.020$, *partial* $n^2 = 0.026$). Participants exposed to more-healthy imagery purchased less whole foods ($M = 0.115$, $SE = 0.006$) compared to exposure to less-healthy imagery ($M = 0.135$, $SE = 0.006$). In other words, if a shopper spent $155 on groceries, exposure to more-healthy imagery versus less-healthy imagery would decrease number of wholefoods purchased by 3. For example, shoppers exposed to more-healthy imagery purchased 17.825 items and shoppers exposed to less-healthy imagery purchased 20.925.

Contradictory to the findings in Study 1, H3 was not supported. However, findings are inconsistent. Testing with wholefoods cost as the dependent variable yielded significant and opposing results to H3, such that less-healthy imagery (versus more-healthy imagery) significantly increased the healthiness of shopping baskets. Yet, healthiness diversity number yielded non-significant results with a low effect size, indicating that wall imagery had little influence on health basket composition.

5.7.2.4 Hypothesis 4

H4 anticipates an interactive effect, *shoppers exposed to "more-healthy" store atmospherics (e.g. herb scent, green shelving, and more-healthy food-related wall imagery) will purchase more thematically congruent baskets of food (healthier foods) than shoppers exposed to "less healthy" store atmospherics.*

A three-way ANCOVA with scent, imagery and colour as independent variables, mood and hunger as covariates, and healthiness diversity number as the dependent variable showed no significant interactions (scent x colour, F (1, 203) = 0.655, $p > 0.05$, *partial* $n^2 = 0.003$, scent x imagery, F (1, 203) = 0.093, $p > 0.05$, *partial* $n^2 = 0.001$, colour x imagery, F (1, 203) = 1.100, $p > 0.05$, *partial* $n^2 = 0.005$, scent, colour x imagery, F (1, 203) = 1.127, $p > 0.05$, *partial* $n^2 = 0.006$). A three-way ANCOVA with scent, imagery and colour as independent variables, mood and hunger as covariates, and wholefoods cost as the dependent variable also showed no significant interactions (scent x colour, F (1, 203) = 0.662, $p > 0.05$, *partial* $n^2 = 0.001$, scent x imagery, F (1, 203) = 0.595, $p > 0.05$, *partial* $n^2 = 0.001$, colour x imagery, F (1, 203) = 0.802, $p > 0.05$, *partial* $n^2 = 0.001$, scent x colour x imagery, F (1, 203) = 0.408, $p > 0.05$, *partial* $n^2 = 0.003$).

Results show no support for hypothesis H4. Shoppers exposed to a pleasant ambient herb scent, green coloured shelving and/or more-healthy food-related imagery prime were not nudged to purchase thematically congruent healthier foods when in combination with other healthier stimuli.

5.7.3 Summary of findings

Table 29 presents a summary of hypotheses findings. Shoppers exposed to the ambient herb scent purchased more thematically congruent baskets of foods (healthier basket) compared to shoppers exposed to a sweet bakery scent (H1 supported).

Shoppers exposed to green shelving did not purchase more thematically congruent baskets of food (healthier basket; H2 not supported). However, findings were inconsistent. Testing with healthiness diversity number as the dependent variable yielded significant and opposing results to H2, such that shoppers exposed to grey shelving as opposed to green shelving purchased a healthier basket of food (significant opposite effect). Yet, wholefoods cost yielded non-significant results with a low effect size, indicating that neither shelving condition had an influence on health basket composition.

Shoppers exposed to more-healthy wall imagery also did not purchase more thematically congruent baskets of food (healthier basket; H3 not supported). However, findings were inconsistent. Testing with wholefoods cost as the dependent variable yielded significant and opposing results to H3, such that shoppers exposed to less healthy wall imagery purchased a healthier basket of goods. Yet, healthiness diversity number yielded non-significant results with a low effect size, indicating that wall imagery had little influence on health basket composition.

No interaction effects between “more-healthy” store atmospherics and healthier food choices were made (H4 not supported).

Table 29. Summary of hypotheses and outcomes

Hypotheses	**Path**	**Outcome**	**Effect size** n^2	
			Healthiness diversity number	**Wholefoods cost**
H1	Herb (versus sweet bakery) scent → healthier basket food	Supported	**0.018**	**0.024**
H2	Green (versus grey) shelving → healthier basket food	Inconsistent	**0.029**	0.001
H3	More-healthy (versus less-healthy) food imagery → healthier basket food	Inconsistent	0.001	**0.026**
H4	Herb scent x green shelving → healthier basket food	Not supported	0.003	0.001
	Herb scent x imagery → healthier basket food	Not supported	0.001	0.001
	Green shelving x more-healthy imagery → healthier basket food	Not supported	0.005	0.001
	Herb scent, green shelving, and/or more-healthy imagery → healthier basket food	Not supported	0.006	0.003

Note: All tests adjusted for mood and hunger

5.8 Discussion of findings

There were three key findings from this experimental trial. First, support for hypothesis 1 showed that participants primed with an ambient herb scent purchased more thematically congruent baskets of food (healthier food) than shoppers primed with an ambient sweet bakery scent. Second, visual store atmospherics as manipulated via shelving colour and wall imagery yielded contradictory and inconsistent findings from what the literature and prior observations anticipated. Thus, this area is ripe for exploration. Third, the store atmospheric primes did not have an interactive effect to influence healthier food choices as predicted.

Overall, these findings in combination with participants reported lack of awareness of the store atmospheric primes shows partial support for the non-conscious cues to prime health behaviours, as per nudging theory (Thaler & Sunstein, 2008). With no apparent conscious effort required on the part of the shopper, the herb scent, grey shelving and less-healthy imagery primes potentially targeted shoppers' less cognitively demanding heuristic system, System 1 (Kahneman, 2003), making it easier and less cognitively depleting for them to make healthier food choices. When primes such as ambient scent, colour and wall imagery manipulated for Study 2 are non-obtrusive and less obvious, misattribution of the incoming information by the shopper to their own internal response may have occurred at times, further informing subsequent processing as explained by the 'situated inference model' (Loersch & Payne, 2011). Based on spreading activation theory (Collins & Loftus, 1975), the store atmospheric prime may have activated health-relevant concepts via a neural network of already established interconnected nodes, making health-relevant information more accessible. The congruity of the herb scent, in particular, with health-relevant concepts, products and the environment potentially enabled these health behaviours to be shaped.

5.8.1 More-healthy ambient scent nudges healthier food choices

With the increase in number of household-shopping trips each week (Consumer lifestyles in New Zealand, 2016), a comparison of a smaller basket of goods (12 items) showed the significant impact exposure to a more-healthy ambient food scent might have on consumer health. The healthiness diversity number score of -0.381 when exposed to an herb scent converts to -4.572 when purchasing 12 items, meaning the average health value of the shopping basket increased. If this score was for 100g of an individual product it could qualify for a health claim. With nutrient profiling, any score less than 4, except for category 1 (beverages) and 3 (oils, butter, margarine, cheeses) products, qualifies to make a health claim (short guide for industry to the nutrient profiling scoring criterion (NPSC) in standard 1.2.7 – Nutrition, Health and Related Claims, 2013). Thus, exposure to a more-healthy ambient scent lead to health basket scores equivalent to products that qualify for health claims. The use of the NPSC in this way is a first step in ranking the healthiness of a shopping basket — it does not account for the amount actually eaten in a given period but it does provide a means of ranking the nutrient density and diet quality of the shopping basket (Alkerwi, 2014; Drewnowski, 2005).

In addition, average weekly household expenditure on grocery, fruit and vegetables, meat, poultry, fish and non-alcoholic beverages in New Zealand is $155 (Household expenditure statistics: Year ended June 2016, 2016). The impact of a more-healthy ambient food scent on consumer health in New Zealand is demonstrated through a comparison between average weekly spend and number of wholefoods purchased in Study 2. Participant average wholefoods cost score when exposed to the scent of herbs converts from 0.135 to 20.925 wholefoods purchased for a total basket cost of $155. This is an increase of 3 more wholefoods purchased weekly when exposed to the scent of herbs, as opposed to a sweet bakery scent. Small incremental changes in shopper food choices might thus be important for both public health and retailers. The outcomes for both health basket scores dependent variables (e.g., DV2 and DV3 in Table 25) show the success of the intervention. A more-healthy ambient food scent in the laboratory environment reduced the number of less healthy foods chosen and increased the number of healthier foods purchased in the virtual store. The scent of herbs (versus sweet bakery) nudged shoppers to make more-healthy (versus less-healthy) food choices using both dependent variables.

This finding is consistent with congruency theory (Mandler, 1982). When a store atmospheric has characteristics that fit with a relevant schema (Mandler, 1982) such as healthiness of the stimulus, congruency with the product is formed. In Study 2, exposure to the ambient herb scent primed participants to select thematically congruent healthier baskets of foods. Spreading activation theory (Collins & Loftus, 1975) and the situated inference model (Loersch & Payne, 2011) can further explain this relationship. The prime activates concepts via a neural network of already established nodes (Collins & Loftus, 1975) where information becomes highly accessible and ready for use in subsequent processing (Loersch & Payne, 2011). The shopper can misattribute the incoming information to their own thoughts and use this to inform decisions (Loersch &

Payne, 2011). Therefore, in Study 2, exposure to the scent of herbs potentially activated a health relevant concept such as selecting ingredients for a healthy home cooked meal and/or the broader concept of healthfulness. With a nonobvious ambient scent, misattribution of the incoming olfactory information to the participant's internal thoughts potentially lead to purchasing of congruent healthier foods. Increased purchasing of healthier foods in the presence of a more-healthy ambient scent highlights the need for congruence between the scent and the target product categories to shape certain health behaviours, as highlighted in the integrative framework of store atmospheric effects on shopper food purchasing (Figure 2).

5.8.2 Shelving colour influences shopper food choice

Inconsistent results showed that in part, counter to theory expectations green shelving encouraged shoppers to purchase less healthy foods compared to grey shelving. A misleading health halo, appetitive cue signalling an open and safe environment, or green colour pairings with the traffic light system (green for "go") might provide explanation for these results.

First, shoppers might have made inferences about the health positioning of the supermarket from the prominent green shelving. A misleading "health halo" (assimilation effect) may have caused shoppers to compare foods in the store to the healthiness projected by the store. For example, in multiple studies on calorie estimation and restaurant health claims Chandon and Wansink (2007) show that participants rely on inferential mechanisms to estimate food value via calories. The health halo allows for perception of health to drive estimation of healthfulness of food choice in a virtual supermarket. And as in this research, it can inspire underestimation of the actual content and health status of any foods viewed in the environment created by health associated (pre-test 2) green shelving. If seeing green shelving gives products a health halo or makes them appear healthier, shoppers may believe they are making healthier choices regardless of the product simply because they are displayed in a green-shelf environment (versus grey shelf). The health halo could have impacted wholefood purchasing increasing number of wholefoods purchased but only to levels equivalent to the grey shelving. Wholefoods are healthy, so little impact was evident compared to the healthiness diversity score, where products across categories were included. Products could therefore be perceived to be healthier than they actually were. Thus, green shelving might have stimulated a misleading health halo that could be more harmful for health outcomes than good. Further investigation into this effect is needed.

Second, the green shelving may have activated an appetitive cue, signalling an open and safe environment to consume foods or a green for go in terms of green colour pairings with the traffic light system (Elliot & Maier, 2012). Green as a mechanism of encouraging approach behaviours is supported by previous studies (e.g. Reutner et al. 2015). Reutner and colleges (2015) found that a greater number of people chose a piece of bread with a green flag as opposed to a red flag. Given the commonness of green pairings in real life with go and safety, the context of the virtual supermarket in Study 2 may have evoked these associations favouring approach behaviours toward the less healthy foods. Pre-test 2 provided support for this notion as traffic light systems, green for go, and nature were mentioned as associations. Thus, the combination of the misleading health halo and green for "go" signalled shoppers of Study 2 that the food was safe and healthy to consume, leading to purchasing of both healthier and less healthy foods. Therefore, green in more-healthy environments (as shown in Study 1) could be beneficial to increasing healthier food purchasing in those stores but green shelving in environments where all types of foods are available could cause more harm than good.

As complex as colour is, the in part contradictory findings that indicate grey shelving can influence healthier food choices needs to be further investigated. A possible explanation could be that shoppers perceived the food to be less appealing on a green shelf. As Bolch (1995) stipulates, individual products can be constrained by the way in which retailers display them. For example, a green cabbage could look rather drab against a green shelf but aesthetically pleasing on a grey shelf. To make sense of the contradictory and inconsistent but highly intriguing results of colour in Study 2, further investigation is needed.

5.8.3 Visual wall imagery influence shopper food choice

Similarly to the previous finding, more-healthy imagery also showed inconsistent and in part contradictory findings. As opposed to H3, the more-healthy imagery influenced less healthy food choices for the wholefoods cost dependent variable. This indicates that more-healthy imagery potentially activated a misleading health halo (assimilation effect) also. Participants cued by the more-healthy imagery may have made inferences about the health positioning of the supermarket, causing shoppers to compare foods in the store to the image of healthiness projected by the store. This inference could have led to less healthy foods being purchased because of underestimation of the healthiness of the foods, as concluded by Chandon and Wansink (2007) and Wansink and Chandon (2006). Thus, more-healthy wall imagery could have activated a misleading health halo that influenced less healthy food choices in terms of wholefoods cost dependent variable. Further investigation is needed.

Furthermore, healthier food purchasing increased in the presence of the less-healthy wall imagery, in part, perhaps due to the contrast effect. The less-healthy wall imagery activated self-regulation, self-presentation goals or guilt in participants, as explained in other food priming studies (e.g. Biswas et al., 2017; Chandon & Wansink, 2007; Fletcher et al., 2007). The hedonic nature of the food items in the wall imagery potentially activated food cravings and guilt (Fletcher et al., 2007) motivating individuals to regulate food choices and buy healthier foods. This aligns with Killgore et al. (2003) findings, where high calorie food images were concluded as being associated with unhealthy inferences and with avoidance tendencies. In pre-test 3, associations such as over-indulgence, fat people, bad eating, obesity, bad health, being overweight, guilt, avoidance foods, chubby children, feeling sick after consuming, diabetes, hypo kids, rotten teeth, weight gain and things that need to be rationed were among participant responses. These associations support the argument that less-healthy food imagery activated goals and concepts related to self-regulation and guilt. Thus, participants exposed to the less-healthy imagery purchased more healthy baskets due to the activation of self-regulation or self-presentation goals or guilt. This is only evident for one of the dependent variables and therefore further investigation is needed.

In terms of the situated inference model (Loersch & Payne, 2011), spreading activation theory (Collins & Loftus, 1975), and nudge priming (Wilson et al., 2016), the less-healthy imagery prime could have also caused the shopper to misattribute the incoming activated self-regulation or self-presentation goals, or guilt to their own thoughts, prompting the shopper to question the types of food being purchased, and nudging them to purchase healthier foods. A shift in focus emerges here, from the less-healthy imagery creating approach tendencies toward congruent less healthy foods, to food inhibition (avoidance tendencies). Less healthy foods are avoided and healthier baskets of foods purchased. To conclude, retailers implementing less-healthy wall imagery in store could do more harm to already at risk individuals. Further understanding is needed to provide guidance to policy makers and retailers.

5.8.4 Interaction between health orientated stimuli and healthier food choices

With some of the stimuli showing opposite effects, the combined “more-healthy” stimuli lacked cohesion and seemed to be activating different internal responses. It is possible that one sensory modality such as scent was dominating others (Hecht & Reiner, 2009). For example, people respond more emotionally and instinctively to scents than to other sensory cues (Spence, 2015). The ambient scent may have driven decisions more directly related to the cued food, such as craving for a home cooked meal evoked by the herb scent, or activation of desire for less healthy foods by the sweet bakery scent. More-healthy wall imagery and green shelving did not effectively prime desire for healthier foods over less healthy foods across both dependent measures. In sum, shoppers could have responded to the combination of store atmospheric cues during the shopping trip (Babin et al., 2003; Ballantine et al., 2010; Bava et al., 2009; Mattalia & Wirtz, 2001), but the group of stimuli in Study 2 did not work interactively.

5.9 Strengths and limitations

Study 2 highlights the ability of store atmospherics as primes (herb scent, grey shelving, less-healthy wall imagery) to nudge healthier food choices in a simulated supermarket context. Despite the mixed and inconsistent findings for colour and wall imagery and the significant positive effect for ambient scent, there was no control condition making it difficult to determine whether the herb scent cued healthier choices or the sweet bakery scent primed more, less unhealthy food choices. What is clear is that store atmospherics, particularly ambient scents, changed the health composition of the basket of goods and therefore can be argued that a healthier basket of goods was purchased in comparison to the less-healthy scent. It is from this limitation that future research will include a control condition to support current evidence for this effect.

This is the first known study to use store atmospherics as primes to measure the effect on food choices in supermarket retailing. Previous research was limited to choice off a menu within the laboratory during exposure to ambient fruit scent (Gaillet et al., 2013; Gaillet-Torrent et al., 2014), purchasing at a vending machine whilst exposed to a poster (Stockli et al., 2016), and healthier food choice at a restaurant and within the laboratory in different lighting conditions (Biswas et al., 2017). These studies do not show how store atmospherics as a cue of healthfulness influence shoppers to select healthier foods, as outlined in the integrative framework of store atmospheric effects on shopper food purchasing, through nudge priming (Wilson et al., 2016), congruency theory (Mandler, 1982; Bone & Ellen, 1990), the situated inference model (Loersch & Payne, 2011), and spreading activation theory (Collins & Loftus, 1975). Study 2 explores part of this relationship.

A limitation here in terms of congruency theory is that the significant positive effect of scent supports congruency theory yet the significant negative effects of wall imagery and colour do not. As a whole, the mixed and inconsistent findings for wall imagery and colour need to be further explored to determine why these stimuli challenge congruency theory. It could be due to the misleading health halo and green for "go" potentially created by the green shelving and more-healthy wall imagery. Testing of the assumption can be conducted in future studies.

The measure of the overall healthiness of the food basket with respect to nutrition profiling is innovative. This measure of the basket does not take into account the quantity of each food or how many people would be fed for how many days. It does however rank the basket in a more objective way as the measure of the nutrition profile of each food is based on a validated nutrient profile model (e.g. Arambepola, Scarborough, & Rayner, 2007) that is the basis of the health star rating used in New Zealand. The wholefood basket score is less objective but still provides an innovative way to measure the overall healthiness of the basket in terms of healthier goods purchased. This score provided the number of wholefood items purchased, and therefore did not show if reductions in other less healthy foods were made.

While a between-subject factorial design most appropriate for this type of comparison, the study sample needs to be large and the cell groups relatively homogeneous. Each person was measured only once, so any intra-individual variability was not accounted for. This study was large, however would also want to see if the same person would change behaviour over a period of time. Shopper purchasing behaviour could be measured in a control condition and then in different environments i.e. within-subject factorial design in the real world. To boost external validity, a replication study of ambient herb scent (versus sweet bakery scent) in the field in a supermarket environment would aid generalizability of the findings.

Although controlling for hunger and mood of participants helped regulate time of day effects, as this research was conducted at various times between 6.30am and 9pm, other influencing factors should be controlled for or investigated in follow-up studies. Participant self-control, nutritional knowledge, health value, family size, income, time-of-day, day-of-the-week, and gender might be potential confounds to examine in future research. For example, individuals concerned about health are typically more influenced by external influences than people who are not (Fedoroff et al., 1997; Fedoroff et al., 2003). Health-conscious individuals may be signalled by health cues such as an ambient herb scent more so than non-health conscious individuals, because those foods are directly relevant to their health-conscious state, potentially nudging them toward healthier food choices more so than others. Individual differences and other external influencing factors should thus be included in future research.

Measures of shopper internal responses such as increased appetite and saliva production to the ambient food scent was not tested, but would provide further insight in to the identified effect. As previously found, food cues are said to prepare the body for intake (Ramaekers et al., 2014) and ambient food scents can induce desire and food cravings from congruent product categories. By testing these physiological and cognitive responses, the relationships presented in the integrative framework (Figure 2) can be further confirmed.

Also, a further explanation for the experimental result in Study 2 could be that the herb scent stimulated mental alertness. This explanation is counter to the theory. In Diego et al. (1998) participants who experienced a rosemary scent (same category of scent as herbs in Study 2) showed greater alertness. In pre-test 1, the scent of herbs was likewise reported as the most stimulating scent. It is thus possible that the scent of herbs encouraged greater alertness or stimulation when participants were doing their grocery shopping. Support from Biswas et al. (2017) study shows that induced mental alertness contributed to healthier food choices in a restaurant and in a laboratory when ambient lighting was manipulated. Bright lighting encouraged participants and patrons to select healthier options. This raises the question of whether mental alertness was the internal response driving the healthiness outcome. To nullify this theory, further testing is required.

Lastly, the store atmospheric primes seem to be incongruent with each other to yield interaction effects. This is a limitation and further testing is needed.

5.10 Conclusion

These findings lend support to the contention that store atmospherics can act as primes to nudge shoppers toward purchasing healthier foods. Further research is needed to further confirm these findings. Three key findings emerge from the between-subject independent factorial design where scent machines were used in conjunction with a computer-simulated virtual supermarket within the laboratory. First, support for hypothesis one showed that exposure to an ambient herb scent (versus sweet bakery scent) primed participants to select healthier (versus less healthy) baskets of food. Health basket scores equivalent to products that qualify for health claims and increase the number of wholefoods by 3 in an average weekly household spend in New Zealand show that the use of smell primes could be useful. These small incremental changes are potentially valuable for public health promotion and retail revenues. The atmospheric stimuli, specifically ambient scent, were both nonobvious and congruent with the target product categories, which could have helped in shaping behaviours.

Secondly, the contradictory and inconsistent yet intriguing results for hypotheses two and three provide an area of research ripe for further exploration. The suggested misleading health halo stimulated by the green shelving and more-healthy imagery needs to be verified. The green shelving and more-healthy imagery in more-healthy food environments in Study 1 could be beneficial for increasing healthier food purchasing in those stores, but not in environments where energy dense, processed foods are heavily sold and promoted. This could cause more harm than good. Times when participants purchased more wholefoods when exposed to less-healthy imagery could be attributed to activation of self-regulation, self-presentation goals or guilt. Implementing less-healthy imagery in stores could do more harm to already at-risk individuals. Thus, to make sense of these contradictory and inconsistent findings for colour and imagery, further investigations are needed.

Third, store atmospherics did not work interactively in this simulated environment, perhaps due to lack of cohesion. Further testing is needed to identify store atmospherics that work well together. The conclusions of this study are for a relatively small and diverse self-selected group of individuals who participated in a one-off study in a simulated supermarket laboratory. Further follow-up studies in stores with a control condition are needed to further confirm results. The practical application of this work is that retailers and public health organisations have some evidence to inform actions that may improve the health of the New Zealand population.

In sum, store atmospherics in particular ambient scent, can be used as a prime to nudge shoppers toward purchasing healthier foods.

Chapter 6: Conclusion

6.1 Introduction

This body of work exists at the intersection of food retailing, consumer food research, consumer psychology, and nutrition and health research. Questions that probe the design and atmosphere of food retail stores to encourage behaviour changes key to public health outcomes are addressed. In this way, this thesis makes a contribution to research in each field while deepening the examination of congruent retail cues with important new knowledge relevant to nutrition experts, policy makers and retail marketers. With New Zealanders' waistlines continuing to expand and current attempts in-store being met with limited success, the investigation of store atmospherics as primes to nudge shoppers toward healthier food purchasing, in a tempting environment such as the supermarket, has been investigated.

The use of non-consciously perceived subtle store atmospherics as manipulations in Study 2 to target the less demanding heuristic system (System 1) potentially made it easier and less cognitively depleting for shoppers to make healthier food choices compared with previous interventions that require conscious intention. The partial success of store atmospherics (namely, unobtrusive scent) as an intervention to improve healthier food choices could further be attributed to the nonobvious nature and congruency of the store atmospheric primes to act as a reminder or prompt for shoppers to engage in healthier behaviours. Further investigation of this effect is needed. The situated inference model and spreading activation theory further suggest that health-oriented primes activate knowledge structures that make health-relevant information highly accessible, guiding subsequent processing and behaviour. Two studies plus a series of three pre-tests helped to explore this theory and tested the relationship between store atmospheric primes and healthier food choices.

6.2 Research purpose

The purpose of this thesis was to answer the overarching research question, "What store atmospheric stimuli could be used to influence shoppers to make healthier food choices?" An overview of the sequential exploration is provided in Figure 5 below. Throughout this thesis, three guiding research questions were explored: (RQ1) which store atmospheric stimuli represent a healthier store environment, (RQ2) what store atmospherics can be tailored to create a message of healthfulness, and (RQ3) what store atmospheric stimuli could act as a prime to nudge shoppers toward healthier food choices? Do these factors work interactively, and if so, how? Each question is discussed next. Research question 1 is answered by Study 1, research question 2 by a series of three pre-tests, and research question 3 by Study 2.

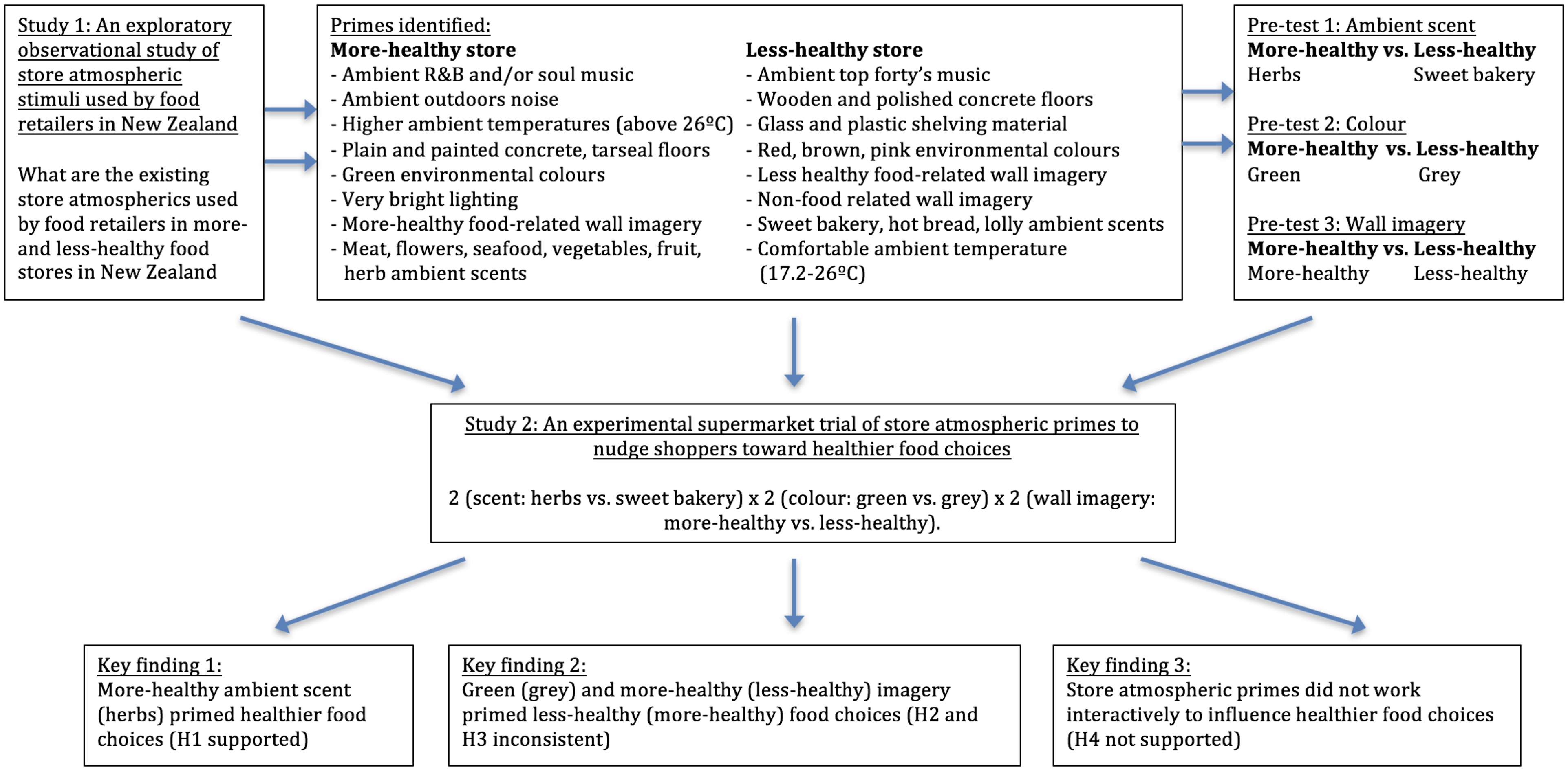


Figure 5. Study results of store atmospheric influence on shopper healthy food choices

6.3 Summary of findings

The goal of the first investigation (Study 1) was to measure and establish which store atmospherics were most prevalent among more- versus less-healthy food retailers (see Figure 5), and to prioritise the most appropriate stimuli for pre-testing. Study 1 was an observation study of 363 physical food retail stores (supermarkets, butchers, fruit and vegetable stores, fishmongers, etc.) in key locations across New Zealand, representing all socioeconomic deprivation levels. With limited guiding evidence from the literature on how retailers might use store atmospherics to encourage healthier food choices, contrasts and comparisons between more- and less-healthy stores were made to identify store atmospherics representative of a healthier environment in answer to research question 1.

The main insight from Study 1's observational exploration is that food stores differed due to the presence of certain types of store atmospheric stimuli (potential primes), rather than the mere presence or pleasantness of the stimuli. More-healthy stores, defined by foods sold and promotional material displayed, had more natural whole food scents, more relaxed ambient music, ambient outdoor noises, higher ambient temperatures, raw and natural flooring materials (e.g. painted and plain concrete, tar seal), cooler environmental colours (e.g. green shelving), very bright ambient lighting and healthier food-related wall imagery than the stores categorized as less healthy (see Figure 5). In contrast, less-healthy stores, defined by foods sold, had more processed ambient food scents, comfortable ambient temperatures (17.5°C to 26°C), exclusive upmarket type floors (e.g., wooden and polished concrete floors), glass and plastic shelving, warm environmental colours (e.g., red and brown walls, pink shelving), and less-healthy or non-food related wall imagery (as shown in Figure 5) than the stores categorised as more-healthy. Thus, more-healthy stores were more focused on the products and communicating the healthfulness of those products, whereas the less-healthy food stores were more focused on providing a comfortable, pleasant, and tempting experience reflective of the hedonic products sold.

