PREDICTION OF PEOPLES' INTENTIONS AND ACTUAL CONSUMPTION OF FUNCTIONAL FOODS IN PALMERSTON NORTH

A thesis presented in partial fulfilment of the requirements
for the degree of
Doctor of Philosophy
in
Food Technology
at Massey University Palmerston North, New Zealand

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2009

ACKNOWLEDGEMENTS

First of all, I would like to thank both of my supervisors Dr. Brian Wilkinson and Dr. Janet Weber who always support me with care and patiently give me good advise.

Without this important person, I may not be able to come to study at Massey University, with lots of help and support. My sincere thanks go to Associate Professor Suwit Laohasiriwong.

The assistance I have for from these people is gratefully acknowledged, Assistant Professor Pisit Dhamvithee for his advice about structural equation modelling

Professor Ian Warrington and Ms Manvir Edwards who always give their help to sort out whatever problems Thai students may have.

I would also like to show my gratitude to Peter Jeffery and Matthew Levin who have super good service mind, to help me sort out any computer related problems. Ms. Yvonne Parkes who help collecting returning survey letters and inform me always when my mum's letters arrive.

Special thanks go to Truyen Vothe and Phoung Dinh for helping me during the surveys many times in freezing cold and provide me regularly with good meals and Ms Gay Eustace for her good advice and support both work and mind.

My close friends who always share loves, laughs and tears, Angkana Noisuwan, Chanapa Sawatdeenaruenat, Somsaowanuch Chamusri, Supannikar Pakkethati and Weerawate Utto and family. Many thanks for always be there when ever I need you.

Big thanks to my family, my parents, brothers, sister-in-law who continuously support me from long distance.

I also would like to acknowledge the Thai government for providing me scholarship and Mahasarakham University for giving me study leave.

Special thanks to all of my participants in both focus groups and questionnaire survey. There are still many people who have helped me in one way or the other, but I cannot name you all here, please be assured you will always remember in my good memory of the time I spent here at Massey University.

ABSTRACT

Functional foods are a growing category in the food market, but little is known about New Zealanders' views or use of them. A study was carried out in Palmerston North over the period 2005-2006 to investigate determinants of functional food use. The study had two stages: firstly focus groups (5 focus groups, n=42) to understand more of the consumer's perspective, and then a detailed consumer survey. The questionnaire was based on the theory of Planned Behaviour (TBP), the Health Belief Model (HBM) and information gathered from the focus groups.

The results from the study showed that participants knew little about the functional food concept. There was also a strong indication of scepticism, with people concerned about adequate dosage and efficacy. Dietary supplements were seen as a way to achieve the benefit without some of the barriers associated with functional foods. Therefore, a significant proportion of the respondents (>30%) preferred to have the functional ingredients in pill form. Other respondents preferred to have functional ingredients delivered in a staple food that was consumed on a daily basis and the most preferred food vehicle was a drink. Nutrition and health were ranked highest as influencers of food choice, with taste and cost also ranked as important. Women were more likely than men to identify nutrition and health as their main influence.

An ANOVA model was used to establish the relationships between socio-demographics, health condition and health behaviour and the five attitudes factors (from exploratory factor analysis). No single attitude factor was significantly correlated with all the socio-demographic variables: women had less positive attitudes towards functional foods in general, were more likely to be sceptical and had less belief in the efficacy of functional foods. While more educated respondents considered functional foods to have less personal benefit, and those with lower income had less confidence in their own ability to consume functional foods.

Talking to others about functional foods was found to be significantly negatively correlated with all attitude dimensions and intentions indicating that when people talk to others that their views about functional foods become more negative. In addition, people who

currently used dietary supplements had less positive attitudes and lower intentions to consume functional foods in general. Those who had existing CHD or arthritis symptoms had lower intentions than others to consume functional foods directed towards these diseases.

Exploratory factor analysis also identified two factors related to intention to consume functional foods; one for functional foods in general and another for disease (arthritis and CHD) functional foods. Women had less intention to consume functional foods in general, while older adults were more likely to intend to consumer disease specific functional foods.

A series of models were evaluated by using structural equation modelling to see how well they could predict peoples' intentions to purchase and their actual purchase of functional foods in general, as well as disease specific functional foods. The analysis showed that the TPB model (R^2=57%) and a modified TPB (R^2=61%) better predicted peoples' intention to consume general functional foods than the theory of reasoned action model (R^2=55%). However, a model that included the modified TPB model plus 2 constructs (perceived benefits, perceived barriers) from the health belief model was best of all (R^2=72%) at predicting peoples' intention to consume general functional foods. Perceived barriers were the most influential predictor of intention (barriers included uncertainty about efficacy and dose; surprisingly taste and cost were not significant predictors, but this was probably due to the fact these constructs were not explored as multi-dimensional constructs.

The models were poor at predicting intentions to consume specific functional foods, but the addition of perceived susceptibility and perceived severity improved prediction of intentions towards anti-CHD functional foods (R^2 = 43%). Perceived susceptibility, but not perceived severity, improved prediction of intention to consumer anti arthritis functional foods (R^2=37%).

The research suggests that attitudes towards the concept of functional foods are generally positive, but scepticism is evident. Functional foods are not necessarily seen as 'healthy', nor are they considered a way to treat existing conditions. Thus careful marketing will be required to target product and messages to relevant segments of the market.

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INTRODUCTION

1.1 Introduction

Foods have long been believed to have specific health promoting benefits in addition to provision of nutrients, e.g Hippocrates, 460 B.C. “let food be thy medicine”. But functional foods as a defined food category first appeared in Japan in the late 1980s when the Government was attempting to address a problem of escalating health care costs (refer to Arai, 1996). One of the government’s strategies for addressing this problem was to fortify foods with ingredients that would be capable of producing health benefits. In 1991, specific legislation was introduced by the Japanese Government to deal with foods for special health uses (FOSHU) and this legislation allowed food companies to make specific health claims for the foods so long as there was scientific proof to demonstrate the food’s efficacy in preventing a targeted health problem. The market for functional foods rapidly developed in Japan over the 90s and the success of the new food category in Japan quickly generated interest in other countries as well with the consequence that the functional sector is forecasted to be globally worth $US167 by 2010 (Business Wire, 2005).

The global functional foods market is a rapidly growing segment of the food industry and in 1998 was estimated to be worth approximately US$33 billion (Hilliam, 1998). According to a recent report released by Price Waterhouse in November 2009, the functional food market in the USA was worth US$27 billion in 2007, i.e. almost as much as the global market in 1998 (Heller, 2009). According to the latest study by global market analyst, Euromonitor International, the global functional foods market is expected to grow to US$167 billion by 2010 (Business Wire, 2005).

The functional foods market is probably healthiest in the USA at the moment. In 2008 the USA accounted for 30% of all functional product launches with 551 new introductions (Heller, 2009). The pace of new introductions remained high in 2009 in the USA, and by the end of August 2009 US companies had released 330 new introductions. Japan was second with 179 releases, followed by Germany (129), Italy (122) and the UK (107). The same Price Waterhouse report claimed that the market in the USA was expected to grow at a rate of up to 20% over coming years. This growth was being stimulated, according to the authors of this report, by consumers' willingness to pay higher prices for foods that target health problems.

While some consumers will pay a premium for functional foods others are sceptical about the claims made (Cross, 2009). Regulation of claims is a controversial aspect of the functional food industry, with industry arguing that health claims on food products are necessary to drive innovation and lead to further health benefits (IFIC, 2000). Health experts argue that many claims that have been suggested for functional foods are not sufficiently substantiated, and that benefits may only be applicable to small segments of the population or with very high consumption (Williams, 1998). Growing concern about the increasing number of unregulated claims resulted in the 2006 European Union legislation which sets out strict guidelines for substantiating claims. This has lead to the situation where in October 2009 the European Food Standards Authority (EFSA) rejected 70 per cent of health claims proposed by industry (Starling, 2009). Matters are so serious in Europe, according to the editor of on-line publication NutraIngredients.com that food companies may have to close their research laboratories in Europe (Starling, 2009). It is possible that EFSA rules on proof of efficacy may spread to other countries as well. If this were to happen, the functional foods market would slump worldwide with serious consequences for many food companies.

The New Zealand legislation on health claims has been under review since 2004, and perhaps consequently, the functional food market does not appear to be as developed as in some other countries. There is no published data on the size of the domestic functional food market in New Zealand. Investment New Zealand, the investment promotion agency of the New Zealand government, has identified functional foods as being a major new investment opportunity. Its promotional materials cite New Zealand as being ideally placed due to existing expertise in food technology and research into functional food components (Functional Foods, 2009). Investment New Zealand goes on to state that New Zealanders are early adopters of new technologies and so would be an ideal test market for newly developed functional foods. But there is no evidence that early adoption of technology applies to food products; in fact in 2009 the New Zealand public appeared to reject the mandatory fortification of bread with folate (Lederman, 2009). Although public objection to folate fortification was partly due to its mandatory nature, there is also anecdotal evidence that New Zealanders are sceptical of the functional food concept. There is no literature at present relating to what New Zealanders know about functional foods, whether they consume them and their attitudes towards them.

Acceptance of functional foods is likely to have a cultural dimension, but the literature shows some similarities across cultures. Studies in the USA, Europe and Asia suggest that socio-demographic factors, such as level of education (Childs and Poryzees, 1998), personal wealth (Childs and Poryzees, 1998; Turrell *et al.*, 2003), gender (Bech-Larsen and Grunert, 2003; Gilbert, 1997; Poulsen, 1999), age (Gilbert, 1997; IFIC, 2002; Poulsen, 1999), make-up of the family (de Jong *et al.*, 2003; IFIC, 2002) have all been shown to be related to peoples' purchases of functional foods. Other factors too, such as knowledge of functional foods (Lappalainen and Sjödén, 1992), health status (IFIC, 2000), and health concerns (de Jong *et al.*, 2003) have been shown to influence peoples' purchases of functional foods.

The use of health claims to market functional foods is making the assumption that increased knowledge about the benefit obtained from a food will lead to increased sales. There has been some evidence of this, for example Kellogg's reported increased sales of high fibre products (Nestle, 2002). But there is also ample evidence that knowledge is not sufficient to lead to food behaviour change (Worsley, 2002). To help determine the content of health claims and related marketing it is important to know how consumers' knowledge and attitudes about functional foods relates to intention to purchase as well as actual purchase. A number of models have been successfully used to predict diet related behaviour and intentions, including the Theory of Planned Behaviour (Ajzen, 1991) and the Health Belief Model (Janz *et al.*, 2002). The Health Belief Model is appealing in relation to understanding functional food use because it posits that highly rating the severity of and personal susceptibility to a disease that can be prevented by a functional food will increase the likelihood of consumption, and hence this information might be a useful part of a marketing campaign, although existing marketing tends to avoid this aspect.

Further understanding of factors predicting consumers' use of functional foods is necessary for the food category to continue its rapid growth. Better understanding of the New

Zealander consumers' views and practices will help identify potential products and marketing strategies, and hopefully also lead to improved health status.

1.2 Purpose of the study

The overall aim of the project was to find out how much New Zealanders knew about functional foods, whether they consumed them, their attitudes to general and specific functional foods and to use these findings to evaluate a series of models to predict their intentions to consume, and their actual consumption of these products.

1.3 Overview outline

In Chapter 2, the literature related to this study is reviewed; definition of functional foods, functional food market, socio-demographic factors related functional food acceptance and theoretical models that could be applied to predict functional food intention and consumption.

The aim of chapter 3 was to find out what New Zealand consumers knew about functional foods, their definition of a functional food, and their attitudes to functional foods in general and to specific functional foods. This was done using focus groups. The focus groups also explored consumers' willingness to purchase functional foods in general, as well as functional foods designed to prevent/ameliorate arthritis.

The aim of chapter 5 was to describe the characteristics of the respondents, the best vehicle for delivering functional ingredients and the effects of socio-demographics on factors influencing peoples' food purchase decisions and also the trustworthiness of sources of information about functional foods.

In chapter 6 the aim of the chapter was to explore what effects socio-demographics, health condition and health behaviour had on various dimensions of attitude to functional foods and on consumption of general and specific functional foods.

The aim of chapter 7 was to assess the predictive power of three models in predicting respondents' intentions to consume general functional foods. The three models considered were the theory of reasoned action (TRA), the theory of planned behaviour (TPB) and a modified theory of planned behaviour.

In chapter 8, the aim was to firstly determine whether people with arthritis would have different attitudes and intentions towards functional foods compared to people without arthritis. The second aim of the chapter was to find out whether the models used to predict the intentions to consume functional foods by people with and without arthritis would have the same constructs in the respective models (i.e. attitudes, subjective norms, and perceived behavioural control) and whether the β–weightings in the respective models would be the same. A modified theory of planned behaviour model that included two constructs from the health belief model (perceived benefits and perceived barriers to the consumption of functional foods) was also evaluated to see whether this model was better at predicting actual consumption by the two groups than was the modified TPB model.

In chapter 9 the aim was to investigate the influence of perceived susceptibility and severity to arthritis and CHD on intention to consume functional foods directed at these diseases. To do this, a further modification to the TPB model plus health belief model was used to predict the respondents' intentions to consume specific functional foods designed to treat both CHD and arthritis. The modified model included two further constructs from the health belief model. These were the perceived severity of the disease and perceived susceptibility to the disease.

Chapter 10 summarises the main findings from the study and offers some recommendations for further work in the area.

Chapter 2

REVIEW OF THE LITERATURE

2.1 Introduction

This chapter provides an overview of the literature that is germane to this study. Literature that is specific to an aspect of the study that is required in greater detail than has been provided in this chapter has been provided in the chapter that deals with that aspect of the study. This chapter contains six sections. The first three sections of this review of the literature deal with issues such as the definition of a functional food, growth of the functional food market, and socio-demographic factors related to functional food acceptance. The other three sections describe two chronic diseases involved in the study, the empirical studies on the models that have been used in the study and a summary.

2.2 Definition of Functional Food

The concept of functional foods first appeared in Japan in the late 1980's when the country was faced with escalating health care costs (refer to Arai, 1996). The Japanese wanted to find alternative ways to reduce these costs by preventive measures. One of the options in their preventative campaign was to fortify foods with ingredients that would be capable of producing the desired health benefits. In 1991, specific legislation concerning foods for special health uses (FOSHU) was introduced in Japan, allowing health claims to be made on the basis of a scientific dossier, after governmental approval (Verschuren, 2002).

Many terms have been given to identify these foods, such as 'functional foods', 'nutraceuticals', 'medical foods', 'nutritional foods', 'pharma foods', 'healthy foods', 'wellness foods', and 'designer foods' and numerous efforts have been made by scientists and organisations to define what is meant by the terms (Childs and Poryzees, 1998; Hasler, 1996). For instance, Hasler (1996) defined a functional food "as being foods or food components, which had been designed to help adjust the human body and heal or prevent disease". The International Food Information Council (IFIC) defined a functional food as 'any food or food component that may provide a health benefit beyond basic nutrition' (IFIC, 2002; Schmidt, 2000) and 'foods that by virtue of physiologically active components provide health benefits beyond basic nutrition' is the definition given by The International Life Sciences Institute (ILSI) (McCaffree, 2001). Stanton *et al*. (2001) defined a functional food in the same way as the above authors, however, he also included probiotic foods, prebiotic compounds, synbiotic substances or biogenic compounds. Food Standards Australia New Zealand (FSANZ) defines functional foods as being "... similar in appearance to conventional foods and intended to be consumed as part of a normal diet, but modified to serve physiological roles beyond the provision of simple nutrient requirements" (*Functional Foods, The Australian Food and Grocery Council*, 2003).

There are many dimensions and terms with the implication being, it is difficult to assess the literature. The term nutraceutical is a bit different from a functional food because it includes dietary supplements and emphasises treatment of disease rather than prevention. Nutraceutical are defined as being 'a food, dietary supplement or medical food that has a medical - health benefit including the prevention and treatment of disease', and it is now becoming a standard term in the medical and scientific industries (Childs and Poryzees, 1998; Dolan and Ponnampalam, 2001). The US Dietary Supplement Health and Education Act of 1994 (DSHEA) defined dietary supplement as "a product, other than tobacco, intended to supplement the diet that contains at least one or more of the following ingredients: a vitamin, a mineral, a herb, an amino acid or, other botanical; a dietary substance for use to supplement the diet by increasing the total dietary intake; or a concentrate, metabolite, constituent or extract of any of these ingredients" (Camire, 2000).

There appears to be disagreement as to whether "fortified foods" are a type of functional food. Fortified foods are described as "any food that has been supplemented with essential nutrients either in quantities that are greater than those present normally, or which are not present in the fortified food" (Sichert-Hellert and Kertsing, 1999). Thus fortified foods are "modified to provide physiological role", but because fortification refers to essential nutrients it could be argued that they are supplying "simple nutrient requirements" and hence not functional. Some researchers have included fortified foods under the functional foods umbrella (Saher *et al.*, 2004; Urala and Lähteenmäki, 2004), while others have excluded them (Ohr, 1999). In some of the literature it is not clear if they are intended to be included or not (Verbeke, 2005). For this study, fortified foods are included under the functional foods concept.

Functional foods can easily be distinguished from dietary supplements in the form of a pill, capsules, liquids or powders, but some dietary supplements are in the form of food. In New Zealand, products sold as dietary supplements have expanded to include some fortified foods that do not meet the requirements of current food regulations (New Zealand Food Safety Authority, 2008). These latter type of dietary supplements are on a blurred line between foods and medicines because legally they are neither food nor medicine. At the moment, all dietary supplements in New Zealand remain under the Dietary Supplements Regulations 1985 as an interim measure pending decisions on the future regulation of these products. Thus, in New Zealand 'foods' can fall under the dietary supplement regulations, e.g. Analene yoghurt, and some fruit flavoured drinks- legislation aside, these appear to be functional foods.

As can be seen from the above there is no formal, agreed definition for a functional food. The definitions of functional food are broadly given and overlap with fortified food, dietary supplements and nutraceuticals. For the purpose of this study, a functional food has been defined as any food or food component that is intended to be consumed as part of a normal diet, but modified to serve physiological roles beyond the provision of simple nutrient requirements. This is interpreted to include fortified foods, e.g. the addition of micronutrients not normally present in a food or added in enhanced amounts. Some functional foods, according to the definition that is used in this research, are legally classified as dietary supplements in New Zealand. However, pills, capsules, powders and liquids not consumed as a 'traditional food' are not included in this definition.

2.3 Functional Food Market

Global market size estimation for functional foods is provided here in more detail (Table 2.1) than was presented in the introductory chapter. The data in Table 2.1 would suggest that the market for functional foods is expanding rapidly and forecasts are predicting continued growth into the future. However, as pointed out in the introductory chapter, legislation in Europe is likely to curtail and even stop growth in Europe and possibly other countries too if a similar regime is adopted by other countries. It is difficult to quantify the market size in part because of the lack of a clear definition. According to de Jong *et al*. (2003), there is some evidence to suggest that dietary supplement consumption is being included in functional food consumption and this too makes it difficult to quantify actual functional food sales and their potential growth in coming years.

Information about the functional food market in specific countries and continents is also available. In Europe, the estimations suggest that the market exceeds US$ 2 billion/annum (Menrad, 2003). The most active area within the functional foods market in Europe has been probiotic dairy products, in particular, probiotic yoghurts and milks. In 1997, these products accounted for 65% of the European functional foods market, valued at US$ 889 million, followed by spreads, valued at US$320 million and accounting for 23% of the market (Stanton *et al.*, 2001). There is evidence to suggest that Europeans are becoming more knowledgeable about functional foods and that their understanding of the relationship between diet and health is growing. This suggests that the functional foods market is ready for rapid growth (Hilliam, 1998).

Table 2.1: Global market size estimation for functional foods*

Year	Definition	Market size (Million US$ per year)	References
1992	Functional, enriched and dietetic foods	15,000	Menrad (2000)
1994	Functional foods	6,600	Hilliam (1998)
1995	Functional foods	10,000	Arthus (1999)
1995	Functional foods	11,300	Heller (2001)
1995	Functional, enriched and dietetic foods	21,700	Menrad (2000)
1997	Foods with specific health benefits	10,000	Byrne (1997)
1998	Foods with specific health benefits	22,000	Gilmore (1998)
1999	Functional foods	16,200	Heller (2001)
2000	Functional foods (forecast from 1998)	17,000	Hilliam (1998)
2000	Functional foods (forecast from 1997)	17,000	Hickling (1997)
2000	Functional foods	33,000	Hilliam (2000)
2000	Foods that make specific health claims	7,000	Weststrate, van Poppel, and Verschuren (2002)
2004	Functional foods (forecast from 2000)	50,000	Euromonitor (2000)
2010	Functional foods (forecast from 2000)	49,000	Heller (2000)

Source: Verbeke (2005)
* the market size each year may vary depending on the definition of functional foods in each report

The functional foods market is rapidly growing in Asia too. Japan is the biggest functional food market in the world. The size of the functional foods market in Japan has been estimated to be around US$11.7 billion in 2003 (Bech-Larsen and Scholderer, 2007). The per capita dollar spend per annum by Japanese people on functional foods is currently US$195 per person a year. This amount is approximately four times that of European consumers (*Novel products in Japan give flavour of future trends*, 2004). In China, the consumption of commercially manufactured functional foods is increasing with increases in their sophistication, wealth and concerns about health and knowledge of health products. The functional foods distributors in China made US$360 million in 2003 (Bostic, 2004). The Singapore market for healthy foods and nutritional supplements was estimated to be worth approximately US$ 45 million, about 60 percent of which was vitamins and mineral supplement products (2001). In Thailand, the market size for health foods products was estimated in 2004 to be about NZ$ 220-360 million, with the demand for functional foods growing by between 5 percent and 10 percent per annum, stimulated by the expansion of hypermarkets and supermarkets (Suwanprakorn, 2002).

There is no published data on the functional food market in NZ. The annual retail worth of New Zealand's health food and supplement industry was estimated to be NZ$222 million in 2002 (Taylor, 2003), which can, according to de Jong *et al*. (2003), be related to functional food consumption. The National Nutrition Survey by the Ministry of Health reported that half of the New Zealand population consumed a vitamin and/or mineral supplement in 1997 and about 29% of New Zealanders consumed other dietary supplement (Russell *et al.*, 1999). The international and domestic sales of one of New Zealand's largest health food and supplements company, Healtheries, rose rapidly at about 15% a year over the period 1998-2002 and had annual sales in excess of NZ$50 million (2002). Possibly functional foods have shown the same growth in sales over the period 1998 – 2002.

In summary, the functional foods market is growing rapidly in most countries. This growth in the functional food market is a result of industry looking for new niches; with scientific breakthroughs motivating development of new products and consumer demand. Ultimately consumers must accept and demand functional foods for their efficacy if the industry is to be sustainable. Thus the reasons why consumers purchase functional foods needs to be determined if the industry really wants to expand functional food demand.

2.4 Functional Food Acceptance

In many countries around the world, people are becoming wealthier to the point where their discretionary income is such that they can afford most foods. Factors other than hunger and poverty now come into play when they make their food decisions. These other factors include preferences, attitudes, ethics, culture, religion, morals, safety, prestige, impulse, satiety and enjoyment. According to Pfannhauser (2003), 'socio-demographic aspects or factors' was stated as one of an important factors that affect food choice. Moreover, other factors such as consumer's knowledge about functional foods and also biological factors had an impact on functional food acceptance as well. These factors need to be considered in the development of any functional food as the success of any such venture will depend on a thorough understanding of the potential consumers of such products.

The consumption of functional foods and supplements by consumers in Holland was studied by de Jong, *et al*. (2003), and they found that the variables that most affected the consumption of these products was firstly the type of functional product, then gender, age, and education. Age, belief, knowledge, and presence of an ill family member have also been shown to be important determinants in functional food acceptance (Verbeke, 2005). Nonetheless, Urala and Lähteenmäki (2003) reported that gender, age, state of health, and BMI had no effect on the frequency of use of functional food products by Finnish consumers.

Because there are numerous definitions of functional food, it is difficult to compare the studies. However, in spite of the non-uniformity of a definition for functional foods there appears to be some underlying variables that are common to many studies and these will be examined in the following sections.

2.4.1 Functional food acceptance and socio-demographic characteristics

Socio-demographic characteristics of the population appear to have a significant impact on functional food consumption. Factors that have been reported by at least one study to affect the types of functional foods that are consumed in a household are: economic circumstances, the household dietary pattern, age of household members and the stage they are at in the family life cycle, and finally the distribution of ages within the family (Urala and Lähteenmäki, 2004). Gender and education have also been identified as relevant.

2.4.1.1 Gender

A number of studies have highlighted the influence of gender on functional food consumption and on interest in nutrition and healthy eating in general. Women were most likely to be functional food users (Bech-Larsen and Grunert, 2003; Gilbert, 1997; Poulsen, 1999), to take supplements (de Jong *et al.*, 2003; Harrison *et al.*, 2004; , 1998) and have a greater concern about health conditions (Beardsworth *et al.*, 2002; Noble *et al.*, 2003) compared to males. Moreover, Childs and Poryzees (1998) reported that females' purchase interests and beliefs in the health benefits of functional food were stronger than that of males. Awareness of food components related to disease and health issues (menopause, urinary tract infections, breast cancer, and osteoporosis) is also higher for US women compared to men. On the other hand, men were more likely to be concerned about food associated with energy and fatigue (2002). It would appear that men are unlikely to use books and magazines as nutrition information sources (Ralph *et al.*, 1996) and are less interested in eating healthily (Ralph *et al.*, 1996; Roininen *et al.*, 1999).

In New Zealand, a study by Worsley and Scott (2000) showed that women were generally more concerned than men about food safety, food system issues and health. The New Zealand National Nutrition Survey (1997/98) showed that women, both New Zealand Maori and European, were more likely to take dietary supplements than men (Russell *et al.*, 1999). It is clear from the above that women have been shown to be more responsive to food and health issues and they seem to adopt diet supplements and functional foods easier than men.