A series of three pre-tests identified associations between retail cues and health, and determined whether store atmospherics could be tailored to create a message of healthfulness, answering research question 2 (see Figure 5). The more-healthy store atmospherics — ambient herb scent, green shelving and more-healthy food-related imagery — were identified as cues of healthfulness compared to the less-healthy store atmospherics of ambient sweet bakery scent, grey shelving and less healthy food-related imagery. From these insights and in combination with former theorising in the literature review, four main hypotheses were developed to guide the investigation in Study 2. Shoppers exposed to more-healthy store atmospheric primes (e.g. herb scent, green shelving, and more-healthy food-related imagery) were anticipated to purchase more thematically congruent baskets of foods (healthier foods) in comparison to the contrasting less-healthy store atmospheric primes (e.g. sweet bakery scent, grey shelving and less-healthy food-related wall imagery).

The aim of Study 2 was to test whether the selected olfactory and visual store atmospherics (e.g. more-healthy ambient scent, colour and wall imagery) could act as a prime to nudge shoppers to purchase healthier foods (Figure 5). Despite an extensive literature search, there appears to be no other publications in marketing and retail investigations concerning the relationship between store atmospherics and healthier "shopping" behaviour. To address this gap in knowledge, a laboratory experiment was designed using a scenario-based grocery-shopping trip through a virtual supermarket simulated on a computer screen. Findings demonstrated that store atmospherics, in particular ambient herb scent, could act as a prime to nudge shoppers toward healthier food choices.

There were three key findings. First, when participants were exposed to "more-healthy" ambient herb scent (versus "less-healthy" ambient sweet bakery scent) on average they selected thematically congruent more-healthy (versus less-healthy) baskets of foods. Second, counter to theory expectations, hypotheses two and three were not supported via inconsistent and mixed findings from Study 2. Participants exposed to green shelving (versus grey shelving) on average selected less healthy (versus healthier) foods when measured via healthiness diversity number and a non-significantly similar level of food choice healthfulness with wholefoods cost dependent variable. Similarly, more-healthy wall imagery (versus less-healthy wall imagery) primed less-healthy (versus more-healthy) food choices in terms of wholefoods cost variable, yet a similar level of food choice healthfulness when measured via healthiness diversity number. These mixed findings show inconsistent results that show no support for the theorised hypothesis in addition to significant findings opposite to the hypothesised effects. Third, hypotheses four was not supported as store atmospheric primes did not work interactively due to lack of cohesion.

Overall, these findings as a whole show the potential for the integrative framework of store atmospheric effects to be applicable, in some manner, across all of the tested atmospheric variables. Even though certain results were counter to what was expected (colour and wall imagery), the framework still applies but further investigation of the mixed and inconsistent results are needed. For the significant findings, the store atmospheric stimuli (scent, colour and imagery) influenced a behavioural response – to approach or avoid healthier foods. Study 1 examined the stimulus part of the integrative framework to decipher what store atmospheric stimuli are health-related and could be used to prime health behaviours. Study 2 investigated the stimulus-response part of the model, with future studies set to unpack some of the mixed results (those challenging congruency theory) and further exploring the organism (shopper) part of the integrative framework (Figure 2).

6.4 Contributions

This thesis makes important theoretical contributions to several streams of research in retail, marketing, and nutrition and health, and likewise has significant methodological and practical implications for researchers, policy makers, nutrition experts, and retailers.

6.4.1 Theoretical contribution

From a theoretical perspective, this thesis shows proof-of-principle that the impact of store atmospherics— specifically ambient scent, colour and imagery— can act as primes to nudge shoppers to approach or avoid healthier food purchasing within a supermarket context in most cases. Previous research has investigated the store atmospheric-health relationship, but was limited to ambient lighting in a restaurant context where immediate consumption takes place (Biswas et al., 2017) and posters displayed on the wall next to a vending machine (e.g. Stockli et al., 2016), where a smaller number of goods were offered. Despite this recent interest in store atmospherics stimuli influencing healthier food choices (e.g. Biswas et al., 2017; Stockli et al., 2016), past atmospheric research has been limited to general effects on food choice (e.g. De wijk & Zijlstra, 2012; Gaillet et al., 2013; Gaillet-Torrent et al., 2014; Feinstein, Hinskton, & Erdem, 2002; North et al., 2016; Yeoh & North, 2010; Zellner et al., 2017) or spending (Gueguen & Petr, 2006; Herrman et al., 2013; Leenders et al., 2016). Such effects include the impact of musical fit between Malay or Western music and Malay or Western food choice (Yeoh & North, 2010), the impact of ambient fruit scents on selection of related items on a three-course menu (Gaillet et al., 2013), or the effect of melon scent on amount spent on groceries (Leenders et al., 2016). This thesis advances previous findings and further validates the relationship specifically between store atmospherics, in particular ambient herb scent, and healthier food choices within a supermarket context.

Despite the newly established store atmospheric-health relationship, ambient scent and environmental colour had not yet been explored in retail research. The closest investigations focused on ambient scent driving approach behaviours toward similar energy-dense foods or category specific foods (e.g. Chambaron et al., 2015; Gaillet-Torrent et al., 2014; Proserpio et al., 2017). Ambient ‘pain au chocolat’ scent, for instance, primes the selection of more high-energy dense desserts as opposed to no scent (Chambaron et al., 2015), and chocolate and beef ambient scents cause greater salivation and intake of chocolate rice (ambient scents representing high energy dense foods) as opposed to the scent of melon and cucumber (Proserpio et al., 2017). Fruity odours, though, do impact food choice intentions (on a menu card) toward items that contained more fruits and/or vegetables (Gaillet-Torrent et al., 2014). The closest investigations for store environmental colour research focused on blue (cool) environments or green departments’ impact on spending and in some cases the selection of more expensive goods (Barli et al., 2012; Bellizzi & Hite, 1992). However, none of these studies concentrated on “more-healthy” ambient scents and/or colour to influence thematically congruent healthier food choices. The findings of this thesis suggest priming effects beyond course/product category or energy density to more abstract concepts of healthfulness, instead influencing healthier purchasing across a number of categories for herb scent and the significant negative effects for colour. Study 2 is the first study to link ambient scent and colour with shopper choices for healthier foods in the retail context.

Importantly, the research in this thesis is the first to examine store atmospheric cues (ambient scent, colour, and wall imagery) through the lens of prime nudging, the situated inference model and System 1 heuristic information processing. Typically, most of the studies in retail and consumer food research had focused on either the priming paradigm (Chambaron et al., 2015; Gaillet et al., 2013; Gaillet-Torrent et al., 2014; Yeoh & North, 2010), priming, congruity and spreading activation theory (North et al., 2016), priming, associations, and concepts (Stockli et al., 2016); S-O-R (Lee et al., 2016), S-O-R and congruency (Spangenberg et al., 2006; Demoulin, 2011), congruency effects (Douce et al., 2013; Mitchell et al., 1995; Proserpio et al., 2017; Schifferstein & Blok, 2002), or approach-avoidance behaviours (Gulas & Bloch, 1995; Morrison et al., 2011). Biswas and colleagues (2017) mention that ambient light can nudge consumers, but nudging was not outlined as a driving theory. Thus, the application of prime nudging, the situated inference model, System 1 heuristic information processing, and the theory of spreading activation offer more thorough theoretical explanation for the relationship between store atmospherics and thematically congruent healthier food purchasing. It is not simply that “more-healthy” store atmospheric cues positively influence healthier food choices. Rather, it is the relationship between more-healthy store atmospheric primes (in this case, herb scent), the activated health associations, and the product type (in this case, healthier foods).

In addition, this thesis further contributes to a better understanding of priming, congruency, stimulus-organism-response model, and approach-avoidance in the context of store atmospherics and healthier purchasing in retail research. An integrative framework of store atmospheric effects on shopper food purchasing (Figure 2) was crafted for this thesis and is a contribution to theory in retailing and S-O-R, especially regarding food choice. The integrated framework advances previous frameworks (Donovan & Rossiter, 1982; Kotler, 1973; Lam, 2001; Mehrabian & Russell, 1974; Spence et al., 2014; Story et al., 2008; Wilson et al., 2016) by organising research on store atmospherics, and research in the food, nutrition and health domain to consider how external (environmental) and internal (shopper) cues nudge healthier food purchasing behaviour. Previous S-O-R frameworks in retail research have not included prime nudging showing that store atmospheric primes (the stimulus) can nudge the shopper (the organism) to approach purchasing of healthier foods (response), making a contribution to retail research. This framework is easily adaptable to other food environments where food choices are to be influenced.

Ultimately, one of the primary aims of the thesis was to advance understanding of the effects of store atmospherics beyond approach-avoidance, priming and congruency effects to show that store atmospherics can act as a prime to create a message of healthfulness to nudge shoppers to purchase healthier foods.

6.4.2 Methodological contribution

Beyond the theoretical contributions, the findings of this thesis offer several methodological contributions to research. First, Study 2's experiment showed the influence of olfactory and visual store atmospheric primes on choices across a number of food categories and products. Previous literature focused on the impact of store atmospherics on a limited number of food choices such as snacks or fruit and vegetables (e.g., Chambaron et al., 2015; Gaillet-Torrent et al., 2014; Stockli et al., 2016; Proserpio et al., 2017) rather than a shopping trip as in this thesis. These are typically fewer choices than offered within food purchasing environments such as supermarkets and grocery stores. The 18 food groups, 91 categories and 1,412 products in the virtual store allowed for participants to experience the complexities offered by an actual supermarket decision making context where food decisions are made. This work establishes the effect even beyond the number of choices within Biswas et al.'s (2017) restaurant context. Thus, use of the virtual supermarket as a method enabled investigations beyond simple choice sets. It provides future researchers with a tool to investigate more complex food decisions across a broad range of food and beverage categories. Food retailers wanting to optimise store design, layout, and merchandising, and nutrition and health researchers wanting to impact what goes into shopper food baskets could find this tool useful.

Secondly, Study 2's virtual supermarket laboratory experiment, with scent machines, to investigate the relationship between store atmospherics and food choice is novel to retail atmospheric research and is the first study of its kind. Previously, scent machines have been used in laboratory studies to investigate the effects of ambient scent on food consumption and choice (e.g., Chambaron et al., 2015; Gaillet-Torrent et al., 2014; Proserpio et al., 2017, among others). Virtual supermarket software has also previously helped with data collection for health interventions and food choice (Waterlander et al., 2016; Waterlander et al., 2014; Waterlander et al., 2011; Waterlander et al., 2012). Yet, no study to the author's knowledge has incorporated the virtual supermarket software, scent machines, the laboratory, a supermarket context, and store atmospherics as a methodology for collecting data, testing causal relationships, and influencing shopper behaviour. Thus, use of this methodology contributes to the way future interested researchers can approach store atmospheric research. It provides a more realistic yet controlled testing environment where store atmospherics are easier to manipulate than in physical stores and supermarket shopper behaviours can be more integrally understood.

Third, the atmospheric study was unique in the fact that exposure to the priming conditions remained throughout the entire shopping trip. Gaillet-Torrent et al. (2014) question "whether different priming effects could be expected using a scent exposure concomitant with food choices, instead of a pre-exposure" (p. 21). Study 2's findings answer this question. The effects of the scent prime seem to be independent of the duration of the exposure. For example, exposure of the ambient scent prime occurred for the duration of the shopping trip instead of pre-exposure to a scent, and then a choice task. Larsen, Hermans, and Engels (2012) support this, when olfactory food cue exposure on food intake was not dependent on the contextual duration of the exposure. The findings of Study 2 add to this work by showing ambient scents impact on food choice as independent of contextual duration of exposure. If prime exposure during the choice task can positively influence purchasing behaviour this could reduce the steps involved in the research process. Pre-exposure to scent seems unnecessary to achieve desired effects.

6.4.3 Practical contribution

This thesis also carries several important practical implications. Findings provide retailers with insight on how different store atmospherics work, and can ultimately be used to guide retail strategy. For example, retailers can easily implement an ambient scent within their stores to influence shoppers to purchase healthier baskets of food and to show concern for the community. If out of every 100 people that enter a supermarket, 1 is nudged in the right direction and this persists over time, this could be worthwhile particularly in supermarkets in more deprived areas. This not only appeals to achieving corporate social responsibility outcomes but also further offers an opportunity to retailers to increase profits by targeting fresh food departments.

More specifically, a more-healthy ambient herb scent distributed through the store could lead to more wholefood purchases in fresh food departments, leading to greater profits and less wastage for retailers. Huge amounts of food wastage can be seen in the figures being donated by a national supermarket in New Zealand. Countdown alone donates around $3.5 million worth of food, to food banks, and an additional $1.2 million dollars worth to farmers (Countdown, 2017). This does not include the food that is being dumped. Pricing structures in supermarkets for fresh food departments compared to grocery departments have higher wastage allowances, meaning larger profit margins (C. Phillips, personal communication, June 10, 2017). The higher the sales in fresh food departments, the higher the profits generated by the supermarkets. Thus, corporate social responsibility outcomes and increased profits are anticipated through implementation of healthier store atmospherics such as ambient scent to prime healthier food choices.

Furthermore, findings from this thesis (particularly novel in the supermarket retailing domain) provide guidance for health professionals, policy makers and responsible supermarket retailers regarding the types of scents, colour and imagery that should (and should not) be used in supermarket settings. All else being equal, ambient herb scents could potentially help to reduce less-healthy food choices as well as increase more-healthy food choices and could be engaged with to improve shopper health outcomes. Green coloured shelving and more-healthy imagery might be avoided in environments that have both healthier and less healthy foods in part they might encourage less healthy food purchasing.

Retailers and policy makers should work together to ensure grocery shoppers' health and wellbeing is protected and encouraged (Lin & McFerran, 2016). Policy makers could be working with retailers to ensure the right types of store atmospheric stimuli are being used that are appropriate for the store, and will guide healthier food choices. Policy makers and health professionals could also educate retailers as well as shoppers about the non-consciously perceived influences of the store environment and ability to activate certain behaviours during the shopping processes, such as the potential effects of prominent green environmental colours or more-healthy imagery in creating misleading health halo effects. At this point no legal requirements need to be actioned as further data and insights are needed, but greater awareness and care when implementing such store atmospherics in-store should be considered. Overall, store atmospheric primes offer another approach for potentially changing health behaviour. Gutherie, Mancino, & Lin (2015) suggest that such approaches should be supplemental to information strategies, as well as other in-store marketing strategies such as pricing or merchandising to further amplify effects.

In addition, the findings of this thesis are highly relevant for supermarket designers and managers, especially the two national supermarket chains in New Zealand. Both operators engage with either the prominent environmental colour of green or more-healthy wall imagery above the fresh food departments within their stores. As Study 2 findings indicate, the potential impact on the health composition of shopper food baskets is complicated. The use of green shelving and/or more-healthy imagery may lead to less-desirable, unintended effects. Supermarkets, in general, already heavily promote and sell a large number of highly processed and energy dense foods. Employing particular store atmospheric stimuli that could activate desire for less healthy foods might add to the already challenging obesogenic environment consumers are currently faced with. Further field studies are needed to test these relationships.

Taken together, this research shows that health professionals, policy makers and retailers must consider the implications of less-healthy ambient food scents, prominent environment colour such as green, and more-healthy imagery in driving less healthy food choices. To tempt shoppers with an artificially introduced less-healthy food cue (e.g. sweet bakery scent) is unethical and should not be practiced by retailers. The current advertising standards authority (ASA) (Advertising Standards Authority, 2016) standard does not go far enough to protect children in supermarkets from store atmospherics but could. Therefore, it is recommended that voluntarily guidelines by retailers should be established to protect shoppers in their stores and the ASA should update the code to include store atmospherics. Overall, retailers that choose to implement policies favouring healthier food choices could be perceived as making a considerable effort toward addressing diet-related public health issues and therefore, may develop a competitive advantage over other food retailers (Berning, Chouinard, Manning, McCluskey, & Sprott, 2010).

6.5 Limitations and directions for future research

Admittedly, while explanations such as priming health relevant concepts, System 1 heuristic information processing, and spreading activation theory have been presented to explain findings the underlying processes were not directly tested. It would be important to determine if health-relevant concepts are activated by the primed stimuli to further advance application of theory. To show the relationship existed, implicit measures such as word completion tasks or lexical decision tasks could be applied (e.g. Gaillet et al., 2013). For example, individuals primed with more-healthy store atmospheric stimuli should show greater accessibility of health relevant concepts, and thus be able to complete word fragments that involve health-relevant words with more speed. Similarly, individuals primed with more-healthy store atmospheric stimuli would be expected to recognise health-relevant words more quickly than individuals primed with less healthy store atmospherics. This would advance understanding beyond the associated healthfulness of the stimuli to the implicitly activated mental concepts. The role and link between store atmospherics (stimulus), the shopper (organism) and healthier food choices (response; S-O-R model) would become more salient and explanations such as priming, the situated inference model, and spreading activation theory could be further clarified.

Also, it remains unclear at what level of consciousness shoppers perceived the store atmospheric stimuli in Study 2's findings. The priming manipulation in Study 2 was unobtrusive, as was priming in other studies where non-consciously perceived behavioural change resulted (e.g., Gaillet-Torrent et al., 2014; Stockli et al., 2016; Zellner et al., 2017). Reported awareness levels were low during the purpose and hypothesis checking, which is consistent with previous priming research (Gaillet-Torrent et al., 2014; Zellner et al., 2017). Despite this, a cognitive load measure in future research could advance these findings. As Stockli et al. (2016) suggest, "unconscious influence requires nearly no cognitive resources, researchers could compare people's response to the exposure of cues with and without additional cognitive load (e.g., remember numbers)" (p. 373). If cognitive resources are depleted with high cognitive load and store atmospheric stimuli still influenced behaviour, the cue could then be attributed to unconscious processing (McFerran, Dahl, Fitzsimons, & Morales, 2010; Stockli et al., 2016). Thus, implementing a cognitive load task (such as remembering a number, as in Stockli et al., 2016) could test at what level of consciousness the effect occurs and provides further support for System 1 heuristic information processing.

Likewise, physiological responses and further cognitive responses were not tested but could be alternative explanations for significant findings in Study 2. Due to the direct link between experienced scents and the emotionally driven part of the brain (Holland et al., 2005; Hirsch, 1995; Douce & Janssens, 2013), in Study 2 the strength of the ambient food scent may have been too strong for individuals to resist, inducing desires and food cravings for congruent products and categories. Food cues are said to prepare the body for intake (Ramaekers et al., 2014). Ambient food scents have been found to increase general appetite (Ramaekers et al., 2014; Proserpio et al., 2017), increase saliva production (Proserpio et al., 2017), increase food intake (Fedoroff et al., 1997; Fedoroff et al., 2003), and remain desirable over time when no food ingestion occurs (Ramaekers et al., 2014; Proserpio et al., 2017). Future research could incorporate physiological mechanisms such salvia production, appetite measures, or offer food at the end of experimental sessions to measure actual food intake. The experimental design could be olfactory versus visual condition. The greater saliva production in the olfactory condition as opposed to the visual condition would suggest greater desire for the food created by the scent rather than the imagery, as an example. Females tend to have higher prevalence of food cravings (Weingarton & Elston, 1999) and often crave sweet foods (Firmin, Gillette, Hobbs, & Wu, 2016). Measuring salvia production and self-reported appetite could help with separating gender differences also.

In terms of individuals assessed, Study 2 included disproportionate numbers of females to males, aged between 18 to 65 years old from the general population of Auckland, New Zealand. Most studies on consumption behaviour are completed with student samples or are predominately female focused, potentially reducing the generalizability of the findings (Papies & Hamstra, 2010). Study 2 used a more diverse and more ethnically representative sample of New Zealand residents. Even though a range of ages, ethnicities, education levels, and genders were represented in the current sample, the behaviours of those individuals most in need of health interventions (such as overweight and obese individuals, and lower socio-economic groups) were not well represented in the sample. The lower socio-economic groups, except for students, may have been unable to afford the time or the expense to drive or take public transport into the city centre to partake in the study. These at-risk groups, plus other population subgroups such as ethnic groups, children, younger and older shoppers, restrained eaters, dieters, and people with heightened reward sensitivity could be considered in future research.

Restrained eaters, dieters, overweight and obese people, and reward-sensitive people are typically more sensitive to food cues than those people not so food-conscious (Beaver et al., 2006; Fletcher et al., 2007; Papies & Veling, 2013; Wang et al., 2016). An investigation into these types of individuals to see whether they are more sensitive to the store atmospheric cues would help to determine if desired food cues are more beneficial or detrimental. Scales such as Herman and Polivy's (1975) restrained eating measures, and Heatherton and Polivy's (1991) body dissatisfaction scale would help to measure some of these individual differences. In Study 2, the less-healthy imagery managed to encourage healthier food choices, but this may be inappropriate for at-risk groups. Further investigations into at-risk groups would help to generalise results to all groups of people and allow for more concrete recommendations for public policy.

It is further important to determine whether green shelving and more-healthy imagery actually cued the suggested health halo effect, as shown in some findings from Study 2. A follow-up study could be completed to test the perceived health positioning of the store atmospheric manipulations. As adapted from Chandon and Wansink (2007), a simple question through an online survey such as "the food displayed here is healthy" could be asked against screen shots of the virtual store environment. The foods within the "more-healthy" store (green shelving and/or more-healthy imagery) would thus be anticipated to be rated as healthier in comparison to the less-healthy store (grey shelving and/or less-healthy imagery). By conducting this small follow-up study, the explanations of the counterintuitive findings of green shelving and more-healthy imagery can be clarified. Also, if the colour green is creating this perceived health halo, can the negative effects be minimised if the colour is isolated to only the healthier sections of the store? Green shelving located in key health areas around a virtual supermarket could thus be tested.

A further direction for future research would be to identify the structural components of the imagery (e.g. colour, food cue, nature, animals, presentation of food, etc.) that are most salient in determining shopper response. For example, the non-food related and diet-related components of the imagery used by Stockli et al. (2016) and Fishbach et al. (2003), respectively, played roles in activating health-concepts related to healthier food purchasing, whereas the food-related components of wall imagery in Study 2 did not play such a role. The imagery in Study 2 included imagery of animals, foods presented in different ways, and some featuring people. Subsequent investigations could focus on isolating effects of the various structural components of the wall imagery rather than focusing on the healthfulness of the imagery, to determine the best type of imagery for use in supermarket retailing to influence healthier food choices. Self-regulation or self-presentation theories could be used as guiding theories for the investigation.

Furthermore, the unfamiliar setting of the virtual supermarket may have encouraged greater attention toward external cues, in this case store atmospherics, to guide decisions than may not have occurred in a familiar environment. As Otterbring, Wastlund, & Gustafsson (2016) point out that shoppers with limited knowledge about a store might direct more attention toward in-store cues than shoppers familiar with a store. However, the unfamiliar setting was held consistent across all experimental manipulations. Also, Study 2 was only based on a single-exposure setting where participant food choices were assessed immediately, during and after exposure. Potential habituation effects could occur if consistently exposed to the same stimuli. This was a new supermarket, a new experience, in the laboratory where more attention may have been paid than in everyday shopping. It would be interesting to see if these effects remain after repeated exposure, over an extended period of time in familiar supermarket environments in the field.

It is further recommended that the findings of this thesis be best interpreted as initial evidence only (Poon & Grohmann, 2014). Laboratory studies exclude important additional factors such as other shoppers, in-store specials, and so on, which can greatly impact upon shopper purchasing behaviour. The experimental setting does offer a high degree of control (Burke et al., 1992; Falk & Heckman, 2009) and internal validity (Bryman & Bell, 2007) and helps to establish causal relationships. Even so, the laboratory environment is not the real world, and participants know they are being observed. There is potential that participants will behave differently to how they would in a physical store, for instance when shopping with children. To further validate the effect, real world retail settings should be used.

As online retailers were outside the scope of both studies, further research into online store atmospheric stimuli such as prominent environmental colour could be investigated to see whether healthier food choices in an online supermarket context could be achieved. Furthermore, well-designed replication studies aimed at overcoming the outlined limitations are clearly required. Ambient music, ambient temperature, outside noise, and ambient lighting are all areas worth investigating. For example, even though ambient music lacked association with more- versus less-healthy store environments in

Study 1's observations, there is potential in showing how congruent music might impact shopper choices in retail settings. The music product-congruency effect previously established by Spence and Shankar (2010), Jacob et al. (2009), North et al. (2016), and Zellner et al. (2017) implies that a relationship between ambient music priming and healthier food choices is at least worth investigating further. Further, validation of Biswas et al.'s (2017) finding that bright lighting increases mental alertness and nudges shoppers toward healthier food choices could be replicated in a supermarket context. This thesis, in combination with other cutting edge research, offers new avenues to investigate a retail atmospheric concept that was long ago brought to the forefront of marketing research (e.g. Kotler, 1973).

6.6 Conclusion

In conclusion, the investigation of store atmospheric stimuli as primes to nudge shoppers toward healthier choices can provide an approach to improving public health outcomes. Current attempts in-store to help New Zealanders reduce their expanding waistlines have previously been met with limited success due to conscious intention required on the part of the shopper. The use of non-consciously perceived store atmospheric primes that create a message of healthfulness can target shoppers' heuristic, System 1 information processing to make healthier food choices easier and less demanding.

With few prior studies to guide development of retail stimuli in relation to food healthiness, Study 1's field observations provided key stimuli representative of a healthier food environment that were further selected via a series of pre-tests for their ability to create a message of healthfulness. The field observations in Study 1 aided in the establishment of new significant findings that may not have otherwise been discovered, such as the ambient scent of herbs as a communicator of healthfulness. Study 2's experimental design further validated the relationship between store atmospherics and healthier food choices within a supermarket context. It showed the relationship also existed with ambient scent and in part, the prominent environmental colour not previously investigated in a retail context. Findings further highlighted the impact of ambient scent beyond course/product category or energy density to more abstract concepts of "healthfulness" influencing purchasing of healthier foods across a broad range of categories. Furthermore, the application of primes as nudges, the situated inference model, System 1 information processing, and spreading activation theory offer a grounded theoretical explanation in addition to retail theories of S-O-R, approach-avoidance and congruency theory.

The findings also provide guidance for health professionals, policy makers and responsible supermarket retailers and the Advertising Standards Authority regarding the types of scents, colours and imagery that should (and should not) be used in supermarket settings. More-healthy ambient scents can help to reduce less-healthy food choices as well as increase healthier food choices, and could be engaged to improve shopper health. Green shelving and more-healthy imagery might be best avoided in environments that have both more healthy and less healthy food, since they in part encouraged less healthy food purchasing in the supermarket in Study 2. Retailers, especially the national supermarket chains in New Zealand, should consider the environmental stimuli they employ in store and the resulting impact upon consumer health. Tempting consumers with artificially introduced ambient scents such as sweet bakery to influence less-healthy food choices is questionable at best, and such a practice should be discouraged to avoid influencing obesity and health outcomes negatively. In sum, store atmospherics as a prime to nudge healthier food choices is another approach health professionals, policy makers and retailers can engage with.

Overall, these findings provide a basis for future research and offer insights for improving the food supply and health in New Zealand and around the world. Future studies might replicate and validate current findings, including a control condition in particular, and further understanding by investigating the underlying process of the causal relationship between health primes and shopping behaviour established in the present studies. With further understanding and more results, development of relatively cheap and feasible intervention tools for public policy makers and retailers can be created and implemented in-store. Using store atmospherics as a prime to nudge shoppers toward healthier food choices fits nicely with Thaler and Sustein’s (2008) approach of nudging individuals toward health behaviours. Shoppers should be able to know that they can enter an environment where healthier food choices will be easy. Store atmospherics as primes can help make these choices easier.

Thus, store atmospherics, in particular ambient herb scent, can act as a prime to create a message of healthfulness to nudge shoppers toward healthier food choices in comparison to a sweet bakery scent. This can aid in public health outcomes such as reducing the number of less healthy foods purchased and increasing the number of wholefoods and less processed foods purchased. Health professionals, policy makers and retailers should consider these findings when trying to improve public health.

Reference list

Advertising standards authority. (2016). *Report on the review of the children's code for advertising food and the code for advertising to children*. Retrieved from http://www.asa.co.nz/wp-content/uploads/2016/10/Final-Report-Childrens-Codes-Review.pdf

Ajzen, I. (1996). The social psychology of decision-making. In Higgins, E & Kruglanski, A (Eds.), *Social psychology: Handbook of basic principles*. New York: Guilford.

Alkerwi, A. (2014). Diet quality concept. *Nutrition*, 30(6), 613-618.

Alpert, J., & Alpert, M. (1990). Music influences on mood and purchase intentions. *Psychology and Marketing*, 7(2), 109-133.

Anderson, J. (1983). A spreading activation theory of memory. *Journal of verbal learning and verbal behaviour*, 22 (3), 261-296.

Andersson, P., Kristensson, P., Wastlund, E., & Gustafsson, A. (2012). Let the music play or not: the influence of background music on consumer behaviour. *Journal of Retailing and Consumer Services*, 19(6), 553-560.

Arambepola, C., Scarborough, P., & Rayner, M. (2008). Validating a nutrient profile model. *Public Health Nutrition*, 11(4), 371-378.

Areni, C., & Kim, D. (1993). The influence of background music on shopping behaviour: classical versus top-forty music in a wine store. *Advances in Consumer Research*, 20, 336-340.

Atkinson, J., Salmond, C., & Crampton, P. (2014). *NZDep2013 Index of Deprivation*. Retrieved from University of Otago, Department of Public Health website: http://www.otago.ac.nz/wellington/departments/publichealth/research/hirp/otago020194.html

Babin, B., Hardesty, D., & Suter, T. (2003). Color and shopping intentions: the intervening effect of price fairness and perceived affect. *Journal of Business Research*, 56(7), 541-551.

Bailey, R. (2015). Processing food advertisements: Initial biological responses matter. *Communication Monographs*, 82 (1), 163-178.

Baker, J. (1986). The role of environment in marketing services: the consumer perspective. In Czpeil, J., Congram, C., & Shanaham, J (Eds.), *The services marketing challenge: Integrated for competitive advantage*. Chicago: American Marketing Association.

Baker, J., & Cameron, M. (1996). The effects of the service environment on affect and consumer perception of waiting time: An integrative review and research propositions. *Journal of the Academy of Marketing Science*, 24(4), 338-349.