2.4.1.2 Age

Age has been shown to be associated with food choice. Quantitative studies reported that middle to older aged people were most likely to be functional food users (Gilbert, 1997; , 2002; Poulsen, 1999); older men were more likely than younger males to take supplements (Lyle *et al.*, 1998); and older consumers were more likely to consume healthy products (Childs and Poryzees, 1998; Poulsen, 1999; Roininen *et al.*, 1999). Whilst older consumers (>55 year olds) tended to choose foods primarily to prevent disease, younger consumers mainly selected foods on the basis of their taste, quality, price and convenience (Bhaskaran and Hardley, 2002). For example, elderly Finnish (68 years) consumers were more interested in products labelled high in fibre than the younger respondents (15 years) (Tuorila *et al.*, 1998).

Age has also been found to be associated with attitudes towards food, health and functional foods. Wrick (1995) stated that 50% of American adult participants, particularly in the older age groups, had not only read or heard about natural substances in foods that could help to prevent chronic diseases, but they also believed that these substances really did work. According to the study of McFarlane and Pliner (1997), their result showed that older participants were usually more enthusiastic to try novel foods than younger ones and were more positive about functional food than younger respondents (Poulsen, 1999). The study of IFIC (2002) reported that older respondents were more concerned about their health than younger respondents. The elderly consumers who were well informed and knowledgeable about functional foods showed a significantly higher likelihood to accept functional foods than younger consumers (Verbeke, 2005).

Research in New Zealand has found similar associations with age. In New Zealand, Worsley and Scott (2000) studied food and health concerns and found that middle-aged and older consumers were more concerned about illness and food issues than younger people. Wright and Lake (1998) reported that calcium and bran use increased with age in New Zealand females, however no clear age trend was observed for supplement use. Surprisingly Russell, Parnell, and Wilson (1999) reported that vitamin/mineral supplement use by New Zealanders was highest amongst the 19-24 years of age group and lowest by those who were 75+ years of age. It would be interesting to see whether functional food use by New Zealand consumers is positively or negatively correlated with increasing age given the supplement trends.

2.4.1.3 Household income

The association between household income and food purchasing and food consumption behaviour has been studied in several countries. According to Lyle *et al*. (1998), income had no relationship to American consumers' consumption of dietary supplements. Moreover, Poulsen (1999) who reported on Danish peoples' attitudes to functional foods showed that they were not influenced by consumer income. Whilst education and occupation showed non-significant association with food choice in Australian consumers, household income showed a strong association with food choice as the high-income households were likely to have a purchasing pattern consistent with nutrition messages (Turrell *et al.*, 2003). In addition, a study by Childs and Poryzees (1998) reported that high-income Americans presented greater belief intensity about the abilities of certain substances in natural foods to prevent disease than low-income groups. Thus income does show some association with food choice related to health, but not so clearly with functional foods, this is surprising given their premium price.

No information is available in New Zealand on the relationship of income to functional food consumption. However, the New Zealand Department of Statistics in their average weekly income reports suggest that people from NZDep96[1] quartile I[2] areas were more likely to take vitamin and mineral supplements compared with people living in quartile IV areas (Russell *et al.*, 1999). This might suggest that wealthier households are more likely to purchase functional foods than low-income households. However, this supposition will need to be investigated in the current research.

2.4.1.4 Household composition

In most developed nations, and even developing countries, household size has tended to decrease over the last 2-3 decades (New Zealand's official statistics agency, 1999). This trend is evident in New Zealand, where the average household size has decreased because of a rising number of one-person households and a decline in the average size of family households (Pink, 2001).

The evidence for the effects that children have on functional food consumption by households is unclear. However, information does exist to show that children in the household do influence food purchase decisions (Gelperowic and Beharrell, 1994) and that older children have a more powerful influence than younger children (Swinyard and Sim, 1987). Nowadays, most families have few children; working parents have enough money for their children to have a major say in what they the children will consume and their

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[1] An index of deprivation for small areas.

[2] Quartile I areas is "least deprived". Quartile IV areas is "Most deprived".

decision making is fuelled by a huge amount of product advertising that is directed at the children (Wimalasiri, 2000). A high proportion of people who have children or look after them tend to look for and feed them healthier food than they might ordinarily eat themselves according to Gilbert (2000). Moreover, their attitudes to diet and health tend to have a major influence on the attitudes of their children (Colavito *et al.*, 1996). It would be expected therefore that children could have a major influence on the purchase of functional foods by a household if the educational advertising were directed at the children. Clearly, this is something that could possibly be investigated in the present study.

Married consumers were more likely to be positive about the concept of functional foods than single consumers (de Jong *et al.*, 2003). It was reported that married people (62%) were more likely to eat functional foods for their health benefits than single Americans ($\simeq$ 52%) (2002). It would seem therefore that household composition is a major sociodemographic factor that affects functional food consumption and should be included in the present study.

2.4.1.5 Education

A number of studies have shown that education has some relationship to the consumption of functional foods and/or dietary supplements. Lyle *et al*. (1998), for instance, found that consumers who had been educated beyond high school tended to consume more multi-nutrient supplements and vitamin C and E supplements than lesser educated US consumers. Bender *et al*. (1992) and Slesinski *et al*. (1996) too found that supplement consumption tended to correlate highly with a higher education level in the US. Swedish men who had higher education than high school were found to be using twice the amount of supplements than men with elementary education but this relationship was not found with women (Messerer *et al.*, 2001). In New Zealand, B-complex and B6 vitamin supplement consumption was found to be correlated with higher educational level (Wright and Lake, 1998). Moreover, education has been reported to be positively associated with belief in nutraceutical claims (Childs and Poryzees, 1998). Conversely, Poulsen (1999) found that education level showed no correlation with functional food consumption by Danish consumers. Most studies have shown that the consumption of supplements tends to increase with increasing educational achievement, however, no such relationship has yet been demonstrated for functional foods. Clearly, this is an aspect that could be investigated in the present study.

In sum, it is clear from the previous studies that there is no consensus on the effects of socio-demographic backgrounds on the consumption of functional foods.

2.4.2 Functional food acceptance and biological factors

2.4.2.1 Health condition and health concern

People want to live longer, so they are more concerned about health and nutrition, which in turn means they are demanding special characteristics in food (Mitsostergios and Skiadas, 1994). According to Sloan (2004), American people want to prevent or treat themselves for diseases such as obesity/overweight, arthritis and high cholesterol and this in turn influences the foods they consume.

According to Xu (2001) people are adopting what he calls a "biodefence" system, i.e., consuming foods and nutraceuticals that may prevent and even cure certain diseases. This sentiment would appear to be evident amongst Danish consumers who were willing to pay more for functional foods if they believed that the foods would have beneficial health effects (Poulsen, 1999). Therefore, health awareness is one factor which appears to have a major impact on peoples' pattern of food consumption. According to Herath, Cranfield and Henson (2008), Canadian respondents' perceptions of disease threats appeared to be a key factor influencing their willingness to consume functional foods and nutraceuticals, and this perceived disease threat tended to increase with age

According to Mark-Herbert (2003), the health and functional foods markets can be divided into four categories; mass market, prevention, at risk and sufferers. The "sufferers" segment (the lowest part of the triangle in Figure 2.1) is most likely to search for ways to relieve the symptoms by taking the product in a tablet form. So for instance, consumers with specific health condition used diet supplements that claimed to reduce the risk for their particular condition (Gunther *et al.*, 2004). In addition the results of Harrison *et al.* (2004) suggested that people with arthritis were more likely to have positive care-seeking behaviours (by taking dietary supplements such as fish-oil supplements). Use of dietary supplements appeared to be related to poor self-perceived health status, indicating that people use supplements as a form of self-medication. Bender *et al*. (1992) also reported that American people who had one or more health problems were more likely, and to more intensely, use supplements than individuals who perceived their health to be very good or excellent.

The "at risk" segment of Mark-Herbert's model (2003) is the group of people who are at risk of getting a disease so they often seek ways to minimize the risks without changing their lifestyle. The "prevention" segment consists of individuals who are interested in prevention and health concerns in general and they may take vitamins, minerals, and herbs to prevent the eventuality of a specific disease or diseases and thus may move to the product as a food. However, those who were at risk of developing or had developed the disease were less inclined to take the supplements. However, the study of Harrison *et al*. (2004) reported that people at risk of primary or secondary cardiovascular disease were less likely to take dietary supplements, although clinical trials of these supplements had shown their possible benefits. Conner *et al*. (2001) explained that beliefs and attitudes of individuals to health and care-seeking behaviours had an influence on dietary supplements use in women in the UK. American consumers who reported excellent health were more likely to consume functional food than other health status groups (IFIC, 2000). It indicates that we cannot assume that health condition or use of supplements will lead to the use of functional foods.

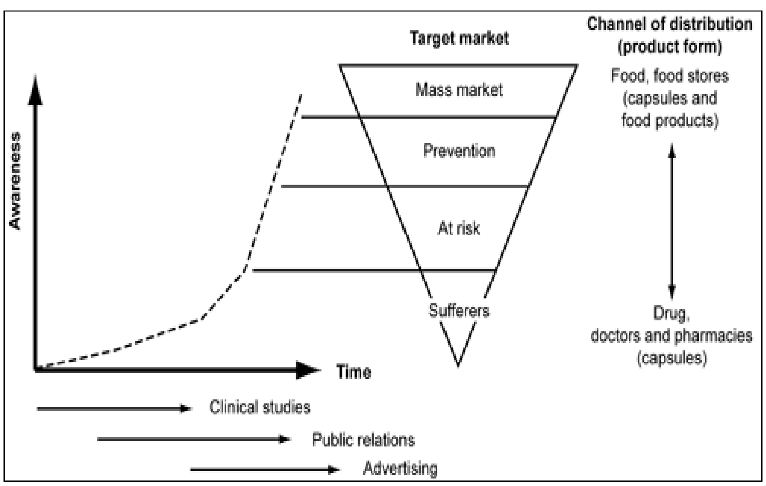


Figure 2.1: The business model for building awareness of consumers to functional foods
Source: Mark-Herbert (2003)

Health prevention is also a very important concern of New Zealanders (Prescott *et al.*, 2002). There is wide awareness that diet can influence disease risk, for instance, Wiseman (1994) reported that more than 90 per cent of New Zealand respondents in her study believed that they should consume less fat and more dietary fibre to reduce the risk of heart disease.

The evidence from previous studies has shown that there is a relationship between consumers' health status and supplement intake. However, there may not be a similar relationship between health status and functional food consumption, particularly consumption by people suffering from a disease such as arthritis and coronary heart disease. The evidence for this relationship is flimsy based on overseas studies and there is no research in New Zealand.

2.4.2.2 Health consciousness

Research suggests that consumption of dietary supplements is related to other health related behaviours. Studies have found that people taking dietary supplements have healthier lifestyles and considered diets to be a form of disease prevention (de Jong *et al.*, 2003; Frank *et al.*, 2000; Messerer *et al.*, 2001). Multi-nutrient supplement use was significantly higher amongst people who had never smoked at the time of the studies as compared to those who smoked (Lyle *et al.*, 1998). By contrast, US respondents who consumed approximately seven or more servings of alcoholic beverages per week were less likely to take multi-nutrient supplements than those who drank less (Harrison *et al.*, 2004; Lyle *et al.*, 1998; Slesinski *et al.*, 1996; Subar *et al.*, 1990). If functional food use followed dietary supplement use, it would be expected that use would be higher amongst those with clusters of healthy lifestyle behaviours (de Jong *et al.*, 2003).

Ironically, people who consume large quantities of vegetables and fruits also appear to be inclined to take vitamin and mineral supplements (Hill *et al.*, 1998). In a recent study, Harrison *et al*. (2004) also found that the consumption of fruits and vegetables by UK consumers was related to the use of vitamin, mineral and/or antioxidant supplements. People who had an average to moderate or high vegetable intake were more likely to consume several functional foods and Echinacea, with the exception of multivitamin and mineral supplements (de Jong *et al.*, 2003)

However, it appears that it is not only the health-conscious consumers who consume functional foods but also smokers and people with poor health status who consume functional foods, such as cholesterol-lowering margarine, to balance their unhealthy lifestyles (de Jong *et al.*, 2003).

Consumers' lifestyle such as physical activity, smoking and alcohol consumption appear to be correlated with food and dietary supplement consumption. These health behaviour factors ought to be explored in the study to see if there is indeed a relationship between healthy lifestyles and functional food consumption.

2.4.3 Functional food acceptance and consumer's knowledge about functional foods

People are unlikely to purchase or consume functional foods when they have no knowledge about them (Lappalainen and Sjödén, 1992). This knowledge gap seems to be a common barrier to functional food consumption. Moreover, the trustworthiness of information sources appears also to have an important influence on food consumption in general, and as a consequence on functional food consumption as well. Increasing interest in diets and nutrition may lead to an increase in interest in functional food. Wansink (2002) argued that although consumers believe in the health properties of certain foods, they normally hesitated to buy foods that they are unfamiliar with. Verbeke (2005) also reported that functional food acceptance was negatively affected by a lack of knowledge and awareness of the concept of functional foods.

The main information source that consumers have about functional foods is the mass-media coverage in the form of advertising. According to Schmidt (2000), consumers named medical sources and the popular media as their primary sources of information about foods and their health benefits. Consumers perceived medical sources (physicians, nutritionists and dieticians) to be more credible and thus more influential than the news media in the form of magazines, newspaper and television news (Lappalainen *et al.*, 1998). Females and respondents who trusted the food-related information sources responded more optimistically to the products with health-related claims than men and non-trusting respondents (Urala, 2005). Consumers want to use nutrition information (Jacoby *et al.*, 1977) and it may help them to understand the underlying science and thus make them more willing to buy food products. When consumers trust the information sources, then they are more accepting of the message and this message thus influences their attitudes and beliefs about the benefits of consuming functional foods. These positive attitudes and beliefs are more likely to lead to the consumption of functional foods.

2.5 Chronic Diseases

Functional foods have the potential to decrease risk and or severity of chronic diseases. From a marketing point of view, it is not clear if it is better to target the most common chronic diseases, i.e. the biggest potential market, or the chronic diseases with the most severe consequences. Chronic disease status of New Zealanders is reported by The Public Health Advisory Committee (2006) each year and according to this publication chronic diseases account for around 8 out of every 10 deaths and are the leading cause of illness. Arthritis is ranked as one of the most common chronic conditions in New Zealand, and affects one in six adults. Heart disease affects one in ten adults and is responsible for 25% of deaths.

2.5.1 Arthritis: prevalence, treatment and prevention

Arthritis is a common term used to cover a multitude of diseases that affect the connective tissue in joints, skin, and various internal organs. This term comes from the Greek words meaning 'inflammation of the joint'. There are more than 100 types of arthritis, including ankylosing spondylitis, chronic back injury, fibromyalgia, gout, infectious arthritis, lupus, osteoporosis, rheumatoid arthritis, and osteoarthritis (Weatherby and Gordon, 1999). The severity and the progression vary from one person to another. In general, the symptoms include pain, stiffness and inflammation of the joints.

The most common form of arthritis is osteoarthritis (OA) and affects over 190 million people worldwide (Barnett *et al.*, 1998; Hoby, 2002). Osteoarthritis is the term used to describe the degenerative diseases of the bone and joint that result from cartilage breakdown in joints, which could occur from injuries, repetitious joint stress, or generic deficiency (Hoby, 2002; Weatherby and Gordon, 1999). This disease mainly afflicts those who are aged 60 years or more, and there are about 16 million American people in need of treatment (Barnett *et al.*, 1998).

Table 2.2: Types of arthritis

Inflammatory	Non-inflammatory
Rheumatoid arthritis	Traumatic
Systemic lupus erythematosus	Osteoarthritis
Gout	Neuropathic
Scleroderma	
Psoriasis	
Sarcoidosis	
Sero-negative arthritis	
Juvenile arthritis	
Ankylosing spondylosis	
Dermatomyositis	
Reiter's syndrome	

Source: Rutter (2003)

Rheumatoid arthritis (RA) has a high prevalence in America (Jacobson *et al.*, 1997) and all over the world (Alamanos and Drosos, 2005). Rheumatoid arthritis is an autoimmune disease that causes chronic inflammation of the joints. Rheumatoid arthritis can also cause inflammation of the tissue around the joints, as well as other organs in the body. This disease imposes an enormous health care burden on consumers, as it requires extremely expensive treatment. People who suffer from rheumatoid arthritis spend 2 or 3 times more money for their health care than unaffected people of the same age and gender. It has been shown that the annual cost for Canadian patients in 1996 who were hospitalised for rheumatoid arthritis, was $US 2,299 per person and $US 13,549 for American patients (Lubeck, 2001).

2.5.1.1 The prevalence of arthritis in New Zealand

The overall incidence of arthritis in New Zealand (as reported by general practitioners) has been reported by the Ministry of Health(2004) as being one-sixth of all adults (15.7%, 15.0–16.4). The prevalence of arthritis amongst New Zealanders is shown in Figure 2.2 and shows that the prevalence in males (12.4%; 11.4–13.3) was lower than amongst females (14.4%; 13.4–15.4) (2004).

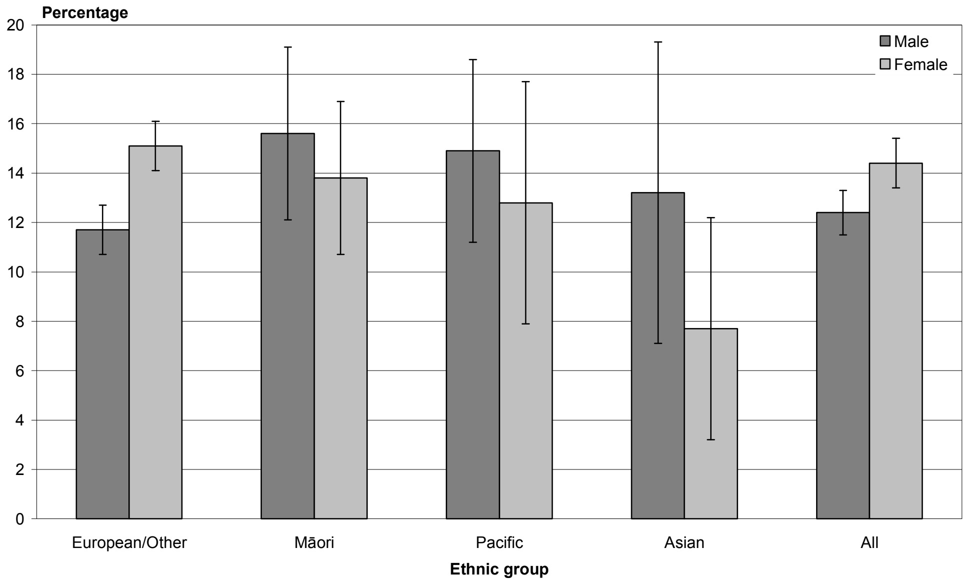


Figure 2.2: Arthritis in adults, by ethnic group and sex
Source: Ministry of Health (2004)

According to the Ministry of Health's document, a Portrait of Health (2004), the incidence of arthritis showed an exponential increase with age. Differences in prevalence between the sexes became evident in the 45 – 54 age bracket and peaked in those aged 65 – 74. Males showed a marked increase in prevalence between those aged 65 – 74 and those over 75 (Figure 2.3). However, the differences between women aged 65 – 74 and over 75 were minor.

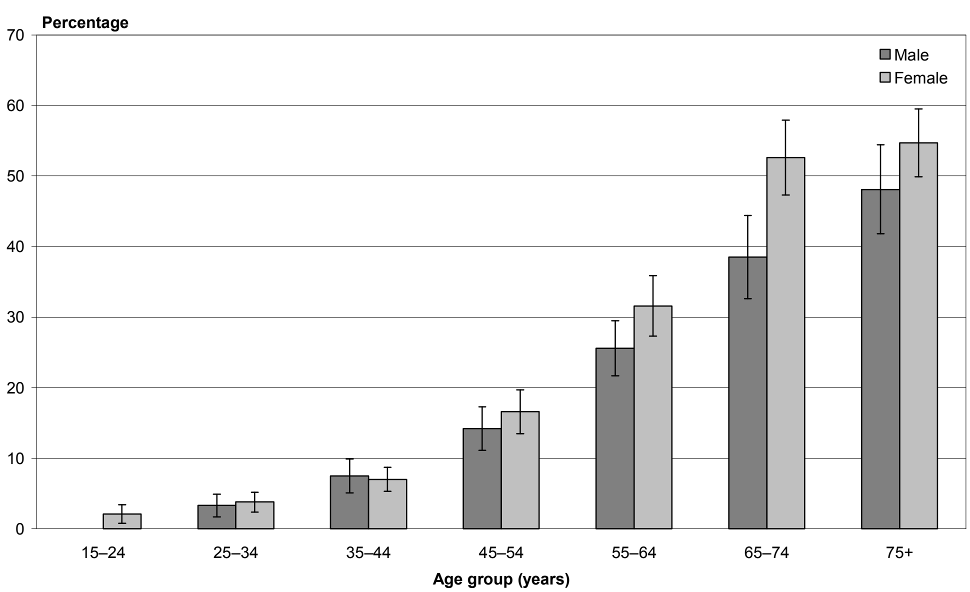


Figure 2.3: Arthritis in adults, by age group and sex
Source: Ministry of Health (2004)

Osteoarthritis has been reported as being in the top 10 list of non-fatal outcomes by the Ministry of Health, New Zealand (*The burden of disease and injury in New Zealand*, 2001). Osteoarthritis (7.7%, 7.2–8.3) is the most common type of arthritis in New Zealand, and is followed by rheumatoid arthritis (3.2%; 2.8–3.6). Since, arthritis is a global problem, the willingness of New Zealanders to take preventative measures for arthritis in the form of functional foods will be investigated in this study.

2.5.1.2 Treatment of arthritis

The treatment of arthritis typically includes drug therapy and physical or occupational therapy and recreational therapy. There are two major categories of drug therapy, which are used to treat symptoms and modify the course of the disease. The approaches to the treatment of arthritis are shown in Table 2.3. The medicines for the treatment of irremediable injured joints include analgesics, nonsteroidal anti-inflammatory drugs (NSAIDs), glucocorticoids, and disease-modifying antirheumatic drugs (DMARDs) (Goldring *et al.*, 2002). The traditional drugs known as non-specific non-steroidal anti-inflammatory drugs (NSAIDs), such as aspirin (ASA) and ibuprofen (Motrin) have been used to treat joint inflammation symptoms for at least a decade. The drugs work by decreasing inflammation and pain and relieving fever.

Table 2.3: Drug therapies for rheumatoid arthritis

For join inflammation and pain management	Traditional NSAIDs	aspirin and ibuprofen (Motrin)
	(COX)[3]-2 inhibition NSAIDs	celecoxib (celebrex) and rofecoxib (Vioxx)
For disease modification	Older drugs	D-penicillamine (Cupramine), gold salts (eg, auranofin (Ridaural)), steroids (eg, prednisone)
	Newer drugs	Methotrexate (Rheumatrex), monocycline (Minocin), etanercept (Enbrel), infliximab (Remicade)

Source: Ignatavicius (2001)

[3] Cyclo-oxygenase (COX) is an enzyme involved in the production of prostaglandins. The COX-1 enzyme protects mucus linings whilst the COX-2 enzyme causes intestinal contractions and inflammation.

Unfortunately, these drugs have long-term adverse effects, particularly the NSAIDs, that include bleeding, gastrointestinal (GI) disturbances, and tinnitus (Dieppe *et al.*, 2004; Singh and Rosen Ramey, 1998). It has been reported that they caused 60% increased risk of congestive heart failure compared to patients not taking the drugs (Page and Henry, 2000).

Complementary and alternative medicine has been defined as a group of diverse medical and health care systems, practices, and products that are not presently considered to be a part of conventional medicine (2007). The main reasons that arthritic patients search for complementary and alternative treatments rather than conventional drug therapies are tied up with the fact that the conventional drugs have failed to provide for the hoped relief of pain and suffering, the high cost of certain traditional medications and surgical treatments, and the potentially serious side effects associated with such medicines (*Alternative Treatments*, 2005). Dietary supplements and functional foods are a form of alternative treatments. Kaboli *et al*. (2001) reported that 28% of the respondents who suffered from some form of arthritis were complementary and alternative users. It has been reported that more than $1 billion is spent each year on non-traditional treatments for arthritis by American people (*Alternative Treatments*, 2005).

2.5.1.3 Anti-arthritis ingredients and products

Dietary supplements are an alternate way for patients to treat their arthritis and in particular osteoarthritis. The most common supplements are glucosamine, and chondroitin sulphate (CS). Commercially glucosamine and chondroitin enjoy very high sales in the USA ($273 million in 2003) and are now ranked in the top ten selling supplements (Runestad, 2004).

Glucosamine is a natural nutraceutical that can be found in the body and is one of the basic sugar components that stimulate cartilage cells to synthesise glycosaminoglycans (GAGs) and proteoglycans – compounds that are the building blocks of articular cartilage (D'Epiro, 1999). It has been studied in humans for more than 40 years and was studied in animals for a much longer time before it was ever fed to humans (Barnes, 2003). Chondroitin sulphate is also a glycosaminoglycan, that naturally occurs in the body and is involved in articular metabolism and can be used as a therapeutic agent in degenerative articular diseases (D'Epiro, 1999). Chondroitin sulphate plays a role in articular and bone metabolism by controlling cartilaginous matrix integrity and bone mineralization (Bali *et al.*, 2001). It is also thought to restrain the enzymes that break down cartilage tissue (D'Epiro, 1999). Several clinical experiments investigating the effectiveness of both glucosamine and chondroitin sulphate in the treatment of osteoarthritis have been executed over the past two decades and the results of these studies have shown positive effects for both active ingredients in osteoarthritis treatment (Braham *et al.*, 2003; McAlindon *et al.*, 2000; Richy *et al.*, 2003).

Glucosamine and chondroitin sulphate in bioavailable form have been shown to be safe and efficacious (Häuselmann, 2001; Leffler *et al.*, 1999), although not all studies have come to the same conclusion. Long-term treatment (3 years) with glucosamine sulphate has been shown to slow down the development of knee osteoarthritis (Pavelka *et al.*, 2002). Braham *et al.* (2003) suggested that the consumption of 2,000 mg of glucosamine daily could improve chronic knee pain after eight weeks. An overview of the efficacy of glucosamine for arthritis complaints has been summarised in Table 2.4.

Table 2.4: Overview of efficacy of glucosamine for arthritic complaints

Study	Joints evaluated	Arthritis symptoms significant difference
Braham *et al*. (2003)	Knees	0.038
D'Ambrosio *et al*. (1981)	Generalized OA	0.01
Das and Hammad (2000)	Knees	0.04
Giordano *et al*. (1996)	Generalized OA	0.001
Houpt *et al*. (1999)	Knees	NCS (0.1)
Hughes and Carr (2002)	Knees	NCS (0.1)
Leffler *et al*. (1999)	Knees or back	0.02
Mund-Hoym (1980)	Back	Sign. Diff. (0.05)
Pavelka *et al*. (2002)	Knees	0.01
Pujalte *et al*. (1980)	Generalized OA	0.01
Reginster *et al*. (2001)	Knees	Sign. Diff. (0.05)
Rindone *et al*. (2000)	Knees	NCS (0.1)
Tapadinhas *et al*. (1982)	Generalized OA	0.001

OA, osteoarthritis; NCS, not clinically significant.
Source: Anderson *et al*. (2005)

Likewise, research is not unanimous about the efficaciousness of chondroitin sulphate in improving osteoarthritis symptoms. A study by Bucsi and Poor (1998) indicated that sufferers taking 400mg of chondroitin sulphate twice a day increased the rate of improvement of osteoarthritis by 37% when compared to a control group. In 2004, Uebelhart *et al*. (2004) reported the efficaciousness of administering an oral dose of 800mg chondroitin sulphate per day for two periods of 3 months each over 1 year. They reported that there was a marked reduction in pain and improved knee function. Moreover, Bourgeois *et al*. (1998) indicated that a 1200 mg daily dose of chondroitin sulphate markedly improved the subjective symptoms of the disease and improved joint mobility in 3 months. However, a study by Michel *et al*. (2005) found that there was no significant difference in the inhibition of cartilage loss in the knee with chondroitin sulphate between treatment groups (800 mg of chondroitin sulphate daily for 2 years) and a control group. The researchers suggested that, whilst there was no significant symptomatic difference, long-term treatment with chondroitin sulphate might slow down progression of osteoarthritis of the knee.

Generally, glucosamine and chondroitin have been shown to have good results for osteoarthritis patients. Even though there are significantly different causes for the pathogenesis and treatment of osteoarthritis compared to rheumatoid arthritis, both diseases have the same end effects of causing joint pain and disability. It would be interesting to see whether these supplements had the same beneficial effects on people with rheumatoid arthritis as they obviously do with osteoarthritis sufferers.

The consumption of glucosamine-containing supplements for arthritis treatment is increasing, though growth in consumption is hampered because of consumers' concerns about the side effects of these supplements. Technically, glucosamine is a carbohydrate and could lead to changing blood sugar levels even though the body cannot convert glucosamine to glucose. However, Scroggie *et al*. (2003) suggested that the combination of glucosamine hydrochloride and chondroitin sulphate supplements did not significantly affect glucose metabolism in patients with type 2 diabetes mellitus. This view was backed up by Anderson *et al*. (2005) who reported that there was no toxicity effect when animals were orally given high doses of glucosamine (5000 – 15000 mg/kg body weight)/animal. However, van Blitterswijk *et al*. (2003) found in a two year study that high doses of glucosamine and chondroitin could possibly cause spinal disc deterioration. Glucosamine has been suggested as a more effective treatment of osteoarthritis than common anti-inflammatory medicines such as ibuprofen and aspirin and with less long term side effects (Fletcher, 2003).

Some other supplements are also used to treat arthritis. For example, phytochemicals from plants may slow and even stop the major oxidation-linked steps that are known to be involved in the development of arthritis (Shetty, 2004). Omega-3 and omega-6 (long chain polyunsaturated fatty acids) can inhibit the pro-inflammatory cytokines production and cartilage degradation enzymes (Cleland *et al.*, 2003). In addition, sea cucumbers are used to treat arthritis because they are rich in muccopolysaccharides and chondroitins which are thought to lubricate joints and connective tissues (Buckley, 2003). Green-lipped mussel (*Perna canaliculus*) extract, a traditional Maori nutraceutical medicine in New Zealand, has a beneficial anti-inflammatory activity and may help prevents arthritis in the rat (Singh *et al.*, 2008; Whitehouse *et al.*, 1997) and human (Gibson, 2000; Halpern, 2000).

In sum, glucosamine and chondroitin, two supplements for the treatment of arthritis, have been evaluated for their efficacy and side effects for over two decades and have proved to have fewer side effects than NSAIDs. Consequently they can be found in a range of supplements such as tablets, capsules, creams, liquid drinks and drink mixes that people can buy in preference to or in combination with NSAIDs to treat their arthritis. Currently, in New Zealand these substances are available as dietary supplement (pills and powders) but not in a 'food' form.

2.5.2 Coronary heart disease: prevalence and prevention

The most common cause of heart disease in New Zealand is coronary heart disease (narrowing or blocking of the coronary arteries that supply blood and oxygen to the heart). Coronary heart disease (CHD) can cause angina and heart attacks and lead to heart failure. The cost of coronary heart disease in New Zealand was last determined in 1993. The direct medical costs for CHD were approximately \$NZ179 million and the indirect costs were \$NZ14 - \$NZ24 million (Scott *et al.*, 1993). This cost would be substantially higher now.

2.5.2.1 The prevalence of coronary heart disease in New Zealand

Approximately 25% of all deaths in men and women in New Zealand are caused by coronary heart disease (Public Health Intelligence, 2004). This means a New Zealander dies from CHD every 90 minutes (16 deaths a day) and about 1 in 20 adults have been diagnosed with CHD (The National Heart Foundation of New Zealand, 2008). The burden of CHD in New Zealand in 2001-2003 (annual average) is depicted in Table 2.5.

Table 2.5: Coronary heart disease burden in New Zealand in 2001-2003 (annual average)

	Incidence count (n)	Prevalence count (n)	Mortality count (n)	Lifetable risk (%)	Median age of onset (yrs)	Median survival duration (yrs)	LE impact[1] (yrs)
Males	6,216	46,244	3,096	35.0	67.5	9.5	6.9
Females	4,418	28,162	2,554	28.3	77.5	6.2	5.7
Total	10,634	74,406	5,650				

Source: Tobias *et al.* (2008)

Note: Counts are average annual counts for the period 2001-2003, all age groups pooled.

[1] LE impact is the difference in life expectancy between the non-CHD and the CHD lifetable at the median age of onset.

The data in Table 2.5 shows that the median age of CHD onset was approximately 67.5 years and 77.5 years for males and females, respectively. Lifetable risks of CHD are 35% for males and 28% for females. 'Lifetable risk' is "the probability that an individual will have a major CHD event in his or her lifetime, taking into account risks of mortality from all causes" (Tobias *et al.*, 2008). There were around 5,700 mortalities from CHD including both in- and out-of-hospital deaths in New Zealand in 2003. Approximately 75,000 people are estimated to be living with CHD, with survival duration ranging from seconds to decades; median survival duration (time from first major CHD event to death from any cause) was 9.5 years for males and 6.2 years for females, reflecting women's much older median age at onset. On average, people with CHD lost 6.9 years of life expectancy (males) or 5.7 years (females). Tobias (2008) reported that the prevalence rates of CHD in NZ rise exponentially from about age 35-39 years, but peak at about age 85-89 (slightly earlier in males than females) and then plateau or even decline (although rates for ages >90 years are unstable because of small numbers).

2.5.2.2 Active ingredients and products for preventing coronary heart disease

There are many diet related risk factors for coronary heart disease; foods or nutrients may increase or decrease risk. Numerous studies have shown that some foods, e.g. oat bran, soya products etc. may reduce the risk of coronary heart disease. These studies have been summarised in reports by the ADA (2004) and IFT (2005). In addition, several active food components have been isolated and scientifically tested to reduce risk of coronary heart disease, although some of the results have been contradictory (Castro *et al.*, 2005). Addition of these components to food products is an important growing segment of the functional food market.

Cholesterol-lowering spreads are an example of a functional food that aims to reduce CHD risk. Phytoserols are natural components of the human diet as they are components of edible vegetable oils such as sunflower seed oil. The properties of plant sterols in lowering cholesterol have been acknowledged since the 1950s (Pollak, 1953), with more recent studies showing the efficacy of phytosterol enriched foods in reducing levels of LDL cholesterol (Castro *et al.*, 2005; Law, 2000). Spreads containing added phytoserols (plant sterols and stanols) to significantly reduce the concentration of LDL cholesterol were launched in 1999 and have been commercially successful for a number of years now (Angus, 2002).

One of major challenges faced by product developers with the task of developing a functional food is determining a food matrix and dose that will be efficacious when consumed in typical amounts. The average consumption of spreads (margarine and butter) per person in Europe is 20-25 g/d but it is a little lower in the United States (15-10 g/d). Clinical trials indicate that approximately 20g/d of spread is needed if it is enhanced with between 8-10% plant sterol or plant stanol. This amount can lower LDL cholesterol by around 8–13% ; this is equivalent to 1.6-2.0g plant sterol or plant stanol consumption per day (Weststrate and Meijer, 1998). A daily consumption of 24g of spread containing 2-3g of plant stanol esters, lowered total serum cholesterol and LDL cholesterol by up to 6.4% and 10.1% respectively (Nguyen *et al.*, 1999). Moreover there are no side effects from consuming plant stanol esters 2- 3g/d (Nguyen, 1999). Hence, they can play an essential role in addressing an important risk factor in coronary heart disease when consumption levels are adequate.

In addition to evidence of efficacy, it is also important that functional foods will not produce side effects. Even though plant sterols are oestrogenic (Mellanen *et al.*, 1996), in vitro assays with vegetable oil plant sterols have not shown that the compounds bind to either the human oestrogen receptor or the immature rat oestrogen receptor and there has been no indication of oestrogenicity in in-vivo rat uterotrophic assays (Baker *et al.*, 1999).

Plant sterols have no adverse effects even when consumption levels are as high as 8.1% vegetable oil sterol esters in the diet – equivalent to 5% free plant sterols (Waalkens-Berendsen *et al.*, 1999) or plant stanol esters up to approximately 4.38% in the diet, equivalent to 2.5% free stanols (Whittaker *et al.*, 1999).

The cholesterol-lowering products are successful examples of functional foods. By early 2001, Benecol™ had cornered approximately 5% of the margarine and spread sector in the UK, which was worth 24 million pounds. Whilst Pro.activ™ market sales had reached 49 million pounds in the first year of its launch in the UK (Angus, 2002). In New Zealand, the extra cost of margarines with added plant sterols or stanols per person is about 50 cents per day, or NZ$170 per year. It is possible that this extra cost could be a concern to some potential consumers and thus limit the consumption of such products.

2.6 Modelling Consumer Behaviour

The theories of Reasoned Action and Planned behaviour have been used in numerous studies to gain a better understanding about consumers' food behaviour (Pilgram, 1957; Randall and Sanjur, 1981). Both the theory of reasoned action (TRA) and the theory of planned behaviour (TPB) have been employed and validated in various studies (Ajzen, 1991; Chang, 1998; Sheppard *et al.*, 1988). The Health Belief Model has been used successfully in studies involved with health behaviour (Kloeblen and Batish, 1999; Sapp and Weng, 2007; Schafer *et al.*, 1995) and so may be applicable to functional foods. Nevertheless, no theories can explain fully consumer behaviour when functional food consumption is being considered.

2.6.1 The theory of reasoned action and theory of planned behaviour

The theory of reasoned action (TRA) is a general theory of human behaviour. It was originally proposed by Fishbein and Ajzen (1975). The TRA has been commonly used as a model for the prediction of behavioural intentions and/or behaviour related to consumer and marketing behaviours (Ajzen, 1991; Chang, 1998; Sheppard *et al.*, 1988), The TRA endeavours to explain the relationship among attitudes, beliefs, subjective norm, intentions and behaviour. The theory is based on the assumption that human beings are rational and apply available information to weigh the benefits of a particular action (Ajzen and Fishbein, 1980). It hypothesises that behavioural intentions, which are the immediate antecedents to behaviour, are a function of salient information or beliefs about the likelihood that performing a particular behaviour will lead to a particular outcome and the belief that others think he should perform the behaviour . The TRA model is presented in Figure 2.4.

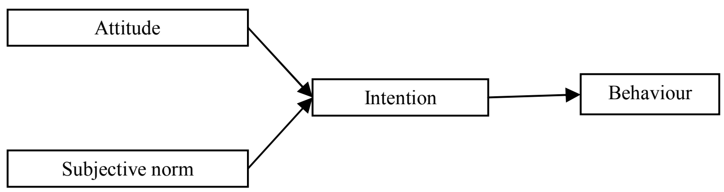


Figure 2.4: Theory of Reasoned Action.
Source: Ajzen and Fishbein (1980)

According to Fishbein (1975), the TRA aims to predict and comprehend behaviours that are principally under the control of the person. However, Sheppard *et al.* (1988) found that ‘‘actions that are at least in part determined by factors beyond individuals volitional control fall outside the boundary conditions established for the model’’ (p. 326). This explains that a consumer may avoid doing a particular action if the consumer finds the process to perform the action is too complicated, or if the consumer does not possess the resources necessary to perform the behaviour. Thus, the theory of planned behaviour was developed as an extension of the TRA to incorporate such deliberation (Ajzen, 1985; Ajzen, 1991).

Theory of reasoned action has been used successfully in many food related studies including purchase beef purchasing intention (McCarthy *et al.*, 2003), attitudes and choice of flavoured milks (Shepherd *et al.*, 1991), and milk consumption (Brewer *et al.*, 1999). The use of TRA in various studies was reviewed (Sheppard *et al.*, 1988). Moreover this theory was also used as a combine model with Health Belief Model in a health related study (Poss, 2001).

The theory of planned behaviour (TPB) extends the TRA by adding ‘perceived behavioural control (PBC)’ as a determinant of behavioural intention. The TPB is based on the assumption that human beings base decisions on reason and will make logical use of the information available to them. The TPB model is an extension of the TRA model and argues that behaviour is also predicated on people’s perceived control over their performance of the behaviour. Thus in the TPB, in order to predict intention to perform a particular behaviour, attitudes, subjective norms and perceived behavioural control are all thought to influence peoples' intentions to consume, act, behave in a particular way.

Firstly, an attitude is defined by Fishbein and Ajzen as "a learned predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object" (Fishbein and Ajzen, 1975). Consumers gain their attitudes by their experience or exposure to the object or issue or by obtaining information about the object or issue. Secondly, subjective norms are defined as "the perceived social pressure to perform or not to perform the behaviour" (Ajzen and Albarracín, 2007). They are a function of an individual's perception of social conformity and motivation to conform to those factors.

The perceived behavioural control (PBC) refers to "the perceived capability of performing the behaviour" (Ajzen and Albarracín, 2007). In this respect individuals are believed to consider the factors that influence them to perform or not perform the behaviour. According to Bandura *et al*. (1980), people's confidence in their ability to perform the behaviour has a strong influence on their behaviour.

Perceived behavioural control has frequently been used interchangeably, with the concept of self-efficacy. But recently it has been argued that PBC actually comprises two distinct constructs; perceived self efficacy and controllability (Tavousi et al, 2009). Perceived self efficacy is defined as "the belief of ability of behaviour performance" and controllability relates to whether the person believes they have control over their behaviour In this respect individuals are believed to consider the factors that influence them to perform or not perform the behaviour. Figure 2.5 presents the components and relationships among the TPB components.

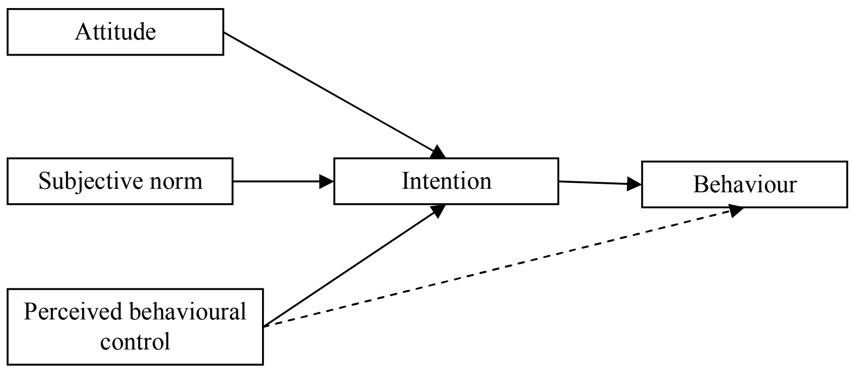


Figure 2.5: The Theory of Planned Behaviour
Source: Ajzen (1991)

Overall, the theory of planned behaviour measures two possible effects of perceived behavioural control upon behaviour. Foremost, perceived behavioural control suggests motivational factors that have an indirect effect on behaviour through intention. In the second case, perceived behavioural control reflects actual control, having a direct link to behaviour not mediated by intentions (Madden *et al.*, 1992). This direct effect of perceived behavioural control on actual behaviour is significant when "(a) the behaviour in question is likely to have some aspect not under volitional control and (b) perceptions of control over the behaviour are accurate (Madden *et al.*, 1992).

The TPB has been used to examine a wide variety of different behaviours (Armitage and Conner, 2001; Conner *et al.*, 2001). It also has been employed widely in predicting consumers' intention (Sheppard *et al.*, 1988) and has been used effectively by a number of researchers to examine consumers' behaviour towards a range of products and services, including food (Armitage and Conner, 2001; Arvola *et al.*, 2008; Conner and Armitage, 1998; Conner *et al.*, 2001; Conner, 2002; Hansen *et al.*, 2004; Sparks and Shepherd, 1992). The food studies include organic food purchasing (Arvola *et al.*, 2008), dietary supplement use (Conner *et al.*, 2001), health-related eating behaviour (Ajzen and Timko, 1986; Povey *et al.*, 2000), fat intake reduction (Paisley *et al.*, 1995), and intentions to purchase specific functional foods such as omega-3 fatty acids (Patch *et al.*, 2005a). This suggests that TPB may provide a framework to better understand and predict functional food consumption intention.

The theory of reasoned action has been compared with the theory of planned behaviour and TPB was found to be better in predicting unethical behaviour of making software copies than TRA (Chang, 1998). Moreover, the study results of Madden *et al.* (1992) showed that perceived behavioural control enhanced the prediction of behavioural intention and behaviour. The TRA and TPB have been beneficially used in predicting an extensive range of behaviour. Therefore, it is logical to compare both theories to see which best predicts peoples' intentions to consume functional foods and their actual functional food consumption.

2.6.2 Health Belief Model

In the 1950s, the Health Believe Model (HBM) was developed to examine peoples' lack of participation in a number of health screening and immunisation programmes (Rosenstock, 1960). The HBM is a value expectancy model. The constructs of the HBM consist of perceived susceptibility (the perception of the risk of developing a poor health condition); perceived severity (perception of the seriousness of contracting an illness or of leaving it untreated); perceived benefits of taking action (the perceived effectiveness of the interventions); perceived barriers to take the suggested behaviour (beliefs about negative features of a course of action); self-efficacy (individual's confidence to effectively perform the suggested action); cue to action (stimulating triggers for people to take action) (Strecher and Rosenstock, 1997). A diagram of the HBM is presented in Fig. 2.6.

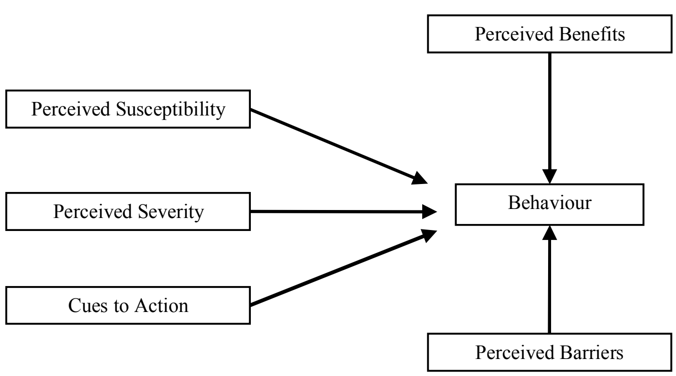


Figure 2.6: Health Belief Model.
Source: Poss (2001)

"The Health Belief Model is a value expectancy theory, which states that an individual's behaviour can be predicted, based upon certain issues that an individual may consider (i.e. perceived susceptibility, perceived severity) when making a decision about a particular behaviour concerning their health" (Glanz, Lewis, & Rimer, 1990).

The model has been widely used in studying behaviours such as attending screening for high blood pressure, breast cancer, or hepatitis B; exercising; smoking cessation; compliance with antihypertensive, diabetes self-management and medication regimens etc (Janz and Becker, 1984). It has been used to explain various food related behaviours including amount of fat in diets (Schafer *et al.*, 1995), folate intake from fortified grain products (Kloeblen and Batish, 1999), and prediction of individuals' dietary quality and body mass (Sapp and Weng, 2007). The HBM aims to predict the health action of the individual in order to decrease or avoid the prospect of disease. The beliefs related to readiness to take action and beliefs related to factors that facilitate or restrain action are two of the many factors that determine whether an individual is likely to take action on something.

2.6.3 Multi-item scales Index (latent variables)

The above models are predicated on the fact that latent variables (multi-item scales) are used to predict peoples' intentions to behave in a particular way and their actual behaviour. The latent variables are used to represent complex psychological constructs that cannot be summarized in a single question. For a latent variable to be a good index it needs to be unidimensional (i.e. measure only one attribute or behaviour); reliable (i.e. needs to produce similar results over time, and its internal measures need to be consistent with one another); valid (i.e. measure what it is supposed to measure) and finally generalizable (i.e. the scale should work with whatever survey type (web, paper, telephone, face-to-face) is used to collect the information and across the population) (Bearden and Netemeyer, 2009). In some cases these multi-item scales have been validated for a number of latent variables in previous studies and have been shown to meet all the requirements of a good index. Whereas in other areas, such as with functional foods, there are a very small number of studies that have used either the theory of reasoned action or planned behaviour models and even fewer that have used the health belief model. Consequently, there are no consistent multi-item scales to determine the latent constructs that are associated with each of the models. As a consequence these scales either have to be developed from scratch or alternatively scales that have been used for other products such as supplements (Conner *et al.*, 2001) used in the study to see whether the multi-item scales in that study are applicable in such a study as this. If they are then a degree of repeatability and standardization would start to develop in the functional foods/supplements area as regards multi-item scales needed to encapsulate the complex psychographic variables associated with the various models used in the study. According to Netemeyer and Bearden (2003) developing a suitable set of scales to measure complex psychographic attributes is a time-consuming endeavour probably best left to a psychometrician. Consequently, it was decided in this study that, where possible, it would be better to use a multi-item scale that had been published in the literature to measure a latent construct than develop it from scratch.

Another issue that needs to be considered when establishing a measurement model for a study is whether it is to be a reflective or a formative model (Jarvis *et al.*, 2003). According to these authors, quoting from Bollen (1989) and Nunnally (1978), many people in market research have adopted the classical approach to theory development where they have "assumed that the variation in the scores on a measure of a construct is a function of the true score, plus error. Thus the underlying latent construct causes the observed variation in the measures." They do not argue that this is necessarily wrong and that in many cases this is a valid assumption to make. This type of model is defined as a reflective measurement model. However, they argue that there are times when this approach to model estimation is incorrect because there are times when the assumption has to be made that "the measures all have an impact on (or cause) a single construct". This type of measurement model is known as a formative measurement model.

As stated earlier most models reported in the literature have assumed a reflective model, i.e., that the measures are all caused by a single underlying construct. The TRA, and PB models, and indeed, HBM all assume a reflective measurement model. For this reason and because reflective indicator models are usually used to model attitudes and intentions to purchase (Jarvis *et al.*, 2003) that it was decided that a reflective model would be more appropriate for this study.

2.6.4 Predicting use of functional foods

Results from some studies suggest that people purchase functional foods because of the foods' perceived healthiness, taste, pleasure, security, and familiarity (Poulsen, 1999; Urala and Lähteenmäki, 2003). Consumers appear to connect functional foods with health and feelings of well-being (Urala and Lähteenmäki, 2003). According to Urala and Lähteenmäki (2004), consumers' willingness to use functional foods is best predicted by considering their attitudes that describe the perceived benefits that they will get from consuming functional foods. These benefits are mainly related to the healthiness of the foods and the well-being that will result from the consumption of these functional foods. Verbecke (2005) also found that anticipated health benefits are the main determinant of functional food acceptance, followed by presence of an ill family member. Thus a range of attitudes towards the food is important in predicting use as well as perception of personal susceptibility and disease severity. This suggests that concepts from both the TPB and the HBM are relevant in predicting functional food use.

A combined model of the TPB and HBM has been used to predict behaviour and intention (Figure 2.7). For instance, researchers have used it to predict iron-fortified soy sauce consumption by Chinese women (Sun *et al.*, 2006). In particular, addition of the constructs of perceived susceptibility and perceived severity (HBM) to the TPB may help explain functional food use. When the two models are combined there is some overlap between the constructs. Perceived benefit and barriers (HBM) is similar to beliefs about the behaviour and evaluation of that behaviour i.e. evaluation of outcome of consuming functional foods. Self-efficacy, which may be included in the HBM, is similar to perceived behavioural control (TPB), although as discussed earlier, some authors suggest that perceived behavioural control is comprised of both self-efficacy and controllability (Tavousi *et al.*, 2009).