Baker, J., Grewal, D., & Parasuraman, A. (1994). The influence of store environment on quality inferences and store image. *Journal of Academy of Marketing Science*, 22(4), 328-339.

Baker, J., Levy, M., & Grewal, D. (1992). An experimental approach to making retail store environmental decisions. *Journal of Retailing*, 68(4), 445-460.

Baker, J., Parasuraman, A., Grewal, D., & Voss, G. (2002). The influence of multiple store environment cues on perceived merchandise values and patronage intentions. *Journal of Marketing*, 66(2), 120-141.

Ballantine, P., Jack, R., & Parsons, A. (2010). Atmospheric cues and their effect on the hedonic retail experience. *International Journal of Retail and Distribution Management*, 38(8), 641-653.

Bargh, J., & Chartrand, T. (1999). The unbearable automaticity of being. *American Psychologist*, 54(7), 462-479.

Barli, O., Aktan, M., Bilgili, B., & Dane, S. (2012). Lighting, indoor color, buying behaviour and time spent in a store. *Colour Research and Application*, 37(6), 465- 468.

Basil, M. (2011). Use of photography and video in observational research. *Qualitative Market Research: An International Journal*, 14(3), 246-257.

Bateson, J., & Hui, M. (1992). The ecological validity of photographic slides and videotapes in simulating the service setting. *Journal of Consumer Research*, 19(2), 271-281.

Bava, C., Jaeger, S., & Dawson, J. (2009). In-store influences on consumers' grocery purchasing decisions: a qualitative investigation. *Journal of Customer Behaviour*, 8(3), 221-236.

Bearden, W., Netemeyer, R., & Haws, K. (2011). *Handbook of Marketing Scales: Multi-Item Measures for Marketing and Consumer Behaviour Research* (3rd ed.). USA: Sage Publications.

Beaver, J., Lawrence, A., Ditzhuijzen, J., Davis, M., Woods, A., & Calder, A. (2006). Individual differences in reward drive predict neural responses to images of food. *The Journal of Neuroscience*, 26(19), 5160-5166.

Bellizzi, J., Crowley, A., & Hasty, R. (1983). The effects of color in store design. *Journal of Retailing*, 59(1), 21-45.

Bellizzi, J., & Hite, R. (1992). Environmental color, consumer feelings and purchase likelihood. *Psychology and Marketing*, 9(5), 347-353.

Bemmaor, A., & Mouchoux, D. (1991). Measuring the short-term effect of in-store promotion and retail advertising on brand sales: a factorial experimental. *Journal of Marketing Research*, 28(2), 202-214.

Berning, J., Chouinard, H., Manning, K., McCluskey, J., & Sprott, D. (2010). Identifying consumer preferences for nutrition information on grocery store shelf labels. *Food Policy*, 35(5), 429-436.

Belk, R., Wallendorf, M., & Sherry, J. (1989). The sacred and the profane in consumer behaviour: theodicy on the Odyssey. *Journal of Consumer Research*, 16(1), 1-38.

Biloukha, O., & Utermohlen, V. (2001). Healthy eating in Ukraine: attitudes, barriers and information sources. *Public Health Nutrition*, 4(2), 207-215.

Biswas, D., Szocs, C., Chacko, R., & Wansink, B. (2017). Shining light on atmospherics: How ambient light influences food choices. *Journal of Marketing Research*, 54(1), 111-124.

Bitner, M. (1992). Servicescapes: the impact of physical surroundings on customers and employees. *Journal of Marketing*, 56(2), 57-71.

Blumenthal-Barby, J., & Burroughs, H. (2012). Seeking better health care outcomes: the ethics of using the "nudge". *The American Journal of Bioethics*, 12(2), 1-10.

Bloch, P. (1995). Seeking the ideal form: product design and consumer response. *Journal of Marketing*, 59(3), 16-29.

Bone, P., & Ellen, P., (1990). Scents in the marketplace: explaining a faction of olfaction. *Journal of Retailing*, 75(2), 243-262.

Boote, J., & Mathews, A. (1999). Saying is one thing; doing is another: the role of observation in marketing research. *Qualitative Market Research: An International Journal*, 2(1), 15-21.

Bos, C., Van Der Lans, I., Van Rijnsoever, F., Van Trijp, H. (2013). Understanding consumer acceptance of intervention strategies for healthy food choices: a qualitative study. *BMC Public Health*, 13(1), 1073-1087.

Bradford, K., & Desrochers, D. (2009). The use of scents to influence consumers: the sense of using scent to make cents. *Journal of Business Ethics*, 90(2), 141-153.

Brangule-Vlagsma, K., Pieters, K., & Wedel, M. (2002). The dynamics of value segments: modelling framework and empirical illustration. *International Journal of Research in Marketing*, 19(3), 267-285.

Brewer, M., & Crano, W. (2000). Research design and issues of validity. In Reis, H., & Judd, C (Eds), *Handbook of research methods in social and personality psychology* (pp. 11-26). New York: Cambridge University Press.

Broekemier, G., Marquardt, R., & Gentry, J. (2008). An exploration of happy/sad and liked/disliked music effects on shopping intentions in a women's clothing store service setting. *Journal of Services Marketing*, 22(1), 59-67.

Bruner, G. (1990). Music, mood and marketing. *Journal of Marketing*, 54(4), 94-104.

Bryman, A., & Bell, E. (2007). *Business research methods (2nd ed)*. USA: Oxford University Press Inc.

Buckland, N., Finlayson, G., Edge, R., & Hetherington, M. (2014). Resistance reminders: Dieters reduce energy intake after exposure to diet-congruent food images compared to control non-food images. *Appetite*, 73, 189-196.

Burke, R., Harlam, B., Kahn, B., & Lodish, L. (1992). Comparing dynamic consumer choice in real and computer-simulated environments. *Journal of Consumer Research*, 19(1), 71-82.

Buttriss, J., Stanner, S., McKevith, B., Nugent, A., Kelly, C., Phillips, F., & Theobald, H. (2004). Successful ways to modify food choice: lessons from the literature. *British Nutrition Foundation Nutrition Bulletin*, 29 (4), 333-343.

Caldwell, C., & Hibbert, S. (2002). The influence of music tempo and musical preference on restaurant patrons behaviour. *Psychology and Marketing*, 19(11), 895-917.

Centers for disease control and prevention (n.d.). *Healthy weight – it's not a diet, its a lifestyle!* Retrieved August 1, 2014, from http://www.cdc.gov/healthyweight/effects/

Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology*, 39(5), 752-766.

Chandon, P., Hutchinson, W., Bradlow, E., & Young, S. (2009). Does in-store marketing work? Effects of the number and position of shelf facings on brand attention and evaluation at the point of purchase. *Journal of Marketing*, 73(6), 1-17.

Chandon, P., & Wansink, B. (2002). When are stockpiled products consumed faster? A convenience – salience framework of postpurchase consumption incidence and quantity. *Journal of Marketing Research*, 39(3), 321-335.

Chandon, P., & Wansink, B. (2007). The biasing health halos of fast-food restaurant health claims: lower calorie estimates and higher side-dish consumption intentions. *Journal of Consumer Research*, 34(3), 301-314.

Chambaron, S., Chisin, Q., Chabanet, C., Issanchou, S., & Brand, G. (2015). Impact of olfactory and auditory priming on the attraction to foods with high energy density. *Appetite*, 95, 74-80.

Cheema, A., & Patrick, V. (2012). Influence of warm versus cool temperatures on consumer choice: a resource depletion account. *Journal of Marketing Research*, 49(6), 984-995.

Clarke, D., Perry, P., & Denson, H. (2012). The sensory retail environment of small fashion boutiques. *Journal of Fashion Marketing and Management*, 16(4), 492-510.

Coelho, J., Polivy, J., Herman, P., & Pliner, P. (2009). Wake up and smell the cookies. The effects of olfactory food-cue exposure in restrained and unrestrained eaters. *Appetite*, 52, 517-520.

Cohen, D., & Babey, S. (2012). Contextual influences on eating behaviours: heuristic processing and dietary choices. *Obesity Review*, 13(9), 766-779.

Colchero, M., Guerrero-Lopez, C., Molina, M., & Rivera, J. (2016). Beverage sales in Mexico before and after implementation of sugar sweetened beverage tax. *Public Library of Science*, 11(9), 1-8.

Collins, A., & Loftus, E. (1975). A spreading-activation theory of semantic processing. *Psychological Review*, 82(6), 407-428.

Consumer lifestyles in New Zealand. (2016). Retrieved from http://www.portal.euromonitor.com.ezproxy.aut.ac.nz/portal/analysis/tab

Countdown. (n.d.). Retrieved from https://shop.countdown.co.nz/?banner=www#url=/Shop/SearchProducts%3Fsearch%3Dbread

Countryman, C., & Jang, S. (2006). The effects of atmospheric elements on customer impression: the case of hotel lobbies. *International Journal of Contemporary Hospitality Management*, 18(7), 534-545.

Crowley, A. (1993). The two-dimensional impact of color on shopping. *Marketing Letters*, 4(1), 59-69.

Custers, P., De Kort, Y., IJsselsteijn, W., & De Kruiff, M. (2010). Lighting in retail environments: atmosphere perception in the real world. *Lighting Research and Technology*, 42(3), 331-343.

D'Astous, A. (2000). Irritating aspects of the shopping environment. *Journal of Business Research*, 49(2), 149-156.

Decre, G., & Pras, B. (2013). Simulating in-store lighting and temperature with visual aids: temperature with visual aids: methodological propositions and S-O-R effects. *The International Review of Retail, Distribution and Consumer Research*, 23(4), 363-393.

De Dear, R. & Brager, G. (1998). Developing an adaptive model of thermal comfort and preference. *ASHRAE Transactions*, 104, 145-167.

Demoulin, N. (2011). Music congruency in a service setting: The mediating role of emotional and cognitive responses. *Journal of Retailing and Consumer Services*, 18(1), 10-18.

Desmet, P., Bordenave, R., & Taynor, J. (2013). Differences in purchasing behaviour between physical and virtual laboratory stores. *Recherche et Applications en Marketing*, 28(2), 70-85.

De Wijk, R., & Zijlstra, S. (2012). Differential effects of exposure to ambient vanilla and citrus aromas on mood, arousal and food choice. *Flavour*, 1(24), 1-7.

Diego, M., Jones, N., Field, T., Hernandez-Reif, M., Schanberg, S., Kuhn, C., McAdam, V., Galamaga, R., & Galamaga, M. (1998). Aromatherapy positively affects mood, eeg patterns of alertness and math computations. *International Journal of Neuroscience*, 96(3-4), 217-224.

Ding, C., & Lin, C. (2012). How does background music tempo work for online shopping. *Electronic Commerce Research and Applications*, 11(3), 299-307.

Dijksterhuis, A., Aarts, H., Bargh, J., & Knippenberg, A. (2000). On the relation between associative strength and automatic behaviour. *Journal of Environmental Social Psychology*, 36(5), 531-544.

Dodd, C., Clark, I., & Kirkup, M. (1998). Camera observations of customer behaviour in fashion retailing: methodological propositions. *International Journal of Retail and Distribution Management*, 26(8), 311-317.

Donovan, R., & Rossiter, J. (1982). Store atmosphere: an environmental psychology approach. *Journal of Retailing*, 58(1), 34-57.

Donovan, R., Rossiter, J., Marcoolyn, G., & Nesdale, A. (1994). Store Atmosphere and Purchasing Behaviour. *Journal of Retailing*, 70(3), 283-294.

Douce, L., & Janssens, W. (2013). The presence of a pleasant ambient scent in a fashion store: the moderating role of shopping motivation and affect intensity. *Environment and Behaviour*, 45(2), 215-238.

Douce, L., Poels, K., Janssens, W., & De Backer, C. (2013). Smelling the books: the effect of chocolate scent on purchase-related behaviour in a bookstore. *Journal of Environmental Psychology*, 36, 65-69.

Drewnowski, A. (2005). Concept of a nutritious food: toward a nutrient density score. *The American Journal of Clinical Nutrition*, 82(4), 721-732.

Drewnowski, A., Aggarwal, A., Hurvitz, P., Monsivals, P., & Moudon, A. (2012). Obesity and supermarket access: proximity or price? *American Journal of Public Health*, 102(8), e74-e80.

Edell, J., & Staelin, R. (1983). The information processing of pictures in print advertisement. *Journal of Consumer Research*, 10(1), 45-61.

Ehrlichman, H., & Halpern, J. (1988). Affect and memory: effects of pleasant and unpleasant odors on retrieval of happy and unhappy memories. *Journal of Personality and Social Psychology*, 55(5), 769-779.

Elliot, A., & Maier, M. (2012). Color-in-context theory. *Advances in Experimental Social Psychology*, 45, 61-125.

Elliot, A., Maier, M., Moller, A., Friedman, R., & Meinhardt, J. (2007). Color and psychological functioning: the effect of red on performance attainment. *Journal of Experimental Psychology: General*, 136(1), 154-168.

Eroglu, S., Machleit, K., & Chebat, J. (2005). The interaction of retail density and music tempo: effects on shopper responses. *Psychology and Marketing*, 22(7), 577-589.

Eroglu, S., Machleit, K., & Davis, L. (2003). Empirical testing of a model of online store atmospherics and shopper responses. *Psychology and Marketing*, 20(2), 139-150.

Esbjerg, L., & Bech-Larsen, T. (2009). The brand architecture of grocery retailers: setting material and symbolic boundaries for consumer choice. *Journal of Retailing and Consumer Services*, 16(5), 414-423.

Evans, J. (2008). Dual-processing accounts of reasoning, judgement, and social cognition. *The annual review of psychology*, 59, 255-278.

Falk, A., & Heckman, J. (2009). Lab experiments are a major source of knowledge in the social sciences. *Science*, 326(5952), 535-538.

Fedorikhin, A., & Patrick, V. (2010). Positive mood and resistance to temptation: the interfering influence of elevated arousal. *Journal of Consumer Research*, 37(4), 689-711.

Fenko, A., Schifferstein, H., Huang, T., & Hekkert, P. (2009). What makes products fresh: the smell or the colour? *Food Quality and Preference*, 20(5), 372-379.

Fedoroff, I., Polivy, J., & Herman, P. (1997). The effect of pre-exposure to food cues on the eating behaviour of restrained and unrestrained eaters. *Appetite*, 28(1), 33-47.

Fedoroff, I., Polivy, J., & Herman, P. (2003). Specificity of restrained versus unrestrained eaters responses to food cues: general desire to eat, or craving for the cued food? *Appetite*, 41(1), 7-13.

Feinstein, A., Hinskton, T., & Erdem, M. (2002). Exploring the effects of music atmospherics on menu item selection. *Journal of foodservice business research*, 5(4), 3-25.

Ferriday, D., & Brunstrom, J. (2008). How does food-cue exposure lead to larger meal sizes. *British Journal of Nutrition*, 100(6), 1325-1332.

Fiechtner, L., Kleinman, K., Melly, S., Sharifi, M., Marshall, R., Block, J., Cheng, E., & Traveras, E. (2016). Effects of proximity to supermarkets on a randomized trial studying interventions for obesity. *American Journal of Public Health*, 106(3), 557-563.

Field, A. (2005). *Discovering Statistics using SPSS: second edition*. Sage publications. London.

Fiore, A., Yah, X., & Yoh, E. (2000). Effects of a product display and environmental fragrancing on approach responses and pleasurable experiences. *Psychology and Marketing*, 17(1), 27-54.

Firmin, M., Gillette, A., Hobbs, T., & Wu, D. (2016). Effects of olfactory sense on chocolate cravings. *Appetite*, 105, 700-704.

Fishbach, A., Friedman, R., & Kruglanski, A. (2003). Leading us not unto temptation: Momentary allurements elicit overriding goal activation. *Journal of Personality and Social Psychology*, 84(2), 296-309.

Fisher, H., Du Rand, G., & Erasmus, A. (2012). The power of food images to communicate important information to consumers. *International Journal of Consumer Studies*, 36(4), 440-450.

Fisher, J. (1974). Situation-specific variables as determinants of perceived environmental aesthetic quality and perceived crowdedness. *Journal of Research in Personality*, 8(2), 177-188.

Fletcher, B., Pine, K., Woodbridge, Z., & Nash, A. (2007). How visual images of chocolate affect the craving and guilt of female dieters. *Appetite*, 48(2), 211-217.

Food Standards Australia New Zealand. (2013). *Short guide for industry to the nutrient profiling scoring criterion (NPSC) in standard 1.2.7 – Nutrition, health and related* *claims*. Retrieved from http://www.foodstandards.govt.nz/industry/labelling/Documents/Short-guide-for-industry-to-the-NPSC.pdf

Forwood, S., Ahern, A., Hollands, G., & Ng, Y. (2015). Priming healthy eating. You can't prime all the people all of the time. *Appetite*, 89, 93-102.

Fukawa, N., & Niedrich, R. (2015). A fluency heuristic account of supraliminal prime effects of product preference. *Psychology and Marketing*, 32(11), 1061-1078.

Furst, T., Connors, M., Bisogni, C., Sobal, J., Falk, L. (1996). Food choice: a conceptual model of the process. *Appetite*, 26(3), 247-266.

Gaillet, M., Sulmont-Rosse, C., Issanchous, S., Chabanet, C., & Chambaron, S. (2013). Priming effects of an olfactory food cue on subsequent food-related behaviour. *Food Quality and Preference*, 30(2), 274-281.

Gaillet-Torrent, M., Sulmont-Rosse, C., Issanchou, S., Chabanet, C., & Chambaron, S. (2014). Impact of a non-attentively perceived odour on subsequent food choices. *Appetite*, 76, 17-22.

Gardner, M., & Siomkos, G. (1985). Toward a methodology for assessing effects of in-store atmospherics. *Advances in Consumer Research*, 13, 27-31.

Gardner, M., Wansink, B., Kim, J., & Park, S. (2014). Better moods for better eating?: How mood influences food choice. *Journal of Consumer Psychology*, 24(3), 320-335.

Garlin, F., & Owen, K. (2006). Setting the tone with the tune: A meta-analytic review of the effects of background music in retail settings. *Journal of Business Research*, 59(6), 755-764.

Geise, S., & Baden, C. (2015). Putting the image back into the frame: modelling the linkage between visual communication and frame-processing theory. *Communication Theory*, 25(1), 46-69.

Gibson, R. (2005). *Principles of nutritional assessment* (2nd ed.). USA: Oxford University Press.

Gilbert, A., & Churchill, J. (1999). *Market Research: Methodological Foundations (7th Ed)*. United States of America: The Dryden Press.

Gittelsohn, J., Franceschini, M., Rasooly, I., Ries, A., Ho, L., Pavlovich, W., Santos, V., Jennings, S., & Frick, K. (2008). Understanding the food environment in a low-income urban setting: implications of food store interventions. *Journal of Hunger and Environmental Nutrition*. 2(2-3), 33-50.

Glanz, K., Bader, M., & Iyer, S. (2012). Retail grocery store marketing strategies and obesity: an integrative review. *American Journal of Preventive Medicine*, 42(5), 503-512.

Glanz, K., Basil, M., Mairach, E., Goldberg, J., & Snyder, D. (1998). Why Americans eat what they do: taste, nutrition, cost, convenience, and weight control concerns as influences on food consumption. *Journal of the American Dietetic Association*, 98(10), 1118-1126.

Glanz, K., Sallis, J., Saelens, B., & Frank, L. (2005). Healthy nutrition environments: concepts and measures. *American Journal of Health Promotion*, 19(5), 330-333.

Glanz, K., & Yaroch, A. (2004). Strategies for increasing fruit and vegetable intake in grocery stores and communities: policy, pricing, and environmental change. *Preventive Medicine*, 39, S75-S80.

Goldkuhl, L., & Styven, M. (2007). Sensing the scent of service success. *European Journal of Marketing*, 41(11/12), 1297-1305.

Grewal, D., Baker, J., Levy, M., & Voss, G. (2003). The effects of wait expectations and store atmosphere evaluations on patronage intentions in service-intensive retail stores. *Journal of Retailing*, 79(4), 259-268.

Gueguen, N., & Petr, C. (2006). Odors and consumer behaviour in a restaurant. *Hospitality Management*, 25(2), 335-339.

Gulas, C., & Bolch, P. (1995). Right under our noses: Ambient scent and consumer responses. *Journal of Business and Psychology*, 10(1), 87-98.

Gustafson, A., Hankins, S., & Jilcott, S. (2012). Measures of the consumer food store environment: a systematic review of the evidence 2000-2011. *Journal of Community Health*, 37(4), 897-911.

Guthrie, J., Mancino, L., & Lin, C. (2015). Nudging consumers toward better food choices: policy approaches to changing food consumption behaviours. *Psychology & Marketing*, 32(5), 501-511.

Hadi, R. (2014). *Homeostasis-driven responses to consumer sensations* (Unpublished doctoral dissertation). New York, USA.

Hamilton, S., Mhurchu, C., & Priest, P. (2007). Food and nutrient availability in New Zealand: an analysis of supermarket sales data. *Public Health Nutrition*, 10(12), 1448-1455.

Harris, D. (2015). The influence of flooring on environmental stressors: a study of three flooring materials in a hospital. *Health Environments Research & Design Journal*, 8(3), 9-2.

Heart Foundation Tick. (2016). Retrieved from http://www.heartfoundation.org.nz/healthy-living/healthy-eating/heart-foundation-tick/what-is-the-tick.

Heatherton, F., & Policy, J. (1991). Development and validation of a scale for measuring state self-esteem. *Journal of Personality and Social Psychology*, 60(6), 895-910.

Hecht, D., Reiner, M. (2009). Sensory dominance in combination of audio, visual, and haptic stimuli. *Experimental Brain Research*, 193(2), 307-314.

Heide, M., & Gronhaug, K. (2006). Atmosphere: conceptual issues and implications for hospitality management. *Scandinavian Journal of Hospitality and Tourism*, 6(4), 271-286.

Hemphill, M. (1996). A note on adults' color-emotion associations. *The Journal of Genetic Psychology*, 157(3), 275-280.

Herman, P., & Polivy, J. (1975). Anxiety, restraint, and eating behaviour. *Journal of Abnormal Psychology*, 84(6), 666-672.

Herrington, D., & Capella, L. (1994). Practical applications of music in service settings. *Journal of Service Marketing*, 8(3), 50-65.

Herrington, D., & Capella, L. (1996). Effects of music in service environments: a field study. *The Journal of Services Marketing*, 10(2), 26-41.

Herrmann, A., Zidansek, M., Sprott, D., & Spangenberg, E. (2013). The power of simplicity: processing fluency and the effects of olfactory cues on retail sales. *Journal of Retailing*, 89(1), 30-43.

Higgins, E. (1996). *Knowledge activation: accessibility, applicability, and salience*. In Higgins, E & Kruglanski, A (Eds.), Social psychology: Handbook of basic principles. New York: Guilford.

Hirsch, A. (1995). Effects of ambient odors on slot-machine usage in a Las Vegas casino. *Psychology & Marketing*, 12(7), 585-594.

Holland, R., Hendriks, M., Aarts, H. (2005). Smells like clean spirit: Nonconscious effects of scent on cognition and behavior. *Psychological Science*, 16(9), 689-693.

Hollywood, L., Cuskelly, G., O'Brien, M., McConnon, A., Barnett, J., Raats, M., & Dean, M. (2013). Heathful grocery shopping. Perceptions and barriers. *Appetite*, 70, 119-126.

Holsten, J. (2008). Obesity and the community food environment: a systematic review. *Public Health Nutrition*, 12(3), 397-405.

Household expenditure statistics: Year ended June 2016. (2016). Retrieved from http://www.stats.govt.nz/browse_for_stats/people_and_communities/Households/HouseholdExpenditureStatistics_HOTPYeJun16/Commentary.aspx

Hui, M., Dube, L., & Chebat, J. (1997). The impact of music on consumers reactions to waiting for services. *Journal of Retailing*, 73(1), 87-104.

Hume, L., Dodd, C., & Grigg, N. (2003). In-store selection of wine – no evidence for the mediation of music. *Perceptual and Motor Skills*, 96(3), 1252-1254.

Humphreys, M., & Hancock, M. (2007). Do people like to feel neutral? Exploring the variation of the desired thermal sensation of the ASHRAE scale. *Energy and Buildings*, 39(7), 867-874.

Hynes, N., & Manson, S. (2016). The sound of silence: why music in supermarkets is just a distraction. *Journal of Retailing and Consumer Services*, 28, 171-178.

Ishihara, S. (1960). *Tests for colour-blindness*. Tokyo, Japan: Kanehara Shuppan Company.

Jacob, C. (2006). Styles of background music and consumption in a bar: an empirical evaluation. *Hospitality Management*, 25(4), 716-720.

Jacob, C., Gueguen, N., Boulbry, G., & Sami, S. (2009). Love is in the air: congruence between background music and goods in a florist. *The International Review of Retail, Distribution and Consumer Research*, 19(1), 75-79.

Jacob, C., Stefan, J., & Gueguen, N. (2014). Ambient scent and consumer behaviour: a field study in a florist's retail shop. *The International Review of Retail, Distribution and Consumer Research*, 24(1), 116-120.

Jain, R., & Bagdare, S. (2011). Music and consumption experience: a review. *International Journal of Retail and Distribution Management*, 39(4), 289-302.

Kahneman, D. (2003). A perspective on judgment and choice: Mapping bounded rationality. *American Psychologist*, 58(9), 697-720.

Kalnikaite, V., Bird, J., & Rogers, Y. (2013). Decision-making in the aisles: informing, overwhelming or nudging supermarket shoppers? *Pers Ubiquit Comput*, 17(6), 1247-1259.

Kantono, K., Hamid, N., Shepherd, D., Yoo, M., Grazioli, G., & Carr, T. (2016). Listening to music can influence hedonic and sensory perceptions of gelati. *Appetite*, 100, 244-255.

Kaya, N., & Epps, H. (2004). Relationship between color and emotion: a study of college students. *College Student Journal*, 38(3), 396-405.

Kearney, J., & McElhone, S. (1999). Perceived barriers in trying to eat healthier – results of a pan-EU consumer attitudinal survey. *British Journal of Nutrition*, 81(2), S133-S137.

Kellaris, J., & Rice, R. (1993). The influence of tempo, loudness, and gender of listener on responses to music. *Psychology and Marketing*, 10(1), 15-29.

Kemps, E., Herman, C., Hollitt, S., Polivy, J., Prichard, I., & Tiggermann, M. (2016). The role of expectations in the effect of food cue exposure on intake. *Appetite*, 103, 259-264.

Kemps, E., Tiggemann, M., & Hollitt, S. (2014). Exposure to television food advertising primes food-related cognitions and triggers motivation to eat. *Psychology and Health*, 29 (10), 1192-1205.

Kent, A., & Kirby, A. (2009). The design of the store environment and its implicaitons for retail image. *The international Review of Retail, Distribution and Consumer Research*, 19(4), 457-468.

Kerfoot, S., Davis, B., & Ward, P. (2003). Visual merchandising and the creation of discernible retail brands. *International Journal of Retail and Distribution Management*, 3(3), 143-152.

Killgore, W., Young, A., Femia, L., Bogorodzki, P., Rogowska, J., & Yurgelun-Todd, D. (2003). Cortical and limbic activation during viewing of high- versus low-calorie foods. *NeuroImage*, 19(4), 1381-1394.

Knasko, S. (1995). Pleasant odors and congruency: effects on approach behaviour. *Chemical Senses*, 20(5), 479-487.

Knoferle, K., Spangenberg, E., Herrmann, A., & Landwehr, J. (2012). It is all in the mix: The interactive effect of music tempo and mode on in-store sales. *Marketing Letters*, 23(1), 325-337.

Kontukoski, M., Paakki, M., Thureson, J., Uimonen, H., & Hopia, A. (2016). Imagined salad and steak restaurants: Consumers' colour, music and emotion associations with different dishes. *International Journal of Gastronomy and Food Science*, 4, 1-11.

Kotler, P. (1973). Atmospherics as a marketing tool. *Journal of Retailing*, 49(4), 48-64.

Krippendorff, K. (2011). Computing Krippendorff's alpha-reliability. Retrieved from http://repository.upenn.edu/asc_papers/43.

Krishna, A., Lwin, M., & Morrin, M. (2010). Product scent and memory. *Journal of Consumer Research*, 37(1), 57-67.

Labrecque, L., Patrick, V., & Milne, G. (2013). The marketers' prismatic palette: A review of color research and future directions. *Psychology & Marketing*, 30(2), 187-202.

Lam, S. (2001). The effects of store environment on shopping behaviour: a critical review. *Advances in Consumer Research*, 28, 190-197.

Larsen, J., Hermans, R., & Engels, R. (2012). Food intake in response to food-cue exposure. Examining the influence of duration of the cue exposure and trait impulsivity. *Appetite*, 58(3), 907-913.

Larson, N., & Story, M. (2009). A review of environmental influences on food choice. *Annals of Behavioural Medicine*, 38(1), 556-73.

Lee, A., & Labroo, A. (2004). The effect of conceptual and perceptual fluency on brand evaluation. *Journal of Marketing Research*, 41(2), 151-165.

Lee, D., Moon, J., Rhee, C., Cho, D., & Cho, J. (2016). The effect of visual and auditory elements on patrons' liquor-ordering behaviour: An empirical study. *International Journal of Hospitality Management*, 55, 11-15.

Lee, N., & Broderick, A. (2007). The past, present and future of observational research in marketing. *Qualitative Market Research: an International Journal*, 10(2), 121-129.

Leenders, M., Smidts, A., & Haji, A. (2016). Ambient scent as a mood inducer in supermarkets: the role of scent intensity and time-pressure of shoppers. *Journal of Retailing and Consumer Services*, in press.

Le Guellec, H., Gueguen, N., Jacob, C., & Pascual, A. (2007). Carton music in a candy store: a field experiment. *Psychological Reports*, 100(3), 1255-1258.

Lennernas, M., Fjellstrom, C., Becker, W., Giachetti, I., Schmitt, A., De Winter, R., & Kearney, M. (1997). Influences on food choice perceived to be important by nationally-representative samples of adults in the European Union. *European Journal of Clinical Nutrition*, 51(2), S8-S15.

Lin, I. (2004). Evaluating a servicescape: the effect of cognition and emotion. *International Journal of Hospitality Management*, 23(2), 163-178.

Lin, L., & McFerran, B. (2016). The (ironic) dove effect: use of acceptance cues for larger body types increases unhealthy behaviours. *Journal of Public Policy & Marketing*, 35(1), 76-90.