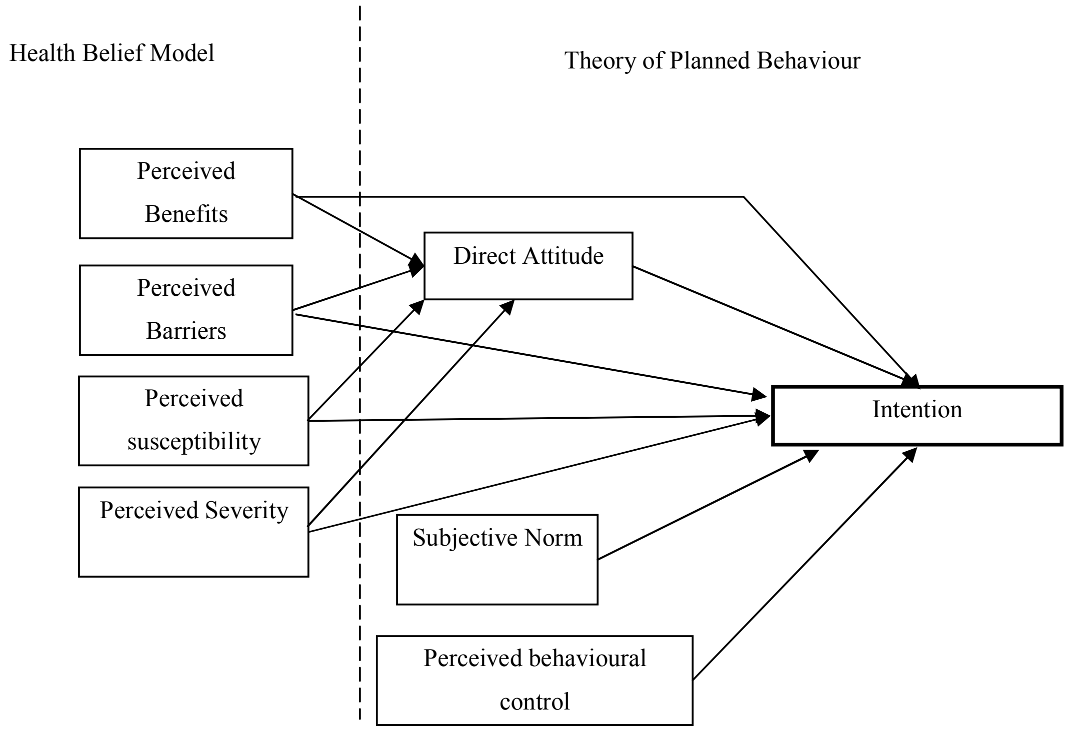


Figure 2.7: Combined model of the Health Belief Model and the Theory of Planned behaviour

More details of the literature predicting the use of functional foods will be presented in Chapter 8 and 9.

2.7 Conclusions

This chapter reviewed the literature on the definition of functional foods, growth of the functional food market in various countries, socio-demographic factors related to functional food use and psychometric models that could be used to predict functional food consumption. Although there is clear agreement that the functional food market is growing, there is no clear agreement on the definition of what a functional food is. Moreover, the description of a functional food consumer is likewise unclear, possibly due to cultural differences or differences in definition of functional foods. Information on who consumes or not consumes functional foods in New Zealand and their reasons for doing so is quite sparse. Consequently, it was decided that this topic would be studied.

The overall aim of the project was to find out how much New Zealanders knew about functional foods, whether they consumed them, their attitudes to general and specific functional foods and to use these findings to evaluate a series of models to predict their intentions to consume, and their actual consumption of these products.

Chapter 3

PRELIMINARY EVALUATION OF CONSUMERS' VIEWS OF FUNCTIONAL FOODS

3.1 Introduction

According to the literature search little is known about New Zealanders' consumption of functional foods, their knowledge about them and indeed their attitudes towards these products. Unless this information is available it is difficult for a food manufacturer to know what products to produce for the functional market, whether they will be accepted by the market, and most importantly how to position the products in the market to maximise sales. The literature suggests that a reasonably high proportion of consumers in overseas markets are quite ignorant about the concept (McGuire, 2002; Poulsen, 1999), though the growth of the functional food market in most developed overseas countries would suggest that the number of people who are quite ignorant about the concept is probably diminishing with time. However, nothing is known about the New Zealand consumers' knowledge of functional foods. Unfortunately, it was not possible to carry out a study that would have evaluated New Zealanders' views of functional foods for cost and logistic reasons. Consequently, it was decided that a study should be conducted of Palmerston North consumers to find out what they knew about functional foods, their attitudes to these foods and whether they would be willing to purchase functional foods that were designed to treat/ameliorate/prevent specific diseases and in particular coronary heart disease and arthritis. As a first stage in the process it was decided that an exploratory series of focus groups should be used to scope out the issues so that a larger study could be designed to obtain quantitative data for modelling purposes.

This chapter describes the process used to run the focus group discussions and also the main findings that were obtained from the series of discussions that took place with the aim of finding out what consumers in New Zealand knew about functional foods, their attitudes to them and whether they would buy disease specific functional foods. The people for the focus groups were selected with a view to obtaining as wide a spectrum of views as possible on the topic of functional foods.

As stated above, this part of the study is part of a larger project aimed at predicting the consumers' purchasing intentions and their underlying attitudes and perceptions towards functional foods. A focus group interview technique was chosen as it is the most appropriate method to explore peoples' attitudes and opinions about functional foods and to identify key points that should be further explored in a large consumer survey (Morgan, 1996). It is a simple and approachable means of gathering this information from a target group (Fowler, 2001).

This chapter presents the focus group methodology, the focus group results, a discussion on the results, and conclusions drawn from the study.

3.2 Method

A focus group is a form of qualitative research in which a group of individuals is questioned about their attitudes, perceptions, and opinions. Individuals are free to respond directly to other group members when questions are asked of the group. The number of participants in an individual focus group session is generally between 6 to 10 people (Krueger, 1994; Morgan, 1988), but it can range from 4 to as many as 12 (Krueger, 1994) depending on the topic and the degree of expertise of the participants.

The number of individual focus group discussions per study can vary from six to 50 depending upon the objectives of the research and the availability of resources (Greenbaum, 1998). Generally, there is no limitation on the number of focus groups, however, at least two groups is required (The Health Communication Unit, 2002). Focus groups are used for a range of purposes, but in this study they were used to obtain consumers' beliefs and attitudes towards functional foods and terms that consumers normally use when discussing these foods. This information was then used to develop a large consumer questionnaire.

3.2.1 Participants

Participants, who were at least 21 years of age, were recruited by contacting the Parent Teacher's Association (PTA) at a number of schools and the Arthritis Foundation's branch in Palmerston North. The organisations were given information sheets that they distributed to potential participants (see Appendix A). The organisations contacted the researcher with names and details of people willing to participate, and from their contacts lists focus groups were organised.

Seven focus group discussions were conducted in August and September 2005, with each group comprised of 4-8 participants. Forty-two participants in total were involved in the discussion. Fifty-five percent of the participants were female (Table 3-1). There were three groups each for women and men, of a similar age range (21-35, 35-60 and over 60) and gender and one mixed gender group of arthritis sufferers. The characteristics of each group are outlined in Table 3.1.

Table 3.1: Focus Group Participant Characteristics

Health condition	Gender	Age			Total
		21-35	35-60	Over 60	
Non-arthritis sufferers	Male	3	4	8	15
	Female	9	6	7	22
Arthritis sufferers	Male	-	-	4	4
	Female	-	-	1	1
Total		12	10	20	42

3.2.2 Discussion guide, pre-questionnaire, and procedure

A discussion guide was developed prior to the focus group sessions to ensure that the issues the researcher wished to focus on were included in each focus group session. The discussion guide was pre-tested using Massey University undergraduate and postgraduate students and reviewed.

The short questionnaire was developed after a thorough review of the literature and a pre-test by consumers within the target group. The questionnaire sought their health status, perceptions about their current diet, whether they took dietary supplements, and their knowledge about fortified and functional foods. The aim of the questionnaire was to gather information on their knowledge of the term functional foods and actual supplement use prior to the group discussion. A copy of the questionnaire can be found in Appendix A and a copy of the discussion guide is shown in Appendix B.

Before the focus group started, participants were asked to sign a consent form that outlined the nature of the study. They were also informed that they were not obliged to answer any question and that they could withdraw at any time from the focus group session. Once the necessary paper work was completed, they were asked to fill out the questionnaire.

At the beginning of the session, the purpose of the discussion was stated. It was emphasised that the information provided would be kept strictly confidential and would never be associated with any individual's name. The participants were reminded that there were no right or wrong answers and they were asked to allow the entire discussion to be audiotaped. Each focus group session took around 90 minutes and was conducted by the researcher as the moderator and facilitator and an observer who helped as note taker.

At the start of the session, the participants were asked to introduce themselves to reduce any tension and anxiety that they might have about the discussion session. The aim was to get the participants into a freewheeling discussion mode so that little input was needed from the moderator, other than to ask all the questions from the group-discussion guide. The moderator asked them to describe their understanding of the terms fortified and functional foods and to give some examples of each. This was followed by an explanation of the concept of functional foods by the moderator and a definition of functional foods as a food product, which has health benefits beyond basic nutrition. To clarify the concept of functional foods, a variety of products were also provided as prompts for discussion. These were: cholesterol-lowering margarine, bread with added iron and fibre, milk with added calcium, iodised salt, symbiotic yoghurt, tomato ketchup, and calcium enriched soymilk. Discussion then was directed towards establishing their attitudes and awareness towards these and similar products. Additional questions were then asked to find out which of the following factors would have an impact on their decision to purchase functional foods: advertisements, food manufacturer's claims, and information from health professionals. Finally, the participants were shown two phrases on the clipboard representing the extremes of how people view food. They were 'You are what you eat' and 'Food is your enjoyment'. Then participants were asked to discuss what sort of person would use each of the phrases as a guiding principle for their food consumption.

3.3 Evaluation of the Obtained Information

Quantitative data from the brief questionnaire was analysed using SPSS, version 15. The data was examined for trends, but no statistical tests were carried out because of the small sample size. The focus group discussions were tape-recorded and transcribed verbatim for analysis whilst the discussions were fresh in the minds of the moderator and recorder. Notes taken by the observer during the discussions were also discussed during the analysis process. The tape was transcribed and data from each focus group was analysed by both inductive and deductive analyses (Krueger and Casey, 2000). The transcripts were read and inductive analysis was used to organise the data into categories. Deductive analysis was used to find themes in answers to the questionnaire and to questions about the product samples.

Hawe, Degeling, and Hall (1990) provided guidelines to ensure that qualitative data was analysed logically and methodically. They suggested that a researcher should follow 4 basic steps: 'organise the data', 'shape' the data into information, 'interpret and summarise' the information, and finally 'explain' the information.

Using inductive analysis eight categories were identified to group the data: (1) influencing factors on dietary behaviour; (2) consumers' views about fortified foods and functional foods; (3) barriers to functional foods consumption; (4) functional foods are not as effective as pills (medicines); (5) food medium; (6) the influence of media and marketing on consumers' perceptions on fortified and functional foods; (7) the consumers' trust of advice from health professionals, and (8) the perception of consumers about specific arthritis supplements and functional foods.

3.4 Results

3.4.1 Results from the questionnaire

Results from the questionnaire analyses showed that the majority of participants across all groups regarded their diet to be healthy. About two-fifths of the participants had taken vitamins, minerals, dietary supplements or herbal supplements within a month before participating in the group discussions. Females (43%) were more likely to take supplements than males (38%). It was interesting to note that a greater proportion of the younger (the 21-35 group, 50%) and older participants (the over 60 group, 47%) took dietary supplements compared to the middle age group (the 36-60 group, 20%) (Table 3.2).

Table 3.2: Supplement or herbal use by gender and age

Taken supplement or herbal	Gender	Age			Total
		21-35	36-60	60 up	
Yes	Male	2	1	4	7
	Female	4	1	5	10
No	Male	1	3	7	11
	Female	5	5	3	13
Total		12	10	19	41*

Note: * One participant did not give the answer.

The participants were asked a series of 7-likert scale questions in the pre-focus group questionnaire and the results are presented in Table 3.3. A score of 1-2 indicated that they disagreed with the statement in the question whilst a score of '6-7' indicated that they agreed with the question, and finally, a score of 3-5 suggested that they were neutral to the question. The data showed that females were more likely than males to buy food products for their health benefits. Moreover, men were less concerned about choosing foods for disease prevention than women.

Table 3.3: Percentage of male and female participants either agreeing or disagreeing with each health concern question

Questions	Gender	Agree scores 6-7 (%)	Disagree scores 1-2 (%)
I buy some food products for their health benefits.	Male	52.6	10.5
	Female	**73.9***	4.3
I choose some foods for disease prevention.	Male	42.1	21.1
	Female	47.8	8.7
I cannot obtain all the food compounds that I need from food alone.	Male	21.1	42.1
	Female	39.3	30.4
My food choices really are affected by my health concerns.	Male	42.1	15.8
	Female	43.5	8.7
Health concerns of my family members affect my food buying decision.	Male	36.8	21.1
	Female	47.8	8.7
I eat food products for benefits beyond their basic nutritional content.	Male	42.1	5.2
	Female	52.2	0.0
Consumption of certain foods can allow me to reduce or avoid reliance on medication	Male	47.4	10.5
	Female	31.8	18.2

*Bold entries indicate sizeable differences from other category
N=42

A reasonably high proportion of subjects bought food products for their health benefits in every age range. Elder and middle age groups were more likely to report that health concerns affected their food choices (Table 3.4). Those in the older age group were much more likely to suggest that consumption of certain foods allows them to reduce their reliance on medication.

Table 3.4: Percentage of participants from the different age groups either agreeing or disagreeing with each health concern question

Questions	Age	Agree scores 6-7 (%)	Disagree scores 1-2 (%)
I buy some food products for their health benefits.	21-35	66.7	0.0
	36-60	70.0	0.0
	>60	60.0	15.0
I choose some foods for disease prevention.	21-35	33.3	16.7
	36-60	60.0	0.0
	>60	45.0	20.0
I cannot obtain all the food compounds that I need from food alone.	21-35	25.0	33.3
	36-60	30.0	**60.0**
	>60	35.0	25.0
My food choices really are affected by my health concerns.	21-35	25.0	8.3
	36-60	**40.0**	0.0
	>60	**55.0**	20.0
Health concerns of my family members affect my food buying decision.	21-35	41.7	8.3
	36-60	40.0	0.0
	>60	45.0	25.0
I eat food products for benefits beyond their basic nutritional content.	21-35	50.0	0.0
	36-60	50.0	0.0
	>60	45.0	5.0
Consumption of certain foods can allow me to reduce or avoid reliance on medication	21-35	25.0	25.0
	36-60	3.3	1.1
	>60	**50.0**	10.0

*Bold entries indicate sizeable differences from other categories
N=42

Interestingly, the results in Table 3.5 indicate that participants who were not taking dietary supplements were more inclined to buy food products for their health benefits. They also thought that foods supplied all the nutrients they needed, and that certain foods had health benefits that may reduce, and in the case of some individuals, even eliminate their needs for medication.

Table 3.5: Percentage of users and non-users of supplements who either agreed or disagreed with each health concern question

Questions	Taking supplement	Agree scores 6-7 (%)	Disagree scores 1-2 (%)
I buy some food products for their health benefits.	Yes	52.9	5.9
	No	**70.8**	8.3
I choose some foods for disease prevention.	Yes	35.3	5.9
	No	50.0	20.8
I cannot obtain all the food compounds that I need from food alone.	Yes	41.2	29.4
	No	20.8	**41.7**
My food choices really are affected by my health concerns.	Yes	47.1	5.9
	No	37.5	**16.7**
Health concerns of my family members affect my food buying decision.	Yes	52.9	5.9
	No	37.5	**20.8**
I eat food products for benefits beyond their basic nutritional content.	Yes	52.9	0.0
	No	54.8	4.2
Consumption of certain foods can allow me to reduce or avoid reliance on medication	Yes	23.5	**23.5**
	No	**47.8**	8.7

*Bold entries indicate sizeable differences from other categories
N=42

3.4.2 Factors influencing food choice

The focus groups confirmed that dietary behaviour is influenced by many interrelated factors that include various physiological and social aspects such as age, health status, educational achievement, socio-economic status and attitudes and beliefs towards functional foods. The findings of the focus groups are described and discussed below.

3.4.2.1 Influence of Age and Health Condition

The groups felt that, in general, people started to become more interested in healthier eating from about the age of 40 and that the interest tended to increase as they got older possibly because health worries and afflictions increase with age. Younger people, on the other hand, tended to think that they are built to withstand most health problems and, in general, have no interest in healthy eating, though, as will be discussed in a later section, this general set of attitudes about disease and age tended to be influenced by peoples' attitudes to eating (see Table 3.6).

According to the older participants, health problems would clearly influence peoples' food choices and, in particular, whether they would purchase functional foods. They recounted how, in their own cases, they had changed their dietary patterns due to a major health problem. Several participants stated that they might purchase functional foods if they had a specific health problem and that price would have little influence over their purchase decisions.

Older participants said that they preferred to eat natural food that did not contain any additives. They followed the basic New Zealand National Heart Foundation healthy eating program of eating '5+ portions of fruit and vegetables a day'.

"We have a starch and a yellow and green vegetables and some meats to try and cook them as best we can" [M 36-60]
"We had meat and 3 veggies that was the basic New Zealand diet" [F 61+]

3.4.2.2 Income influences

Price is one of the important factors determining food choice (Krystallis *et al.*, 2008; Teratanavat and Hooker, 2004). Moreover, people believe that functional foods will be more expensive than the equivalent non-functional food. Therefore, one might expect that household income may influence consumer purchase decisions of functional foods. People with high discretionary income may not be influenced to any great extent by price, whereas, low income individuals or households may not purchase the foods unless they had strong evidence to convince them of the value of consuming a particular functional food. However, in this focus group study, it was not possible, given the small sample size, to assess the true effect of income on the purchase and consumption of functional foods. It was only possible to measure this effect indirectly by assessing peoples' attitudes towards functional foods and assessing whether they thought that the foods were too expensive to purchase. Participants expressed the view that low income did not necessarily stop people from purchasing healthy food for their family. In addition, the participants also related their household income to education achievements.

Theoretically, the more educated an individual the higher their income (within reason), but of course this is not always the case. Educational status of the individual appeared to influence the types of food purchased by the participants, and the more educated the participants the more expensive their food choices. They said that better educated and hence higher income individuals should be more inclined to purchase the more expensive functional foods (see Table 3.6).

3.4.2.3 Educational influences

From the comments in Table 3.6 it would appear that the participants believed that well-educated people were more likely to be concerned about their food choices than less educated people and, as a consequence, would be more likely to choose healthier foods for their health benefits. This was in spite of the perceived fact that formal school educational programs did little to inform school children about nutrition and healthy eating. The discussion appeared to imply that the more-educated members of the population were better able to read about nutrition and, in particular, functional foods than less educated people, and therefore, make better reasoned purchasing decisions about healthy foods. The participants felt that all family members needed to become better informed in order to make better food choices.

Table 3.6: Demographic factors affecting dietary consumption

Factors	Sample Quote	Speaker*
Age	*"I think most people get more interest in what they are eating as they get older… usually for example 40"*	[M 36-60]
	"I think that 60 is a good age to consider from the point of view that we are less inclined to believe the adverts and more likely to consider whatever it is,	[M 61+, A]
	"Maybe if you didn't have that attitude (concern about health) when you were younger, you might have that when you are older"	[F 21-35]
	"Well, in the older age group, I think that there is concern because of cholesterol and blood pressure and so on"	[F 61+]
Income	*'We are probably middle-class income but we don't buy on price we buy on quality.'*	[F 36-60]
	'I have never had a very large income, but I would rather have the smaller amount of better quality than the larger amount of a lesser quality.	[F 36-60]

Table 3.6: (continued)

Factors	*Sample Quote*	Speaker*
Education	*"highly educated parents would show concern to make sure that children had the right food may be more than a slightly less educated parent"*	[M 21-35]
	"I think that the formal education system does not provide a general education relating to foodstuffs or healthy living."	[M 36-60]
	"the better educated people also would have learnt more from their studies or their reading"	[F 61+]

Note: * M=Male, F=Female, A= Arthritis sufferer

3.4.2.4 Health status/ health concern

Participants stated that they were concerned about their health and they checked the nutrition facts on food packages. They were also aware of the benefits of functional foods and might consume them, if they had a specific health problem.

Table 3.7: The effect of health and marital status on the dietary consumption

	Quote	Speaker*
Health status	*"My health is important therefore I will just check it out about high sugar, high cholesterol."*	[M 61+ A]
	"I read the label and I look at the fats and cholesterol because I am concerned about my health"	[M 61+ A]
	"If someone tells me... it makes me aware that there is a kind of bread out there that has iron in it, if I feel that I need it or my kids need it."	[F 36-60]
	"*if I did have a calcium deficiency, I definitely would buy that [milk with added calcium] regardless of the price."*	[F 21-35]
Marital status	*"You can certainly see a correlation there between whether they are single and whether they are married. Families bring stability to eating habits as well as to everything else"*	[M 36-60]

Note: * M=Male, F=Female, A= Arthritis sufferer

3.4.2.5 Marital status

The participants felt that marital status had a significant impact on the foods eaten at home, particularly on young children. Many of the men believed that their partners would do everything possible to ensure that the household ate healthy foods, and thus ensure their health. The worldwide obesity epidemic and dietary patterns of some New Zealand households (Russell *et al.*, 1999) suggests that these views and beliefs are not always put into practice.

> *"I will take the personal line that my wife is very concerned about the family and my children's health and she would be the one that pushed the health if that's she something to do with mothering"* [M 36-60]

Participants felt that people who take supplements were more likely to exercise regularly, be moderately concerned about their health and would probably consume functional foods.

3.4.3 Consumers' views about fortified and functional foods

Analysis of the questionnaire showed that three-fourths of the participants had heard of the term 'fortified food'. They clearly knew about fortified foods and could describe the definition and give examples of fortified foods as, for example, this statement written by a female respondent (36-60) shows:

> "*Fortified foods are those processed foods that contain so called healthy additives, for example milk with added vitamin D and /or calcium, bread with vitamins added etc."*

One-fourth of the participants had not heard about the term before, and some of them also had misconceptions.

> *"I have absolutely no idea what a fortified food is"* [F 21-35]
>
> *"Food which has had much of the natural nutrients removed during manufacture, and synthetic or other nutrients have been added to replace these and add to their nutrient value"* [M 61+]

A few participants put food products with added nutrients or nutritive substances into the same category as enhanced products. Some participants also gave partially wrong definitions of fortified food such as:

> *"Food that has been grown/produced to improve its nutritional value"* [M 61+]

"It's mostly used by people in training for sport" [F 61+]

The participants were asked what they understood by the term 'functional food' in the questionnaire, and over 80 percent of the participants were found to have never heard the term 'functional food' before. The focus group discussion results showed that the majority did not understand the term so could not say if they had consumed them. When shown examples of functional foods some had actually consumed them.

"Oh, yeah. I have heard of that (symbiotic yoghurt). I have used that" [M 61+]

"Oh, I think I know now." [F 21-35]

"I know that thing but who knows what they are called." [F 21-35]

Because of the confusion they could not provide any views about functional foods when answering the self-administered questionnaire. When trying to answer the questionnaire some participants related functional food to normal basic food.

"I suppose it means plain food like bread, milk, eggs, fruit and vegetables, but I don't really know." [F 61+]

"I've heard of the term before, but I can't quite pin it on what it meant. I think it's something to do with added health benefits, but it is probably a stab in the dark." [F 21-35]

To give them a clearer view of functional foods, participants were shown a number of commercial products available in the New Zealand market and these were passed around during the focus group sessions so that all participants were aware of the types of food under discussion. After the samples were shown and the concept of functional foods explained, they had a clearer view of the functional food concept. Consequently, they redefined them in this way:

"I think functional food would be defined as foods that are taken for a specific purpose". [M 61+]

"Foods that have an ingredient that is seen to have a positive health effect." [F 36-60]

The results from the survey suggest that the term 'functional foods' has not become part of the vocabulary of normal consumers. It is a term that is understood by the food technologist/scientist working in foods understands and uses on a regular basis, but not the average consumer. It is possible that the consumers viewed functional foods as fortified foods, though this aspect was not explored in the focus groups. It creates a dilemma for companies spending vast sums of money demonstrating the efficacy of additives and foods to which the additives have been added. They are clearly hoping to charge more for foods with these additives in than similar foods without the additives. However, if the consumers are categorising the functional foods as similar to fortified foods then there is a strong probability that they may not pay the higher prices for the functional products that industry is predicating their research on.

3.4.4 Benefits to functional food consumption

Participants' views of functional and fortified foods were varied and quite diverse, both between and within focus groups. Those with positive views towards functional foods could see benefits either for themselves or for others. They could usually see no harm in adding nutritive ingredients to foods, and supposed that there would have to be some health benefits.

> *"Acidophilus. Very functional. That is very good stuff if you are travelling."* [M 61+]
> *"My husband changed to that [margarine with added plant sterols] and lowered his cholesterol by taking that."* [F 61+]
> *"It's easier for children to consume fortified food instead of taking dietary supplement tablets."* [F 21-35]

3.4.5 Barriers to functional food consumption

Those who felt negatively about functional foods were the ones that expected the products would not taste as good as 'normal' foods, that they would cost more, that the foods had been changed in a harmful way, or that people could consume too much of some substances without realising it and they might be at risk of some harm. (See Table 3.8) Cost was a great barrier for the consumers' purchasing decision. A number of participants expressed the view that functional foods might be more expensive than normal food. Females were more likely to consider cost than males. A small premium price may be acceptable, but participants were aware that a functional food was not the only way to get a specific health benefit, so were not willing to pay a large premium.

Participants also raised concerns during the discussion that the precise dosage of the functional ingredients they obtained from functional foods would be unknown. They were sceptical of active ingredients in certain foods as well. For this reason, supplements were thought to be better than functional foods. Another concern raised was the problem of consuming an overdose of active ingredients by having too many functional foods with the same active ingredients at the same time.

Factors that affected food preference, such as taste and flavour, were repeatedly expressed as a requirement in making a decision as to whether or not to consume a particular functional food. There was no indication to suggest that participants would trade taste for health, and there was a commonly expressed view that if functional food did not taste good, then they would not buy it.

Table 3.8: Barriers to functional food consumption

Factors	Sample Quotes	Speaker*
Cost	*"Hopefully it isn't adding to your grocery bill by doing it…"*	[M 36-60]
	"I think if you had health concerns, if these things [fortified and functional food products] could help, you might buy them but it is linked into your education and your income as well coz a lot of these things are a lot more expensive."	[F 21-35]
	"If it's for milk, 5 cents more and I am a female and feel I need more calcium. I'd probably pay the extra 5 cents. If it was like 50 cents more, then no, I'd find that vitamin another way. But if I think that it is worth a little bit more. Then, yeah I would."	[F 21-35]
	"If the price is more expensive, I think I would just take the pill [dietary supplements]."	[F 21-35]
Over dosing	*"… if all the products have supplements in them, it's hard to control how much of each of the supplements you're getting compared to a pill."*	[M 21-35]
	"But the body can only tolerate so much stuff that is added."	[F 36-60]

Table 3.8 (Continue)

Factors	Sample Quotes	Speaker*
Precise dose	*"Pills you know what you're having. If you eat food, say butter with olive oil you don't know how much olive oil you're getting. In one spread, what is the usual dose? Whereas if you have a pill, you know exactly how many pills to have a day."*	[F 21-35]
	"I think I would want to know that it worked and how much I would have to drink to get some effect because if it is something that I have to do. I have to drink these bottles a week but for how long?"	[M 36-60]
	"However, you have to eat so much of that [functional foods] for it to do you any good."	[F 61+ A]
Taste	*"Even though I know that this [margarine with added plant sterols] is better for me, if I know that it doesn't taste as good I just eat butter anyway."*	[F 21-35]
	"I don't really care if it has vitamins or minerals in it or not, as long as it tastes good."	[F 36-60]
Reduced effectiveness	*"I don't think medicinal things should be added to food."*	[F 36-60]
	"Every time you add something to a food…you are usually reducing the effectiveness of some of it."	[M 61+]
Unnatural	*"Some people might actually want the natural product without the additives. I mean even though they claim the additives are good for you, they're still not natural. They are added."*	[F 21-35]

Note: * M=Male, F=Female, A= Arthritis sufferer

Participants believed that some people might want to have natural products without any additives even if the additives were claimed to be good for health. They also questioned the effectiveness of added ingredients. Two viewpoints were commonly expressed: some thought that food should never be altered with additives; whilst others doubted that ingredients that have been extracted from foods would ever have health benefits. The latter view was rather strong among the middle-aged and the older groups.

"Like the pro-active margarine, I probably wouldn't consider that. I would probably consider not eating margarine rather than buying margarine that has got something to lower cholesterol." [M 36-60]

3.4.6 Functional foods VS pills

Disparate views were evident when the focus group members were asked to determine whether the functional ingredients should be added to food or delivered in supplement (pill) form. The general consensus of all groups was that supplements were a very good vehicle for delivering functional ingredients to consumers, though not necessarily the 'best' way. Their conclusions were based on the following factors: firstly, they knew exactly how much they were consuming if they used supplements and secondly, they felt that they would not have to consume excessive amounts of a food to get the correct dosage of the functional ingredient. Additionally, they were not sure about absorption of the supplement. Pills were regarded as having specific benefits, intrinsically linked to being 'more effective', and easier to consume and more convenient.

"*Depends how much of a supplement you need. If you can do it by just putting that margarine on rather than by taking a pill, then I would do that. But if margarine was not going to do enough, then you would have to take a pill to look after yourself."* [F 21-35]

"*Pills you know what you're having, if you have a pill, you know exactly how many pills to have a day.*" [F 21-35]

"*You are only just getting a massive dose of it too in a pill. You break that down in your body and bang you know it is in there."* [M 21-35]

"*It [pill] is easier to take*" [F 21-35]

"*But this [functional food] has probably got sugar and who knows what the other ingredients are. It's better to take a pill.*" [F 21-35]

"*Capsule or the powder in the natural form.*" [F 61+A]

"I think that if I had a family history of arthritis, I think I would have the capsules rather than the drink, because you don't know what else is in that." [M 36-60]

"Probably your daily foods" [F 21-35]

Others felt that functional foods would be a very good delivery vehicle for children and they were more likely to eat the foods than taking dietary supplement tablets. Furthermore, some of these people really enjoyed food and so there was a preference to have them included in food rather than as supplement tablets.

> "*Because we enjoy our food, I think we would rather eat it instead of pills.*" [M 35-60]
> "*It's easier for children, isn't it? I mean they are not going to want to take tablets, are they?*" [M 35-60]

3.4.7 Food medium

A number of participants stated that food manufacturers should be allowed to add active ingredients to foods. However, several of them did not agree with adding medicinal supplements to food. Participants were asked what sort of food would be the most appropriate for adding functional ingredients to. Most participants voted for regularly consumed foods such as drinks, milk, breads, and breakfast cereals.

> *"Drinks or liquid food."* [F 36-60]
> "*Like breakfast cereals or bread, I was thinking*" [M 36-60]

3.4.8 Perceived influence of the media, marketing and health professionals on the perception of fortified and functional foods

The focus group members were ambivalent in their attitudes towards claims made by manufacturers of functional food products. On the one hand, they said that they distrusted claims that appeared on television and in magazines, but on the other hand, a majority of them liked to see these claims on food packaging.

> *"I wouldn't trust the ad. I would actually want to see it [information on food products] on the packet and actually be able to read and understand it."* [M 21-35]
> "*I believe that these people in supermarkets who advertise all these meals, which are 98.9 % fat free, are wanting to make money and so they advertise it to make money.*"[M 61+]

But, notwithstanding this distrust, the females, particularly in the younger groups, were inclined to purchase new food products if they had seen or heard the advertisement, as illustrated by the statement of a female respondent (21-35): '*I'd keep it [the advertised* *product] in mind. If I am having a problem with cholesterol, I then would probably choose it [margarine with added plant sterols]'.*

Some individuals said that their purchasing decisions were based on the nutrition panel information on the packaging of food products, not just on the claims in advertisements or on the food packets. In addition, people also tended to trust food products that had the 'Heart Tick' on the product package, as they knew the company had had to meet stringent specifications in order for the food to meet the criteria of the New Zealand Heart Foundation.

> *"…if I have to make a decision while doing the shopping…I would probably look for the tick."* [M 36-60]

The participants agreed that they were more likely to follow the recommendations from their health professionals to consume functional foods than from any other sources of information. Example quotes are:

> *"The question was "Do your medical advisors suggest these things to you?" And we responded, "Yes"."* [M 61+]

"If my doctor said you need to have this pro- active stuff because you need to lower you cholesterol, then I'll do it." [F 21-35]

> "*I grew up with a father and mother who said 'you must eat your vegetables'*." [F 61+]

In addition, the participants considered that their basic knowledge and understanding on health and diet came from their parents and school teachers.

Perceptions of anti-arthritis supplements and functional foods Most of the participants were not aware of the high incidence of arthritis in New Zealand compared to other countries. Some participants in the non-arthritic groups stated that their family members were afflicted with arthritis, but did not know what medicines and supplements they were taking to treat the affliction. Elderly participants in the non-arthritic group acknowledged that they had a little bit of arthritis in their fingers and/or toes. Participants who were suffering from arthritis indicated that they had used arthritis supplements such as glucosamine, chondroitin and methylsulfonylmethane (MSM or dimethylsulfone). They declared that it was useful for their conditions.

Participants were shown some pictures of anti-arthritis supplements and functional foods (anti-arthritis drinks, snack bars) that were not available in New Zealand. Some participants claimed that they had used arthritis supplements, which were present in the New Zealand or USA markets. They thought that they might purchase functional foods with anti-arthritis ingredients, so long as the price was right.

> *"It is easier to take. It is easy to say pay $5 for that than have a $2.50 cost that is better for my joints."* [F 21-35]
>
> *"Yeah, I think they should. If it is proven that it will have some sort of health advantage to them, surely they would be foolish not to take whatever is necessary to ultimately keep them in good health."* [F 21-35]

3.5 Discussions

A majority of the participants were familiar with the term 'fortified foods' than they were of the term "functional foods'. Moreover, many of the participants were able to define a fortified food, but only 2 could define a functional food. There were a range of views about the value of functional foods in peoples' diets; a majority had rather negative views about functional foods. A number of the participants in the focus group appeared to be doubtful about the efficacy of ingredients to prevent or ameliorate disease whilst others appeared to think of functional foods as being unnatural. However, a few, and in particular those who had used functional foods, were quite positive about the benefits to their lives. In studies carried out in other countries (McGuire, 2002; Poulsen, 1999), the researchers also found respondents had limited knowledge about functional foods and were rather dubious about the functional food concept. McGuire (2002) found that a majority of his participants described functional foods as being 'artificial foods designed for specific health' problems. In contrast, Finnish consumers viewed functional foods positively (Urala, 2005) and had more positive attitudes than Danish and American consumers towards functional foods (Bech-Larsen and Grunert, 2003).

In this study, the major influences that were likely to impact on peoples' functional food purchasing decisions appeared to be price, taste, consumers' doubt about the health effects of the food and the precise dosage of added active ingredients. These findings are consistent with those of a multi-country study reported by Prescott *et al.* (2002) who found that New Zealanders' motives for food choice were influenced firstly by sensory appeal, followed by price, and health. Similarly, Patch, Tapsell, and Williams (2005b) found Australians' beliefs about the use of omega-3-enriched functional foods included taste, cost, overdosing possibility, and ambiguous health benefits of functional ingredients. People in other countries were doubtful about the effects of functional ingredients and could easily relate functional foods to something negative such as unnatural (Poulsen, 1999) and artificial (McGuire, 2002).

In the focus group, some participants said they would be more likely to find alternative ways to obtain a healthy diet rather than purchase expensive functional foods. This is not surprising given the fact that cost has always been considered to be the most important barrier to healthy eating (Sloan, 2006) and that New Zealanders believe that 'healthy foods cost more' (Weber, 2005).

In accordance with the findings of many studies (Patch *et al.*, 2005b; Verbeke, 2006; Wansink and Chan, 2001), a number of participants in this study were hesitant to trade taste for health benefits, and they would not buy functional foods if the taste was not as good as similar unfortified products. Interestingly, some people were already consuming functional foods because of their superior taste or flavour without them being aware of their health benefits.

Even though the above barriers are important determinants of peoples' willingness to consume functional foods, health status can possibly override these concerns. Participants said that they were more likely to consider consuming functional foods, if they had health problems. The findings are supported by previous studies which found that health concerns was one of the most important variables affecting functional food choice (Lappalainen *et al.*, 1998) besides taste (Bech-Larsen *et al.*, 2001; Urala and Lähteenmäki, 2003). This is despite the fact that there appeared to be no relation between general beliefs and the functional food healthfulness (Patch *et al.*, 2005b). It would be very interesting to find out whether perceived susceptibility to a specific disease, and its severity, had any influence over peoples' functional food purchase intentions.

The media is an external factor, which has been reported to have a significant influence on consumers' food choice. The mass media has been found to be a significant source of information for consumers (Moschis and Churchill, 1978) and advertisements can have huge effects on the sales of products (Mitsostergios and Skiadas, 1994). Manufacturers' claims are major sources of information and stimulate purchase decisions (Ippolito and Mathios, 1990). Yet, most participants in this study said that they distrusted the food manufacturers' claims, i.e. magazine and television adverts, but some of them relied on the information on the product package. This intimates that product evaluation and purchase intention in some way has been affected by manufacturers' claims since it reveals that they evaluate health claims by using the fact panel. This attitude may come from the perception that they implicitly trust the regulators, the New Zealand Food Safety Authority (NZFSA), to ensure that no undesirable ingredients will be included in the foods they purchase.

The discussion from the focus group showed that advertisements could influence and convince young females to purchase functional foods even though the participants stated that they placed little credence on the advertisement message. It clearly had a subconscious effect on their decision making when selecting their food purchases. It therefore implied that health claims by functional food manufacturers might be used to stimulate female consumers' willingness to buy functional foods and these views concur with those of Poulsen (1999) and Verbeke (2005). However, these researchers also found that older people were also more likely to purchase functional foods than younger people. The findings that females were more likely to purchase functional foods is not surprising given the fact that they are the primary food purchasers and guardians of their family's health. Women are the primary decision makers about food choice in their households as well as the primary purchasers of foods in most households and therefore, show stronger functional food purchase intentions than males (Childs and Poryzees, 1998).

In addition, the results of this study suggested consumers trusted the advice they might get from their health professionals and certification by health organisations (i.e. 'heart tick' from the New Zealand Heart Foundation). Participants of other studies also felt a responsibility to consider health advice from their health professionals (Bogue and Sorenson, 2001) and the trustworthiness of the information was reinforced by trusted organisations (Bhaskaran and Hardley, 2002).

3.6 Conclusions

Participants felt that the people who were most likely to purchase functional foods were people who were firstly concerned about their health, had a high income, were well educated, married, and had children in the household.

From a personal perspective, some participants preferred to take dietary supplements in a pill form instead of a food form because they thought that it would be cheaper per daily dose. As well, they would ingest the correct daily dosage as pills would be easier to consume and more convenient than having to eat functional foods. The main barriers to their ever consuming functional foods were price, dosage of active ingredients, taste, unnatural and doubt about effectiveness. Moreover, the media seemed to have a greater influence over the female participants than the males.

This study was limited by the capability of the focus group technique, which used a small number (42) of people to explore consumers' knowledge and attitudes towards functional foods. With this limitation in mind, a large consumer survey study was planned to further explore the issue and to obtain quantitative data that could be used in the development of a model to predict consumer's likelihood of purchasing functional foods. The findings from this study were partly used in the design of the consumer survey form. Demographics and other factors that are linked with attitudes and intentions towards the purchase of functional foods were also to be included in the survey.

Chapter 4

THE SURVEY METHODOLOGY

4.1 Introduction

In this chapter, the methodology for the quantitative phase of the study is described. This includes sample size requirement, sampling procedure, questionnaire development, data collection, descriptive analysis and statistical modelling.

4.2 Sample Size Requirements

Normally, a sample size is established for a study by using statistical power analysis. This analysis takes into account four factors. These include the significance level that will be used in the study (i.e. the probability of making a Type 1 error), the power to detect an effect, the minimum effect size (i.e., the effect size that the researcher wants to detect), the variation in one or more of the key response variables and finally the actual variation in the response. Logistics, cost and time to administer the survey also play a part in the sample size determination and often compromises have to be made to arrive at some pragmatic sample size. However, sampling theory really has not as yet been adequately developed for structural equation modelling (SEM) (Hair et al., 1998) because in most cases it depends on how many estimated parameters are included in the final model specification (private communication, Christian Fischer). As SEM was to be used as the primary statistical tool to prescribe the models for this study some estimate of sample size needed to be made to ensure that the final models had some statistical validity. According to Hair *et al*. (1998), a relatively large sample size (N>200) was suggested for structural equation modelling. Moreover, Comfrey and Lee (1992) suggested that "the adequacy of sample size might be evaluated very roughly on the following scale: 50 – very poor; 100 – poor; 200 – fair; 300 – good; 500 – very good; 1000 or more – excellent" (p. 217).

Based on the Monte Carlo study of Gebring & Anderson (1985), where they used samples ranging in size from 50 to 300, they recommended that a sample size per group of 100-200 was acceptable. A sample size less than 100 subjects was not recommended, but at least a sample size of 200 for modelling was required (Boomsma, 1982). An alternative approach for determining sample size for structural equation modelling was suggested by (Hair *et al.*, 1998; Kline, 1998). These two researchers suggested that the number of respondents for a good to very good survey should be based on the number of parameters to be included in the survey form, i.e., that there should be some defined number of respondents per parameter. Using this rationale Geweke and Singleton (1980) looked at the behaviour of the likelihood ratio chi-square test statistics when assessing model fit in maximum likelihood (ML) factor analysis. The fit statistics behaved well in a sample size of 10 for a one factor, five-observed-variable indicator model and a sample size of 25-30 for a two-factor, five-variable model. Comrey and Lee (1992) also suggested that a minimum of five subjects per variable based on the requirements was needed for exploratory factor analysis. For this survey, it was decided that we should use the advice of Comfrey and Lee (1992) to establish a minimum sample size, and since it was intended that respondents would be questioned on 60 different parameters the minimum sample size would have to be at least 300. We also decided that the maximum sample size should be 500 based on the advice again of Comfrey and Lee (1992) who stated that the adequacy of survey would be very good if the sample size was 500. Cost and logistics were also serious determinants in the decision of arriving at the maximum sample size for the study.

4.3 Sampling Procedure

The target population of this study was respondents aged 21 and over who lived in Palmerston North. The official estimated population in June 2005 of Palmerston North showed a population of 78,400 (Statistic New Zealand, 2007).

In July 2006, 80 potential participants who were 21 or over were randomly selected from the Palmerston North electoral roll. They were sent a questionnaire, a covering letter on Massey University letterhead (Appendix B.1), and a reply-paid envelope. Only 21.25% (n=17) of the sample responded by returning the completed questionnaire. The return rate was in keeping with many postal surveys. Due to the costs associated with postal recruiting and the lengthy time getting completed surveys forms back a decision was made to change the sampling procedure and after looking at various options it was decided that we would have to pursue a convenience sampling procedure in order to speed up the returns and reduce the workload.

Another reason for adopting the convenience sampling plan was to ensure that we had an equal number of people with arthritis, heart disease and non-diseased people in the sample. Respondents were recruited in public places such as the Palmerston North Public Library, in front of supermarkets, churches and the main city mall. Random dates and times for visiting each of the public places were generated to ensure that there was no systematic biasing of the sample. People in the appropriate age brackets were approached in each public place and asked if they would like to participate in the survey. The purpose of the survey was explained to them, as well as their rights to withdraw or not answer any of the questions they found objectionable. The participants who agreed to participate in the study were handed an information letter (Appendix B.2), a consent form and the questionnaire together with a self-addressed envelope for the completed questionnaire. They took the self-administered questionnaire home to complete and mailed it back.

To increase the response rates three $100 grocery vouchers were offered as prizes. To be eligible the respondents had to have completed the entire questionnaire. Once all the survey forms had been returned three names were randomly drawn from a hat and the winners were called on and handed their winning vouchers. The return rate for the convenience sampling plan was 84.9% (n=467). The combined response rate for both sampling procedures was 75.2%, 474 usable questionnaires were collected and only 10 incomplete questionnaires (they failed to complete more than 40% of the questionnaire) were discarded. The sample size requirement should have been at least 150-200 respondents in the non-disease, arthritis and coronary heart disease groups. The sample size did not reach the requirement for the CHD group but attempts to increase the recruitment were unsuccessful for this group.

The questionnaire and study survey design were approved by Massey University's Human Ethics committee and was given a "Low Risk Notification" tick by the committee. Confidentiality and anonymity of the results was declared and maintained throughout the course of the study. Instead of using names, participants' ID numbers were subsequently assigned for each participant. All questionnaires and documents were stored in locked filing cabinets and separated from names and addresses of the participants.

4.4 Questionnaire Development

The questionnaire was developed after considering the requirements of both the Health Belief Model and the Theory of Planned Behaviour, as well as points made in the focus groups and also the questions from the British study (Conner *et al.*, 2001) were included. The variables included are attitudes to functional foods, perceived benefits and barriers of functional foods including belief in the efficacy of functional foods, the influences of the environment (subjective norm) and perceived behavioural control (theses constructs were mainly adaption of the constructs used by Conner et al. (2001) in their study on supplement use). Furthermore, general functional foods consumption intentions and the intention to consume functional foods designed to treat/prevent arthritis and coronary heart disease were also sought. Questions on the taste of real and imaginary products (arthritis functional foods) and cost were also sought. These last two constructs were added because the focus group members considered the parameters to be most important in functional food consumption. However, due to the length of the survey these factors were only included as uni-dimensional constructs and not multi-dimensional constructs as they clearly are.

The socio-demographic factors included gender, age, education, income, and having young children in the household. In addition, several health behaviour variables (taking dietary or herbal supplements, smoking, doing physical activities, and talking about functional foods), and variables related to current health condition were included.

A copy of the questionnaire, along with the introduction and information sheet, appear in Appendix C.

4.4.1 Description of the Survey Instrument

The ten-paged questionnaire comprised seven sections of 83 questions. The first section explored participants' views on food, health and their experience in using dietary supplements and consuming functional foods, while the second section measured variables related to the participants' concerns about arthritis and coronary heart disease. Section 3 measured respondents' attitudes to functional foods, perceived benefits, and barriers to the consumption of functional foods.

The fourth section measured respondents' assessment of the dependability of information from different sources. This was measured by asking respondents to rank the sources of functional food information including documentaries, advertisements, interviews with scientists, seminar/conferences, food manufacturers and pharmacists, from 1 = the most dependable to 6 = the least dependable. They were also asked dichotomous questions (yes and no) about various aspects of functional foods.

In Section 5, the influence of the subjective norm on participants' intention to consume functional foods was measured. In the sixth section of the survey, the participants were asked a number of questions that related to their perceived behavioural control and also their direct attitudes to functional foods and their intentions to consume functional foods. A seven-point Likert scale was used to measure the above variables ranging from 1 = strongly disagree to 7 = strongly agree. In the final section, demographic information was collected. The questions included gender, age, education, ethnicity, income, health condition and also health habits (whether they smoked, exercised regularly etc.).

4.4.2 Pre-test

The questionnaire was pre-tested to ensure that people understood the questions. The pre-test of the questionnaire was conducted before data collection. Twenty participants, who were not included in this study, were involved in this process. The pre-test questionnaire revealed unexpected mistakes such as inept expressions and leading questions. In addition, some questions in the questionnaire were removed to reduce unexpected problems in data processing and analysis so that the data obtained from this process could be coded, tabulated and analysed (Zikmund, 2000). Some wording revisions were made to the questionnaire after the pre-test. The wording of the questionnaire was further modified slightly after the initial postal survey in response to further pretesting.

4.4.3 The Measurement of Constructs

This section explains the operation of the research model constructs based on the Theory of Planned Behaviour and the Health Belief model. Twelve constructs have been included in this study. Each construct consists of multiple indicator questions to better explain measurement error (Steenkamp and Baumgartner, 2000). Each of the multi items in each construct was measured using a seven-point Likert scale and either a 7-point rating scale. The Each construct and associated questions is explained below.

Consumer's direct attitudes to functional food consumption

This construct was adopted from the Theory of Planned Behaviour and it measures peoples' attitudes to the consumption of functional foods. This construct asks about the participants' overall thinking concerning the eating/drinking of functional foods. Seven items were used to measure this construct and these included:

- Worthless-Valuable;
- Harmful-Beneficial;
- Unenjoyable-Enjoyable;
- Negative-Positive;
- Bad-Good;
- Unnatural-Natural;
- Difficult-Convenient.

Subjective norm

This too was adopted from the Theory of Planned Behaviour. This construct measures the influence that people in the respondent's social environment have on their consumption of functional foods. Three items were used to measure this construct. These included:

- My family thinks I should eat/drink functional foods;
- My friends or colleagues think I should eat/drink functional foods;
- My doctor thinks that I should eat/drink functional foods.

Perceived behavioural control

This construct was also adopted from the Theory of Planned Behaviour (Ajzen, 2002) and the study of Conner *et al.* (Conner *et al.*, 2001), and it measures whether the individual believes he/she has control over his/her actions with regards to the consumption of functional foods. Six items were used to measure this construct. These included:

- If I wanted to, I could easily eat/drink functional foods;
- Eating/drinking functional foods does me no harm;

- Eating/drinking functional foods makes some people dependent;
- I can afford to try new food products such as functional foods;
- I feel confident to buy functional foods;
- I know where to buy functional foods.

Perceived susceptibility to arthritis

This construct has been adopted from the Health Belief Model (Champion and Scott, 1997; Green and Kelly, 2004; Kelly *et al.*, 1987; Poss, 2001; Secginli and Nahcivan, 2006; Turner *et al.*, 2004; Tussing and Chapman-Novakofski, 2005) and it measures the individual's perceived susceptibility to arthritis. Four items were used to measure this construct. These included:

- I am worried about getting arthritis;
- I will get arthritis sometime in my life;
- My family history suggests that I will get arthritis;
- My physical health makes it less likely that I will get arthritis (R)[4].

Perceived severity of arthritis

This construct was adopted from the Health Belief Model (Champion and Scott, 1997; Green and Kelly, 2004; Kelly *et al.*, 1987; Poss, 2001; Secginli and Nahcivan, 2006; Turner *et al.*, 2004; Tussing and Chapman-Novakofski, 2005) and it measures the perceived severity of the arthritis afflicting each individual. Four items were used to measure this construct. These included:

- If a doctor told me that I had arthritis, I would be;
- If I had arthritis, it would change my life;
- If I had arthritis, it would limit my daily activities;
- The problems I would experience from arthritis would last a long time (R).