Loersch, C., & Payne, K. (2011). The situated inference model: an integrative account of the effects of primes on perception, behaviour and motivation. *Perspectives on Psychological Science*, 6(3), 234-252.

Lutomski, J., van den Broeck, J., Harrington, J., Shiely, F., & Perry, I. (2010). Sociodemographic, lifestyle, mental health and dietary factors associated with direction of misreporting of energy intake. *Public Health Nutrition*, 14(3), 532-541.

Macdiarmid, J., & Blundell, J. (1998). Assessing dietary intake: who, what and why of under-reporting. *Nutrition Research Reviews*, 11(2), 231-253.

MacInnis, d., & Park, C. (1991). The differential role of characteristics of music on high- and low- involvement consumers' processing of ads. *Journal of Consumer Research*, 18(2), 161-173.

Mackenzie, J. (2017). *Living wage put at $20.20 an hour*. Retrieved from http://www.radionz.co.nz/news/national/324968/living-wage-put-at-$20-point-20-an-hour

Mancino, L., Todd, J., & Lin, B. (2009). Separating what we eat from where: measuring the effect of food away from home on diet quality. *Food Policy*, 34(6), 557-562.

Mandler, G. (1982). The structure of value: accounting for taste. *Center for Human Information Processing Report*, 101.

Maric, Y., & Jacquot, M. (2013). Contribution to understanding odour-colour associations. *Food Quality and Preference*, 27(2), 191-195.

Massara, F. (2003). Store atmosphere: still a fledgling art. *ECR Journal*, 3(2), 47-51.

Mattila, A., & Wirtz, J. (2001). Congruency of scent and music as a driver of in-store evaluations and behaviour. *Journal of Retailing*, 77(2), 273-289.

McCormick, H., & Livett, C. (2012). Analysing the influence of the presentation of fashion garments on young consumers' online behaviour. *Journal of Fashion Marketing and Management: An International Journal*, 16(1), 21-41.

McDaniel, C., & Gates, R. (2010). *Marketing Research* (8^{th} ed.). United States of America, MA: John Wiley & Sons, Inc.

McFerran, B., Dahl, D., Fitzsimons, G., & Morales, A. (2010). Might an overweight waitress make you eat more? How the body type of others is sufficient to alter our food consumption. *Journal of Consumer Psychology*, 20(2), 146-151.

McGee, B., Johnson, G., Yadrick, K., Richardson, V., Simpson, P., Gossett, J., Thornton, A., Johnson, C., & Bogle, M. (2011). Food shopping perceptions, behaviours, and ability to purchase healthful food items in the lower Mississippi delta. *Journal of Nutrition Education and Behaviour*, 43(5), 339-348.

McGrath, M., Aronow, P., & Shotwell, V. (2016). Chocolate scents and product sales: a randomized controlled trial in a Canadian bookstore and café. *SpringerPlus*, 5(1), 670-676.

Mehrabian, A., & Russell, J. (1974). *An approach to environmental psychology*. Cambridge, MA: MIT Press.

Meyers-levy, J., Zhu, R., & Jiang, L. (2010). Context effects from bodily sensations: examining bodily sensations induced by flooring and the moderating role of product viewing distance. *Journal of Consumer Research*, 37(1), 1-14.

Mhurchu, C., Blakely, T., Jiang, Y., Eyles, H., Rodger, A. (2010). Effects of price discounts and tailored nutrition education on supermarket purchases: a randomized controlled trial. *The American Journal of Clinical Nutrition*, 91(3), 736-747.

Mhurchu, C., Brown, R., Jiang, Y., Eyles, H., Dunford, E., & Neal, B. (2016). Nutrient profile of 23 596 packaged supermarket foods and non-alcoholic beverages in Australia and New Zealand. *Public Health Nutrition*, 19(3), 401-408.

Michaelidou, N., Christodoulides, G., & Torova, K. (2012). Determinants of healthy eating: a cross-national study on motives and barriers. *International Journal of Consumer Studies*, 36(1), 17-22.

Milliman, R. (1982). Using background music to affect the behaviour of supermarket shoppers. *Journal of Marketing*, 46(3), 86-91.

Milliman, R. (1986). The influence of background music on the behaviour of restaurant patrons. *Journal of Consumer Research*, 13(2), 286-289.

Milliron, B., Woolf, K., & Appelhans, B. (2012). A point-of-purchase intervention featuring in-person supermarket education affects healthful food purchases. *Journal of Nutrition Education and Behaviour*, 44(3), 225-232.

Ministry of Health. (2013). *New Zealand Health Survey: Annual update of key findings 2012/13*. Retrieved from http://www.health.govt.nz/publication/new-zealand-health-survey-annual-update-key-findings-2012-13.

Ministry of Healthy. (2015). *Eating and activity guidelines for New Zealand* adults. Retrieved from http://www.health.govt.nz/system/files/documents/publications/eating-activity-guidelines-for-new-zealand-adults-oct15_0.pdf

Mitchell, D., Kahn, B., & Knasko, S. (1995). There's something in the air: effect of congruent or incongruent ambient odor on consumer decision making. *Journal of Consumer Research*, 22(2), 229-238.

Mohan, G., Sivakuaran, B., & Sharma, P. (2012). Store environment's impact on variety seeking behaviour. *Journal of Retailing and Consumer Services*, 19(4), 419-428.

Morrin, M., & Ratneshwar, S. (2000). The impact of ambient scent on evaluation, attention, and memory for familiar and unfamiliar brands. *Journal of Business Research*, 49(2), 157-165.

Morrison, M., Gan, S., Dubelaar, C., & Oppewal, H. (2011). In-store music and aroma influences on shopper behaviour and satisfaction. *Journal of Business Research*, 64(6), 558-564.

Nath, C. (2009). Behaviour of customers in retail store environment – An empirical study. *The XIMB Journal of Management*, 6(2), p. 63-74.

Nisbett, R., & Wilson, T. (1977). Telling more than we can know: verbal reports on mental processes. *Psychological review*, 84(3), 231.

Nijs, I., Franken, I., & Muris, P. (2008). Food cue-elicited brain potentials in obese and healthy-weight individuals. *Eating Behaviours*, 9(4), 462-470.

North, A., & Hargreaves, D. (1996). The effects of music on responses to a dining area. *Journal of Environmental Psychology*, 16(1), 55-64.

North, A., Hargreaves, D., & McKendrick, J. (1999). The influence of in-store music on wine selections. *Journal of Applied Psychology*, 84(2), 271-276.

North, A., Shilcock, A., & Hargreaves, D. (2003). The effect of musical style on restaurant customers spending. *Environment and Behaviour*, 35(5), 712-718.

North, A., Sheridan, L., & Areni, C. (2016). Music congruity effects on product memory, perception, and choice. *Journal of Retailing*, 92(1), 83-95.

Nunnally, J. (1978). *Psychometric theory*. Michigan, USA: McGraw-Hill.

Oh, J., Fiorito, S., Cho, H., & Hofacker, C. (2008). Effects of design factors on store image and expectations of merchandise quality in web-based stores. *Journal of Retailing and Consumer Services*, 15(4), 237-249.

O'Loughlin, G., Cullen, S., McGoldrick, A., O'Connor, S., Blain, R., O'Malley, S., & Warrington, G. (2013). Using a wearable camera to increase the accuracy of dietary analysis. *American Journal of Preventive Medicine*, 44 (3), 297-301.

Olsen, N., Menichelli, E., Sorheim, O., Naes, T. (2012). Likelihood of buying healthy convenience food: an at-home testing procedure for ready-to-heat meals. *Food Quality and Preference*, 24(1), 171-178.

Orth, U., & Bourrain, A. (2008). The influence of nostalgic memories on consumer exploratory tendencies: echoes from scents past. *Journal of Retailing and Consumer Services*, 15(4), 277-287.

Otterbring, T., Wastlund, E., Gustafsson, A. (2014). Eye-tracking customers' visual attention in the wild: Dynamic gaze behaviour moderates the effect of store familiarity on navigational fluency. *Journal of Retailing and Consumer Services*, 28, 165-170.

Papies, E. (2016). Goal priming as a situated intervention tool. *Current opinion in psychology*, 12, 12-16.

Papies, E., & Hamstra, P. (2010). Goal priming and eating behaviour: enhancing self-regulation by environmental cues. *Health Psychology*, 29(4), 384-388.

Papies, E., & Veling, H. (2013). Healthy dining. Subtle diet reminders at the point of purchase increase low-calorie food choices among both chronic and current dieters. *Appetite*, 61, 1-7.

Park, N., & Farr, C. (2007). Retail store lighting for elderly consumers: an experimental approach. *Family and Consumer Sciences Research Journal*, 35(4), 316-337.

Parsons, A. (2004). *The influence of in-store, experience mediated, non-utilitarian sensory stimuli on shopper affect and shopper behaviour* (Unpublished Doctor of Philosophy thesis). Auckland University, Auckland, New Zealand.

Parsons, A. (2009). Use of scent in a naturally odourless store. *International Journal of Retail and Distribution Management*, 37(5), 440-452.

Parsons, A. (2011). Atmosphere in fashion stores: do you need to change? *Journal of Fashion Marketing and Management*, 15(4), 428-445.

Parterre flooring systems. (2017). Retrieved from https://parterreflooring.com/supermarket-flooring/#

Peck, J., & Childers, T. (2008). Effects of sensory factors on consumer behaviour: if it tastes, smells, sounds, and feels like a duck, then it must be a. In Haugtvedt, C., Herr, P., & Kardes, F (Eds), *Handbook of Consumer Psychology* (p. 193-219). New York, United States of America: Taylor & Francis Group.

Petty, R., Cacioppo, J. & Schumann, D. (1983). Central and peripheral routes to advertising effectiveness: the moderating role of involvement. *Journal of Consumer Research*, 10(2), 135-146.

Piche, L., & Garcia, A. (2001). Factors influencing food buying practices of grocery shoppers in London, Ontario. *Canadian Journal of Dietetic Practice and Research*, 62(4), 199-202.

Pierre, N., Receveur, O., Macaulay, A., & Montour, L. (2007). Identification of barriers and facilitators of healthy food choices among children aged 6 to 12 years: from the kahnawake schools diabetes prevention project. *Ecology of Food Nutrition*, 46(2), 101-123.

Pomerantz, J. (1981). *Perceptual grouping in information processing*. In M. Kubovy and J. R. Pomerantz (Eds.), Perceptual Organisation. Hillsdale, NJ: Erlbaum.

Poon, T., & Grohmann, B. (2014). Spatial density and ambient scent: effects on consumer anxiety. *American Journal of Business*, 29(1), 76-94.

Poor, M., Duhachek, A., & Krishnan, S. (2013). How images of other consumers influence subsequent taste perceptions. *Journal of Marketing*, 77, 124-139.

Proserpio, C., De Graaf, C., Laureati, M., Pagliarini, E., & Boesveldt, S. (2017). Impact of ambient odors on food intake, saliva production and appetite ratings. *Physiology & Behaviour*, 174, 35-41.

Quartier, K., Vanrie, J., & Cleempoel, K. (2014). As real as it gets: what role does lighting have on consumer's perception of atmosphere, emotions and behaviour? *Journal of Environmental Psychology*, 39, 32-39.

Raab, C., Zemke, D., Hertzman, J., & Singh, D. (2013). Restaurant customers perceptions of noise and their satisfaction and loyalty behaviours. *International Journal of Hospitality and Tourism Administration*, 14(4), 398-414.

Radocy, R., & Boyle, J. (2012). *Psychological foundations of musical behaviour*. Springfield, Illinois, USA: Charles C Thomas Publisher, Ltd.

Rae, M. (1999). *The Iesna lighting handbook reference and application*. New York, NY: Illuminating Engineering Society of North America.

Ramaekers, M., Boesveldt, S., Lakemond, C., van Boekel, M., & Luning, P. (2014). Odors: appetizing or satiating? Development of appetite during odor exposure over time. *International Journal of Obesity*, 38(5), 650-656.

Reima Air Concepts. (2016). Retrieved from http://www.duftmarketing.de/en/our-scents.html

Reutner, L., Genschow, O., & Wanke, M. (2015). The adaptive eater: perceived healthiness moderates the effect of the color red on consumption. *Food Quality and Preference*, 44, 172-178.

Richard, J., & Zucco, G. (1989). Cognition and olfaction: A review. *Psychological Bulletin*, 105(3), 352-360.

Roy Morgan Research (2010). Turning hot and cold: how the weather changes Australians' food likes and consumption. Retrieved from http://www.roymorgan.com/findings/6496-seasonal-trends-in-soup-and-salad-preferences-june-2015-201510080139.

Scheibehenne, B., Todd, P., & Wansink, B. (2010). Dining in the dark. The importance of visual cues for food consumption and satiety. *Appetite*, 55(3), 710-713.

Schifferstein, H., & Blok, S. (2002). The signal function of thematically (in)congruent ambient scents in a retail environment. *Chemical Senses*, 27(6), 539-549.

Schuldt, J. (2013). Does green mean healthy? Nutrition label colour affects perceptions of healthfulness. *Health Communication*, 28(8), 814-821.

Shadish, W., Cook, T., & Campbell, D. (2002). *Experimental and quasi-experimental design for generalized causal inference*. United States of America, NY: Houghton Mifflin Company.

Shepherd, J., Harden, A., Rees, R., Brunton, G., Garcia, J., Oliver, S., & Oakley, A. (2006). Young people and healthy eating: a systematic review of research on barriers and facilitators. *Health Education Research,* 21(2), 239-257.

Shiffrin, R., Schneider, W. (1977). Controlled and automatic human information processing: II. Perceptual learning, automatic attending and a general theory. *Psychological Review*, 84(2), 127-190.

Sigurdsson, V., Larsen, N., & Gunnarsson, D. (2011). An in-store experimental analysis of consumers' selection of fruits and vegetables. *The Service Industries Journal*, 31(15), 2587-2602.

Sigurdsson, V., Larsen, N., Gunnarsson, D. (2014). Healthy food products at the point of purchase: an in-store experimental analysis. *Journal of Applied Behaviour Analysis*, 47(1), 151-154.

Sigurdsson, V., Saevarsson, H., & Foxall, G. (2009). Brand placement and consumer choice: an in-store experiment. *Journal of Applied Behaviour Analysis*, 42(3), 741-745.

Sloman, S. (1996). The empirical case for two systems of reasoning. *Psychological Bulletin*, 119(1), 3-22.

Smale, A., Keown, J., & Brendish, L. (2015*). Top global food trends: healthy food*. Retrieved from http://idealog.co.nz/venture/2015/12/top-global-food-trend-4-healthy-food.

Smith, P., Curnow, R. (1966). Arousal hypothesis and the effects of music on purchasing behaviour. *Journal of Applied Psychology*, 50(3), 255-256.

Soars, B. (2003). What every retailer should know about the way into the shopper's head. *International Journal of Retail and Distribution Management*, 31(12), 628-637.

Soars, B. (2009). Driving sales through shoppers sense of sound, sight, smell and touch. *International Journal of Retail and Distribution Management*, 37(3), 286-298.

Social and economic research team (2014). *Auckland profile – initial results from the 2013 census*. Retrieved from http://www.aucklandcouncil.govt.nz/EN/planspoliciesprojects/reports/Documents/aucklandprofileinitialresults2013census201405.pdf.

Spangenberg, E., Crowley, A., & Henderson, P. (1996). Improving the store environment: do olfactory cues affect evaluation and behaviours. *Journal of Marketing*, 60, 67-80.

Spangenberg, E., Grohmann, B., & Sprott, D. (2005). It's beginning to smell (and sound) a lot like Christmas: the interactive effects of ambient scent and music in a retail setting. *Journal of Business Research*, 58(11), 1583-1589.

Spangenberg, E., Sprott, D., Grohmann, B., & Tracy, D. (2006). Gender-congruent ambient scent influences on approach and avoidance behaviours in a retail stores. *Journal of Business Research*, 59(12), 1281-1287.

Spence, C. (2015). Leading the consumer by the nose: on the commercialization of olfactory design for the food and beverage sector. *Flavour*, 4(31), 1-15.

Spence, C., Puccinelli, N., Grewal, D., & Roggeveen, A. (2014). Store atmospherics: a multisensory perspective. *Psychology and Marketing*, 31(7), 472-488.

Spence, C., & Shankar, M. (2010). The influence of auditory cues on the perception of, and responses to, food and drink. *Journal of Sensory Studies*, 25(3), 406-430.

Spence, C., Shankar, M., & Bluementhal, H. (2011). Sound bites': Auditory contributions to the perception and consumption of food and drink. *Art and the senses*, 207-238.

Spendrup, S., Hunter, E., & Isgren, E. (2016). Exploring the relationship between nature sounds, connectedness to nature, mood and willingness to buy sustainable food: A retail field experiment. *Appetite*, 100, 133-141.

Statistics New Zealand. (2006). *Industrial Classifications*. Retrieved from http://www.stats.govt.nz/methods/classifications-and-standards/classification-related-stats-standards/industrial-classification.aspx.

Statistics New Zealand. (2013). *Major ethnic groups in New Zealand*. Retrieved from http://www.stats.govt.nz/Census/2013-census/profile-and-summary-reports/infographic-culture-identity.aspx.

Steinberg, S., & Yalch, R. (1978). When eating begets buying: the effects of food samples on obese and nonobese shoppers. *Journal of Consumer Research*, 4 (4), 243-246.

Steptoe, A., Pollard, T., & Wardle, J. (1995). Development of a measure of the motives underlying the selection of food: the food choice questionnaire. *Appetite*, 25(3), 267-284.

Stevenson, C., Doherty, G., Barnett, J., Muldoon, O., & Trew, K. (2007). Adolescents' views of food and eating: identifying barriers to healthy eating. *Journal of Adolescence*, 30(3), 417-434.

Stockli, S., Stampfli, A., Messner, C., & Brunner, T. (2016). An (un)healthy poster: When environmental cues affect consumers' food choices at vending machines. *Appetite*, 96, 368-374.

Story, M., Kaphingst, K., Robinson – O'Brien, R., & Glanz, K. (2008). Creating healthy food and eating environments: policy and environmental approaches. *Annual review of public healthy*, 29, 253-272.

Stroebele, N., & Castro, J. (2004). Effect of ambience on food intake and food choice. *Nutrition*, 20(9), 821-838.

Stroebe, W., Mensink, W., Aarts, H., Schut, H., & Kruglanski, A. (2008). Why dieters fail: Testing the goal conflict model of eating. *Journal of Experimental Social Psychology*, 44(1), 26-36.

Sullivan, M. (2002). The impact of pitch, volume, tempo on the atmospheric effects of music. *International Journal of Retail and Distribution Management*, 30(6), 323-330.

Summers, T., & Hebert, P. (2001). Shedding some light on store atmospherics influence of illumination on consumer behaviour. *Journal of Business Research*, 54(2), 145-150.

Sunstein, C., & Thaler, R. (2003). Libertarian paternalism is not an oxymoron. *The University of Chicago Law Review*, 70(4), 1159-1202.

Sweeney, J., & Wyber, F. (2002). The role of cognitions and emotions in the music-approach-avoidance behaviour relationship. *Journal of Service Marketing*, 16(1), 51-69.

Swinburn, B., Egger, G., & Raza, F. (1999). Dissecting obesogenic environments: the development and application of a framework for identifying and prioritizing environmental interventions of obesity. *Preventive Medicine*, 29(6), 563-570.

Tal, A., & Wansink, B. (2015). An apple a day brings more apples your way: Health samples prime healthier choices. *Psychology & Marketing*, 32(5), 575-584.

Teevale, T., Thomas, D., Scragg, R., Faeamani, G., & Nosa, V. (2010). The role of sociocultural factors in obesity aetiology in Pacific adolescents and their parents: a mixed-methods study in Auckland, New Zealand. *Journal of the New Zealand Medical Association*, 123(1326), 26-36.

Thaler, R., & Sunstein, C. (2008). *Nudge improving decisions about health, wealth, and happiness*. NY, USA: Penguin Group.

Thompson, C., Cummins, S., Brown, T., & Kyle, R. (2013). Understanding interactions with the food environment: an exploration of supermarket food shopping routines in deprived neighbourhoods. *Health and Place*, 19, 116-123.

Thornton, L., Cameron, A., McNaughton, S., Worsley, A., & Crawford, D. (2012). The availability of snack food displays that may trigger impulse purchases in Melbourne supermarkets. BMC Public Health, 12, 194-204.

Toomath, R. (2016). *Fat science why diets and exercise don't work and what does*. Auckland, New Zealand: Auckland University Press.

Trope, Y., & Fishbach, A. (2000). Counteractive self control in overcoming temptation. *Journal of Personality and Social Psychology*, 79(4), 493-506.

Turley, L., & Milliman, R. (2000). Atmospheric effects on shopping behaviour: a review of the experimental evidence. *Journal of Business Research*, 49(2), 193-211.

Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, 5(2), 207-232.

Valdez, P., & Mehrabian, A. (1994). Effects of color on emotions. *Journal of Experimental Psychology: General*, 123(4), 294-409.

Van Rompay, T., Deterink, F., & Fenko, A. (2016). Healthy package, healthy product? Effects of packaging design as a function of purchase setting. *Food Quality and Preference*, 53, 84-89.

Vida, I., Obadia, C., & Kunz, M. (2007). The effects of background music on consumer responses in a high-end supermarket. *The International Review of Retail, Distribution and Consumer Research*, 17(5), 469-482.

Vieira, V. (2013). Stimuli-organism-response framework: a meta-analytic review in the store environment. *Journal of Business Research*, 66(9), 1420-1426.

Wang, Y., Dong, D., Todd, J., Du, J., Yang, Z., Lu, H., & Chen, H. (2016). Neural correlates of restrained eaters' high susceptibility to food cues: An fMRI study. *Neuroscience Letters*, 631, 56-62.

Wansink, B. (2004). Environmental factors that increase the food intake and consumption volume of unknowing consumers. *Annual Review of Nutrition*, 24, 455-479.

Wansink, B., & Chandon, P. (2006). Can "low-fat" nutrition labels lead to obesity. *Journal of Marketing Research*, 43(4), 605-617.

Wansink, B., & Van Ittersum, K. (2012). Fast food restaurant lighting and music can reduce calorie intake and increase satisfaction. *Psychological reports: Human Resources & Marketing*, 111(1), 228-232.

Wansink, B., Van Ittersum, K., & Painter, J. (2004). How diet and health labels influence taste and satiation. *Journal of food science*, 69(9), S340-S346.

Ward, J., Bitner, M., & Barnes, J. (1992). Measuring the prototypicality and meaning of retail environments. *Journal of Retailing*, 68(2), 194-220.

Ward, P., Davies, B., & Kooijman, D. (2007). Olfaction and the retail environment: examining the influence of ambient scent. *Service Business,* 1(4), 295-316.

Waterlander, W., Blakely, T., Nghiem, N., Cleghorn, C., Eyles, H., Genc, M., Wilson, N., Jiang, Y., Swinburn, B., Jacobi, L., Michie, J., & Mhurchu, D. (2016). Study protocol: combining experimental methods, econometrics and simulation modelling to determine price elasticity's for studying food taxes and subsidies (The Price ExaM study). *BMC Public Health*, 16(1), 601.

Waterlander, W., Jiang, Y., Steenhuis, I., Mhurchu, C. (2015). Using a 3D virtual supermarket to measure food purchase behaviour: a validation study. *Journal of Medical Internet Research*, 17(4), e107.

Waterlander, W., Mhurchu, C., & Steenhuis, I. (2014). Effects of a price increase on purchases of sugar sweetened beverages. Results from a randomized controlled trial. *Appetite*, 78, 32-39.

Waterlander, W., Scarpa, M., Lentz, D., & Steenhuis, I. (2011). The virtual supermarket: an innovative research tool to study consumer food purchasing behaviour. *BMC Public Health*, 11(1), 589-599.

Waterlander, W., Steenhuis, I., de Boer, M., Schuit, A., Seidell, J. (2012). The effects of a 25% discount on fruits and vegetables: results of a randomized trial in a three-dimensional web-based supermarket. *International Journal of Behavioural Nutrition and Physical Activity*, 9 (1), 11-23.

Waterlander, W., Steenhuis, I., de Boer, M., Schuit, A., & Seidell, J. (2013). Effects of different discount levels on healthy products coupled with a healthy choice label, special offer label or both: results from a web-based supermarket experiment. *International Journal of Behaviour Nutrition and Physical Activity*, 10(1), 59-66.

Weingarten, H., & Elston, D. (1991). Food cravings in a college population. *Appetite*, 17(3), 167-175.

Wilson, A., Buckley, E., Buckley, J., & Bogomolova, S. (2016). Nudging healthier food and beverage choices through salience and priming. Evidence from a systematic review. *Food Quality and Preferences*, 51, 47-64.

Wilson, S. (2003). The effects of music on perceived atmosphere and purchase intentions in a restaurant. *Psychology of Music*, 31(1), 93-112.

Wilson, T., Aronson, E. & Carlsmith, K. (2010). The art of laboratory experimentation. In Fiske, S., Gilbert, D., & Lindzey, G (Eds.), *Handbook of Social Psychology* (Vol. 5). USA: John Wiley & Sons.

Wu, J., Ju, H., Kim, J., Damminga, C., Kim, H., & Johnson, K. (2013). Fashion product display: an experiment with Mockshop investigating color, visual texture, and style coordination. *International Journal of Retail and Distribution Management*, 41(10), 766-789.

Wyer, R. (2011). Procedural influences on judgments and behavioural decision. *Journal of Consumer Psychology*, 21(4), 424-438.

Yalch, R., & Spangenberg, E. (1990). Effects of store music on shopping behaviour. *Journal of Consumer Marketing*, 7(2), 55-63.

Yalch, R., & Spangenberg, E. (2000). The effects of music in a retail setting on real and perceived shopping times. *Journal of Business Research*, 49(2), 139-147.

Yeh, M., Ickes, S., Lowenstein, L., Shuval, K., Ammerman, A., Farris, R., & Katz, D. (2008). Understanding barriers and facilitators of fruit and vegetable consumption among a diverse multi-ethnic population in the USA. *Health Promotion International*, 23(1), 42-51.

Yeoh, J., & North, A. (2010). The effects of musical fit on choice between two competing foods. *Musicae Scientiae*, 14(1), 165-180.

Yeshurun, Y., & Sobel, N. (2010). An odor is not worth a thousand words: from multidimensional odors to unidimensional odor objects. *Annual Review of Psychology*, 61, 219-241.

Zellner, D., Geller, T., Lyons, S., Pyper, A., & Riaz, K. (2017). Ethnic congruence of music and food affects food selection but not liking. *Food Quality and Preference*, 56, 126-129.

Appendix A: Ethics approval

AUTEC Secretariat

Auckland University of Technology
D-88, WU406 Level 4 WU Building City Campus
T: +64 9 921 9999 ext. 8316
E: ethics@aut.ac.nz
www.aut.ac.nz/researchethics

14 October 2016

Sommer Kapitan
Faculty of Business Economics and Law
Dear Sommer

Re: Ethics Application: **16/177 The influence of the store environment on shopper's healthy food choices. (Working title)**

The influence of the retail food environment on shoppers behaviours.

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

The minor amendment to the recruitment protocols has been approved and the change of supervisor has been noted.

I remind you that as part of the ethics approval process, you are required to submit the following to the Auckland University of Technology Ethics Committee (AUTEC):

- A brief annual progress report using form EA2, which is available online through http://www.aut.ac.nz/researchethics. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 30 May 2019;
- A brief report on the status of the project using form EA3, which is available online through http://www.aut.ac.nz/researchethics. This report is to be submitted either when the approval expires on 30 May 2019 or on completion of the project.

It is a condition of approval that AUTEC is notified of any adverse events or if the research does not commence. AUTEC approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

AUTEC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to obtain this.

To enable us to provide you with efficient service, please use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

All the very best with your research,

K O'Connor

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

Cc: mphillips@aut.ac.nz; Megan Phillips; Elaine Rush; Andrew Parsons

Appendix B: The Heart Foundation tick programme categories

One Tick Categories	
Fruit & vegetables	Fruit Juice, Fruit Bars, Dried Fruit, Vegetable Juice
Cereal products	Bread, breakfast cereals, pasta and noodles, savoury biscuits, baked products
Meat & meat alternatives	Meat, poultry, small goods, seafood, meat alternatives
Legumes, nuts & seeds	Nuts and seeds, spreads, nut and seed bars
Diary & alternatives	Milk and milk alternatives, yoghurt and dairy desserts, cheese, cream alternatives, frozen desserts
Meals	Meal kits, ready meals, recipe concentrates, sandwiches, soup
Fats & Oils	Vegetable oils, edible oils spreads, bakery fats
Condiments	Tables sauces, salad dressings, relishes and chutneys, stocks, cooking sauces
Two Tick Categories	
Fruit and vegetables	Fresh and shelf stable fruit, fresh and shelf stable vegetables
Cereal products	Wholegrain bread, pasta and noodles, breakfast cereals, whole grains
Meat and meat alternatives	Plain meat, poultry and seafood
Legumes, nuts and seeds	Dried and shelf stable legumes, plain nuts and seeds
Dairy alternatives	Plain, low fat milk and milk alternatives, low-fat yoghurt

Appendix C: Definition of food retailers

Supermarket and grocery stores as a class "mainly engage in retailing groceries or non-specialised food lines (including convenience stores), whether or not the selling is organised on a self-service basis" (Statistics New Zealand, 2006, p. 244). Primary activities include convenience store operations, grocery retailing and grocery supermarket operations. Units mainly engaged in retailing specialised food lines are included in specialised food retailing (Statistics New Zealand, 2006).

Fresh meat, fish and poultry retailing as a class consists of "units mainly engaged in retailing fresh meat, fish or poultry" (Statistics New Zealand, 2006, p. 244). Primary activities include butcher's shop operation (retail); fish, fresh, retailing; meat, fresh, retailing; poultry, fresh, retailing; seafood, fresh, retailing (Statistics New Zealand, 2006).

Fruit and vegetable retailing as a class consists of "units mainly engaged in retailing fresh fruit and vegetables" (Statistics New Zealand, 2006, p. 244). Primary activities consist of fruit, fresh, retailing; greengrocery operations (retail) and vegetable, fresh, retailing (Statistics New Zealand, 2006).

Liquor retailing as a class consists of "units mainly engaged in retailing beer, wine or spirits for consumption off the premises only" (Statistics New Zealand, 2006, p. 244). Primary activities are alcoholic beverage retailing (Statistics New Zealand, 2006).