Perceived susceptibility to coronary heart disease

[4] R = Reversed question

This construct is adopted from the Health Belief Model (Champion and Scott, 1997; Green and Kelly, 2004; Kelly *et al.*, 1987; Poss, 2001; Secginli and Nahcivan, 2006; Turner *et al.*, 2004; Tussing and Chapman-Novakofski, 2005) and it measures the individual's perceived susceptibility to coronary heart disease. Four items were used to measure this construct. These included:

- I am worried about getting coronary heart disease;
- I will get coronary heart disease sometime in my life;
- My family history suggests that I will get coronary heart disease;
- My physical health makes it less likely that I will get coronary heart disease.

Severity of coronary heart disease

This construct was adopted from the Health Belief Model (Champion and Scott, 1997; Green and Kelly, 2004; Kelly *et al.*, 1987; Poss, 2001; Secginli and Nahcivan, 2006; Turner *et al.*, 2004; Tussing and Chapman-Novakofski, 2005) and it measures the severity of the individual's coronary heart disease. Four items were used to measure this construct. These included:

- If a doctor told me that I had coronary heart disease, I would be;
- If I had coronary heart disease, it would change my life;
- If I had coronary heart disease, it would limit my daily activities;
- The problems I would experience from coronary heart disease would last a long time (R).

Perceived benefits of functional foods

This construct can be found in the Health Belief Model (HBM) (Champion and Scott, 1997; Green and Kelly, 2004; Kelly *et al.*, 1987; Poss, 2001; Secginli and Nahcivan, 2006; Turner *et al.*, 2004; Tussing and Chapman-Novakofski, 2005) and it measures the individual's perceived benefits from consuming functional foods. Nine items were used to measure this construct. These included:

- Eating/drinking functional foods would help prevent chronic disease;
- Eating/drinking functional foods would help me to be healthy;
- Eating/drinking functional foods would stop me from getting ill;
- Functional foods make it easier for me to follow a healthy lifestyle;

- I get pleasure from eating/drinking functional foods;
- I don't need to take dietary supplements if I eat/drink functional foods;
- I can reduce taking medication if I eat/drink functional foods;
- I do not worry about eating a balanced diet, if I eat/drink functional foods.

Perceived barriers to the consumption of functional foods

This construct has been adopted from the HBM (Champion and Scott, 1997; Green and Kelly, 2004; Kelly *et al.*, 1987; Poss, 2001; Secginli and Nahcivan, 2006; Turner *et al.*, 2004; Tussing and Chapman-Novakofski, 2005) and also from the results of the focus group (Chapter 3). It measures the individual's perceived barriers to the consumption of functional foods. Focus groups were conducted to explore the ideas of participants about the things (barriers) that were stopping them from consuming functional foods. Six items were used to measure this construct. These included:

- Eating/drinking functional foods would cause unpleasant side-effects;
- Functional foods cost more than other foods;
- I am unsure of the dosage of active ingredients in functional foods;
- It is difficult to see the benefits of functional foods;
- I do not have enough knowledge about functional foods;
- I trust the health claims made by food manufacturers about functional foods (R);
- Functional foods do not taste good.

Intention to consume general functional foods

This construct has also been adopted from the Theory of Planned Behaviour (Ajzen and Madden, 1986; Chang, 1998; Conner and Armitage, 1998; Madden *et al.*, 1992) and it measures the intention of participants to consume functional foods. Three items were included when measuring this construct. These included:

- I intend to eat/drink functional foods in the next few months;
- I aim to eat/drink functional foods for my healthy lifestyle;
- I want to eat/drink functional foods.

Intention to consume functional foods designed to treat/prevent arthritis

This construct was also adopted from the Theory of Planned Behaviour (Ajzen and Madden, 1986; Chang, 1998; Conner and Armitage, 1998; Madden *et al.*, 1992) and it measures the participants' intentions to consume specific functional foods designed to prevent/treat arthritis. Four items were included in this construct. These included:

- I am likely to eat/drink functional foods to prevent me from getting arthritis;
- If a new food product was developed that included compounds that have been scientifically proven to **treat** the symptoms of some types of arthritis, I would purchase such a product;
- If a new food product was developed that included compounds that have been scientifically proven to **prevent** the symptoms of some types of arthritis, I would purchase such a product;
- Glucosamine has been scientifically proven to relieve the symptoms of some types of arthritis. If it were added to a food, I would purchase such a product.

Intention to consume functional foods designed to help treat/prevent coronary heart disease

This construct was also adopted from Theory of Planned Behaviour (Ajzen and Madden, 1986; Chang, 1998; Conner and Armitage, 1998; Madden *et al.*, 1992) and it measures the participants' intentions to consume specific functional foods designed to help prevent/treat coronary heart disease. Four items were included to measure this construct. These included:

- I am likely to eat/drink functional foods to prevent me from getting coronary heart disease;
- If a new food product was developed that included compounds that have been scientifically proven to **treat** the symptoms of coronary heart disease, I would purchase such a product;
- If a new food product was developed that included compounds that have been scientifically proven to help **prevent** coronary heart disease, I would purchase such a product;

- Plant sterols have been scientifically proven to reduce cholesterol, which helps prevent heart disease, and if it were added into a food, I would purchase such a product.

4.5 Missing Data Treatment

Whilst listwise deletion is one of the most frequently used methods of dealing with missing data (Hair *et al.*, 1998), it is not the only method. Listwise deletion is not appropriate when the sample size is small. An expectation-maximisation (EM) procedure has been developed and seemingly introduces the least bias into estimated models (Hair *et al.*, 1998). In this study, 10 incomplete questionnaires (respondents had completed 40% or less of the questionnaire) from 484 were excluded. Moreover, there was only 0.2% (at the most) of missing data in each of the remaining questionnaires. Consequently, the EM method was used in this study to deal with missing data. This method replaced missing values with imputed values in the data sets where appropriate for the CFA and SEM analyses.

4.6 Data Analysis

All data from the questionnaires was coded, entered into an EXCEL spreadsheet and analysed using the Statistical Package for Social Science (SPSS) version 15.0 (SPSS, 2006). Before detailed statistical analysis of the data, the FREQUENCIES operation was carried out on the responses to each question to identify any data entry or coding errors and most importantly to determine whether the data was normally distributed. Where possible the means, standard deviations, skewness and kurtosis measures were determined for a number of the questions.

Means and standard deviations were determined by using SPSS 15. Then the following data analysis plan was enacted.

4.6.1 Cross-tabulations

Cross-tabulations were carried out to see if the socio-demographic variables had any influence on both consumers' food choice (Section 5.5, chapter 5) and also on the trustworthiness of sources of functional food information (Section 5.6). Participants were asked to rank a number of factors that influenced their food purchases and also to rank the trustworthiness of information sources, the most important being given a score of 1, and the least important a score of 7. The rank total scores for each of the sources was obtained using the following formula:

$$\text{Rank total score} = \sum_{i=1}^{n=7} (\textit{rank of}_n \ \mathrm{X} \ \textit{number of people selecting rank})$$

The chi-squared test was used to test the differences of the percentage of the respondents with different characteristics choosing a given factor as first rank. The results are reported in chapter 5.

4.6.2 Factor analysis technique and ANOVA model

Principal Components Analysis (PCA) was performed in chapter 6 to summarise the respondents' attitudes to functional foods. The objective of PCA analysis was to establish the minimum number of principle components that described a high proportion of the variance in the data and to see whether the items that had been arbitrarily assigned to a construct actually appeared in that principal component. In this part of the study, orthogonal Varimax rotation was applied by using SPSS Version 15. To ensure that the data could actually be analysed by factor analysis firstly, the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were tested. If Bartlett's sphericity test had a p-value < 0.000 then this test indicated that the data could be satisfactorily factor analysed.

Hair *et al*. (1998) suggested that a KMO of 0.80 or above indicated that the data was ideal for factor analysis; 'a value between 0.80 and 0.71 is satisfactory; between 0.70 and 0.60 is average; between 0.60 and 0.50 is fair; below 0.50 is unacceptable'. The number of factors in a solution was limited to those factors with an eigenvalue > 1. The scree test was also used to confirm that the number of factors extracted was optimal. The observed variables would be removed from a factor if their loadings were low (<0.40), low communalities (<0.30), and/or high cross-loadings (>0.40) (Churchill, 1979 ; Hair *et al.*, 1998; Rossiter, 2002).

The factor scores from the PCA were used as variables in a number of Analysis of Variance models (ANOVA). The ANOVA models were used to identify those socio-demographic and health behavioural variables that had an impact on the attitudes to functional foods and peoples' intentions to consume functional foods. In the first model, only socio-demographic variables were included. In the second model, socio-demographic and health behavioural variables were embraced and then in the third model, all variables including socio-demographic variables, health behavioural variables and health status were included. Urala and Lähteenmäki (2004) had used a similar two-stage method of factor analysis and analysis of variance to identify the important attitude variables that influenced peoples' attitudes to functional foods. Moreover, Niva and Mäkelä (2007) had used the approach to find out what attitudes affected the acceptability ratings of health-promoting foods. More details related to the statistical methodology and the results are provided in Chapter 6.

4.6.3 Exploratory factor analysis, confirmatory factor analysis and structural equation modelling

To examine the reliability and validity of the items, each set of items representing the constructs was examined for their corrected item-total correlations. Factor analysis is based on the Pearson correlation coefficient, i.e., items are grouped into a factor if they have high inter-correlation with one another. According to Nunnally and Bernstein (1994) item-total correlation coefficients (ITC) should be greater than 0.30 and inter-item correlations should be less than 0.70. According to Clark and Watson (1995) if the inter-item correlations are over 0.4 and the corrected item-to-total correlations are above 0.50 then the solution is excellent (Bearden and Netemeyer, 1998). Items with an ITC value below 0.40 were removed. The reliability and validity were taken into account to give the factor dimensionality (Gerbing and Anderson, 1988; Hair *et al.*, 1998).

Exploratory factor analysis was used to confirm variables actually belonged to the theoretical constructs as described in section 4.4.3. Principle Axis Factoring (PAF) is one of a number of factor analysis techniques, which is normally used to obtain the least number of factors reflecting theoretical constructs. When the researcher "wants to obtain parameters reflecting latent constructs or factors, PCA is not recommended" (Widaman, 1993). Thus, PAF was used in Chapter 7 to extract the factors for confirmatory factor analysis. The criteria for the PAF are the same as for PCA as described in section 4.5.2.

Cronbach's alpha was used to assess whether each question contributed to the factor that it was grouped in. When factor analysis is carried out, variables often have significant loadings on more than one component, i.e. they are correlated with two or more factors. To minimise this correlation of variables with more than one factor, the components or factors are rotated in some fashion to maximise the loadings of the variables on each factor. The two most common forms of rotation are orthogonal and oblique rotation (Churchill and Iacobucci, 2004). Hair *et al*. (1998) suggested that the orthogonal rotation is appropriate for reducing the number of original variables, in spite of how meaningful the resulting factors may be. The oblique rotation method, according to Hair *et al*. (1998), is appropriate for obtaining several theoretically meaningful constructs. Orthogonal rotation ensures that the factors are not correlated with one another (Rossiter, 2002), whilst oblique rotation allows the factors to be correlated with one another. The direct oblique rotation routine was employed in this study as the intention of the study was obtain several theoretically meaningful constructs.

The variables were grouped using the theoretical constructs and confirmatory factor analysis (CFA) was used to confirm the reliability and validity of these factors. Then, structural equation modelling (SEM) was performed by using LISREL 8.0 (Jöreskog and Sörbom, 1997) with maximum-likelihood (ML) estimation to assess a range of theoretical models (TPB, TRA, HBM). More details related to this methodology are included at the beginning of the results in Chapters 7.9.

4.6.3.1 The reliability and validity of the constructs

Squared multiple correlations of each indicator, composite reliability, and variance extracted are some of the test statistics that can be used to measure the construct reliability in structural equation modelling. The output of LISREL supplies the R^2 of each indicator. The constructs are reliable when their R^2 is larger than 0.50 (Byrne, 1998), their composite reliabilities surpass 0.70, and their extracted variance are above 0.50 (Hair *et al.*, 1998). The composite reliability and variance extracted can be calculated by using the formulas shown below (Fornell, 1981):

$$\text{Composite Reliability} = \frac{(\Sigma\lambda_i)^2}{(\Sigma\lambda_i)^2 + \Sigma\varepsilon_i} \qquad \text{…….. (7.1)}$$

$$\text{Variance Extracted} = \frac{\Sigma\lambda_i^{\ 2}}{\Sigma\lambda_i^2 + \Sigma\varepsilon_i} \quad \text{…….. (7.2)}$$

where λ_i = the standardised loading of each indicator (manifest variable)

ε_i = the error variance associated with each indicator

4.6.3.2 Structural Equation Modelling

Structural equation modelling (SEM) is a further development of multiple regression. It can cope with problems in the data such as multicollinearity that are not possible with conventional linear multiple regression such as interactions, nonlinearities, correlated independent variables, measurement error, correlated error terms, and many more problems with the data. It is a more powerful alternative to not only multiple regression, but also path analysis, factor analysis and analysis of covariance (Singh, 2007). As a consequence, SEM is generally not used in exploratory analysis, but is instead mainly used in theory testing. One of the great strengths of SEM is its "ability to model constructs as latent variables (these are variables which are not measured directly, but are constructed from measured variables, which are assumed to be a component of the latent variables)" (Robins *et al.*, 2007; Tomarken and Waller, 2005). As a consequence, it is possible to capture the unreliability of measurements in the model, which in theory allows the structural relations between latent variables to be accurately estimated. With SEM, one normally starts with some hypothesis or theory that can be represented as a path model. The constructs are then developed and these latent variables (can be dependent or independent) are then tested and the model(s) may be modified depending on the results (MacKenzie, 2001). These causal relationships between observed variables and latent variables can often be drawn up as null hypotheses, and this allows one to test the causal relationships (Segars and Grover, 1993). As a result one can show how well a predictor(s) describes each of the variables in the model and most importantly which variables are essential for describing the model (Maruyama, 1997). Essentially SEM is a merger between exploratory factor analysis and multiple regression analysis (Ullman, 2000).

4.6.3.3 Reasons why SEM was used in this study

There are four main reasons why SEM was used in this study. Firstly, this research is not exploratory, it is based on the theory of reasoned action (Brewer *et al.*, 1999; Poulsen, 1999; Shepherd *et al.*, 1991) and the theory of planned behaviour (Patch *et al.*, 2005a;

Sun *et al.*, 2006) which have each been used in studies about consumption of functional foods. It is also based on the health belief model (Colavito *et al.*, 1996; Kloeblen and Batish, 1999; Schafer *et al.*, 1995) which has been used in studies related to health and diet. The second reason for using SEM in the study is to do with the fact that each construct (i.e. factors) could not be defined by the measurement of a single variable, but instead required the measurement of a number of component variables that essentially encapsulated the construct. The various factors used in this part of the study could not be observed directly, they had to be determined from two, or more observed variables. These observed variables may vary in the degree of their observational meaningfulness and validity (Steenkamp and Baumgartner, 2000).

The third reason for using SEM relates to the fact that observed variables always have some error associated with them. When the variables are combined to form one of the constructs, we have errors associated with each variable comprising the component. Multiple regression has difficulty coping with this type of situation, whereas SEM has the facility to deal with this problem. For these reasons, SEM was adopted for the study. The final reason for using SEM is the fact that "SEM can be used to compare the relationships between latent factors across groups and contexts" (Steenkamp and Baumgartner, 2000).

4.6.3.4 Model fit indices

There are a large number of fit indices that have been recommended to indicate whether a model is a particularly good fit with the data. These include Chi-square, goodness-of-fit index (GFI), adjusted goodness of fit index (AGFI), non-normed fit index (NNFI) (Hu and Bentler, 1995), comparative fit index (CFI) (Bentler, 1990), relative fit index (RFI) (Bollen, 1986), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA) (Bollen, 1989a).

Of these fit indices the normed fit index (NFI), which is currently widely used, should not be used because it is affected by sample size (Hu and Bentler, 1995). Furthermore, NFI is not a good indicator for evaluating model fit when N is small (Hoyle, 1995). Instead, fit indices that are not affected by sample size should be used. These include the NNFI index and the CFI index. According to Maruyama (1997) the NNFI index is widely used. The independent model (also known as the null model) is used in the computation of the NNFI

(Bentler and Bonett, 1980) and CFI (Bentler, 1990). In cases where the sample size is large this model serves as a good baseline against which to compare alternative models for the purposes of evaluating the gain in improved fit. If you had a sound hypothetical model, one would expect the χ^2 value for the null model to be extremely high, thereby indicating that the fit was extremely poor. To get round this problem the NNFI fit index is used, as it takes the complexity of the model into account when comparing the hypothesised model with the independent model.

The comparative fit index (CFI) is used when you want to see how well a hypothesised model differs from an independent model. A model is deemed to be a very good fit if the CFI is ≥ 0.9 (Bentler, 1992) and ideally one should aim to have CFIs that are ≥ 0.95 to be able to say that the hypothesised model is close to the independent model (Hu and Bentler, 1999). The RMSEA values should be ≤ 0.05 for a good fit, and a recent study has shown that if the RMSEA value is between 0.08 – 0.10 then the fit of the hypothesised model is only mediocre (MacCallum *et al.*, 1996). Another fit index generally used to indicate goodness of fit is the standardised root mean square residual (SRMR). A cut off value for the SRMR should be ≤ 0.08 for good fitting models (Hu and Bentler, 1999). The criteria for the various goodness of fit indices has been summarised in Table 4.1.

Table 4.1: Summary of model fit indices

Index	Criteria	Remarks
Satorra Bentler Chi-square (χ^2)	p>.05, at the α=.05	Greatly affected by sample size[1]
Normed Chi-square (χ^2/df)	$1<\chi^2/df<5$	Values close to 1 indicate good fit. Values between 2 to 5 indicate satisfactory fit.
Goodness-of-Fit (GFI) and Adjusted Goodness-of-Fit (AGFI)	>.90	AGFI takes into account the df
Root mean square error of approximation (RMSEA)	<.05	Values between .05 to .08 indicate satisfactory fit
Non-Normed Fit Index (NNFI)	>0.90	Values > 1 indicate over fit
Comparative Fit Index (CFI)	>0.90	CFI = 1 indicate a perfect fit
Standardized Root Mean Square Residual (SRMR)	<.08	Values between .05 to .08 indicate satisfactory fit

Note: [1] In large samples, differences of trivial size will be found to be significant, whereas in small samples even sizable differences may test as non-significant.

4.6.3.5 Model modification index

Modification fix indices are the most common approach to improve a model tested using SEM procedures. If SEM is found to be deficient, then it is modified according to suggestions from the LISREL program and an index is generated to indicate whether the model is better. "The modification index is a measure of predicted decrease in chi-square if a single fixed parameter or equality constraint is relaxed and the model is re-estimated" (Jöreskog and Sörbom, 1997). To gain a maximal benefit, the fixed parameter corresponding to the largest index is suggested and the model adapted accordingly. "Before relaxing a parameter, it must make sense from a substantive point of view, where the estimated value of parameter can be clearly interpreted. The modification index should be over 5 in order to improve the model fit" (Jöreskog and Sörbom, 1997).

Chapter 5

PROFILE OF RESPONDENTS' SOCIO-DEMOGRAPHIC CHARACTERISTICS AND HEALTH BEHAVIOUR, CONSUMERS' FOOD CHOICES AND INFORMATION SOURCE TRUSTWORTHINESS

5.1 Introduction

This chapter briefly summarises the socio-demographic data and health related behaviours that were obtained from the respondents, and then the relationship between these factors, priorities in food choice and finally the most trusted sources for functional food information. This is important information from a product development perspective as it identifies who may be influenced by reports of health benefits and indicates how the message about the efficacy of the functional foods should be communicated to the market segments that will most likely consume the functional foods.

5.2 Respondent Characteristics

The profile of the respondents' characteristics is shown in Table 5.1. A higher proportion of females (65.5%) compared to males (34.5%) were prepared to answer the survey form. The Statistics New Zealand (2007) reported that on census night 51.2% of the population was female and 48.8% male. Almost 68% (67.6%) of the population was defined as European and the balance as other ethnic groups. In Palmerston North almost 83% of the population was defined as European and so the survey sample with 80% Europeans was representative of the city population (Ministry of Social Development, 2006).

The highest proportion (34.9%) of respondents in the sample had school leaving certificate or less. The other three educational categories were approximately equal at 20%. However, a comparison of the sample with the New Zealand population clearly indicates that in the sample people with a diploma or a higher qualification are over represented (Ministry of Education, 2006). Respondents with household incomes between \$60 – 100 thousand (33.0%) were also over represented (New Zealand's official statistics agency, 2008). Respondents mostly worked in the field of education, research or administration. More than 70% of respondents did not have children under 16 years of age in the household. Approximately 65% of the respondents were married or living with their partner, and the majority of respondents were primary purchasers or often purchased food for their households.

Table 5.1: Profile of the respondents (Socio-demographic)

Socio-demographic variables		N = 474	
		N	%
Gender	Female	305	64.5
	Male	168	35.5
Age	21-30	108	22.9
	31-40	70	14.8
	41-50	102	21.6
	51-60	88	18.6
	>60	104	22.0
Education	Up to high school	162	34.9
	Diploma	109	23.5
	Bachelor	103	22.2
	Post grad or higher	90	19.4
Income	Less than 20000	68	15.2
	20001-40000	91	20.3
	40001-60000	75	16.7
	60001-100000	152	33.9
	Over100000	62	13.8
Have children under 16 years in the household	Yes	105	22.6
	No	360	77.4
Martial status	Single	111	23.9
	Married/living with partner	305	65.7
	Separated/divorced/widowed	48	10.3
Ethnic group	NZ European	379	80.3
	NZ Maori	7	1.5
	Other European	35	7.4
	Pacific Islander	3	.6
	Asian	29	6.1
	Other	19	4.0
Occupation	Education/researcher	100	21.6
	Manager/tradesperson/Administrator	145	31.3
	Farmer	12	2.6
	Student	60	12.9
	Retired/ Unemployed	64	13.8
	Other	83	17.8
Household purchaser	Primary purchaser	268	57.8
	Often purchase food	147	31.7
	Seldom purchase food	49	10.6

5.3 Health Behaviour of Respondents

The respondents were asked a number of questions that dealt with their individual health behaviour. Eighty-seven percent of respondents did not smoke, almost 42% exercised daily, whilst a further 49.4% exercised at least weekly. Clearly, the survey was answered by people who took reasonable care of themselves. The Ministry of Health (2007) states that around 80% of adult New Zealanders were non-smokers and approximately 50% of adults regularly physically active at least 30 minutes a day on five or more days.

A high (34.7%) proportion of respondents took dietary supplements on a daily basis, though an equal number (40%) never took dietary supplements at all. The remainder of the sample took supplements on a less regular basis (Table 5.2). Fifty four percent of the respondents spent between $1-20 per week on supplements.

Approximately 63% of respondents indicated that they consumed functional foods[5] everyday and about 63% of respondents had spent approximately $1 - $20 per week on functional foods. However, it was unclear whether they reported on family or individual use. Sixty-seven percent of subjects had talked about the health benefits of functional foods with someone who was consuming them. However, less than 30% had talked about functional foods with their health professionals. It would appear that the respondents do not view functional food consumption as a medical issue. Over 90% of respondents indicated that they did not purchase food for treating arthritis or coronary heart disease.

There were also some questions dealing with their current health condition. One hundred and ninety eight respondents (41.8%) indicated that they had symptoms of either arthritis (joint stiffness) and/or coronary heart disease (high blood pressure and high cholesterol). This was a result of convenience sampling (see Chapter 4) and is not representative of the population.

[5] The definition of 'functional food' was given in the questionnaire and examples were also given.

Table 5.2: Health behaviour of respondents

Health behaviours		N = 474	
		N	%
Smoke cigarettes	Every day	39	8.4
	Occasionally	20	4.3
	Not at all	405	87.3
Physical activity for At least 30 minutes	Every day	192	41.4
	Weekly	229	49.4
	Occasionally/Never	43	9.3
How often do you take dietary supplements such as vitamins, minerals, medicinal herbs etc.?	Every day	163	34.7
	2-3 times a week	48	10.2
	Once a week	30	6.4
	2-3 times a months	21	4.5
	Once a month	20	4.3
	Not at all	188	40.0
Approximately, how much do you spend on dietary supplements each week?	$0	192	43.4
	$1-$20	242	54.8
	$21-$60	8	1.8
How often do you eat/drink functional foods?	Every day	293	62.5
	2-3 times a week	72	15.4
	Once a week	31	6.6
	2-3 times a months	22	4.7
	Once a month	14	3.0
	Not at all	37	7.9
Approximately, how much do you spend on functional foods each week?	$0	41	9.3
	$1-$20	280	63.3
	$21-$60	88	19.9
	$61-$100	25	5.7
	>$100	8	1.8
Purchasing any foods/beverages as a substitute for taking medicine	Yes	53	11.4
	No	410	88.6
I know someone who is eating/drinking functional foods for their health benefits	Yes	373	79.4
	No	97	20.6
I have talked about the health benefits of functional foods with someone who is eating/drinking them	Yes	314	67.0
	No	155	33.0
I have talked to a health professional about functional foods	Yes	129	27.6
	No	338	72.4
Purchase food for Arthritis	Yes	13	4.8
	No	249	91.9
	Not sure	9	3.3
Purchase food for CHD	Yes	9	3.3
	No	254	93.0
	Not sure	10	3.7
Health condition	Non-arthritis or CHD	276	58.2
	Arthritis & Coronary heart disease	198	41.8

5.4 Preference of Delivery Medium

As shown in Table 5.3, more than 30% of participants would prefer to have a functional food active ingredient for either arthritis and/or coronary heart disease in pill form rather than in a food. The second most commonly chosen vehicle was a drink rather than any other food type (24.6% for anti-arthritic functional foods, and 19.4% for anti-CHD functional foods). The third most popular vehicle for active arthritis ingredients were breakfast cereals and fat spreads for CHD active components. Although pills were the most individually preferred vehicle for delivering functionally active ingredients, when all foods were taken together they obviously accounted for 70% of all respondents' choices.

Table 5.3: Respondents' most preferred product that specific functional ingredients should be delivered in

	Product preference								
	Pill Form	Drink	Breakfast Cereal	Dairy Product	Bread	Spread	Snack Bar	Pasta	Other
Arthritic Functional Food	177 (38.5%)	113 (24.6%)	78 (17.0%)	33 (7.2%)	25 (5.4%)	23 (5.0%)	5 (1.1%)	3 (0.7%)	3 (0.7%)
CHD Functional Food	139 (30.6%)	88 (19.4%)	57 (12.6%)	47 (10.4%)	31 (6.8%)	78 (17.2%)	4 (0.9%)	5 (1.1%)	5 (1.1%)

5.5 Consumers' Food Choices

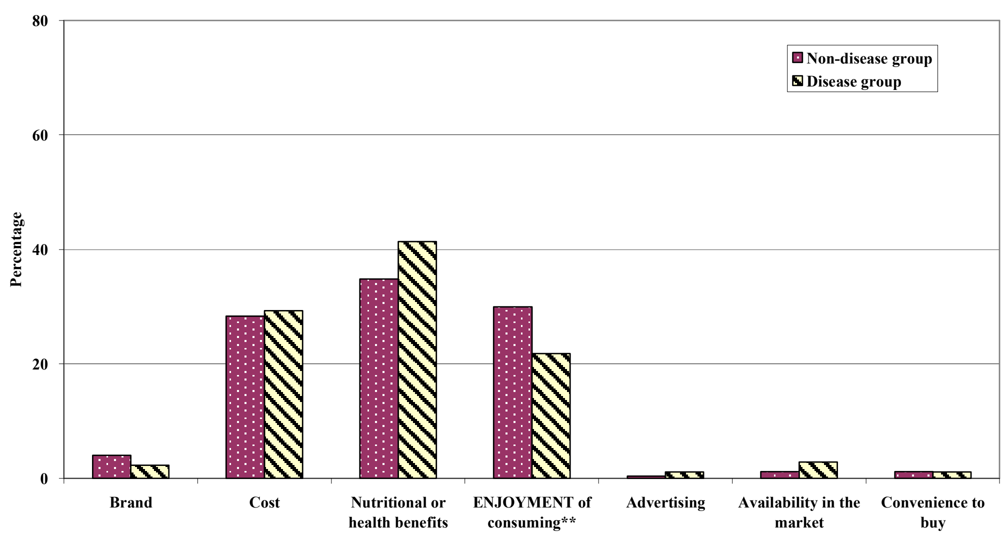
Respondents were asked to rank factors on their importance to their food choice. 'Nutrition or health benefits' was the factor that had the most influence over food choices of respondents (rank total score of 1054). This was followed next by cost (1121), next most important was enjoyment of consuming (1148), convenience to buy (1881), availability in the market (1896), then brand (2031), with advertising (2645) as having the least impact on peoples' food choices.

Table 5.4 presents the ranks of factors that influence consumers' food choices. It was found that nutritional or health benefit was ranked first by 37.53% of respondents. This was followed by cost (28.74%), enjoyment of consuming (26.60%), brand (3.33%), availability in the market (1.90%), convenience to buy (1.19%), and product advertising (0.71%), respectively. Ranking for the consumers' highest rank food choice were the same as the total ranking score.

Table 5.4: Ranking of various factors affecting consumers' food choices

Ranking	Brand	Cost	Nutritional or health benefits	Enjoyment of consuming	Advertising	Availability in the market	Convenience to buy
				N (%)			
The first	14(3.3)	121(28.7)	158(37.5)	112(26.6)	3(.7)	8(1.9)	5(1.2)
The second	35 (8.3)	109(25.9)	92(21.9)	109(25.9)	2(.5)	40(9.5)	34(8.1)
The third	57 (13.5)	80(19.0)	63(15.0)	83(19.7)	10(2.4)	59(14.0)	72(17.1)
The fourth	70(16.6)	46(10.9)	50(11.9)	51(12.1)	16(3.8)	90(21.4)	99(23.5)
The fifth	50(11.9)	41(9.7)	36(8.6)	39(9.3)	48(11.4)	110(26.1)	96(22.8)
The sixth	119(28.3)	15(3.6)	11(2.6)	19(4.5)	90(21.4)	77(18.3)	89(21.1)
The seventh	76(18.1)	9(2.1)	11(2.6)	8(1.9)	252(59.9)	37(8.8)	26(6.2)

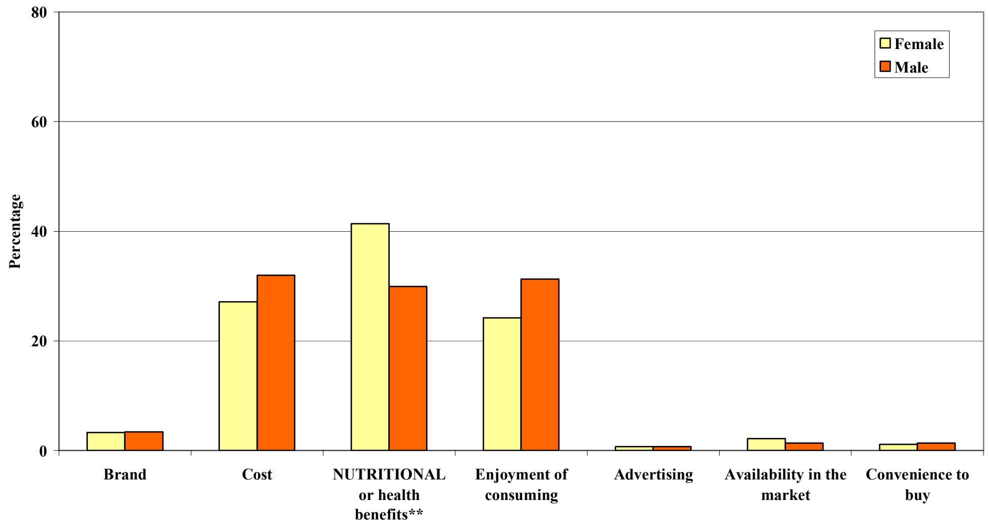
The relationships between socio-demographic variables and the first ranked factor in determining the respondents' food choices are presented in Figures 5.1 – 5.7. The relationship between presence of arthritis or CHD symptoms and the first ranked influence on the consumers' food choices is shown in Figure 5.1. Here we can see that there were significant differences between respondents in the non-disease group and those in the two disease groups, i.e. those with arthritis and/or CHD. Enjoyment of consuming seemed less important for consumers with symptoms of arthritis and/or CHD than people in the non-disease group.



** significant difference (p<0.05)

Figure 5.1: Relationship of health condition to factor stated as being the most important in determining food choice (the first ranking)

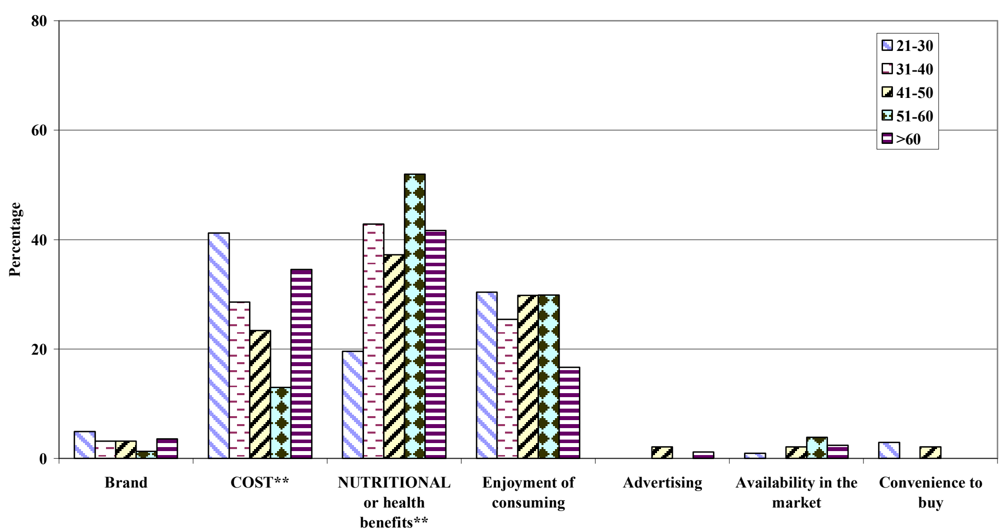
In Figure 5.2, females showed greater concern about the nutritional or health benefits of food compared to males.



** significant difference (p<0.05)

Figure 5.2: Relationship of gender on which factor was deemed to be most important in determining food choice

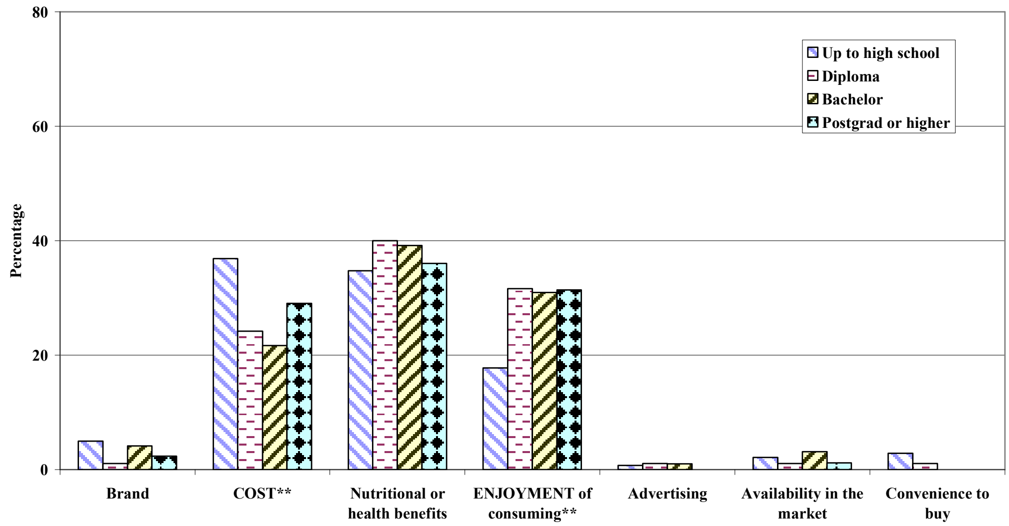
Young respondents and those who were over 60 were more concerned about the cost of their food than other groups, whilst the respondents who were over 30 were far more concerned about the health benefits of their foods (Figure 5.3).



**significant difference (p<0.05)

Figure 5.3: of age on which factor was deemed to be most important in determining food choice

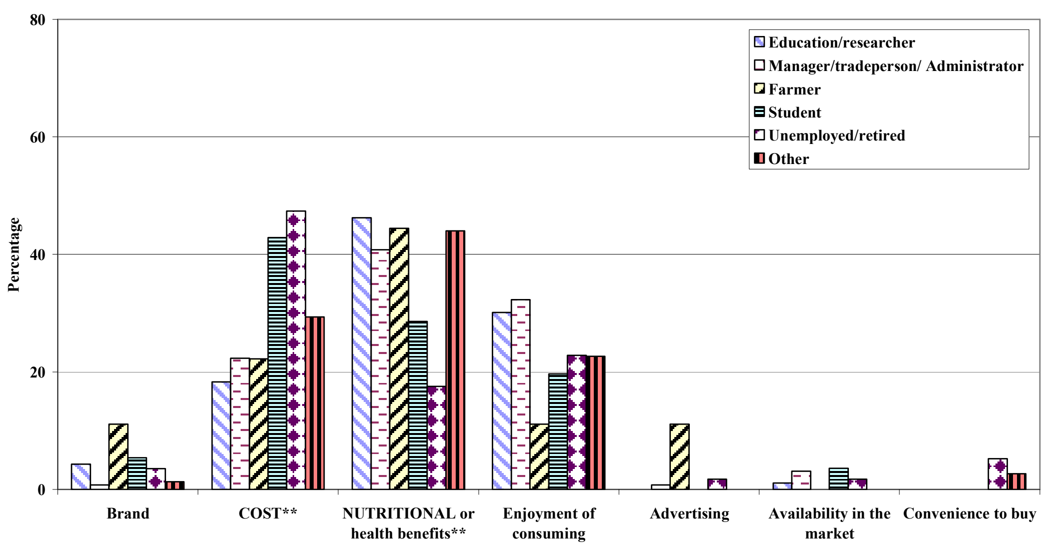
Consumers with education past high school were less likely to be concerned about the cost of the food they purchased and instead thought that 'enjoyment of consuming' was the most important determinant of what foods they purchased (Figure 5.4). Education was not associated with the importance placed on nutritional or health benefits.



** significant difference ($p<0.05$)

Figure 5.4: Relationship of education on which factor was deemed to be most important in determining food choice

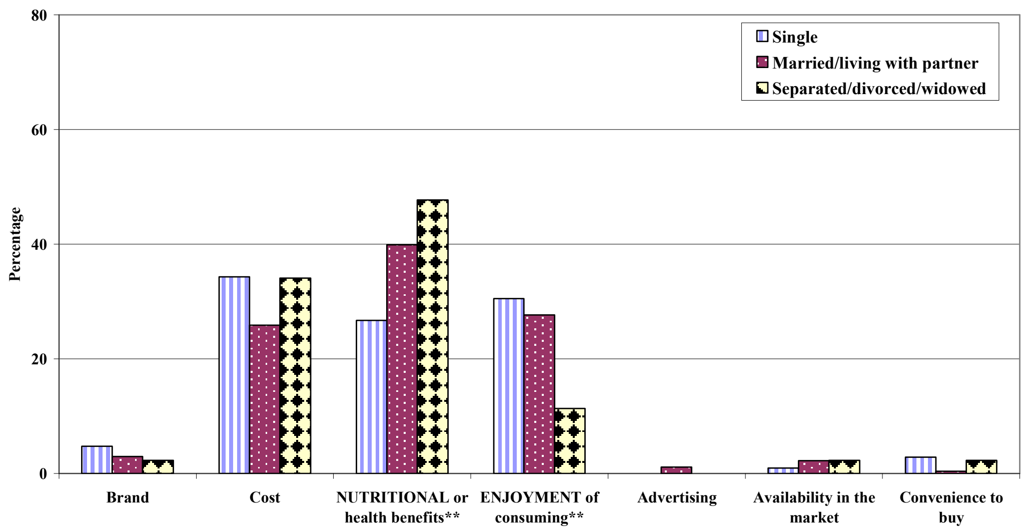
Students and unemployed participants were more concerned about the cost and were less concerned about nutritional value than others (Figure 5.5).



** significant difference ($p<0.05$)

Figure 5.5: Relationship of occupation on which factor was deemed to be most important in determining food choice

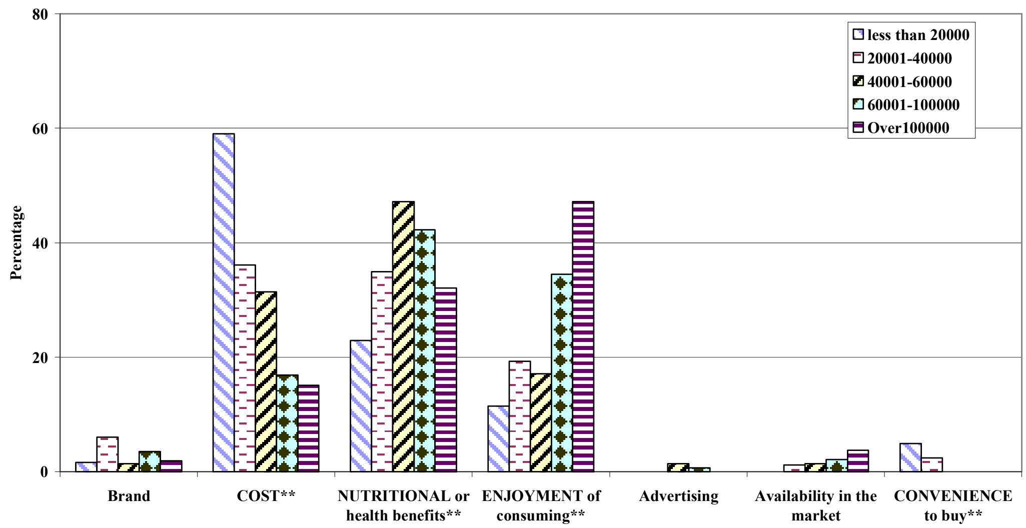
Single participants were less likely to be concerned about the nutritional content or the health benefits of their food, and separated, divorced or widowed placed less importance on the enjoyment of consuming food (Figure 5.6).



** significant difference ($p<0.05$)

Figure 5.6: Relationship of marital status on which factor was deemed to be most important in determining food choice

Concern about cost appeared to be inversely related to household income, and enjoyment of consuming seemed to follow the opposite pattern. Nutritional or health benefit concern was also related to household income, with middle income people showing the most concern (Figure 5.7).



** significant difference ($p<0.05$)

Figure 5.7: Relationship of household income on which factor was deemed to be most important in determining food choice

5.6 Trustworthiness of Information Sources

In the survey, the participants were asked to rank a number of information sources on how trustworthy they deemed them to be. According to the data presented in Table 5.5 the source with the lowest overall rank, i.e., the most trustworthy source of information, was interviews with a scientist (949) followed by documentaries (1052), seminars/conferences (1264), then pharmacists (1384) then food manufacturers (1948) with advertisements as the least trustworthy (2075) source of information on functional foods. Clearly, the respondents felt that scientists, whether they were giving an interview either on radio or television or at a conference were most likely to provide reliable information about functional foods. Documentaries too were seen as unbiased sources of information and therefore worthy of belief. The respondents ranked pharmacists a bit lower, and clearly put little trust in information from food manufacturers, and in particular, any adverts by the companies.

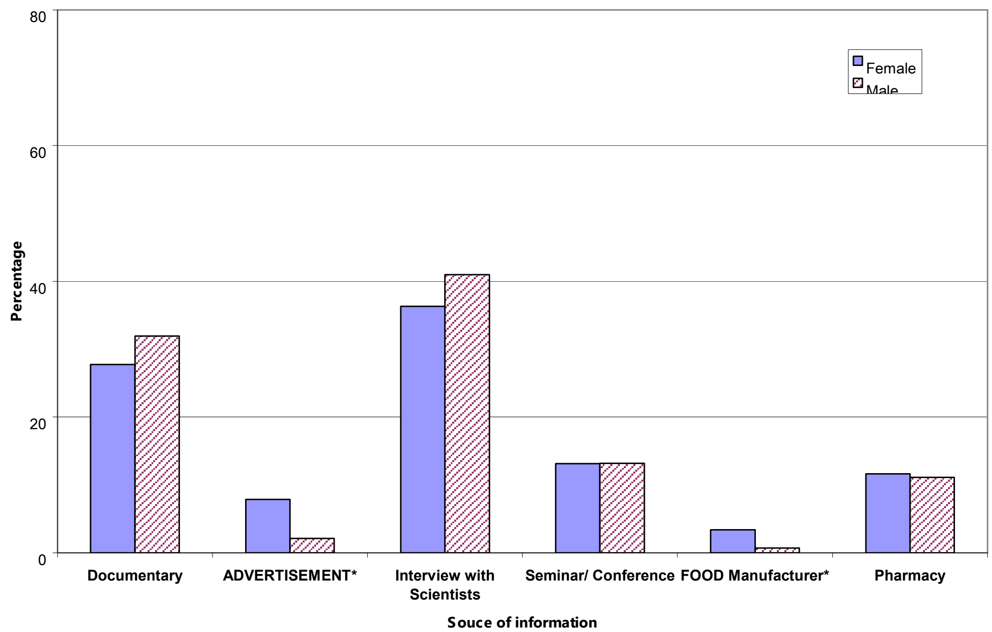
If we look at the proportion of respondents that ranked each of the sources first (see Table 5.5), we see that interviews with scientists (38% of consumers) were most likely to provide reliable information about functional foods, followed by documentaries (29.2%), seminar/conference (13.1%), pharmacists (11.4%), advertisements (5.8%) and food manufacturers (2.4%). This ranking was the same as the overall ranking for the trustworthiness of sources of information.

Table 5.5: The rank of information sources of functional foods

Ranking*	Documentary	Advertisement	Interview with scientist	Seminar /conference	Food manufacturer	Pharmacy
	N (%)					
The first	120 (29.1)	24 (5.8)	156 (37.8)	54 (13.1)	10 (2.4)	47 (11.4)
The second	90 (21.8)	13 (3.1)	115 (27.8)	97 (23.5)	22 (5.3)	78 (18.9)
The third	101 (24.5)	24 (5.8)	66 (16.0)	119 (28.8)	23 (5.6)	81 (19.6)
The fourth	68 (16.5)	32 (7.7)	36 (8.7)	82 (19.9)	69 (16.7)	127 (30.8)
The fifth	27 (6.5)	95 (23.0)	19 (4.6)	35 (8.5)	185 (44.8)	50 (12.1)
The sixth	7 (1.7)	225 (54.5)	21 (5.1)	26 (6.3)	104 (25.2)	30 (7.3)

* rank from 1 = most trustworthy to 6 = less trustworthy

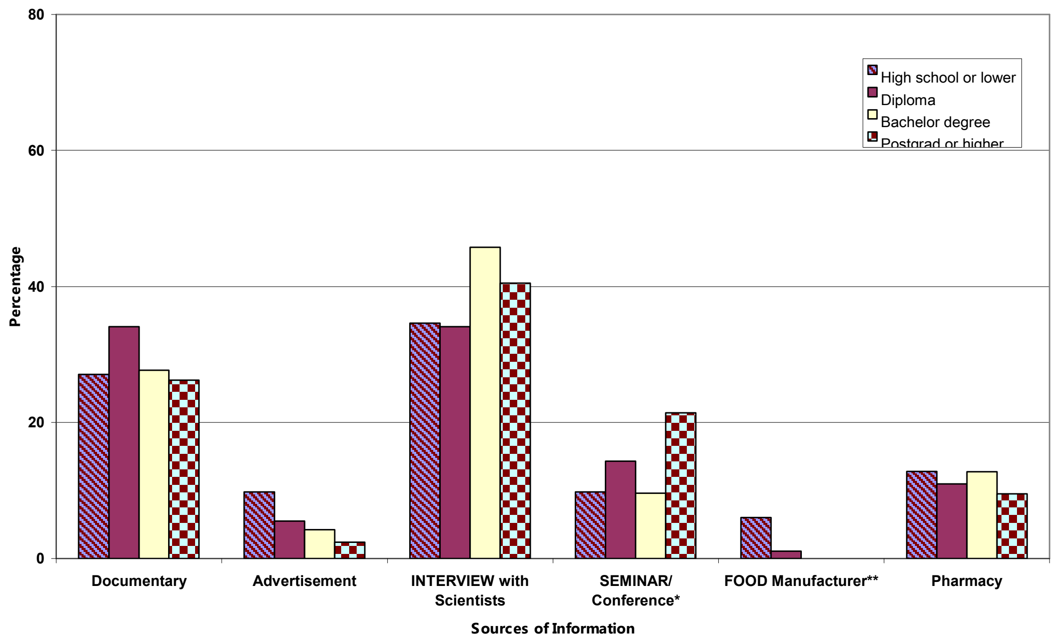
The relationship between socio-demographic variables and information sources was examined and the information is summarised in Figures 5.8-5.10. Results (figures) are only shown for the significant relationships. If we look at the relationship between gender and peoples' ranking of the importance of the various sources of information, it can be seen that women were more likely to assign credibility to manufacturers' claims and by their advertisements than men, although very few women ranked them first. Men tended to trust information more from documentaries and interviews with scientists than women (Figure 5.8). These trends were similar to the results obtained from the focus groups.



* significant difference ($p<0.05$)

Figure 5.8: Relationship of gender on respondents' ranking of the trustworthiness of various sources of information on functional foods.

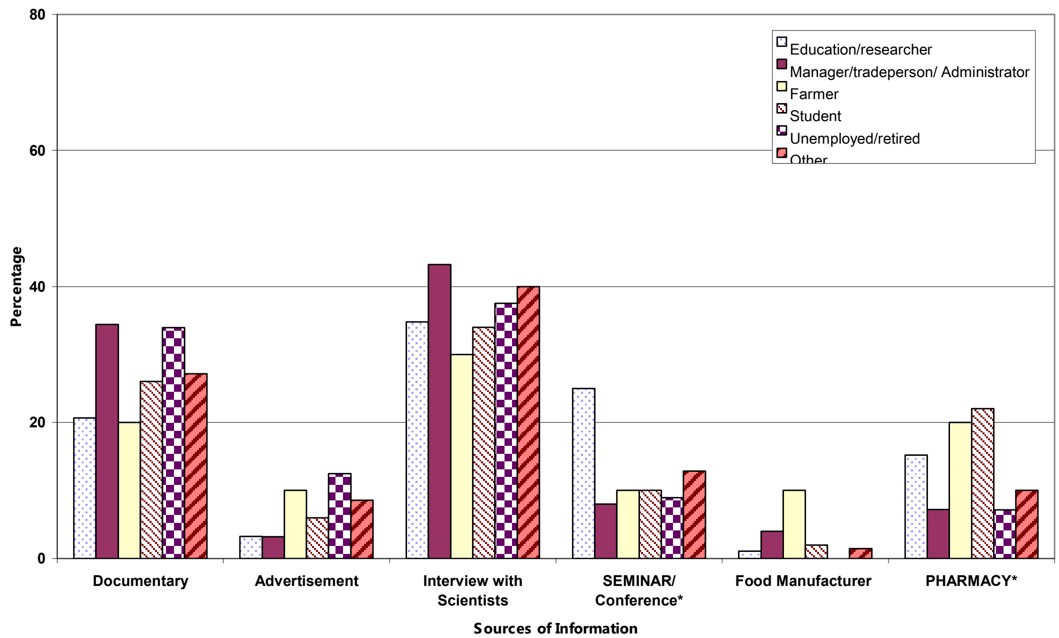
The relationship between education and sources of information shows that there were significant differences between groups for credibility of Seminar/Conferences and Food Manufacturers (Figure 5.9). More highly educated participants were more likely to trust scientists and papers at 'seminars/conferences' than the other groups. However, these people were clearly sceptical about manufacturers' claims and their advertisements. Consumers with lower educational achievements tended to be more likely to trust information from food manufacturers.