Other specialised food retailing as a class consists of "units mainly engaged in retailing specialised food lines, such as confectionary or small goods or bread and cakes (not manufactured on the same premises)" (Statistics New Zealand, 2006, p. 244). Primary activities include biscuit retailing, bread retailing, cake retailing, bread vendor, confectionery retailing, non-alcoholic drinks retailing, pastry retailing and specialised food retailing (Statistics New Zealand, 2006).

Café and restaurants as a class consists of "units mainly engaged in providing food and beverage serving services for consumption on the premises. Customers generally order and are served while seated (i.e., waiter/waitress service) and pay after eating" (Statistics New Zealand, 2006, p. 244). Primary activities are café operations and restaurant operations (Statistics New Zealand, 2006).

Takeaway food services as a class consists of “units mainly engage in providing food services ready to be taken away for immediate consumption. Customers order or select items and pay before eating. Items are usually provided in takeaway containers or packaging. Food is either consumed on the premises in limited seating facilities, taken away by the customer or delivered. This class also includes units engaged in supply food services in food halls and food courts” (Statistics New Zealand, 2006, p. 244). Primary activities are juice bar operation, mobile food van operations and takeaway food operations (Statistics New Zealand, 2006).

Appendix D: Field observation form

Observational Form

Classification Number: ________________ (ANZIC 2006) **Size:** Small Medium Large

Store Name: ________________________________ **Location:** ____________________________

Date: ______________________________ **Time:** ________________________________

Scent: Absent Present Pleasant Unpleasant Type: ____________________________

Temperature: ______ °C Controlled Uncontrolled Comfortable Uncomfortable

Music: Absent Present Foreground Background Fast Tempo Slow Tempo

Style: ____

Noise: Talking Fridge Freezers Checkouts Quiet Loud Other: ______________________

Lighting: _________ Lux Dim (300lx or less) Standard (301-1499lx) Bright (1500lx or more)

Lighting Fixtures: Florescent Tubes: Exposed Not Exposed Pendant: Halogen Decorative

Spot Lighting Down Lights Natural Other: ______________________________________

Exterior: Automatic Doors Non Automatic Doors Double Door Single Door No Door

Container Exposed to Natural Conditions Mall Window Displays Windows No Windows

Branding Promotions Product Outside Novel Bright Dull Pot Plants Seating Board

Free Standing Other: ____

Layout: Grid Loop Counter Free-Form Forced Path **Aisles**: Narrow Wide N/A

Environment: Cluttered Spacious Comfortable Lively Relaxing Tense Attractive Exciting

Boring Dated Up-to-date Pleasant Unpleasant Clean Dirty Tidy Untidy Novel

Fixtures/Fittings: Wooden ________ Glass ________ Metal ________ Grass ________

Stainless Steel ________ Plastic ________ Decorated

Other: ____

Floor Coverings: Carpet ________ Wood ________ Concrete ________ Tiles ________

Lino/Vinyl ________ Other: ________________________________

Wall Coverings: Paint ____________ Wood ____________ Brick ____________

Decorative Art Work ____________ Other: ________________________

Ceiling: Painted ________ Panels ________ Wooden ________ Exposed False

High Low Decorative Other: ________________________________

Colours: ____

Warm (red/orange) ________________________________ Cool (blue/green)

Selection/Assortment: ________________________________

____

____

____

Merchandising of Product: Minimal Piled High Attractive Creative Well Organised Chaotic

Full Empty Other: ________________________________

____

____

Categories of Product: Two Tick Products One Tick Products No Tick Products

Promotional Material: Big Discrete Informational Specials Other: ____________

Promoting: Two Tick Products One Tick Products No Tick Products

Environmental Type: Healthier ________________________________ Least Healthy

Additional Stimuli Information:

____

____

____

____

Appendix E: Frequency of store atmospheric stimuli detected in more and less healthy supermarket and grocery store environments

Ambient scent presence

A Fishers Exact Test (2-sided) between more- versus less-healthy supermarket and grocery stores and scent presence showed no significant association (p > 0.05, V = 0.32)(Table 1). Even with insignificant associations between more- versus less-healthy supermarket and grocery stores (p > 0.05), the standardized residuals helped to show the direction of association. More-healthy supermarket and grocery stores had more stores than expected with ambient scents present (80% within more-healthy supermarket and grocery stores, Z = 1.4) compared to absent (Z = -1.1). Less-healthy stores had more stores without scents (65.6% within less-healthy supermarket and grocery stores, Z = 0.5) compared to with (34.4% within less-healthy supermarket and grocery stores, Z = -0.5). The environmental healthiness of supermarket and grocery stores did not influence scent presence. More-healthy supermarket and grocery stores tend to have more stores with ambient scent present.

Table 1. Frequency of ambient scent presence detected in more- and less-healthy food store environments

Store type	Ambient scent presence		
	Absent	**Present**	**Total stores**
More-healthy supermarket & grocery stores	1 (20%)	4 (80%)	5 (100%)
Less-healthy supermarket & grocery stores	21 (65.6%)	11 (34.4%)	32 (100%)
Total	22 (59.5%)	15 (40.5%)	37 (100%)

Note: p > 0.05, V = 0.32.

Ambient scent pleasantness

A Fishers Exact Test (2-sided) between more- and less-healthy supermarket and grocery stores and scent pleasantness likewise showed non-significant associations (p > 0.05, V = 0.32). The pleasantness of scents in supermarket and grocery stores were only pleasant (100% within pleasant scent). Eighty percent of more-healthy supermarket and grocery stores had pleasant scents (26.7% within scent pleasantness, Z = 1.4) compared with 34.4% of less-healthy food stores (73.3% within scent pleasantness, Z = -

0.5)(Table 2). Thus, the environmental healthiness of the supermarket and grocery store does not influence scent pleasantness. Scents were generally pleasant when present in both more- versus less-healthy supermarket and grocery stores.

Table 2. Frequency of ambient scent pleasantness detected in more- and less-healthy supermarket and grocery stores

Store type	**Pleasantness of scent**		
	Absent	**Present**	**Total stores**
More-healthy supermarket & grocery stores	1 (20%)	4 (80%)	5 (100%)
Less-healthy supermarket & grocery stores	21 (65.6%)	11 (34.4%)	32 (100%)
Total	22 (59.5%)	15 (40.5%)	37 (100%)

Note: $p > 0.05$, $V = 0.32$.

Ambient scent type

Focusing on supermarket and grocery stores, six Fisher's Exact tests (2-sided) were performed. There were no significant associations between supermarket and grocery stores environmental healthiness and five of the ambient scent types (e.g. sweet bakery, café hot food, hot bread, cleaning products, and fresh fruit)($p > 0.05$). The ambient scent of herbs and spices was associated with a more-healthy supermarket and grocery store; this result will be discussed below.

Table 3. Frequency of ambient scent detected in more- and less-healthy supermarket and grocery stores

Food store type	**More-healthy n=5**		**Less-healthy n=32**			
Scent type	**Absent**	**Present**	**Absent**	**Present**	***p*-Value**	**Cramer's *V***
Herbs and spices	1 (20%)	4 (80%)	31 (96.9%)	1 (3.1%)	**0.001**	**0.77*** **
Sweet bakery	5 (100%)	0 (0%)	30 (93.8%)	2 (6.3%)	1.000	0.09
Café hot food	5 (100%)	0 (0%)	25 (78.1%)	7 (21.9%)	0.560	0.19
Hot bread	5 (100%)	0 (0%)	30 (93.8%)	2 (6.3%)	1.000	0.09
Cleaning products	5 (100%)	0 (0%)	31 (96.9%)	1 (3.1%)	1.000	0.07
Fresh fruit	5 (100%)	0 (0%)	31 (96.9%)	1 (3.1%)	1.000	0.07

Note: * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

Ambient music presence

For supermarket and grocery stores, a Fisher's Exact Test (2-sided) showed no significant association between music presence and the environmental healthiness of the stores (more- versus less-healthy supermarket and grocery stores)($p > 0.05$, $V = 0.26$). The presence of ambient music in-store varied from either being present (40% within more-healthy, 75% within less-healthy) or absent (60% within more-healthy, 25% within less-healthy) (Table 4). Thus, the supermarket and grocery stores environmental healthiness did not determine ambient music presence. The presence or absence of ambient music was considered normal.

Table 4. Contingency table of ambient music presence based on supermarket and grocery stores environmental healthiness

Store type	**Ambient music presence**		
	Absent	**Present**	**Total stores**
More-healthy supermarket & grocery stores	3 (60%)	2 (40%)	5 (100%)
Less-healthy supermarket & grocery stores	8 (25%)	24 (75%)	32 (100%)
Total	11 (29.7%)	26 (70.3%)	37 (100%)

Note: $p > 0.05$, $V = 0.26$

Ambient music volume

Focusing on supermarket and grocery stores, there was no significant association between store environmental healthiness (more- versus less-healthy supermarket and grocery stores) and the volume of music present (Fishers Exact Test (2-sided), $p > 0.05$, $V = 0.26$). Background music was played in all supermarket and grocery stores with ambient music. Out of all of the more- and less-healthy supermarket and grocery stores, 40% of more-healthy food stores (5.4% of the total, 7.7% within background music) and 75% of less-healthy food stores played background music (64.9% of the total, 92.3% within background music) (Table 5). These findings showed that if music was present, supermarket and grocery stores no matter the environmental healthiness typically had background music.

Table 5. Frequency of ambient music volume detected in more- and less-healthy supermarket and grocery stores

Store type	**Ambient music volume**		
	Absent	**Present**	**Total stores**
More-healthy supermarket & grocery stores	3 (60%)	2 (40%)	5 (100%)
Less-healthy supermarket & grocery stores	8 (25%)	24 (75%)	32 (100%)

Total	11 (29.7%)	26 (70.3%)		37 (100%)

Note: $p > 0.05$, $V = 0.26$.

Ambient music tempo

A Fishers Exact Test (2-sided) also showed a non-significant association between supermarket and grocery stores environmental healthiness and tempo of music (fast, slow, and average, $p > 0.05$). The presence of ambient music tempo ranged from slow to average for more-healthy stores and slow to fast for less-healthy stores, with the majority of less healthy stores having slow tempo ambient music (Table 6). There were too few more-healthy supermarket and grocery stores to determine the most common type of ambient music tempo but overall a slow tempo was the most common across stores.

Table 6. Frequency of ambient music tempo detected in more- and less-healthy supermarket and grocery stores

Store type	**Ambient music tempo**				
	No Music	**Slow**	**Average**	**Fast**	**Total**
More-healthy supermarket & grocery stores	3 (60%)	1 (20%)	1 (20%)	0 (0%)	5 (100%)
Less-healthy supermarket & grocery stores	8 (25%)	18 (56.3%)	4 (12.5%)	2 (6.3%)	32 (100%)
Total	11 (29.7%)	19 (51.4%)	5 (13.5%)	2 (5.4%)	37 (100%)

Note: $p > 0.05$, $V = 0.30$.

Ambient music style

Focusing on supermarket and grocery stores, there was no significant association between store environmental healthiness (more- versus less-healthy supermarket and grocery stores) and music style played (Fishers Exact Test (2-sided), $p > 0.05$). A summary of the results is present below (Table 7).

Table 7. Frequency of ambient musical style detected in more- and less-healthy supermarket and grocery stores

Store type	Musical Style	df	χ^2	*p*-Value	Cramer's *V*
More-healthy food supermarket & grocery stores	Radio			1.000	0.04
	Ethnic			0.255	0.25
Less-healthy food supermarket & grocery stores	Top forty			0.135	0.30
	Classic hits			1.000	0.11
	Pop			1.000	0.06
	Electronic			1.000	0.06

Note: * = significant at $p < .05$ level, ** = significant at $p < .01$, *** = significant at $p < .001$.

Ambient noise presence

Focusing on supermarket and grocery stores, Table 8 below summarises the findings from multiple Fisher's Exact Tests (2-sided). Ambient noise only varied significantly across store environmental healthiness in terms of the presence of outside noise and marginally significant for equipment noise within supermarket and grocery stores. The marginally significant and significant *p*-values are discussed below.

Table 8. Frequency of ambient noise detected in more- and less-healthy supermarket and grocery stores

Store type	Ambient noise Type	df	χ^2	*p*-Value	Cramer's *V*
More-healthy supermarket & grocery stores	**Outside**			**0.005**	**0.63****
	Human			1.000	0.04
Less-healthy supermarket & grocery stores	Equipment			0.080	0.37

Note: * = significant at $p < .05$ level, ** = significant at $p < .01$, *** = significant at $p < .001$.

A Fisher's Exact Test (2-sided) between store environmental healthiness (more- versus less-healthy supermarket and grocery stores) and outside noise showed a significant association, $p < 0.005$, $V = 0.63$. Outside ambient noise was present in 60% of more-healthy supermarket and grocery stores (75% within outside noise, $Z = 3.3$) compared to 3.1% within less-healthy stores (25% within outside noise, $Z = -1.3$)(Table 9). These findings show that more-healthy supermarket and grocery stores typically had outside noise present than less-healthy supermarket and grocery stores.

Table 9. Frequency of outside ambient noise detected in more- and less-healthy supermarket and grocery stores

Store type	Ambient noise – outside		
	Absent	Present	Total stores
More-healthy supermarket and grocery stores	2 (40%)	3 (60%)	5 (100%)
Less-healthy supermarket and grocery stores	31 (96.9%)	1 (25%)	32 (100%)
Total	33 (89.2%)	4 (10.8%)	37 (100%)

Note: $p > 0.05$, $V = 0.63$.

A Fisher's Exact (2-sided) between store environmental healthiness (more- and less-healthy supermarket and grocery stores) and ambient equipment noise was marginally significant ($p < 0.08$, $V = 0.37$). In 60% of more-healthy supermarket and grocery stores ambient equipment noises were present (9.1% within equipment noise present) compared to absent within 40% of more-healthy supermarket and grocery stores (50% within equipment noise absent) (Table 10). The standardised residuals showed that significantly more-healthy supermarket and grocery stores than expected had ambient equipment noise absent ($Z = 2.0$) than present ($Z = -0.7$). Ambient equipment noise was absent more than expected from more-healthy supermarket and grocery stores.

Table 10. Frequency of equipment ambient noise detected in more- and less-healthy supermarket and grocery stores

Store type	Ambient noise – equipment		
	Absent	Present	Total stores
More-healthy supermarket and grocery stores	2 (40%)	3 (60%)	5 (100%)
Less-healthy supermarket and grocery stores	2 (6.3%)	30 (93.8%)	32 (100%)
Total	4 (10.8%)	33 (89.2%)	37 (100%)

Note: $p > 0.05$, $V = 0.37$.

Ambient temperature

Focusing on supermarket and grocery stores, Table 11 below summarises the findings from multiple Fisher's Exact Tests (2-sided). The marginally significant and significant *p*-values are discussed below.

Table 11. Frequency of ambient temperature detected in more- and less-healthy supermarket and grocery stores

Store type	Ambient Temperature	df	χ^2	*p*-Value	Cramer's *V*
More-healthy supermarket & grocery stores	Low			0.080	0.37
	Medium absent			**0.008**	**0.51****
	High			0.126	0.31

Note: * = significant at $p < .05$ level, ** = significant at $p < .01$, *** = significant at $p < .001$.

A Fisher's Exact Test showed a marginally significant association between supermarket and grocery stores environmental healthiness and a low ambient temperature ($p < 0.08$, $V = 0.37$). Lower ambient temperatures were present in 40% of more-healthy supermarket and grocery stores (50% within low temperature, $Z = 2.0$) compared with 6.3% within less-healthy supermarket and grocery stores (50% within low temperature, $Z = -0.8$) (Table 12). The standardised residuals show that significantly more-healthy supermarket and grocery stores than expected had a low ambient temperature compared to less-healthy supermarket and grocery stores. Thus, more-healthy supermarket and grocery stores have directionally more stores than expected with a low ambient temperature.

Table 12. Frequency of low ambient temperature detected in more- and less-healthy supermarket and grocery stores

Store Type	Ambient temperature - low		
	Absent	Present	Total stores
More-healthy supermarket & grocery stores	3 (60%)	2 (40%)	94 (100%)
Less-healthy supermarket & grocery stores	20 (93.8%)	2 (6.3%)	118 (100%)
Total	33 (89.2%)	4 (10.8%)	212 (100%)

Note: $p < 0.08$, $V = 0.37$.

A Fisher's Exact Test showed a significant association between supermarket and grocery stores environmental healthiness and a medium ambient temperatures presence ($p < 0.008$, $V = 0.51$). Medium ambient temperatures were absent from 80% of more-healthy supermarket and grocery stores (44.4% with medium temperature absent, $Z = 2.5$) and present in 20% of the stores (3.6% with medium temperature present, $Z = -1.4$). A medium temperature was present in 84.4% of less-healthy stores (96.4% within medium temperature present, $Z = 0.6$) and absent in 15.6% of less-healthy supermarket and grocery stores (55.6% within medium temperature absent, $Z = -1.0$) (Table 13). The Z-values show that significantly more-healthy supermarket and grocery stores than expected had a medium temperature absent compared to present. Thus, more-healthy supermarket and grocery stores had medium ambient temperatures absent.

Table 13. Frequency of medium ambient temperature detected in more- and less-healthy supermarket and grocery stores

Store Type	**Ambient temperature - medium**		
	Absent	**Present**	**Total stores**
More-healthy supermarket & grocery stores	4 (80%)	1 (20%)	5 (100%)
Less-healthy supermarket & grocery stores	5 (15.6%)	27 (84.4%)	32 (100%)
Total	9 (24.3%)	28 (75.7%)	37 (100%)

Note: $p < 0.008$, $V = 0.51$.

Flooring textures

Focusing on supermarket and grocery stores, there were no significant association between flooring texture and healthiness of the supermarket and grocery store environment (Fisher's Exact Test (2-sided), $p > 0.05$) (Table 14).

Table 14. Frequency of flooring texture detected in more- and less-healthy supermarket and grocery stores

Store Type	**Flooring texture**	**df**	χ^2	***p*-Value**	**Cramer's *V***
More-healthy supermarket & grocery stores	Painted Concrete			0.135	0.42
	Plain Concrete			0.255	0.25
	Tiles			0.456	0.12
Less-healthy supermarket & grocery stores	Mat			0.144	0.26
	Wooden			0.564	0.21
	Polished concrete			0.307	0.02
	Lino/Vinyl			1.000	0.05
	Rubber			1.000	0.09

Note: * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

Shelving material

Focusing on supermarket and grocery stores, there were no significant association between shelving material and healthiness of the supermarket and grocery store (Fisher's Exact Test (2-sided), $p > 0.05$) (Table 15).

Table 15. Frequency of shelving material detected in more- and less-healthy supermarket and grocery stores

Store Type	Shelving material	df	χ^2	*p*-Value	Cramer's *V*
More-healthy supermarket & grocery stores	Metal			1.000	0.09
Less-healthy supermarket & grocery stores	Wooden			0.577	0.14
	Glass			1.000	0.14
	Plastic			1.000	0.07

Note: * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

Ambient lighting

Focusing on more- versus less-healthy supermarket and grocery stores, Fisher's Exact Test (2-sided) showed no significant association with ambient lighting level ($p > 0.05$) (Table 16).

Table 16. Frequency of ambient lighting level detected in more- and less-healthy supermarket and grocery stores

Store Type	Ambient lighting level (lux)	df	χ^2	*p*-Value	Cramer's *V*
More-healthy supermarket & grocery stores	Standard (301-749 lux)			0.364	0.18
	Bright (750-1500 lux)			0.538	0.07
Less-healthy supermarket & grocery stores	Dim (below 300 lux)			0.364	0.18

Note: * = significant at $p < .05$ level, ** = significant at $p < .01$, *** = significant at $p < .001$.

Wall colour

Focusing on more- versus less-healthy supermarket and grocery stores, Fisher's Exact Test (2-sided) showed a marginal association with yellow wall colour (p < 0.08). No significant association with wall colour based on supermarket and grocery stores environmental healthiness were found ($p > 0.05$)(Table 17). The marginal association will be discussed below. Typically, more-healthy and less-healthy supermarket and grocery stores were undifferentiated by the colour of the walls.

Table 17. Frequency of wall colour presence detected in more- and less-healthy supermarket and grocery stores

Store type	Wall colour	df	χ^2	*p*-Value	Cramer's *V*
More-healthy food stores	Yellow			0.080	0.37
Less-healthy food stores	Creamy White			1.000	0.04
	Grey			1.000	0.12
	Green			1.000	0.09
	Beige			1.000	0.12
	Blue			1.000	0.09
	Brown			1.000	0.07
	Red			1.000	0.12
	Turquoise			1.000	0.07

Note: * = significant at $p < .05$ level, ** = significant at $p < .01$, *** = significant at $p < .001$.

A Fisher's Exact Test (2-sided) between store environmental healthiness (more- versus less-healthy supermarket and grocery stores) and yellow wall colour showed marginal significance, $p < 0.080$, $V = 0.37$. Only 10.8% of supermarket and grocery stores had yellow coloured walls (Table 18). The standardised residuals gave guidance on the direction of the association. More-healthy supermarket and grocery stores had significantly more stores than expected with yellow walls (40% within more-healthy stores, 50% within yellow coloured walls present, $Z = 2.0$) in comparison to 6.3% of less-healthy supermarket and grocery stores (50% within yellow coloured walls present, $Z = -0.8$). Thus, yellow wall colour was observed marginally more in more-healthy supermarket and grocery stores compared to less-healthy stores.

Table 18. Frequency of yellow wall colour detected in more- and less-healthy supermarket and grocery stores

Store Type	Wall colour - yellow		
	Absent	Present	Total stores
More-healthy supermarket & grocery stores	3 (60%)	2 (40%)	94 (100%)
Less-healthy supermarket & grocery stores	30 (93.8%)	2 (6.3%)	118 (100%)
Total	33 (89.2%)	4 (10.8%)	212 (100%)

Note: $p < 0.080$, $V = 0.37$

To further current insights, supermarket and grocery stores were focused on. The absence of black and grey shelving in more-healthy supermarket and grocery stores compared to less-healthy stores were significantly associated ($p < 0.05$). There were no other significant associations between shelving colour and supermarket and grocery store environmental healthiness. The significant *p*-values of 0.5 are discussed below.

Shelving colour

Table 19. Frequency of shelving colour presence detected in more- and less-healthy supermarket and grocery stores

Store type	Shelving colour	df	χ^2	*p*-Value	Cramer's *V*
More-healthy supermarket & grocery stores	Creamy White			1.000	0.12
	Brown			1.000	0.10
	Green			1.000	0.07
	Yellow			1.000	0.04
	White			0.177	0.26
	Black			**0.037**	**0.41***
	Grey			**0.014**	**0.47***
Less-healthy supermarket & grocery stores	Silver			0.577	0.14
	Blue			0.597	0.12
	Red			0.144	0.26
	Gold			1.000	0.09
	Purple			1.000	0.16
	Orange			1.000	0.07
	Pink			1.000	0.07
	Maroon			1.000	0.07

Note: * = significant at $p < .05$ level, ** = significant at $p < .01$, *** = significant at $p < .001$.

With two expected cell counts below 5 (within the more-healthy category), Fisher's Exact Test (2-sided) was performed between store environmental healthiness (more- versus less-healthy supermarket and grocery stores) and black coloured shelving to find a significant value of $p < 0.05$; this was based on a moderate association of 0.41 (Cramer's *V*). In total, 81.1% of stores had black shelving. Of those stores, 93.3% were within less-healthy food stores (87.5% of less-healthy supermarket and grocery stores) and 6.7% within more-healthy food stores (40% within more-healthy supermarket and grocery stores). Standardised residuals demonstrated that significantly more stores (Z = 2.1) than expected within the more-healthy supermarket and grocery stores had black shelving absent. Thus, black shelving in more-healthy supermarket and grocery stores is typically absent.

Table 20. Frequency of black shelving detected in more- and less-healthy supermarket and grocery stores

Store Type	Shelving colour - black		
	Absent	**Present**	**Total stores**
More-healthy supermarket & grocery stores	24 (25.5%)	70 (74.5%)	94 (100%)
Less-healthy supermarket & grocery stores	45 (38.1%)	73 (61.9%)	118 (100%)
Total	6 (32.5%)	143 (67.5%)	212 (100%)

Note: $p < 0.05$, $V = 0.41$

A Fisher's Exact test was performed between grey and more- versus less-healthy supermarket and grocery stores to find a significant association ($p < 0.05$). This result was based on a moderate effect size of 0.47 (Cramer's V). In total, 73% of stores had grey coloured shelving. Of those stores, 96.3% were within less-healthy supermarket and grocery stores (81.3% of less healthy supermarket and grocery stores) compared with 3.7% of more-healthy supermarket and grocery stores (20% within more-healthy supermarket and grocery stores). The standardised residuals helped to show that more-healthy supermarket and grocery stores than expected had grey shelving absent ($Z = 2.3$) in comparison to present ($Z = -1.4$). Thus, grey shelving in more-healthy supermarket and grocery stores is typically absent.

Table 21. Frequency of grey shelving detected in more- and less-healthy supermarket and grocery stores

Store Type	Shelving colour - grey		
	Absent	**Present**	**Total stores**
More-healthy supermarket & grocery stores	4 (80%)	1 (20%)	5 (100%)
Less-healthy supermarket & grocery stores	6 (18.8%)	26 (81.3%)	32 (100%)
Total	10 (27%)	27 (73%)	37 (100%)

Note: $p < 0.05$, $V = 0.47$.

Wall imagery

Fisher's Exact Test (2-sided) showed no significant association between store environmental healthiness and imagery types, $p > 0.05$ (Table 22). Wall imagery was not representative of a more-healthy supermarket or grocery store.

Table 22. Frequency of wall imagery type detected in more- and less-healthy supermarket and grocery stores

Store Type	Wall imagery type	df	χ^2	*p*-Value	Cramer's *V*
More-healthy supermarket and grocery stores	Healthier Food Related			0.126	0.31
Less-healthy supermarket and grocery store	Less Healthy Food Related			0.638	0.13
	Non Food Related			1.000	0.15

Note: * = significant at $p < 0.05$ level, ** = significant at $p < 0.01$, *** = significant at $p < 0.001$.

Appendix F: Scent pre-test response form

Instructions for each scent:

Select a vial. Open the vial about 6 cm from your nose. Close your eyes and breathe normally for 30 seconds. If you are having difficulty smelling the scent bring it slightly closer to your nose. You may smell the vial as many times as required. After smelling each scent please fill in the corresponding questions. In between scents please smell the coffee beans to refresh your pallet, wait at least 60 seconds before smelling the next scent.

Scent 1:

1. What kind of scent can you smell? Please list.

2. Do you associate the scent with anything? If so, what?

3. Does the scent bring back any memories or thoughts? If so, what?

4. I feel that the scent is: (*Please tick the appropriate circle for each scale*)

	1	2	3	4	5	6	7	
Very Pleasant	○	○	○	○	○	○	○	Very Unpleasant
Very Familiar	○	○	○	○	○	○	○	Very Unfamiliar

I feel that the scent is: (*Please tick the appropriate circle for each scale*)

	1	2	3	4	5	6	7	
Very Calming	○	○	○	○	○	○	○	Very Stimulating
Very Unhealthy	○	○	○	○	○	○	○	Very Healthy

Scent 2:

1. What kind of scent can you smell? Please list.

2. Do you associate the scent with anything? If so, what?

3. Does the scent bring back any memories or thoughts? If so, what?

4. I feel that the scent is: (*Please tick the appropriate circle for each scale*)

	1	2	3	4	5	6	7	
Very Pleasant	○	○	○	○	○	○	○	Very Unpleasant
Very Familiar	○	○	○	○	○	○	○	Very Unfamiliar

I feel that the scent is: (*Please tick the appropriate circle for each scale*)

	1	2	3	4	5	6	7	
Very Calming	○	○	○	○	○	○	○	Very Stimulating
Very Unhealthy	○	○	○	○	○	○	○	Very Healthy

Scent 3:

1. What kind of scent can you smell? Please List

2. Do you associate the scent with anything? If so, what?

3. Does the scent bring back any memories or thoughts? If so, what?

4. I feel that the scent is: (*Please tick the appropriate circle for each scale*)

	1	2	3	4	5	6	7	
Very Pleasant	○	○	○	○	○	○	○	Very Unpleasant

I feel that the scent is: (*Please tick the appropriate circle for each scale*)

	1	2	3	4	5	6	7	
Very Familiar	○	○	○	○	○	○	○	Very Unfamiliar

Very Calming	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Very Stimulating
Very Unhealthy	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Very Healthy

Scent 4:

1. What kind of scent can you smell? Please list.

2. Do you associate the scent with anything? If so, what?

3. Does the scent bring back any memories or thoughts? If so, what?

4. I feel that the scent is: (*Please tick the appropriate circle for each scale*)

Very Pleasant	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Very Unpleasant

I feel that the scent is: (*Please tick the appropriate circle for each scale*)

Very Familiar	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Very Unfamiliar

Very Calming	1	2	3	4	5	6	7	Very Stimulating
Very Unhealthy	1	2	3	4	5	6	7	Very Healthy

Scent 5:

1. What kind of scent can you smell? Please List.

2. Do you associate the scent with anything? If so, what?

3. Does the scent bring back any memories or thoughts? If so, what?

4. I feel that the scent is: (*Please tick the appropriate circle for each scale*)

Very Pleasant	1	2	3	4	5	6	7	Very Unpleasant

I feel that the scent is: (*Please tick the appropriate circle for each scale*)

Very Familiar	1	2	3	4	5	6	7	Very Unfamiliar

	1	2	3	4	5	6	7	
Very Calming	○	○	○	○	○	○	○	Very Stimulating
Very Unhealthy	○	○	○	○	○	○	○	Very Healthy

Scent 6:

1. What kind of scent can you smell? Please List.

____

____

2. Do you associate the scent with anything? If so, what?

____

____

3. Does the scent bring back any memories or thoughts? If so, what?

____

____

4. I feel that the scent is: (*Please tick the appropriate circle for each scale*)

	1	2	3	4	5	6	7	
Very Pleasant	○	○	○	○	○	○	○	Very Unpleasant

I feel that the scent is: (*Please tick the appropriate circle for each scale*)

	1	2	3	4	5	6	7	
Very Familiar	○	○	○	○	○	○	○	Very Unfamiliar

Very Calming	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Very Stimulating
Very Unhealthy	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Very Healthy

Scent 7:

1. What kind of scent can you smell? Please List.

2. Do you associate the scent with anything? If so, what?

3. Does the scent bring back any memories or thoughts? If so, what?

4. I feel that the scent is: (*Please tick the appropriate circle for each scale*)

Very Pleasant	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Very Unpleasant

I feel that the scent is: (*Please tick the appropriate circle for each scale*)

Very Familiar	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Very Unfamiliar

Very Calming	1 ◯	2 ◯	3 ◯	4 ◯	5 ◯	6 ◯	7 ◯	Very Stimulating
Very Unhealthy	1 ◯	2 ◯	3 ◯	4 ◯	5 ◯	6 ◯	7 ◯	Very Healthy

Scent 8:

1. What kind of scent can you smell? Please List.

___

___

2. Do you associate the scent with anything? If so, what?

___

___

3. Does the scent bring back any memories or thoughts? If so, what?

___

___

4. I feel that the scent is: (*Please tick the appropriate circle for each scale*)

Very Pleasant	1 ◯	2 ◯	3 ◯	4 ◯	5 ◯	6 ◯	7 ◯	Very Unpleasant

I feel that the scent is: (*Please tick the appropriate circle for each scale*)

Very Familiar	1 ◯	2 ◯	3 ◯	4 ◯	5 ◯	6 ◯	7 ◯	Very Unfamiliar

	1	2	3	4	5	6	7	
Very Calming	○	○	○	○	○	○	○	Very Stimulating
Very Unhealthy	○	○	○	○	○	○	○	Very Healthy

Scent 9:

1. What kind of scent can you smell? Please List.

2. Do you associate the scent with anything? If so, what?

3. Does the scent bring back any memories or thoughts? If so, what?

4. I feel that the scent is: (*Please tick the appropriate circle for each scale*)

	1	2	3	4	5	6	7	
Very Pleasant	○	○	○	○	○	○	○	Very Unpleasant
Very Familiar	○	○	○	○	○	○	○	Very Unfamiliar
Very Calming	○	○	○	○	○	○	○	Very Stimulating

Very Unhealthy	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Very Healthy

Scent 10:

1. What kind of scent can you smell? Please List.

2. Do you associate the scent with anything? If so, what?

3. Does the scent bring back any memories or thoughts? If so, what?

4. I feel that the scent is: (*Please tick the appropriate circle for each scale*)

Very Pleasant	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Very Unpleasant
Very Familiar	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Very Unfamiliar
Very Calming	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Very Stimulating
Very Unhealthy	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Very Healthy

You are nearly finished

Scent

Please smell each scent again. Do you think the scent represents any of the following scents? If yes, which one? If no, select no (*Please tick one option per line*).

	Apple	Apricot	Lemon	Grapefruit	Mandarin	Kiwi	Orange	Herbs	Banana	Lime	Rosemary	Pineapple	None
Scent 1													
Scent 2													
Scent 3													
Scent 4													
Scent 5													
Scent 6													
Scent 7													
Scent 8													
Scent 9													
Scent 10													

Demographics

1. Sex (*Please tick one)*

- Male
- Female

2. Age (*Please tick one*)

- 16-24 years old
- 25-34 years old
- 35-44 years old
- 45-54 years old
- 55-64 years old
- Older than 65 years

3. What ethnic group(s) do you identify with?

- European
- Maori
- Pacific peoples
- Asian
- Middle Eastern
- Latin American
- African
- Other (*please specify*) ____________________

4. Income (*Please tick one*)

- Less than $20,000
- $20,000 - $39,999
- $40,000 - $79,999
- $80,000 - $119,000
- $120,000 - $149,000
- Over $150,000

5. What is your highest qualification? (*Please tick one*)

- NCEA Level 1
- NCEA Level 2
- NCEA Level 3
- Diploma
- Bachelors Degree
- Postgraduate Degree
- Other (*please specify*) ____________________

6. What is your current employment status? (*Please tick one*)

- Full-Time
- Part-Time
- Unemployed
- Retired

Thank you for your participation,
Please check that you have answered every question

Appendix G: Verbatim spontaneous associations and memories of pre-tested scents

Scent type	Categories	Associations and memories (frequency of respondent elicitation)
Mandarin	Healthier Food & Beverages	Mandarin (1), oranges (2), sour, orange (1), fruit (2), lemon (1), tangelo's fruit (1), breakfast (1), Fruit segments (1), pulpy orange juice (1), fruit bowl (1), eating and peeling tangelos off my parents tree at home (1)
	Less Healthy Food & Beverages	Sweet (1), Hawaiian breeze (1), mulled wine (1), reminds me of dessert (1)
	Nature and Outdoors	Like being in nature (1), Farm where I was brought up (1), of a picnic (1), winter (1), summery (1), summer (1), summertime (1)
	Cleaning, Personal Hygiene and/or Household Products	Cleaning products (1), bathing (1), dishwashing liquid (1), bathroom spray (1), clean (1), washing dishes (1)
	Other	Nice times (1), no (3)
Lemon	Healthier Food & Beverages	Lemon (4), lemon/honey drinks (1), fruit (1), sour fruit (1)
	Less Healthy Food & Beverages	Having candies with my brother (1), orange candies, orange lollies, sweet (1), fruity, lemon flavoured things (1), sugar free lemon drops (1)
	Nature and Outdoors	Lemon trees (2), flowers (1)
	Cleaning, Personal Hygiene and/or Household Products	Fly spray (1), cleaners (2), perfume (1), a type of lotion, rub, something like vicks (1), perfume tester, kit I was given as a gift, reminds of candles (1), cleaning fluids e.g. disinfectant, fresh, sharp (1), cleaning the house (1), smells

Scent type	Categories	Associations and memories (frequency of respondent elicitation)
		like a rub that I give to the children when they had a cold (1), cleaning e.g. bathroom (1), oils (1)
	Other	Soft soothing scent (1), calming (1), happiness, colourful (1), relaxation (1), childhood memories, colouring books (1), when I was 11-12 years old (1), felt tips (1), massage (1), childhood, colouring, relaxation (1), no (5)
Apple	Healthier Food & Beverages	Fruit (1), apples, crunchy, fresh (1), fruit bowl, apples, red + white (1)
	Less Healthy Food & Beverages	Sweetness (1), apple ice blocks (1), wine (1), high school, cafeteria lunches (1), apple juice (1)
	Nature and Outdoors	Shrub (1), flowers (1), going for a picnic (1), Hawaii (1)
	Cleaning, Personal Hygiene and/or Household Products	Disinfectant (1), bubble bath (1), freshness, soap (1), other women’s perfume, quite empowering (1), hand soap (1), washing powder (1), shampoo (5), strong flower fragrance (1), soap (1), bath time (1), doing the laundry (1), washing hair (1), showering (1)
	Other	Feels like I am walking into a department store (1), I’ve smelt this but I cant place it
Herbs	Healthier Food & Beverages	Herbs or stuffing (1), cooking, kitchen (1), spices (1), cooking food, bbq meat (1), bit like food seasoning (1), herbs for cooking (1), herbs (1), a herb (1), Italian dressing, could put it in my food, and eat it (1), roast chicken (1), cooking (2), summer cooking (1), weekend dinner (1), cooking casseroles (1), roast dinners (1)
	Less Healthy Food	Off vegetables (1), BBQ ribs, southern food (1), rib shack

Scent type	Categories	Associations and memories (frequency of respondent elicitation)
	& Beverages	meals in Texas/NC (1), going to an Indian restaurant (1), Asian Food (3), BBQ Sauce (1), Chicken Gravy (1), oven baked ribs (1)
	Nature and Outdoors	Undergrowth (1), farm bush (1)
	Cleaning, Personal Hygiene and/or Household Products	Cleaning (1), housework (1), dirty bathrooms, kitchens (1)
	Other	Industrial material (1), grubby trash can/sour off smell (1)
Lime	Healthier Food & Beverages	Lemon (2), lime fruit (2), Rosedale lime juice (1), drinking lemon juice (1), sour (1)
	Less Healthy Food & Beverages	Gum mint, green, fresh (1), Mexican beer, margaritas (1), lollies (5), energy drink, mountain dew (1), 50c mix (1), lollies, chews lime (1), sweet (1), diary lollies (1), like rainbow sours, sweet/sour raspberries and cherry (1), the mountain dew ad (1)
	Nature and Outdoors	From a type of plant (1), fruit trees (1), I think it's a plant that I have in my garden (1), Summer in Lx Tapa, Mexico (1), flowers (1)
	Cleaning, Personal Hygiene and/or Household Products	Spray and wipe (1), cleaning spray (1), yes nice scents in the house (1), soap, washing (1), cleaning (1), freshness, sprays (1)
	Other	Child hood with my sister (1), green, red, dudes, sweat (1), no (6)
Orange	Healthier Food &	Fruit (2), morning drinks (1), lemon (2), orange (2), oranges, subtler than lemon (1), orange juice (1),

Scent type	Categories	Associations and memories (frequency of respondent elicitation)
	Beverages	yellowish, sour (1), sour fruit (1)
	Less Healthy Food & Beverages	Orange and chocolate (1), lollies (1), oranges e.g. Cointreau (1), sweet, bubblegum (1), sweet (1)
	Nature and Outdoors	Home gardens (1), smells like the fruit in my garden (1), travelling to Jeju Island (1)
	Cleaning, Personal Hygiene and/or Household Products	Cleaning, laundry (1), soap (1), children toothpaste under 3 years, laundry day (1), common smell from some lotions (1)
	Other	Tropical weather (1), mild sweet and acidic smell (1), childhood (2), cinemas (1), being sick, throat hurts (1), my job (1), sickness, wanting to be healthy, getting better (1), no (7)
Banana	Healthier Food & Beverages	
	Less Healthy Food & Beverages	Jelly (1), Hubba Bubba, Coke (1), pink bubblegum, my childhood (1), candy, lollies (3), 50c mix (1), bubblegum (1), Banana Dots, lollies, Fruit Burst (1), Eskemo lollies (1), I want to eat it (1), Starburst banana (1), soft, sweet, white (1), dessert (1), childhood lollies (1), eating candy (2), reminds me of the blue and pink round bubble gum that I used to have during my childhood (1), sweets from the diary (1), candy, fat, sugar (1), childhood memories, ate them all the time (1), sweet (1)
	Nature and Outdoors	Orchards (1), farm life (1)
	Cleaning, Personal Hygiene and/or Household	Acetone, strong, sharp, biting (1), reminds me of my body lotion with sweet scent (1), removing polish (1)

Scent type	Categories	Associations and memories (frequency of respondent elicitation)
	Products	
	Other	Childhood (1), children (1), soft (1), white (1), my childhood (1), happy times, blowing bubbles, pink (1), no (1)
Pineapple	Healthier Food & Beverages	Fruit (1)
	Less Healthy Food & Beverages	Drinks, ice cream (1), alcohol (1), it reminds me of some alcoholic drink (1), sweet (1)
	Nature and Outdoors	Flowers (1), Gardens (1)
	Cleaning, Personal Hygiene and/or Household Products	Toilets (1), car freshener (1), bubble bath (1), clean, fresh smell (1), females, perfume (1), candle, smelly scent things (sticks) (1), bathroom, soap, perfume (1), children having baths, myself enjoying a bubble bath (1), soap (1), clean (1), tinned polish (1)
	Other	Colourful, green (1), clubs (1), clean shoes, strong, new vinyl (1), cars (1), a part of it like a food scent, the other part of it like a industrial scent (1), no(1)
Apricot	Healthier Food & Beverages	Fruit (2), fruit tea/T2 (1), berry fruits, red fruit (1), I have strawberry mixed with yoghurt for my breakfast because its healthy (1), having a pot of fruit tea in Shanghai airport (1), eating peaches in my uncles orchard as a child (1)
	Less Healthy Food & Beverages	Lollies (3), grape soda (1), pick n mix (1), grape soda in US as a kid (1), eating childhood candy (1), oversweet berries e.g. ice cream toppings (1), sweet (1), juice (2), sweetness (1)
	Nature and	Flowers (1), farms (1), spring (1), farm life (1)

Scent type	Categories	Associations and memories (frequency of respondent elicitation)
	Outdoors	
	Cleaning, Personal Hygiene and/or Household Products	Shampoo (1), soapy, washing (1), my scentsy (1), my friends perfume and scentsy candles (1), mixture of flowers and vanilla (1)
	Other	Ticksey licks, cough syrup (1), child sickness (1), being 16 shopping with my mom (1), childhood (1), scent reminds me of a nail salon (1), Body Shop shopping (1), red (1)
Kiwi Fruit	Healthier Food & Beverages	Fruit (1), cooking (1), maybe mango/paw paw, fleshy fruit (1), soft fruits, over ripe (1), kiwifruit (1), fresh (1)
	Less Healthy Food & Beverages	Kiwifruit lollies (1), sweets (1), cordiale (1), lollies, fruity (1)
	Nature and Outdoors	Summer (2), flowers (1), holidays at the beach (1)
	Cleaning, Personal Hygiene and/or Household Products	Fresheners (1), scented candles (1), aftershave (1), apple shampoo (1), shampoo (1), smelly candles (1), finishing the gym and spraying myself with this (1), it remind me of my auntie, must be the perfume that she use, similar smell in her room (1), reminds me of one of my perfumes (1), smells like female perfume (1)
	Other	Supermarket (1), childhood (1), male (1), pleasure (1), a nice relaxing scent (1)

Appendix H: Sample of pre-test colour and imagery questions from online questionnaire

AUT

For the colour below, please answer the following questions:

Do you associate this colour with anything? If so, what?

Does this colour bring back any memories or thoughts? If so, what?

>>

AUT

For the colour below, please answer the following questions

How healthy do you think this colour is? (*Please select a circle*)

Very Unhealthy ○ ○ ○ ○ ○ ○ ○ Very Healthy

I feel that the colour is: (*Please select the appropriate circle for each scale*)

Very Unpleasant	○ ○ ○ ○ ○ ○ ○	Very Pleasant
Very Calming	○ ○ ○ ○ ○ ○ ○	Very Stimulating
Very Unfamiliar	○ ○ ○ ○ ○ ○ ○	Very Familiar

How appropriate do you think this colour is for supermarket shelving (*Please select one*)

1 Extremely Inappropriate	2 Moderately Inappropriate	3 Slightly Inappropriate	4 Neither inappropriate nor appropriate	5 Slightly Appropriate	Mo App

AUT

For the colour below, please answer the following questions:

Do you associate this colour with anything? If so, what?

Does this colour bring back any memories or thoughts? If so, what?

>>

For the colour below, please answer the following questions:

How healthy do you think this colour is? (*Please select a circle*)

Very Unhealthy	○	○	○	○	○	○	○	Very Healthy

I feel that the colour is: (*Please select the appropriate circle for each scale*)

Very Unpleasant	○	○	○	○	○	○	○	Very Pleasant
Very Calming	○	○	○	○	○	○	○	Very Stimulating
Very Unfamiliar	○	○	○	○	○	○	○	Very Familiar

How appropriate do you think this colour is for supermarket shelving (*Please select one*)

1 Extremely inappropriate	2 Moderately inappropriate	3 Slightly inappropriate	4 Neither appropriate nor inappropriate	5 Slightly appropriate	Mod app

For the below image, please answer the following questions:

What is the first thing that came to your mind when you saw this image?

Do you associate this image with anything? If so what?

>>

For the below image, please answer the following questions:

How healthy do you think this image is? (*Please select a circle*)

Very Unhealthy	○	○	○	○	○	○	○	Very Healthy

I feel that the image is: (*Please select the appropriate circle for each scale*)

Very Unpleasant	○	○	○	○	○	○	○	Very Pleasant
Very Calming	○	○	○	○	○	○	○	Very Stimulating
Very Unfamiliar	○	○	○	○	○	○	○	Very Familiar

How appropriate do you think this image is for a supermarket? (*Please select one*)

1 Extremely inappropriate	2 Moderately inappropriate	3 Slightly inappropriate	4 Neither inappropriate nor appropriate	5 Slightly appropriate	6 Moder appro

Does this image encourage you to want to purchase from any of the following product categories? (*Please select all that apply*)

- No
- Dairy
- Bakery
- Frozen
- Butchery
- Confectionary
- Fruit and Vegetables
- Grocery
- Seafood
- Delicatessen
- Other (Please Specify)

>>

For the image below, please answer the following questions:

What is the first thing that came to your mind when you saw this image?

Do you associate this image with anything? If so what?

>>

For the image below, please answer the following questions:

How healthy do you think this image is? (*Please select a circle*)

Very Unhealthy ○ ○ ○ ○ ○ ○ ○ Very Healthy

I feel that the image is: (*Please select the appropriate circle for each scale*)

Very Unpleasant	○ ○ ○ ○ ○ ○ ○	Very Pleasant
Very Calming	○ ○ ○ ○ ○ ○ ○	Very Stimulating
Very Unfamiliar	○ ○ ○ ○ ○ ○ ○	Very Familiar

How appropriate do you think this image is for a supermarket? (*Please select one*)

1 Extremely inappropriate	2 Moderately inappropriate	3 Slightly inappropriate	4 Neither inappropriate nor appropriate	5 Slightly appropriate

Does this image encourage you to want to purchase from any of the following product categories? (*Please select all that apply*)

- No
- Dairy
- Bakery
- Frozen
- Butchery
- Confectionary
- Fruit and Vegetables
- Grocery
- Seafood
- Delicatessen
- Other (Please Specify)

>>

You are nearly finished

Gender (*Please select one*)

Male

Female

Age (*Please select one*)

16-24 years old

25-34 years old

35-44 years old

45-55 years old

55-64 years old

Older than 65 years

What ethnic group(s) do you identify with? (*Select all that apply*)

- European
- Maori
- Pacific peoples
- Asian
- Middle Eastern
- Latin American
- African
- Other (*Please specify*)

Income (*Please select one*)

- Less than $20,000
- $20,000 - $39,999
- $40,000 - $79,999
- $80,000 - $119,000
- $120,000 - $149,000
- Over $150,000

What is your highest qualification (*Please select one*)

NCEA Level 1

NCEA Level 2

NCEA Level 3

Diploma

Bachelors Degree

Postgraduate Degree

Other (*Please specify*)

>>

AUT

We thank you for your time spent taking this survey.
Your response has been recorded.

Appendix I: Verbatim spontaneous associations of green and grey

Colour type	Health categories	Associations (frequency of respondent elicitation)
Green	Foods	Green crocodile lollies (1), apples (2), veges (1), salad (1), green jet plan lollies (1), something like a salad (1), green lolly pops (1)
	Meal occasions and consumption	Picnic with family (1), picnics (1)
	Attributes, attractiveness and appetite	Fresh (3), cleanliness (1), clean (1), freshness (1), yes. My son's favourite colour and he used to associate green with apple. We had a great discussion about how apple is not only green in colour but could also be red (1), Eldest son, it was his favourite colour (1), favourite colour (1), green (3), The taste of green crocodile lollies (1),
	Health and Well Being	Goodness (1), cheap health products (1), calm (1), health (1), healthy (1), peace (1), healthy stuff (1), being sick (1), calming (1), happiness (2)
	Nature, Outdoors, Animals	Grass (15), Nature (10), Garden (1), green grass (1), growth (1), trees (3), algae (1), weed (1), summer (3), outdoors (2), meadow (1), being outside (1), playing outside as a child (1), sitting in the garden, reading in summer (1), being in nature (1), being outside in the bush (1), play grounds as a child (1), it reminds me of unnatural algae blooms in polluted rivers (1), the farm (2), many pleasant, outdoor memories (1), Auckland Domain (1), a paddock on the farm (1), helping out on my grandparents farm (1), Being in my hometown going for bush walks with my family. Also my childhood backyard (1), my home town where there is a lot of bush and trees (1), playing outside as a kid (1), cow (1), frogs (1)
	Places, People and Corporations	Ireland (2), Countdown (1), home, Whangarei (1), raiders (1), teenage mutant ninja turtles (1), working for The National Bank, our logo was this colour (1), Enza apples logo (1), Kermit (1), yes,

Colour type	Health categories	Associations (frequency of respondent elicitation)
		school friends (1), just reminds me of a TV show (1), A baby's room from breaking bad (1)
	Sports	Rugby, sports (1), Yes. Playing soccer as a teenager (1), golf (1)
	Other	Christmas (1), go, correct (1), motorway signs (1), childhood memories (1), my old car (1), Traffic light, getting an answer right on online test (1)
Grey	Foods	
	Meal occasions and consumption	
	Attributes, attractiveness and appetite	Bland (1), blandness (1), grim (1), cold (2), old (1), sadness (2), grey (1), boring (1), dull (3), neutral (1), neutral colour (1), sad (1)
	Health and Well Being	Calm (3)
	Nature, Outdoors, Animals	Rain (7), winter (3), grey stormy day (1), weather (1), I thought of grey clouds upon seeing the colour, though the sky on rainy days (1), stones in my garden (1), an elephant (1), cloudy and bad weather (1), clouds (2), rain clouds (1), rainy days (1), wolves (1), weather, cloudy & depressing (1), grey clouds (1), rainy days at primary school (1), Cloudy days (1), Bad weather (1), Rainy weather - staying inside (1), Perhaps gloomy days (1), cloudy days out side (1)
	Places, People and Corporations	Old people (1), work (1), my first house (1), concrete (3), houses (1), cement (3), house roof (1), shelving in libraries (1), school shorts (1), work (2), office blocks (1), concrete car parks (1), office, buildings and city (1), blending into the crowd (1), I miss my first home I built (1), footpaths (1), Walking on concrete (1), a roof (1), Houses as I am currently looking at painting my house a grey colour (1), dad pouring concrete (1), My grandfather's funeral (1),

Colour type	**Health categories**	**Associations (frequency of respondent elicitation)**
		Steel (1), uniforms (1), reminds me of the school shorts boys were at high school (1), the colour of a building I worked on (1), colour of house roofs in the sixties (1), memories when I first moved to Auckland (1), sitting inside and watching movies (1), Me trying to look like the "fashionable" Aucklanders - change/loss of identity (1)
	Sports and Fitness	Gym clothing (1), Fitness (1), netball (1)
	Other	Default (1), paint (1), cars (1), fashion (1), smoke (1), an error (1)

Appendix J: Between-subject design questionnaires imagery

Dessert:

Scones with jam and cream:

Appendix K: Pre-test imagery questionnaire one

Bagels:

Chickens:

Cheese:

Lollies:

Fresh Seafood:

Meat on a Platter:

Fresh Fruit and Vegetables:

White Bread:

Appendix L: Pre-testing imagery questionnaire two

Brown Bread:

Cows in Meadow:

Coffee and Biscuits:

Cooked Fish:

Bakery Items:

Salad:

Cow Chopped:

Winery:

Pie:

Appendix M: Imagery pre-test intent to purchase

Imagery Type	Category	Frequency	Percentage
Fruit and vegetables	No Intent to Purchase	1	4%
	Diary	2	8%
	Frozen	2	8%
	Butchery	3	12%
	Fruit and Vegetables	23	92%
	Grocery	6	24%
	Seafood	3	12%
	Deli	3	12%
Scallop salad	No Intent to Purchase	2	7.4%
	Diary	1	3.7%
	Butchery	1	3.7%
	Fruit and Vegetables	24	88.9%
	Grocery	4	14.8%
	Seafood	10	37%
	Deli	3	11.1%
Fresh seafood	No Intent to Purchase	5	20%
	Frozen	3	12%
	Butchery	1	4%
	Fruit and Vegetables	2	8%
	Grocery	2	8%
	Seafood	20	80%
	Deli	2	8%
Cooked fish	No Intent to Purchase	8	29.6%
	Bakery	1	3.7%
	Frozen	1	3.7%

Imagery Type	Category	Frequency	Percentage
	Butchery	3	11.1%
	Fruit and Vegetables	9	33.3%
	Seafood	19	70.4%
	Deli	2	7.4%
Chickens in meadow	Other	1	4%
	No Intent to Purchase	10	40%
	Diary	9	36%
	Frozen	3	12%
	Butchery	10	40%
	Fruit and Vegetables	2	8%
	Grocery	4	16%
	Deli	1	4%
Meat on platter	Other – Wine Match	1	4%
	No Intent to Purchase	3	12%
	Diary	1	4%
	Bakery	1	4%
	Frozen	2	8%
	Butchery	22	88%
	Fruit and Vegetables	6	24%
	Grocery	2	8%
	Seafood	1	4%
	Deli	3	12%
Cows in meadow	No Intent to Purchase	5	18.5%
	Diary	19	70.4%
	Bakery	2	7.4%
	Frozen	2	7.4%
	Butchery	11	40.7%

Imagery Type	Category	Frequency	Percentage
	Fruits and Vegetables	1	3.7%
	Grocery	1	3.7%
	Deli	2	7.4%
Brown Bread	No Intent to Purchase	3	11.1%
	Diary	5	18.5%
	Bakery	24	88.9%
	Confectionary	1	3.7%
	Fruit and Vegetables	2	7.4%
	Grocery	5	18.5%
	Deli	6	22.2%
Bakery Items	No	6	22.2%
	Diary	3	11.1%
	Bakery	18	66.7%
	Butchery	1	3.7%
	Confectionary	9	33.3%
	Grocery	3	11.1%
	Deli	1	3.7%
Bagels	No	6	24%
	Diary	4	16%
	Bakery	22	88%
	Frozen	1	4%
	Butchery	1	4%
	Confectionary	2	8%
	Fruit and Vegetables	3	12%
	Grocery	6	24%
	Seafood	2	8%
	Deli	4	16%

Imagery Type	Category	Frequency	Percentage
Winery	Other	8	29.6%
	No	6	22.2%
	Bakery	1	3.7%
	Seafood	1	3.7%
	Deli	2	7.4%
	Alcohol	11	40.8%
Scones with Jam and Cream	No	2	3.7%
	Diary	7	13%
	Bakery	21	38.9%
	Frozen	2	3.7%
	Fruit and Vegetables	1	1.9%
	Grocery	2	3.7%
	Deli	1	1.9%
Pie	No	8	29.6%
	Diary	2	7.4%
	Bakery	10	37%
	Frozen	4	14.8%
	Butchery	6	22.2%
	Fruit and Vegetables	2	7.4%
	Grocery	7	25.9%
	Deli	1	3.7%
Coffee and Biscuits	No Intent to Purchase	3	11.1%
	Diary	6	22.2%
	Bakery	18	66.7%
	Confectionary	7	25.9%
	Fruit and Vegetables	1	3.7%
	Grocery	11	40.7%

Imagery Type	Category	Frequency	Percentage
	Deli	1	3.7%
Dessert	No Intent to Purchase	4	7.4%
	Diary	14	25.9%
	Bakery	20	37%
	Frozen	13	24.1%
	Butchery	1	1.9%
	Confectionary	11	20.4%
	Fruit n Vegetables	3	5.6%
	Grocery	3	5.6%
	Seafood	1	1.9%
	Deli	3	5.6%
Lollies	No Intent to Purchase	11	44%
	Diary	1	4%
	Bakery	1	4%
	Confectionary	14	56%
	Grocery	1	4%

Appendix N: Verbatim spontaneous associations of imagery pre-test

Imagery type	Health categories	Associations (frequency of respondent elicitation)
Fruit and Vegetables	Food Items	Vegetables (1), vegies (3), healthy veges (1), fresh fruit and veg (1), fruit and vegetables (1), fresh produce (1), fresh produce delivery (1), salads and cooked vegies (1), fresh tasty condiments (1)
	Meal occasions and consumption	Dinner preparation (1), remembered my salad for lunch actually! (1), cooking international dishes with loads of herbs and spices (1), cooking (1), healthy easy eating (1), I need to eat more greens (1), everyday healthy eating (1), healthy eating (5), I would like to eat them (1)
	Attributes, attractiveness and appetite	Yum (3), fresh (3), they look nice and fresh (1), gorgeous colours (1)
	Health and Well Being	Healthy living (2), healthy (5), very healthy (1), health (3), cleanness (1), 5+ a day (1), good for you (1), healthy, colours for health (1), yes wellness (1), good feelings (1), health food (1)
	Nature	Fresh garden (1), gardening (1)
Scallop Salad	Food Items	Fresh salads (1), fresh produce (1), scallop salad (1), salad (7), healthy salad (1), fresh scallops fried in butter and garlic (1), fruit, different salad dressing, scallop (1)
	Meal occasions and consumption	I want that for lunch (1), BBQ (3), healthy dinner (1), summer BBQs (1), lunch (2), summer dinners (1), lunch and dinner (1), dinner ideas (1), going out to dinner (1), restaurant meals (1), food and healthy eating (1), all about healthy eating (1), healthy food (2), healthy diet (1), healthy eating (1), being on a diet (1)

Imagery type	Health categories	Associations (frequency of respondent elicitation)
	Attributes, attractiveness and appetite	Fresh (3), yum (4), taste (1), my favourite (1), overpriced, boring (1), taste of freshly cooked scallops (1)
	Health and Well Being	Well-being (1), healthy (3), lifestyle (1), healthy lifestyle (1), health (1), being healthy (1), self-conscious (1)
	Nature, Place or Other	Freshly grown (1), summertime (1), my garden (1), summer (5), warmth (1), summer holidays on the boat (1), Takapuna (1)
Fresh Seafood	Food Items	Seafood (8), fish (7), fish and chips (2), raw fish (1), sashimi (1), crayfish (1), fish tacos (1), lobster tacos (1), seafood in general (1)
	Meal occasions and consumption	Kai (1), cooking fresh fish, other seafood, summer BBQs (1), dinner (1)
	Attributes, attractiveness and appetite	Bad smell when you walk past this section (1), fresh from the sea (1), do not like seafood (1), yes, smelly (1), fresh (4), tasty (1), fresh, chilled (1), also the fishy smell at the supermarket seafood counter (1), eww seafood (1), reminds me of my childhood avoiding meat and seafood (1)
	Health and Well Being	Health and wealth (1), healthy food (1), healthy (2)
	Nature, Place or Other	A great marcoms campaign for Chathams Island blue cod, showed similar images of fresh cold seafood (1), Supermarket display (1), Going fishing (1), fishing (5), diving (1), surf (1), the beach (1), the sea, beach, holidays, Mexico (1), ocean (2), sea (1)
Cooked Fish	Food items	Mediterranean food (1), fish (4), cooked fish (1), Asian (1), Thai, fish (1), seafood (4), foreign, Mediterranean (1),

Imagery type	Health categories	Associations (frequency of respondent elicitation)
		experimental, high class food (1), steamed veges (1)
	Meal occasions and consumption	Dinner (3), fancy dinner (1), dinner with friends (1), food (2), BBQ (1), lunch (1), great meals (1), dinner time (1), dinner ideas (1), different recipes for dinner (1), weekend markets (1), Asian style cooking (1)
	Attributes, attractiveness and appetite	Ewww (1), fresh (4), zesty (1), looks amazing (1), a mess (1), ugly (1), meals I don't enjoy (1), gross (2), smelly (1), delicious dish (1), healthy but delicious dish (1), colourful (1), hungry (2)
	Health and Well Being	Health (1), being healthy (1)
	Nature, Place or Other	Travel (1), somewhere in Asia (1), home (Rarotonga) (1), Spain (1), Asia (1), time in Spain (1), family (1), Jamie Oliver (1), high class people (1), summer (3), sealife (1), fishing (2), sunshine and summer (1), summer holidays by the beach (1)
Cow Chopped	Food Items	Beef (3), meat (10), dairy products, yoghurt, milk (1), butchery good beef (1), red wine (1), steak, cuts of meat, interest to learn (1), a nice steak (1), red meat (1)
	Meal occasions and consumption	BBQ (2), Sharing with friends or family (1), summer barbees (1)
	Attributes, attractiveness and appetite	Funny (1), sadness, guilt (1), warmth (1), Yummy meals (1), yum, good food (1)
	Health and Well Being	
	Nature, Place	Butcher (5), vegans (1), butchery (3), USA, ranches and farms (1), how they cut up a cow (1), cow (3), animal cruelty (1), art

Imagery type	Health categories	Associations (frequency of respondent elicitation)
	or Other	(1), chalkboard (1), cookbooks and the internet (1), the art of the cow (1), killing animals (I don't want to see the animal that I'm eating and where everything came from even though I know the reality is just that) (1), makes me feel sad for the cow (1), the places where I have seen an image like this, for example, restaurants, supermarket, butcher (1)
Cows in Meadow	Food Items	Cheese, meat, healthy, organic food (1), hamburgers, meatballs, mince (1), milk (5), beef (4), steak (1), dairy foods (4), Swiss cheese (1), meat (1), fresh milk (1), New Zealand product, locally grown, freshness (1),
	Meal occasions and consumption	Summer BBQs (1), food (1)
	Attributes, attractiveness and appetite	
	Health and Well Being	Happiness (1)
	Nature, Place or Other	New Zealand (5), clean, green, nature (1), Switzerland, nature, small village, favourite place (1), cow (5), south island, farming (an old job of mine) (1), farms/country side (1), summer (1), high country farming (1), Alpine (1), Crisp weather, clean air (1), Swiss, space, clean air (1), natural (2), farming (1), home, childhood (1), not New Zealand (1) Switzerland (3), farms (4), nature (2), beautiful scenery & space (1), home (grew up on a farm) (1), organic, calmness (1), grown local, rural (1), the sound of music (1), happy cows (1), looking after a friends farm recently, feeding the cows (1), luscious coats (1), traveling (1)

Imagery type	Health categories	Associations (frequency of respondent elicitation)
Meat on platter	Food Items	Meat (6), steak (5), sizzling meat (1), free range beef steaks (1), fresh farm raised beef (1), Japanese beef (1), BBQ meat (1), aged rib eye (1), beef (1), uncooked meat (1), steak bbq (1)
	Meal occasions and consumption	Dinner (5) Dinner, family, bbq (1), BBQ (4), Medium rare steak on the BBQ (1), Summer BBQs (1), having fun cooking and trying to make cooking fancy (1), hope they cook it (1), gathering of people for a meal together (1), summer, cooking on the grill in the sunshine. Picnic at the beach (1), my partner cooking steak for tea (1), fine dining (1), night out for dinner (1), bbq in the sun (1)
	Attributes, attractiveness and appetite	Medium rare (1), that would be nice for dinner (1), yum (1), fancy and upmarket eating (1), yuck – im vegetarian (1)
	Health and Well Being	
	Nature, Place or Other	Master Chef (1), animals (1), family time (1), summer (1), cow (1), restaurants (1)
Chickens in meadow	Food Items	Free range eggs, free range poultry (1), natural farm eggs (1), meat (1), eggs (1)
	Meal occasions and consumption	Eating chicken (1), food (1)
	Attributes, attractiveness and appetite	Those look like free range birds (1), hens dirty, farm dirty hens (1)
	Health and Well Being	

Imagery type	Health categories	Associations (frequency of respondent elicitation)
	Nature, Place or Other	Chickens, farms (1), farm, organic (1), nice they are outside (1) farm kitchen garden (1), they I think my neighbours chickens laid a lot of eggs today (1), my brothers new lifestyle block hes so happy out on the farm with his horses and chickens :):) (1), free range happy hens (1), kind to animals (1), lifestyle (1), chooks on our farm when I was very small (1), farm life and free range chooks (1), farms (3), the country, farm(s), my grandfathers farm (1)
Brown Bread	Food Items	Whole wheat, jam (1), toast (4), bread (5), sandwiches (1), cheese and jam (1), wholemeal bread sandwich (1), bakery goods (1), kind of associate this with soup (1), healthy, sandwiches & toast (1), healthy bread (1), bread, toast, sandwich (1), freshly baked goods (1), delicious bakery goods (1), fresh bread with butter (1), mmmmm bread (1)
	Meal occasions and consumption	Breakfast (7), home cooked (1), eating (1), lunch (3), lots of good memories of eating, particularly breakfast (a favourite meal) (1), Yes. Having great breakfast time with my family (1), lunchtime (1), mornings, breakfast (1), breakfast, a great start to the day (1)
	Attributes, attractiveness and appetite	Food, fresh, rustic (1), safety, comfort, guilt (1), food, more food (1), yum (2), nice, hunger (1), fresh (1), bread smell (1), hunger (1), food (2), freshness (1), it looks stale (1), healthy food that isn't tasty (1), amazing tastes (1)
	Health and Well Being	Healthy (2)
	Nature, Place or Other	Mum (2), weekends (1), bakery (1)
White Bread	Food Items	Bread (10), Artisan bread (1), homemade bread (1), rustic, authentic breads (1), country, artisan breads (1), white bread (2), garlic bread (1), toast, French toast (1), Fresh Bread (1),

Imagery type	Health categories	Associations (frequency of respondent elicitation)
		Oh bread (1), Ciabatta (1), Butter (1), Soup (1), fresh artisan breads (1), that's a whole lot of bread (1), wheat (1)
	Meal occasions and consumption	Lunch (2), morning route – eggs on toast (1), breakfast (2)
	Attributes, attractiveness and appetite	Carbs (4), bread baking smell (1), the smell of fresh bread in the bakery (1), my mother loves to cook home made bread it reminds me of coming home to the smell of freshly baked bread (1), carbohydrates (1), fresh Sunday bread (1), comfort (1), yum (2)
	Health and Well Being	Pain! (Crohn's disease) (1), but also more unpleasant associations like stomach cramps etc (1), fat (1), unhealthy (1)
	Nature, Place or Other	Bakery (3), yes, childhood (1), Europe (1)
Bakery Items	Food Items	Chocolate, flour (1), hot bread, chocolate (1), baking (1), sugar (2), sweets (2), bakery food (2), home baking (1), baked muffin (1)
	Meal occasions and consumption	Lack of self-control (1), morning tea (1), over indulgence (1), treats (2), special treat (1), the munchies (1), morning afternoon tea (1), breakfast (1), food (2), kids parties (1), shared morning tea (1)
	Attributes, attractiveness and appetite	Sweet (1), delicious (1), soft (1), fresh, homemade (1), carbs (1), sugar cravings (1), baking smells (1), too sweet (1), high sugar level (1), calories (2), over processed sludge and filled with additives (1), a mess (1), yum, exactly what I feel like right now (1), sweet goodies (1), messy, clutter (1), yum (1)
	Health and Well Being	Not healthy (1), exercise (1), fat people (1), getting fat (1), bad food (1), unhealthy diet (1), bad eating days (1), unhealthy (1), obesity (1), bad health and being overweight

Imagery type	Health categories	Associations (frequency of respondent elicitation)
		(1), unhealthy refined baking lots of sugar/butter and white flour (1), unhealthy breakfast treats (1), guilt (1)
	Nature, Place or Other	Bakery (8), judgment, mum (1), my kitchen at home with my wife and daughter baking (1), supermarket bakeries (1), what am I actually looking at, it's a busy image (1)
Bagels	Food Items	Bread (2), Fresh, bread baking, bakery smell (1), donuts (5), cream cheese and salmon (1), sesame seeds (1), doughnuts not healthy but they could be bagels (1), baked goods, bakery (1), bagel (1), fresh bagels with sesame seeds (1), cream cheese (1)
	Meal occasions and consumption	Breakfast (5), Brunch (1), social gathering in a café (1), bagels at breakfast, morning tea time, coffee (1), breakfast/brunch (and toppings: jam, cream cheese, smoked salmon) (1), food (5)
	Attributes, attractiveness and appetite	Yuk (1), sweetness (1), hungry (2), the lighting make them look fatty (1), sweet tooth cravings (1), yum (1), eating (1), made me hungry (1), eww they look gross (1), Yum I love bagels. Why are they in water? (1)
	Health and Well Being	Unhealthy (1), unhealthy eating (2), being heavy (1)
	Nature, Place or Other	Bakery (2), brand names - Best Ugly Bagels, Al's Deli bagels (1), my friend being allergic to sesame seeds and how sad that is for them because I like sesame seeds! Also reminds me of being back in the USA, they love bagels overseas! (1), Dunkin Donuts (1), New York (the NY bagel), America (1), mornings (1)
Coffee & Biscuits	Food Items	Coffee, tea, cookie, chocolate (1), milk (1), sugar (3), cookies (3), hot chocolate (2), coffee (5), homemade cookies (1), biscuits (1), chocolate cookies (1), home baking (1), subway

Imagery type	Health categories	Associations (frequency of respondent elicitation)
		cookies (1)
	Meal occasions and consumption	Snack (1), treats (2), mornings (1), morning tea (6), late night snack (1), coffee break (3), Relaxing with a cup of tea and biscuit and morning tea time and night time (1), Tea-break (1), afternoon break (1), dipping biscuits in hot chocolate (1), tea time (1), afternoon tea (1), cup of tea and biscuits (1), snacking on cookies with a coffee, sweet treats (1), a night time snack (1), afternoon snack (1), growing up and having biscuits as treats (1), yes – food (1)
	Attributes, attractiveness and appetite	Sweet (2), savory (1), warm (2), yum (5), guilt (1), cravings (1), indulgence (1), they look good (1), comfort food (1)
	Health and Well Being	Unhealthy (1), scales (1), break-time, a "time out" to consider, rest, reflect (1), time out (1), taking a break (1), being fat (1), yummy naughty food/ sweet goodies I try and stay away from (1)
	Nature, Place or Other	Winter (1), home (1), break from work (1), cafes (1), Mrs Higgins cookies (1), childhood, and cold weather (1), pyjamas (1)
Pie	Food Items	Pie (6), meat pie (2), potato top pie (1), diary food (1), Potato-topped pies I ate as a kid (1), food, deli (1), meat (1), food (2), potato pie (1), meat pie homemade (1), minced/shepherd's pie (1), yummy delicious homely food made by mom (1), cottage pie (1), shepherds pie (1),
	Meal occasions and consumption	Dinner (2), home cooking (1), oven baking (1), take a short break (1), lunch (1), school lunch (1), eating (1)
	Attributes, attractiveness	Delicious (1), warm (1), low quality, jelly meat (1), good tasty food (1), makes me feel like eating pies (1), hunger, yum

Imagery type	Health categories	Associations (frequency of respondent elicitation)
	and appetite	(1), yum (2), that's a funny looking pie (1), comfort food (1), looks pretty good (1)
	Health and Well Being	Unhealthy (1), unhealthy bakery (1), fatty food (1)
	Nature, Place or Other	Winter (4), bakery (2), New Zealand cuisine (1), my kitchen (1), a hangover (1)
Winery	Food Items	Wine (20), alcohol (3), Chardonnay (1), bourbon (1), red wine (1)
	Meal occasions and consumption	Drinking (3), on the piss (1), wine tasting (1)
	Attributes, attractiveness and appetite	Aged, quality (1), strong mellow flavours, sophistication, friendship (1), romance (1), delicacy (1), deliciousness (1)
	Health and Well Being	Being calm (1), relaxing (1)
	Nature, Place or Other	Winery (4), not me, don’t fit in (1), Italy/France (1), Wine Cellar (1), vineyards (4), friends and family (1), turning up (1), wine barrels (1), Queenstown and vineyard work, beauty (1), brewery (1), barrel (1), yes, memories with friends at wineries (1)
Cheese	Food Items	Cheese (10), cheese and crackers (3), crackers (4), wine (4), Yum cheese! And I also thought about my favourite cheese - blue cheese - with figs and crackers (1), fresh cheeses, global selection (1), a very nice selection of cheeses (1), wine and cheese (1), cheese and crackers, cheese and wine, spaghetti (parmesan cheese) (1), beer (1), cheeseboard and wine (1), cheese platter (2), dairy (1), cheese selection (1)

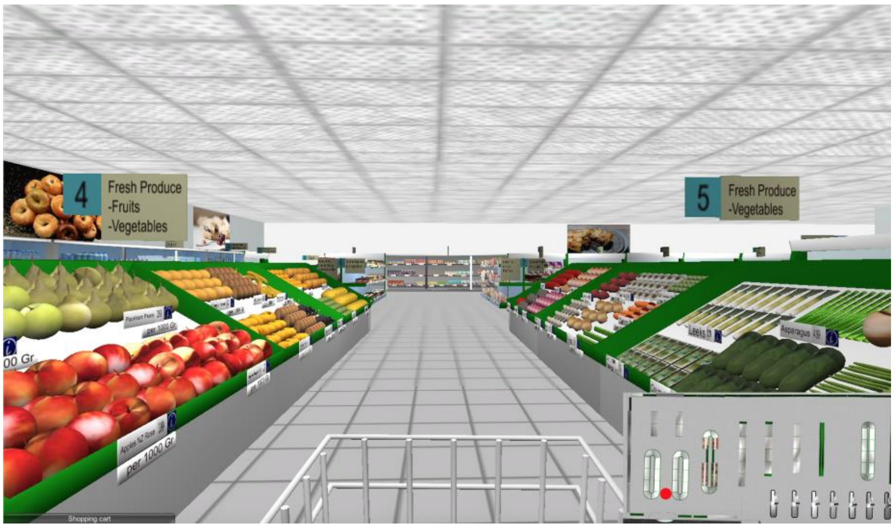
Imagery type	**Health categories**	**Associations (frequency of respondent elicitation)**
	Meal occasions and consumption	Treats (1), picnics (1), crackers and cheese before dinner snacks (1), snacks (2), dinner, snacks, social food (1), something you would have with friends/family/a large group (1), entertaining friends with wine cheese and crackers (1)
	Attributes, attractiveness and appetite	Yum (4), too bright coloured (1), OMG I loooovvveee cheese, but it hates me :((highly intolerant!) (1), Me wanting to eat cheese on crackers with tomatoes and lemon pepper! (1), delicious cheese, looks French (1), yummy cheeseboard (1), I love cheese (1), cheese and wine would be good (1), yummy (1),
	Health and Well Being	Fatty (1) but fattening (1)
	Nature, Place or Other	Parties, socializing (1), socializing with friends (1), holidays (1), Switzerland (1), yellow (1), having guests over (1)
Lollies	Food Items	Lollies, sugar, treats (1), sugar (8), Sour snakes! (1), sweets (4), a mass amount of sugar (1), Pick n' mix candies at supermarket, Halloween (1), lollies (4), sours (1), cakes (1)
	Meal occasions and consumption	Treats (1), Kids birthday parties, cakes, sweets, the bakery (1)
	Attributes, attractiveness and appetite	Colourful, sweet (1), so much sugar - sugar rush (1), I love sugar! (1), sugar, way too much (1), my general dislike of highly coloured confectionery (1), artificial colour (1), too sweet (1), yum (1), multi-coloured items, sweet (1), yum I want some lollies now (1)
	Health and Well Being	Chubby children (1), that Sugar Film and how bad refined sugar is for you (1), diabetes, obesity, rotten teeth (1), Very unhealthy lollies for children, Yes, tooth decay – fillings (1),

Imagery type	Health categories	Associations (frequency of respondent elicitation)
		bad teeth (2), tooth ache (1), Feeling sick after you eat them, sugar high (1), unhealthy diet (1), diabetes and hypo kids (1)
	Nature, Place or Other	Kids, fun (1), Being a kid, going to the movies (1), when your hung over (1), children's parties, Halloween, movie cinemas, weddings (candy stations), the dairy (usually have lollies on display near counter) (1), children (1), movies (1), buying lollies from the dairy, going to the movies, being as little kid eating lollies for the first time (1)
Dessert	Food Items	Chocolate and ice cream desert (1), warm, gooey chocolate. Yum. I am now hungry (1), sugar (2), desert (4), salted caramel (1), ice cream (2), chocolate (3), coffee (2), sweets (1), advertising for brownies (1), really good desert I have to have (1), chocolate cake and ice cream (1), chocolate fudge ice cream (1), all ingredients can be bought and made at home (1)
	Meal occasions and consumption	Sugar overload (1), eating out (1), dinner out for special occasions, birthday, celebration, reward, Treat. Sugar (1), desert with my daughter (1), chocolate xmas (1), dining out (1), treats (1), desert at a nice restaurant (1)
	Attributes, attractiveness and appetite	Delicious (5), Yum (7), Yummy food (1), hunger (1), yummy (2), too sweet (1), sweet and satisfied (1),
	Health and Well Being	Obesity (1), indulgence (1), Yes, gaining weight (1), calories (2), weight gain (1), indulge (1), weight (1), my weight (1), fun times (1), fat (1), Feeling positive and happy eating (1), diabetes (1)
	Nature, Place or Other	Bakery near my house (1), going on holiday (1), supermarket (1), a movie by Pier Paolo Pasolini (1)
Jam Scones	Food Items	Scones (2), strawberry Jam (1), messy desert (1), raspberry

Imagery type	Health categories	Associations (frequency of respondent elicitation)
with Cream		jam (1), jam (2), mmm jam & cream scones (1), food (1), berries (2), desert (1), home baking (1), baking, nana (1), my grandmothers baking (1), mom baking cookies (1), scone cream and jam (1), raspberry jam and scone yum (1), toast (1), good baking (1)
	Meal occasions and consumption	Morning tea (1), eating (1), brunch (1), high tea (2), delicious desert (1), lunch time (1), something sweet to eat after a meal or for dessert (1), yes afternoon tea (1), shared lunch (1), morning tea at nanas (1)
	Attributes, attractiveness and appetite	Yummy scones (1), sweet (3), tart (1), yum (4), I'm hungry (1), eating (1)
	Health and Well Being	Guilty pleasure (1), overweight, things I need to ration (1)
	Nature, Place or Other	Spending time with my grandparents when I was younger (1), Holiday season, i.e. thanksgiving/Christmas (1), Christmas (1), nosh (1), Victoria and Albert museum London, I had the best traditional English scone and cup of tea there (1), England (1)

Appendix O: Supermarket scenes

Green shelving, less-healthy imagery



Grey shelving, more-healthy imagery

Appendix P: Promotional material

Facebook page

Facebook/Instagram advertisement

Flyer:


PARTICIPANTS
WANTED FOR VIRTUAL
SUPERMARKET STUDY!
• Are you 18 years and over?
• Are you available to come into AUT city campus for one laboratory visit?
We are conducting a study to understand shopper behaviour within the supermarket environment. The aim of the study is to see how shoppers respond to a range of store atmospheric elements within a virtual supermarket.
Commencement date: January 2017
All participants will receive a $10 food voucher as a token of appreciation.
For more information, or if you are interested in taking part in the study, please contact:
Megan Phillips, Auckland University of Technology, Marketing, Advertising, Retailing and Sales (MARS) Department.
Email: mphillip@aut.ac.nz | Tel: 09 921 9999 ext 5428

Appendix Q: Participant information sheet

Participant Information Sheet

Date Information Sheet Produced:

01 April 2016

Project Title

The influence of the food store environment on shopper behaviours

An Invitation

Dear Sir/Madam,

You are invited to participate in a research project looking at the supermarket environment and shopper behaviour. This project will be run by Megan Phillips, a staff member and Doctor of Philosophy (PhD) candidate from the Marketing, Advertising, Retailing and Sales department within the Faculty of Business and Law at Auckland University of Technology.

What is the purpose of this research?

I am completing this project as part of my PhD thesis. The information collected may be used for publications in academic journal articles, conference papers, research papers, academic presentations and other academic publications.

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

You have been identified to participate in this research as you are:

- An adult living in New Zealand
- Aged 18 years and over
- Are available to come into the AUT city campus for one laboratory visit

You may have heard about this study through a friend, your employer, through Facebook, Auckland University of Technology or a supermarket you shop at.

What will happen in this research?

You will be seated at a computer in the laboratory where you will be given an ID number and consent form to sign. The computer in front of you will be used to complete your virtual shop. There may be other people participating at the same time but they will be on their own computer. Before beginning the shopping task you will be asked a couple of questions about your general shopping behaviours. A tutorial of how to use the virtual supermarket will also be completed. The shopping task will be to buy groceries for three days in a virtual supermarket. The virtual supermarket will be used to see how you react to different elements within the store such as music, lighting, and temperature. After completing your shop you will be asked about your virtual shopping experience, your general shopping behaviour and demographic information. Participation in this study is a one-off, so you will not be contacted or asked to come back for follow-up information.

The research will be done in the Marketing, Advertising, Retailing and Sales department in WY Building (WY421), AUT City campus.

What are the discomforts and risks?

There are minimal risks or discomforts involved in this project. The virtual supermarket is designed to collect information on your behaviour. If you are worried about using the virtual supermarket, an introduction will be given before using it; this is to ensure you are familiar with how to get around, how to select items, how to check prices, how to review product information and make purchases.

If you have allergies or are sensitive to scents please notify the researcher before accepting participation in this study.

How will these discomforts and risks be alleviated?

Through the allocation of an ID number and information being collected through the computer, hopefully this will make you feel more comfortable knowing that your information is not directly related to you or your name. Participation in this project is voluntary. You may withdraw at any time and you do not have to answer any questions you do not feel comfortable answering. I am dedicated to making sure you have an enjoyable experience and therefore, will ensure discomfort and risks are alleviated.

What are the benefits?

It is expected that this project will help retailers, marketing and retail researchers, and research participants to learn more about shopper behaviours within the supermarket environment. As a thank you for your participation you will be given a $10 food voucher. Participation in this study will help me to meet the criteria for fulfilment of my Phd from Auckland University of Technology.

How will my privacy be protected?

Your privacy will be protected through the ID number. Information such as contact information, consent forms, participant identity and the data collected will remain confidential. Information will be kept in a safe (locked) place. You will not be identified in the final reporting.

What are the costs of participating in this research?

Participation in the project will involve a briefing and debrief session, two questionnaires (one short, one longer) and a virtual shop. This should take approximately 1 hour. You will need to come into the laboratory to participate in this study. Transportation into the laboratory (Auckland City) is at your own cost. If you need a car park this can be organised for you, so no parking cost will be incurred.

What opportunity do I have to consider this invitation?

You are invited to consider and respond to this invitation within two weeks. One reminder email will be sent to you if you have not responded.

How do I agree to participate in this research?

You agree to participate via email or telephone (see researchers contact details below). If you are interested in participating, you will receive a confirmation email specifying the times the study will be run. You will be given the opportunity to select the time that is most convenient for you. If none of the times suit I can work with you to schedule a more convenient time. Once a time has been confirmed, I will send through a consent form. You do not need to sign this straight away but please do read. Signing of the consent form will be done in the briefing session before the study starts.

Will I receive feedback on the results of this research?

Once the study is completed a copy of the results will be emailed to you, unless you specify otherwise.

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

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Dr Sommer Kapitan, sommer.kapitan@aut.ac.nz, 09 921 9999 ext 5131.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEC, Kate O'Connor, *ethics@aut.ac.nz* , 09 921 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:

Megan Phillips, mphillip@aut.ac.nz or 09 921 9999 ext 5428

Project Supervisor Contact Details:

Dr Sommer Kapitan, sommer.kapitan@aut.ac.nz or 09 921 9999 ext 5131

Approved by the Auckland University of Technology Ethics Committee on *1st June 2016*, AUTEC Reference number *16/177*.

Appendix R: Consent form

Consent Form

Project title: ***The influence of the store environment on shopper behaviours***

Project Supervisor: ***Dr Sommer Kapitan***

Researcher: ***Megan Phillips***

- ○ I have read and understood the information provided about this research project in the Information Sheet dated 01 April 2016.
- ○ I have had an opportunity to ask questions and to have them answered.
- ○ I understand that the virtual supermarket software will be recording shopping behaviours.
- ○ I understand I will be answering two questionnaires (before and after the virtual shop)
- ○ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- ○ If I withdraw, I understand that all relevant information will be destroyed.
- ○ I agree to take part in this research.
- ○ I wish to receive a copy of the report from the research (please tick one): Yes ○ No ○

Participant's signature: ....

Participant's name : ....

Date:

Approved by the Auckland University of Technology Ethics Committee on 1st June 2016 Reference number 16/177

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

Appendix S: Pre-experimental questionnaire

0% Survey Completion 100%

AUT

ID Number (*Please enter below*)

Next

Powered by Qualtrics

0% Survey Completion 100%

AUT

Do you purchase groceries? (*Please select an option from the drop down menu*)

Where do you usually purchase your grocery items (*Select multiple if needed*)

- Fruit and Vegetable Store
- Supermarket
- Liquor Store
- Butchery
- Food Market
- Other (Please Specify)

Are you the main grocery shopper for your household? (*Please select one*)

- Yes
- No

Next

Powered by Qualtrics

0% Survey Completion 100%

AUT

How much do you approximately spend on groceries over a 3 day period (2 week days, 1 weekend day)? (*Include supermarket, butchery, fruit and vegetable, speciality food, liquor and food market purchases in the estimated total*)

The following statements relate to your hunger and thirst level. I feel: (*please select one for each line*)

Not at all Hungry	○	○	○	○	○	○	○	Very Hungry
Not at all Thirsty	○	○	○	○	○	○	○	Very Thirsty

Please agree or disagree with the following statements: (*one tick per statement*)

	1 Strongly Disagree	2 Disagree	3 Slightly Disagree	4 Neither agree nor disagree	5 Slightly Agree	6 Agree	7 Strongly Agree
Currently, I am in a good mood	○	○	○	○	○	○	○
As I answer these questions I feel cheerful	○	○	○	○	○	○	○
For some reason I am not very comfortable right now	○	○	○	○	○	○	○
At this moment I feel edgy or irritable	○	○	○	○	○	○	○

Next

0% Survey Completion 100%

AUT

We thank you for your time spent taking this survey.
Your response has been recorded.

Powered by Qualtrics

Appendix T: Shopping scenario

Welcome to the Virtual Supermarket

Please complete a shop for food and beverages for 3 days (two week days and 1 weekend day). Complete this shop as you would do in real life.

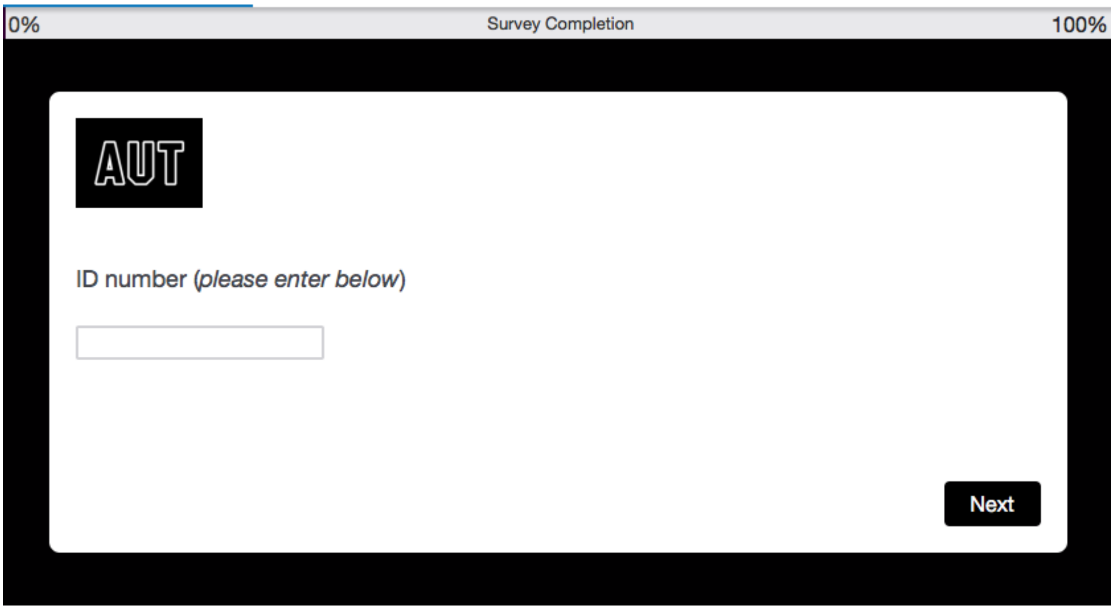
Buy everything you need for the three days in the virtual supermarket even if you buy some items from other stores such as bakeries, butcheries, markets, diaries and fruit and vegetable stores. So, if you normally buy meat at the butcher, buy it in the virtual supermarket for this study. Do not include restaurant foods or takeaways.

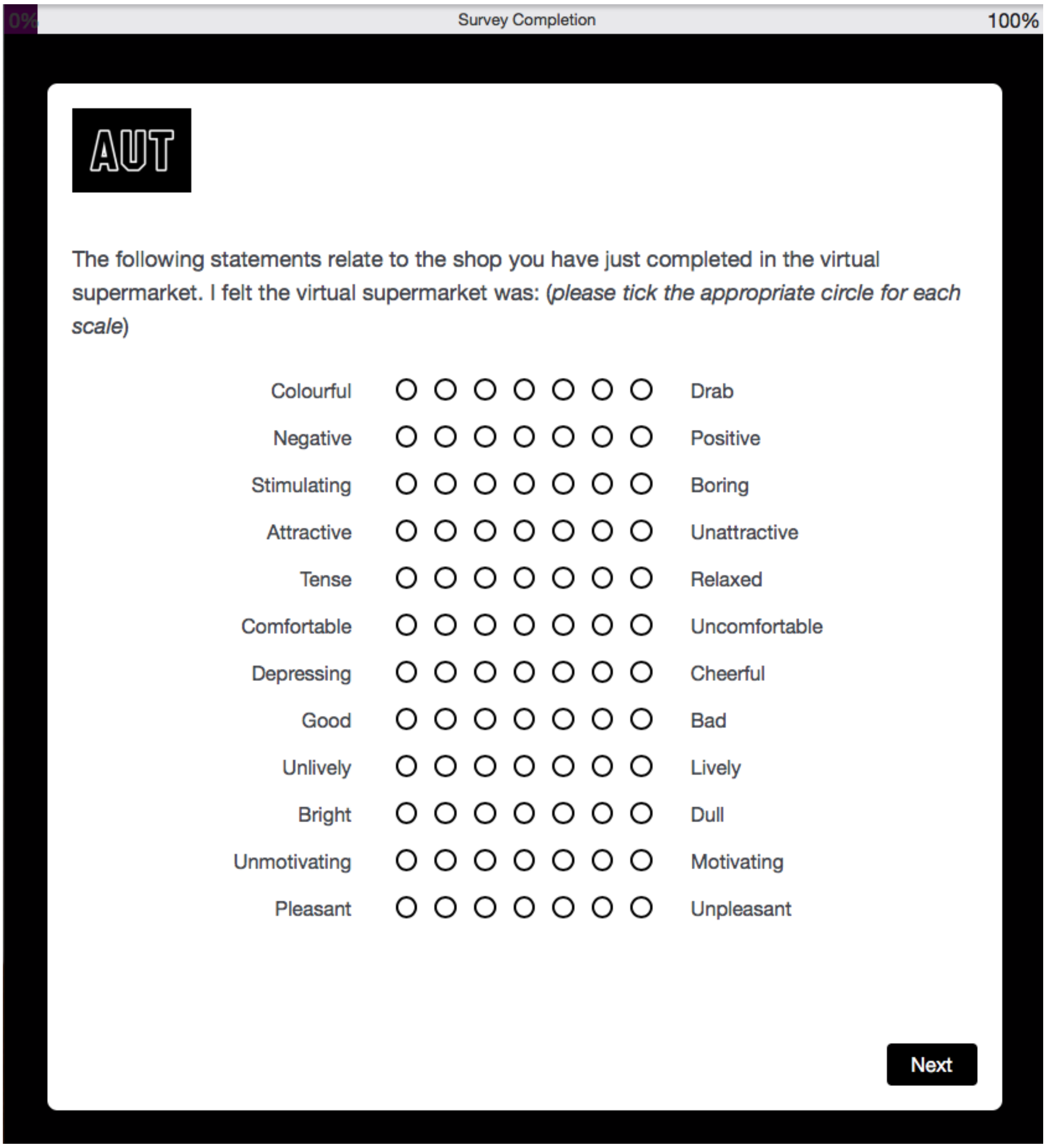
Buy ALL foods, drinks and alcoholic drinks you need for three days. Buy items for two-week days and one weekend day.

Do not buy items you are not planning to buy in real life in the next week. For example, if you have enough salt in your pantry, don't buy salt.

Please stick to your normal budget. Do not spend any more than you normally would.

Appendix U: Post experimental questionnaire





0% Survey Completion 100%

AUT

The following statements relate to the shop you have just completed in the virtual supermarket. I felt the virtual supermarket was: (*please tick the appropriate circle for each scale*)

Colourful	○	○	○	○	○	○	○	Drab
Negative	○	○	○	○	○	○	○	Positive
Stimulating	○	○	○	○	○	○	○	Boring
Attractive	○	○	○	○	○	○	○	Unattractive
Tense	○	○	○	○	○	○	○	Relaxed
Comfortable	○	○	○	○	○	○	○	Uncomfortable
Depressing	○	○	○	○	○	○	○	Cheerful
Good	○	○	○	○	○	○	○	Bad
Unlively	○	○	○	○	○	○	○	Lively
Bright	○	○	○	○	○	○	○	Dull
Unmotivating	○	○	○	○	○	○	○	Motivating
Pleasant	○	○	○	○	○	○	○	Unpleasant

Next

0% Survey Completion 100%

AUT

The grocery items selected in the virtual supermarket are something: (*please tick one circle per statement*)

	1 Strongly disagree	2 Disagree	3 Slightly disagree	4 Neither agree nor disagree	5 Slightly agree	6 Agree	7 Strongly agree
That I purchase frequently	O	O	O	O	O	O	O
That I purchase automatically	O	O	O	O	O	O	O
That I purchase without having to consciously remember	O	O	O	O	O	O	O
That I purchase without thinking	O	O	O	O	O	O	O
That would require effort not to purchase	O	O	O	O	O	O	O
That belongs to my (daily, weekly, fortnightly, monthly) routine	O	O	O	O	O	O	O
That I start purchasing before I realise I'm purchasing it	O	O	O	O	O	O	O
That I would find hard not to purchase	O	O	O	O	O	O	O
That I have no need to think about purchasing	O	O	O	O	O	O	O
That I have been purchasing for a long time	O	O	O	O	O	O	O
That's typically me	O	O	O	O	O	O	O

That makes me feel weird if I do not purchase them

Are there any items that you purchased in the virtual supermarket that you do not typically purchase in real life? (*please tick one*)

Yes (Please Specify)

No

Next

Powered by Qualtrics

0% Survey Completion 100%

AUT

When selecting grocery items, how important are each of the following to you? Rank them from 1 (most important) to 17 (least important) (*drag and drop each of the items in order of importance*)

Taste

Cost

Weight control

Health

Ingredients

Routine

Cultural or religious beliefs

Familiarity

Convenience

Quality

Household preferences

Presentation of product in-store

Dietary requirements (e.g. gluten free, vegan)

Ethical concerns

Habit

Freshness of food

Packaging

Next

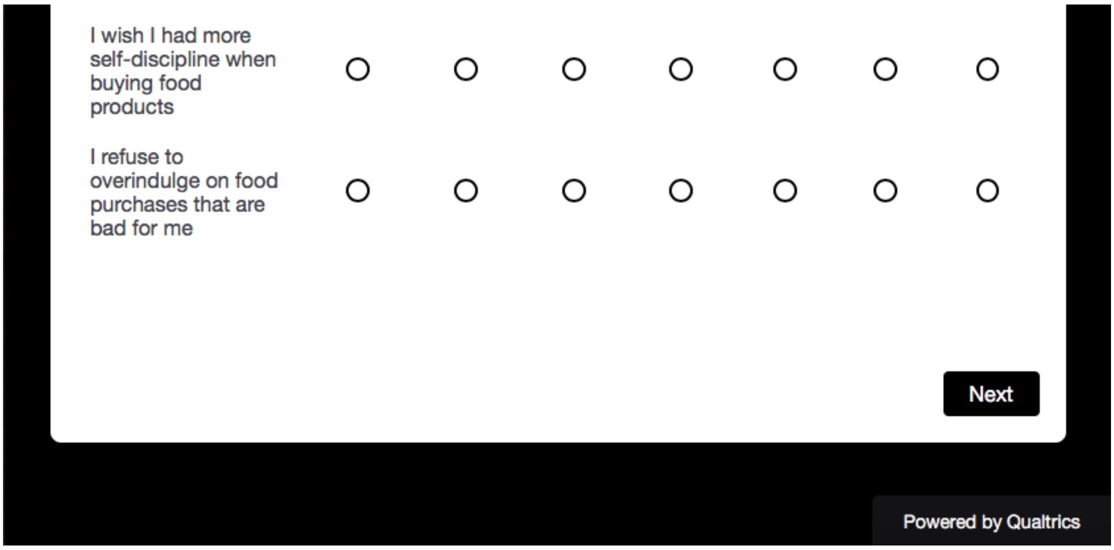
Powered by Qualtrics

0% Survey Completion 100%

AUT

Thinking about when you purchase groceries, do you agree or disagree with the following statements: (*one tick per statement*)

	1 Strongly disagree	2 Disagree	3 Slightly disagree	4 Neither agree nor disagree	5 Slightly agree	6 Agree	7 Strongly agree
I don't want to change my food purchasing habits	○	○	○	○	○	○	○
It is difficult to know what is healthy when purchasing foods	○	○	○	○	○	○	○
Sometimes I can't stop myself from buying something, even if I know it is bad for me	○	○	○	○	○	○	○
I purchase certain foods that are bad for my health, if they are delicious	○	○	○	○	○	○	○
Purchasing healthier items is too big of a change	○	○	○	○	○	○	○
I purchase inappropriate foods	○	○	○	○	○	○	○
People would say that I have iron self-discipline with my food purchasing	○	○	○	○	○	○	○
I am good at resisting temptation when food shopping	○	○	○	○	○	○	○
I have a hard time breaking bad food purchasing habits	○	○	○	○	○	○	○
I often buy without thinking through the health consequences	○	○	○	○	○	○	○



I wish I had more self-discipline when buying food products	○	○	○	○	○	○	○
I refuse to overindulge on food purchases that are bad for me	○	○	○	○	○	○	○

Next

Powered by Qualtrics

0% Survey Completion 100%

AUT

Please agree or disagree with the following statements: (*one tick per statement*)

	1 Strongly disagree	2 Disagree	3 Slightly disagree	4 Neither agree nor disagree	5 Slightly agree	6 Agree	7 Strongly agree
When grocery shopping, I compare the prices of different brands to be sure I get the best value for the money	○	○	○	○	○	○	○
I will grocery shop at more than one store to take advantage of low prices	○	○	○	○	○	○	○
My friends think of me as a good source of price information	○	○	○	○	○	○	○
The money saved by finding low prices is usually not worth the time and effort	○	○	○	○	○	○	○
When buying a product, I always try to maximise the quality I get for the money I spend	○	○	○	○	○	○	○

Next

Powered by Qualtrics

0% Survey Completion 100%

AUT

The following questions are related to general lifestyle behaviours. Please agree or disagree with the following: (*one tick per statement*)

	1 Strongly disagree	2 Disagree	3 Slightly disagree	4 Neither agree nor disagree	5 Slightly agree	6 Agree	7 Strongly agree
Having good health means a lot to me	O	O	O	O	O	O	O
I lack time to prepare foods	O	O	O	O	O	O	O
I am able to work effectively toward long-term health goals	O	O	O	O	O	O	O
I think of myself as a person who is concerned about healthy food	O	O	O	O	O	O	O
I often think about my health	O	O	O	O	O	O	O
I lack the skills to cook a good nutritious meal	O	O	O	O	O	O	O
Good health is important to me	O	O	O	O	O	O	O
I'm very concerned about the health-related consequences of what I eat	O	O	O	O	O	O	O
I have limited cooking facilities	O	O	O	O	O	O	O
I have good food storage facilities	O	O	O	O	O	O	O

You are well over half way

0% Survey Completion 100%

AUT

Demographic Information

Gender (*please tick one*)

Male

Female

How old are you? (*enter age in box*)

0 years old

What ethnic group(s) do you identify with? (*select all that apply*)

New Zealander

Maori

European

Pacific people

Asian

Middle Eastern

African

Other (please specify)

Income (*please tick one*)

Less than $20,000

$20,000 - $39,999

$40,000 - $79,999

$80,000 - $119,999

$120,000 - $149,999

Over $150,000

What is your highest qualification? (*please tick one*)

NCEA Level 1

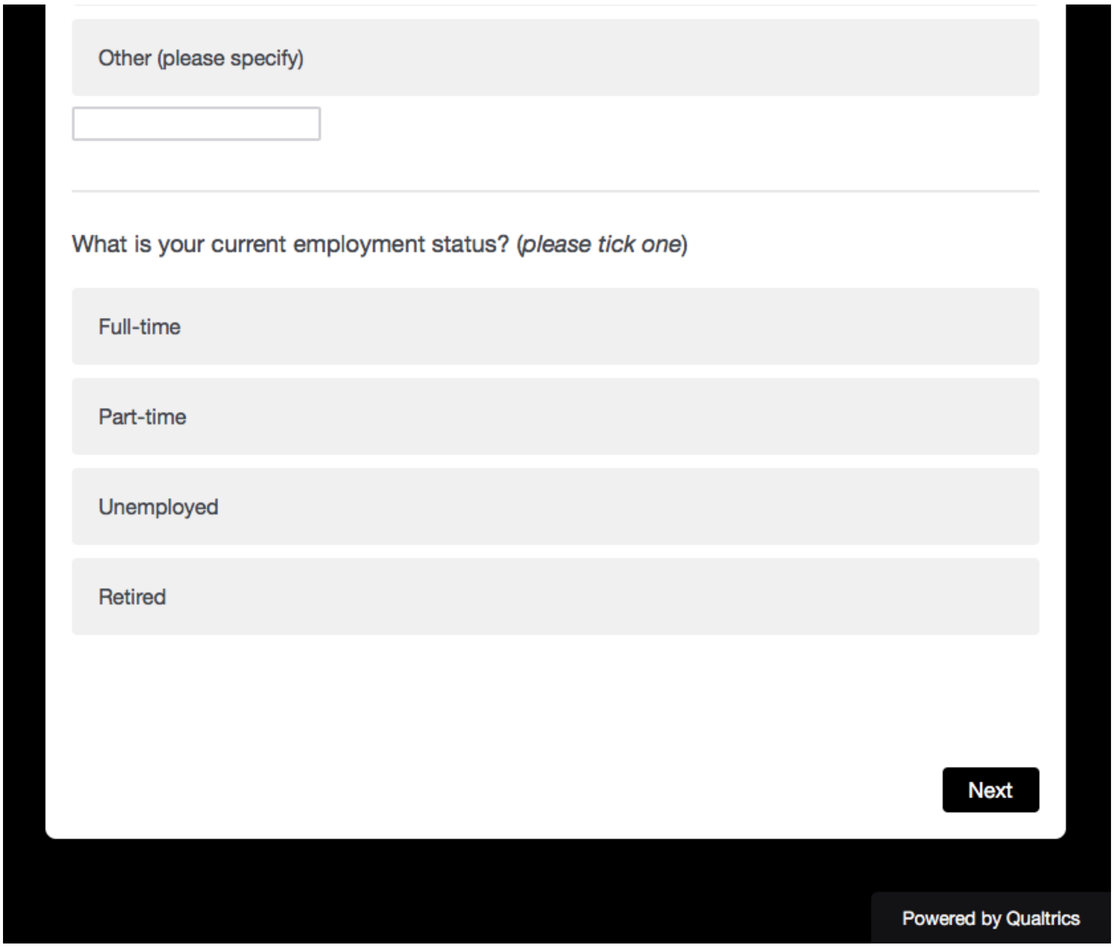
NCEA Level 2

NCEA Level 3

Diploma

Bachelors Degree

Postgraduate Degree


Other (please specify)

What is your current employment status? (*please tick one*)

Full-time

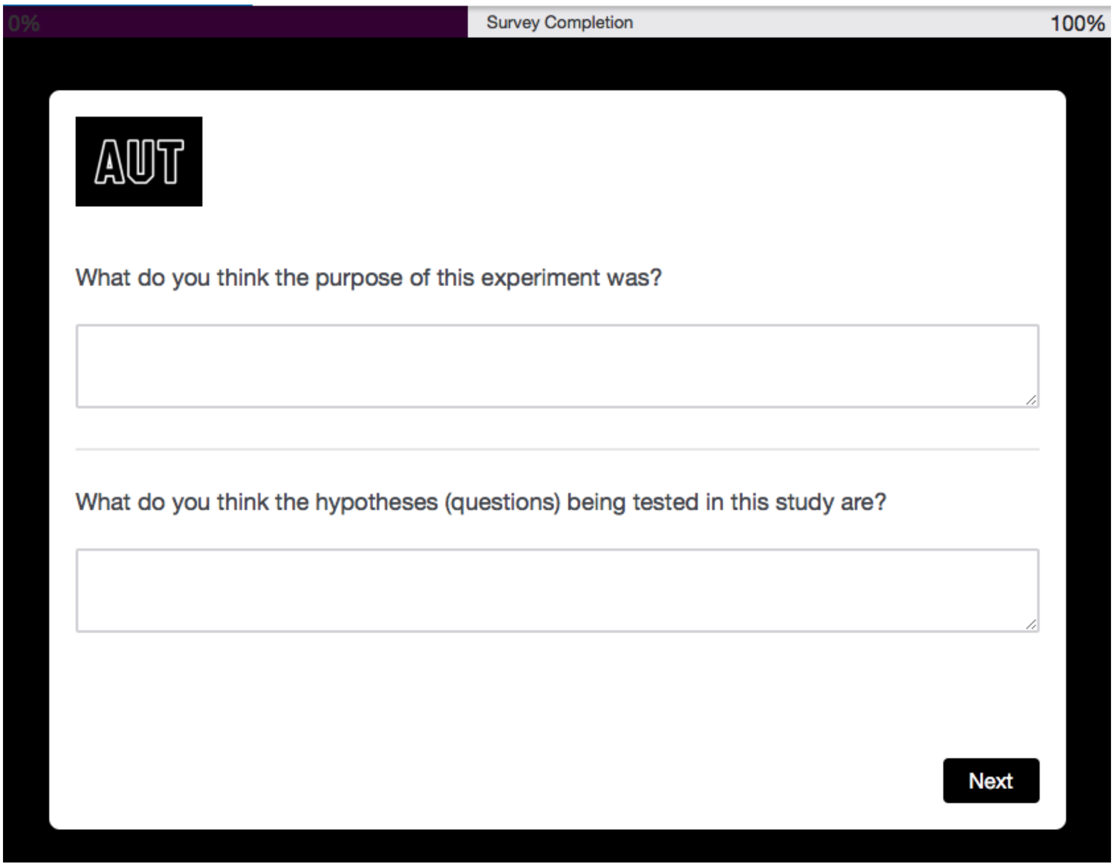
Part-time

Unemployed

Retired

Next

Powered by Qualtrics


0%
Survey Completion
100%

AUT

What do you think the purpose of this experiment was?

What do you think the hypotheses (questions) being tested in this study are?

Next

0% Survey Completion 100%

Colour Test

You will be shown six colour plates (like the one below). For each plate enter the number you see. If you do not see anything just leave it blank.

For the above plate, enter the number you see in the box below. If you do not see anything leave the box blank

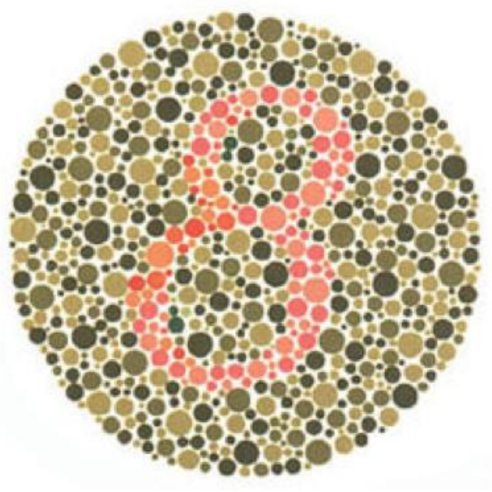
0 Number

Next

Powered by Qualtrics

0% Survey Completion 100%

AUT



For the above plate, enter the number you see in the box below. If you do not see anything leave the box blank

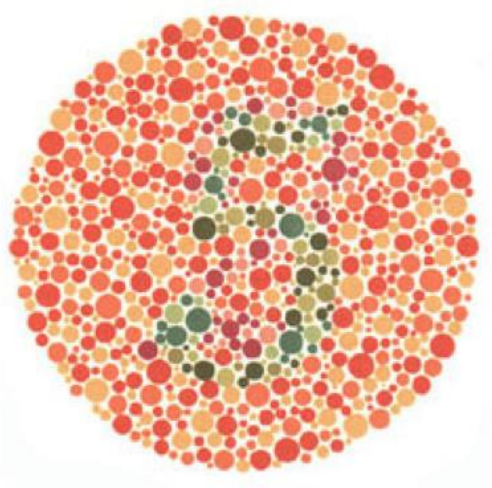
0 Number

Next

Powered by Qualtrics

0% Survey Completion 100%

AUT



For the above plate, enter the number you see in the box below. If you do not see anything leave the box blank

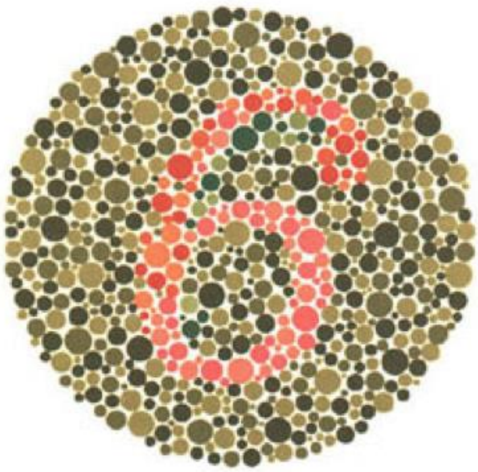
0 Number

Next

Powered by Qualtrics

0% Survey Completion 100%

AUT



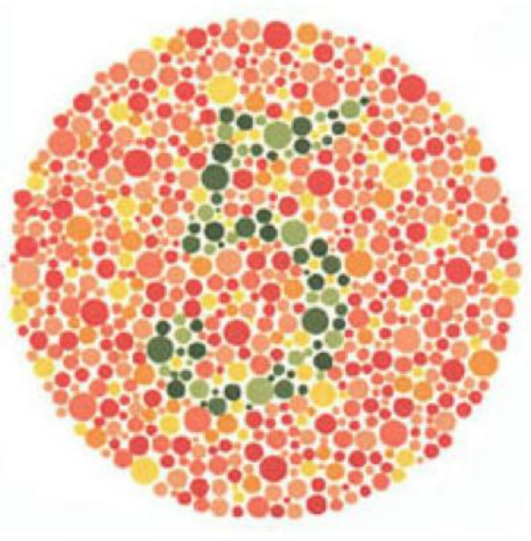
For the above plate, enter the number you see in the box below. If you do not see anything leave the box blank

0 Number

Next

0% Survey Completion 100%

AUT



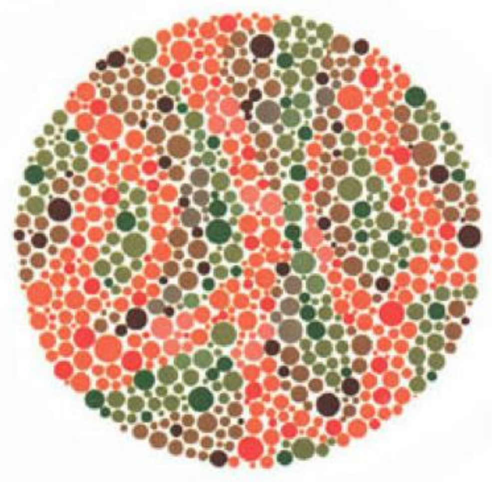
For the above plate, enter the number you see in the box below. If you do not see anything leave the box blank

0 Number

Next

0% Survey Completion 100%

AUT



For the above plate, enter the number you see in the box below. If you do not see anything leave the box blank

0 Number

You are nearly finished

Next

0% Survey Completion 100%

AUT

Did you notice any scents within the laboratory setting?

Yes (If so, what can you smell?)

No

I feel that the scent is: (Please select the appropriate circle for each line) *If you did not smell any scents please disregard this question*

Very Unpleasant	O	O	O	O	O	O	O	Very Pleasant
Very Unfamiliar	O	O	O	O	O	O	O	Very Familiar
Very Weak	O	O	O	O	O	O	O	Very Strong

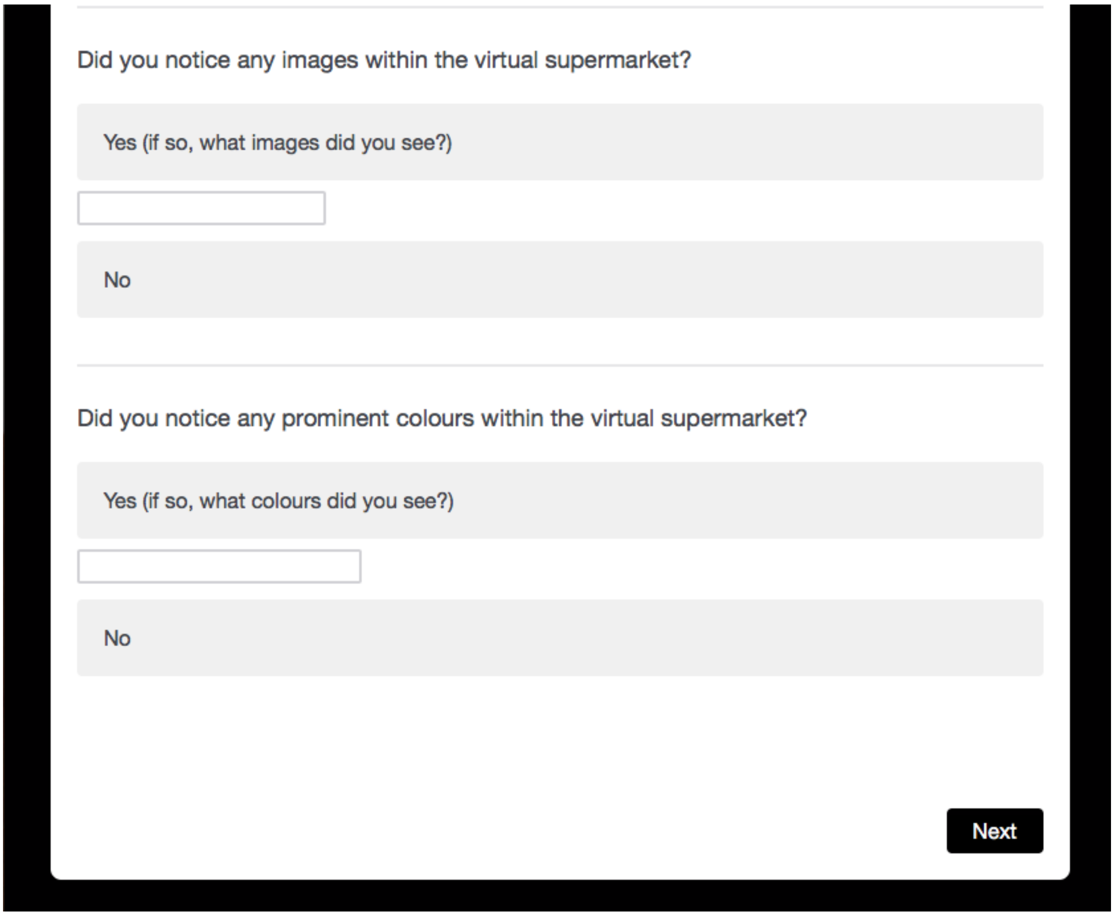
Did you notice any sounds or background music whilst in the virtual supermarket?

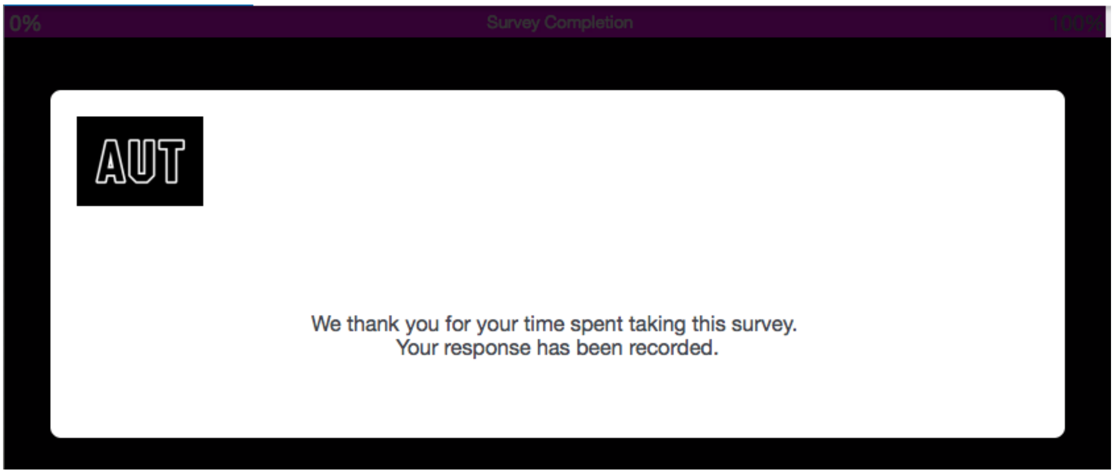
Yes (if so, what did you hear)

No

On a scale of 1-7, how irritating was the noise heard through your headphones? *If you did not hear any sounds or music please disregard this question*

Not at all irritating	O	O	O	O	O	O	O	Very irritating


Did you notice any images within the virtual supermarket?
Yes (if so, what images did you see?)
No
Did you notice any prominent colours within the virtual supermarket?
Yes (if so, what colours did you see?)
No
Next


0%
Survey Completion
AUT
We thank you for your time spent taking this survey.
Your response has been recorded.

Appendix V: Online calculator NPSC

http://www.foodstandards.govt.nz/industry/labelling/pages/nutrientprofilingcalculator/Default.aspx

Appendix W: Example health basket scoring

Your receipt for your groceries

-8	Avocado Hass	$1.99	F&V
-8	Avocado Hass	$1.99	F&V
-7	5 Kumara Red Washed	$3.50	F&V
-10	Courgette	$4.99	F&V
-5	4 Bananas Yellow	$1.20	F&V
-10	Pak Choy bunch	$1.99	F&V
-8	Cherry tomatoes punnet	$3.49	F&V
-10	Eggplant	$1.79	F&V
-13	Broccoli	$1.79	F&V
0	Fresh Eggs Mixed Grade	$3.25	Eggs
-10	Chickpeas	$1.69	F&V O
4	500 gr. NZ King Salmon	$18.00	M&S
-2	1000 gr. Chicken drumsticks	$10.99	M&S
2	Pita bread	$3.25	B&B
-11	Spinach	$3.99	F&V

total: $63.89

Total NPSC Basket Score: -92
DV1 Score: -1.440
DV2 Score: -6.13
DV3 Score: 0.219
DV4 Score: 0.933

Fruit & Veg (F&V) = 10
F&V Other (F&V O) = 1
Meat & Seafood (M&S) = 2
Bread & Bakery (B&B) = 1
Eggs = 1
Total Healthier Product Category Basket Score =14