* significant difference (p<0.05)

Figure 5.9: Relationship of educational achievement on respondents' ranking of the trustworthiness of various sources of information on functional foods

All of the occupational groups ranked interviews with scientists ahead of the other five information sources as providing most trustworthy information about functional foods (Figure 5.10). Educationalists/researchers put most trust in information obtained from seminars and conferences. Pharmacists were a trustworthy source of information for the farmers, students and educationalists/researchers.



* significant difference (p<0.05)

Figure 5.10: Relationship of occupation on respondents' ranking of the trustworthiness of various sources of information on functional foods

5.7 Discussions

The Palmerston North sample was over-represented by women, people with high income and educational status compared to the national population since this group of people were more likely to participate in the research. Within this sample, 63% reported they ate functional foods daily, while less than 8% reported that they did not consume them at all. This high level of consumption is surprising. Respondents were given a definition of functional foods, which includes fortified foods, but unfortunately, they were not asked to state what food(s) they currently consumed. Only a small percent were knowingly consuming a functional food for either arthritis or CHD, in spite of 41% reporting symptoms of one of these two conditions.

Whilst a large majority reported that they were consuming functional foods at least weekly, most respondents reported spending less than 21$/week on the products, and only 11% were taking functional foods as a substitute for medicine. A Japanese study reported that the average Japanese consumer spends $134 annually on functional foods (about $NZ5 per week), US consumers spend $72.2 per person ($NZ2.55 per week), Europeans spend $54.4 per person ($NZ2 per week), and consumers in other Asian countries spend around $3.40 per person ($NZ0.20 per week) (The Consulate General of Canada in Osaka, 2006). However, the reports could have been using different definitions for a functional food than was used in this study. Consequently, it is difficult to make valid comparisons between studies. In the Canadian report, the consumption of functional foods was reported as per capita consumption. In this study, participants were probably reporting household use and not per capita use, hence the much higher spending reported in this study compared to other studies.

Interestingly most people knew someone who was consuming functional foods and had talked with them about their health benefits. Medical sources such as health professionals were perceived as credible sources (Lappalainen *et al.*, 1998), but less than 30% of participants reported that they had talked to a health professional about functional foods.

Thirty percent of participants would prefer to take functional food active ingredients for either arthritis and/or coronary heart disease in pill form rather than in a food. This view was strongly expressed in the focus group where they were concerned about the fact that it was difficult to control the dosage you received each day with a food, because people ate varying amounts of the food, and did not want to be forced into eating the same amount of a food on a daily basis. In the case of pills, they knew exactly what they would be getting each day. Childs and Poryzees (1998), in their study on functional food consumption, found that respondents were more likely to take a pill or capsule over functional foods. The most preferred food to be the delivery medium for the functional ingredients would be a drink. The focus group participants also indicated that a drink was the best food to add the functional ingredients too. Spreads were the second most popular vehicle for an ingredient that prevented or ameliorated CHD. This is probably due to the fact that products like Pro-Activ^{TM} (a margarine with phytosterols in the product for reducing cholesterol uptake) have been around for some time in New Zealand and so consumers would be quite accepting of other products in this style of food product. Pro.Activ^{TM} was first launched onto the New Zealand market in October 1999 (Heasman and Mellentin, 2001). On the other hand, arthritis functional foods had not appeared on the New Zealand market at the time of the survey. Therefore, it was quite difficult for the respondents to answer the questionnaire without seeing a sample of an anti-arthritis functional food. For instance, Poulsen (1999) found that attitudes to concrete examples of functional foods were much more positive than attitudes to a nebulous functional food concept.

This study showed that nutrition and health benefits were the main influencers on food choice. This was not surprising given the fact that the majority of participants were female and the study showed that female respondents were more likely to choose their food on the basis of the foods' nutritional health benefits than men. This may be because females are more commonly concerned about health than males (Roininen *et al.*, 1999; Worsley and Scott, 2000). In this study, young people seemed to be governed more by cost than any of the other age groups when it came to deciding what food to purchase. This is supported by the study of Marie (2005) who showed that the price of food was a very important motivational determinant of the type of foods eaten by students living in residence halls.

Consumers who were over 30, on the other hand, tended to choose their food more on the basis of its nutritional health benefits than the other factors. This is similar to a report by Worsley & Scott (2000) that showed that young and highly educated people were least concerned about food safety, food system issues and health, whereas the older participants were quite concerned about their health.

Like other studies, this study also showed that people from different socio-demographic backgrounds tended to have a different world-view about the trustworthiness of different information sources on functional foods. For instance, women tended to put more trust in manufacturers' claims and their advertising than men did. This trend was similar to the result obtained from the focus groups. Eastlick and Lotz (2000) also reported that women perceived the claims of manufacturers to be more beneficial than men did.

Interviews with scientists and documentaries were ranked as the most credible sources of information, with food manufactures and advertising as least. This pattern was seen through all socio-demographic groups analysed, although the relative rating varied somewhat. More highly educated participants put more trust in information presented at seminars or conferences, whilst participants who had lower educational achievements (up to high school certificate) were more likely than those with higher educational achievements to be affected by food manufacturer's claims, though information from seminars and conferences were the most trustworthy sources of information for them too.

This might be explained by the fact that the higher educated consumers were probably working in an educational facility or research institute and could therefore easily have attended seminars and conferences and read papers from these conferences and so be familiar with the views of the scientists. As a consequence, they trust the ethical and impartial standards of scientists more than they do the ethical standards of marketing and business people.

Occupation also influenced the way people perceived the trustworthiness of information sources. For instance, the educationalists/researchers group was most influenced by information obtained from conferences and seminars. According to Galobardes, Morabia, and Bernstein (2001), occupation was believed to influence dietary patterns to quite an extent because people tend to associate with people at work and outside of work who have a similar worldview to themselves. The influence of these work cultures and social networks tend to result in similar dietary behaviours as well as other behavioural patterns. Moreover, the reason behind understanding the health-related information of consumers was dissimilar to the understanding of science-based information of the scientist (Lähteenmäki, 2004).

5.8 Conclusions

A majority of participants reported that they had consumed functional foods (63%). Most of the participants accepted the idea of having anti-CHD and anti-arthritic ingredients in the food. A drink appeared to be the most favoured food to include functionally active ingredients in, a result that was similar to the focus groups' conclusions. The drink was favoured because the dosage could be controlled (so long as the individual drank all the drink), it was something that was consumed on a daily basis, and finally it was convenient. Other foods are familiar, staple foods and can be consumed daily such as bread, and cereal. However, a high proportion of respondents (30%) were still sceptical and would prefer to ingest a functional food ingredient developed to either prevent or ameliorate arthritis or coronary heart disease in the form of a supplement pill rather than in a food. The result of the survey have quite restrictive constraints on the product developer, because it appears as though the respondents are saying that totally new products should not be developed for these functional foods, but instead products that are regularly consumed should be used as the delivery vehicle for the functional ingredients.

The study also showed that the socio-demographic circumstances of the individual had a large bearing on what variables influenced their food choices. For instance people on low incomes were most influenced in their food choices by the cost of the food, whereas, the wealthy were less influenced by cost or health issues, but were instead most likely concerned that the food taste good. Consumers who were aged over 30, on the other hand, whilst influenced by the other factors, tended to be influenced most in their food choices by the food's nutritional content. Female respondents were more influenced by the nutritional content of the food, which is not surprising since most women want their families to be healthy and so try to make sure that they give them healthy, safe food. However, the high incidence of obesity in New Zealand, and indeed, other countries, suggests that women are not ensuring that their families are eating healthily. Why this is so is a matter of conjecture. However, probably it is either because they have misconceptions about what constitutes a healthy diet, and/or are constrained by financial pressure or do not act on their beliefs. If people consider functional foods as nutritional, then women over 30 were most likely to consume them.

The ranking of reasons for the purchase of foods suggest that a functional food needs to taste good even if it has nutritional benefit and is not too costly. The study suggests that any newly developed new functional food should not be overly priced; otherwise, a sizeable market (low-income consumers) will be unable to afford the food. The wealthy will pay for the new functional food so long as it tastes good and does what the manufacturers claim it does.

Scientists and documentaries were chosen as the most reliable sources of information, whilst advertisements and food manufacturers were the least trustworthy information sources. The study also showed that peoples' perceptions of the trustworthiness of a source disseminating information about the efficacy of a new functional food product were dependent on their socio-demographic status. The well-educated respondents in this survey placed greater trust on material appearing in seminars/conferences than they did on the pronouncements of manufacturers or their advertisements. Very few people claimed to trust advertisement and food manufacturers but women and people with less education were more likely to be influenced by them.

Chapter 6

CONSUMER ATTITUDES AND INTENTIONS TO CONSUME FUNCTIONAL FOODS: RELATIONSHIP WITH SOCIO-DEMOGRAPHICS AND HEALTH BEHAVIOURS

6.1 Introduction

The consumption of functional foods is increasing all over the world, but there is incomplete information as to who consumes them and why. This is particularly so in New Zealand. Socio-demographic factors such as age, gender, education, and income appear to be associated with consumer attitudes and intention to consume functional foods (Bech-Larsen and Grunert, 2003; Gilbert, 1997; Poulsen, 1999; Saher *et al.*, 2004). Moreover, the surveys have also shown that socio-demographics also affects the health awareness of consumers (IFIC, 2000; Urala and Lähteenmäki, 2003, 2004).

It was hypothesised that consumers in New Zealand would be no different to their overseas counterparts when it came to the factors that would influence their attitudes to functional food and intentions to consume these functional foods. This chapter explores the influence that socio-demographic factors, as well as health related behaviours, and health condition have on respondents' attitudes to functional foods and intentions to consume functional foods, both in general, and functional foods specific for arthritis and coronary heart disease (CHD).

6.2 Data Analysis

The study contained 27 attitudes and 8 intention related statements (presented in Table 6.1, and Table 6.7). Principal components analysis (PCA) was employed to identify broader dimensions of attitude towards functional foods and intentions to consume general and disease specific functional foods. The use of PCA was exploited in this part of the study in order to reduce the data associated with 35 variables down to a smaller number of factors, which incorporated the original variables. "These factors are weighted linear combinations of the variables included in the analysis. The factor loadings represent the extent to which each variable correlates with each factor. Thus, the interpretation of a factor is based on the variables that have the highest loadings on it" (Hair *et al.*, 1998; Howitt and Cramer, 2005).

The factor scores from the PCA were used as variables in the analysis of variance models (ANOVA). The first step was a one-way ANOVA for each factor against all socio-demographic and health behaviour variables. Then ANOVA was performed for three models. In Model 1 only the following socio-demographic variables are included: gender, age group, education, income, and having young children in the household. In Model 2, these socio-demographic variables and the following health behaviour variables were included: smoking, physical activity, purchasing foods as a substitute for medicine, taking dietary supplements, and talking about the benefits of functional foods with others. Model 3 included the socio-demographic, health behaviour and also the following health condition variables were all considered: non-disease and disease (arthritis and/or coronary heart disease symptoms).

A similar two-stage method of factor analysis followed by analysis of variance was used by Urala and Lähteenmäki (2004) on attitudes to functional foods and by Niva and Mäkelä (2007) on dimensions of acceptability of health-promoting foods.

6.3 Results

6.3.1 Attitude statements

Means and standard deviations of each attitude and intention statements are presented in Table 6.1 and Table 6.9. Scores range from 1 to 7, with 7 being strongly agree. In general, respondents had an overall positive attitude to functional foods (statement 1-6 with mean scores > 5.0), even though evidence suggests that respondents were also sceptical about the functional food concept and the benefits of functional foods (statement 25-27, mean <5.0).

Dimension of attitudes

Twenty-seven questions were included in the study and they could be summarised by five factors using PCA. The KMO statistic of this study was 0.904 suggesting that the data was ideally suited for factor analysis (Hair *et al.*, 1998). The factor loadings and communalities (h^2) for each variable are presented in Table 6.1 and they ranged from 0.413 to 0.852. Eight statements[6] had to be removed from the analysis because of low factor loading (lower than 0.50) and/or high cross-loading (over 0.40) (Hair *et al.*, 1998).

As with all PCA analyses, the first factor accounted for the majority of the variance in the data. The variables included in this first factor suggested that the factor could be described as a general attitude to functional food consumption. The variable loadings on the factor were all positive suggesting that it was describing peoples' positive feelings about the benefits of functional foods. The second factor was represented as a dimension of belief in the personal benefits of consuming functional foods. The statements included in this factor concerned the benefits to help/prevent chronic disease, reduce taking medicine, and having a healthy lifestyle. The third factor could be interpreted as a dimension of self-efficacy,

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[6] The eight statements removed are

1. Overall, I think that consuming functional foods would be worthwhile (5.57$\pm$1.41)
2. Eating/drinking functional foods does me no harm (5.70$\pm$1.28)
3. Eating/drinking functional foods makes some people independent (3.25$\pm$1.70)
4. I don't need to take dietary supplements if I eat/drink functional foods (4.01$\pm$1.70)
5. Eating/drinking functional foods would cause unpleasant side-effects (2.41$\pm$1.47)
6. I trust the health claims made by food manufacturers about functional foods (R) (3.87$\pm$1.62)
7. Functional foods cost more than other foods (5.24$\pm$1.45)
8. Functional foods do not taste good (R) (3.11$\pm$1.54)

i.e., the ability of respondents to purchase and consume functional foods. In this dimension, statements from two constructs, self-efficacy and controllability (or perceived behavioural control), were included. After PCA was performed, statements from both constructs fell into the same principal component. Factor 4 appeared to be associated with peoples' belief in the efficacy of functional foods. The fifth factor related to consumers' concerns about their knowledge of functional foods and scepticism towards the benefits from functional foods.

Table 6.1: Attitudes to functional foods (mean, S.D., communality, factor component)

Variable				Factor				
	Mean	SD	h^2	1	2	3	4	5
1. Overall, I think that consuming functional foods would be good	5.56	1.40	.852	.898				
2. Overall, I think that consuming functional foods would be positive	5.55	1.32	.845	.872				
3. Overall, I think that consuming functional foods would be beneficial	5.47	1.57	.689	.806				
4. Overall, I think that consuming functional foods would be enjoyable	5.02	1.36	.665	.740				
5. Overall, I think that consuming functional foods would be natural	5.00	1.59	.653	.733				
6. Overall, I think that consuming functional foods would be convenient	5.01	1.38	.547	.636		.322		
7. Eating/drinking functional foods would stop me from getting ill	4.69	1.57	.585		.715			
8. Functional foods make it easier for me to follow a healthy lifestyle	4.90	1.68	.708	.351	.689			
9. Eating/drinking functional foods would help me to be healthy	5.56	1.43	.672	.381	.650			
10. Eating/drinking functional foods would help prevent chronic disease	5.17	1.34	.624		.644		.323	
11. I can reduce taking medication if I eat/drink functional foods	3.96	1.92	.423		.639			
12. I do not worry about eating a balanced diet, if I eat/drink functional foods	2.98	1.76	.413		.617			
13. I get pleasure from eating/drinking functional foods	4.59	1.69	.569	.303	.586			
14. Eating/drinking functional foods make me feel in control of my health	4.63	1.64	.559	.349	.583			
15. I can afford to try new food products such as functional foods	5.22	1.60	.616			.778		
16. I feel confident to buy functional foods	5.12	1.44	.724	.319		.687		
17. I know where to buy functional foods	5.51	1.49	.588			.679		
20. If I wanted to, I could easily eat/drink functional foods	5.97	1.23	.515	.330		.619		
22. I believe that certain foods reduce the risk of disease	5.75	1.23	.651				.776	
23. I buy foods to treat or reduce the risk of a specific health condition	3.37	1.61	.636				.759	
24. I consume at least one food because of the health benefits I believe it provides	5.81	1.53	.643				.750	
25. I am unsure of the dosage of active ingredients in functional foods	4.88	1.68	656					.809
26. I do not have enough knowledge about functional foods	3.37	1.61	.494					.654
27. It is difficult to see the benefits of functional foods	3.94	1.76	.491					.592
Reliability								
Rotation Sums of Squared Loadings				19.348	15.409	10.096	9.256	7.627
Kaiser-Meyer-Olkin Measure of Sampling Adequacy (.904)								

Extraction Method: Principal Component Analysis. , Rotation Method: Varimax with Kaiser Normalization. (factor loading < 0.3 is not presented in the table)

6.3.2 Results for ANOVA models

The results in Tables 6.2 - 6.6 show the one-way unadjusted relationships between each of the socio-demographic and health behaviour variables (independent variables) and each of the 5 factors (dependent variables) that were extracted from the questions presented in Table 6.1. The *F*-value and statistical significance of each independent variable in each of the models is presented in bold in the tables. Parameter estimates for each level of the independent variables are shown as a comparison with the control category (the last category of each independent variable). For example, in column 2 of Table 6.2, males' main effect was 0 (as reference), whilst the main effect for females was negative (-0.238), i.e. males had more positive attitudes than females to functional foods.

The one-way effects of each variable are shown in the left column and the three models in the next three columns. In the first model, only the socio-demographic variables (gender, age, education, household income, and having kids in the household) are included. In model 2, health behaviour variables are added apart from socio-demographic variables. In model 3, all of the above variables were included as well as the health condition variables. Two-way interaction effects were examined and significant terms were viewed. However, the interactions were excluded due to fact that they were not significant in any of the models.

6.3.2.1 General attitudes to functional foods

From the one-way main effect, it was found that general attitudes to functional foods was associated with gender, education, dietary supplement taking, talking about functional food, and health condition (Table 6.2). In general, males had more positive attitudes to functional foods than females. Surprisingly, people who were taking dietary supplements or had talked with others about functional foods were less likely to have positive attitudes.

An examination of the respondents' general attitudes to functional foods with multivariate analyses, in Model 1, showed that only gender is significant, with men having a more positive attitude (Table 6.2). When the health behaviours are added to the socio-demographic variables (Model 2), talking about functional foods is the only variable to have a significant relationship and gender is no longer significant. This is also the case when health condition is added (Model 3).

6.3.2.2 Belief in personal benefits of functional foods

There were relationships between perceived personal benefits of functional foods and education, income, purchasing foods that substituted for medicine, talking about functional foods and health condition (Table 6.3). When Model 1 was examined, only education has a strong effect on perceived benefit of functional foods. Education remains significant in Models 2 and 3, with purchasing foods as a substitute for medicine and talking about functional foods also significant variables. Respondents with higher education had a less strong belief in the personal benefits of functional foods. Unexpectedly, people who purchased foods as a substitute for medicine or who talk with others about functional foods were less likely to perceive the benefits of functional foods.

6.3.2.3 Self-efficacy

Self-efficacy for functional foods was highly related to household income, smoking and talking about functional foods (Table 6.4). Consumers with lower household income, those who smoked and those who had talked about functional foods with others were less likely to feel confident about purchasing or consuming functional foods. Those with lower education were also less confident. However, the multivariate analyses showed that in Model 1, only income was significantly associated with self-efficacy. Smoking and talking about functional foods, in addition to household income, were significant in both Models 2 and 3.

6.3.2.4 Belief in efficacy of functional foods

Respondents' views about the efficacy of functional foods were positively associated with the presence of young children in the household (Table 6.5). People who exercised daily were also more likely to believe in their efficacy than were respondents that were more sedentary. Women, young adult respondents, (21-30 year olds), those who purchase foods as a substitute for medicine, take dietary supplements and those who have talked about functional foods were less likely to believe in the efficacy of these kinds of food. People with health conditions, i.e. arthritis or heart disease, were also less likely to believe in their efficacy. In Model 1, gender and children in the household were the only variables significantly related to belief in efficacy. In Model 2, having children in the household remained significant along with physical activity, taking dietary supplements and talking about functional foods. In Model 3, the same variables as model 2 remained significant, along with presence of a health condition. Symptoms of arthritis or CHD were related to less belief in the efficacy of functional foods.

6.3.2.5 Sceptical views

Sceptical views about the value of functional foods were more common among women (Table 6.6). People who take foods as a substitute for medicine, those who take dietary supplements and those who talked about functional foods with others were also more sceptical. People who exercise regularly were less likely to be sceptical about the value of functional foods. In Model 1, gender remained the only significant variable. In Model 2, gender and people who talked about the benefits of functional foods were both significant. With the addition of health condition in Model 3, gender was no longer significant, and only talking about functional foods with others was significantly related to scepticism about functional food.

Table 6.2: **ANOVA results of one-way main effects with *F*-values and parameter estimates of factor 1 (General attitudes to functional foods)**

Independent variable	Factor 1 General attitudes to functional foods			
	One-way main effect	Model 1	Model 2	Model 3
Gender	**6.188***	**4.651***	**1.936**	**1.807**
Female	-.238	-.213*	-.143	-.138
Male	0	0	0	0
Age group	**.511**	**.580**	**.921**	**1.592**
21-30	.007	.057	.080	.080
31-40	-.075	-.084	-.064	-.064
41-50	-.086	-.090	-.071	-.071
51-60	-.172	-.205	-.184	-.184
>60	0	0	0	0
Education	**2.649***	**1.554**	**1.877**	**1.638**
High school	.225	.221	.215	.215
Diploma	.199	.202	.220	.220
Bachelor	-.083	-.077	-.057	-.057
Postgrad or higher	0	0	0	0
Income	**1.995**	**.755**	**.481**	**.341**
less than 20000	.287	.275	.260	.260
20001-40000	.396	.396	.384	.384
40001-60000	.155	.155	.148	.148
60001-100000	.103	.095	.100	.100
Over 100000	0	0	0	0
Have kids under 16 years in the household	**.146**	**.506**	**.693**	**.683**
Yes	-.043	-.094	-.110	-.109
No	0	0	0	0
Smoking	**.050**		**.094**	**.122**
Daily	.043		.063	.063
Occasionally	.047		.058	.058
Not at all	0		0	0
Physical activity for at least 30 minutes	**1.100**		**0.546**	**0.549**
Every day	0.097		0.112	0.112
Weekly	-0.048		-0.044	-0.044
Occasionally/never			0	
Purchasing foods as a substitute for medicine	**.003**		**2.008**	**2.327**
Yes	-.008		.223	.240
No	0		0	.0
Taking dietary supplements	**4.447***		**1.525**	**1.264**
Yes	-.198*		-.127	-.115
No	0		0	0
Talking about benefits of functional foods	**15.123*** **		**12.202*** **	**11.534** **
Yes	-.378***		-.379***	-.368**
No	0		0	0
Health condition	**4.554***			**3.448**
Non-disease	.198*			.216
Disease	0			0
Adjusted R^2		**.015**	**.036**	**.041**

Table 6.3: ANOVA results of one-way main effects with *F*-values and parameter estimates of factor 2 (Belief in personal benefits of functional food)

Independent variable	Factor 2 Belief in personal benefits of functional food			
	One-way main effect	Model 1	Model 2	Model 3
Gender	**.692**	**.234**	**.001**	**.001**
Female	-.080	-.047	.003	.004
Male	0	0	0	0
Age group	**2.121**	**.468**	**.403**	**.417**
21-30	-.280	-.278	-.282	-.282
31-40	-.369	-.362	-.350	-.350
41-50	-.344*	-.362*	-.358*	-.358*
51-60	-.246	-.213	-.200	-.200
>60	0	0	0	0
Education	**14.173*** **	**8.412*** **	**9.901*** **	**9.637*** **
High school	.580***	.605***	.619***	.619***
Diploma	.327*	.333*	.354*	.354*
Bachelor	-.138	-.127	-.108	-.108
Postgrad or higher	0	0	0	0
Income	**4.974** **	**1.896**	**1.563**	**1.518**
less than 20000	.490*	.495*	.453*	.453*
20001-40000	.573**	.573**	.561**	.561**
40001-60000	.504*	.504**	.512**	.512**
60001-100000	.177	.173	.167	.167
Over 100000	0	0	0	0
Have kids under 16 years in the household	**.067**	**.364**	**.105**	**.104**
Yes	.029	-.078	-.041	-.041
No	0	0	0	0
Smoking	**.157**		**.028**	**.030**
Daily	.087		.099	.099
Occasionally	.058		.066	.066
Not at all	0		0	0
Physical activity for at least 30 minutes	**0.605**		**0.007**	**0.009**
Every day	0.132		0.183	0.183
Weekly	0.036		0.060	0.060
Occasionally/never	0		0	0
Purchasing foods as a substitute for medicine	**17.356*** **		**11.508*** **	**11.310** **
Yes	-.600***		-.507***	-.504**
No	0		0	.0
Taking dietary supplements	**.930**		**.062**	**.073**
Yes	-.091		.024	.026
No	0		0	0
Talking about benefits of functional foods	**26.170*** **		**20.581*** **	**20.302*** **
Yes	-.489***		-.466***	-.464***
No	0		0	0
Health condition	**9.542** **			**.122**
Non-disease	.285**			.039
Disease	0			0
Adjusted R^2		**.081**	**.146**	**.144**

Table 6.4: **ANOVA results of one-way main effects with *F*-values and parameter estimates of factor 3 (Self-efficacy on functional food consumption)**

Independent variable	Factor 3 Self-efficacy on functional food consumption			
	One-way main effect	Model 1	Model 2	Model 3
Gender	**1.315**	**1.945**	**.587**	**.627**
Female	.110	-.133	-.074	-.077
Male	0	0	0	0
Age group	**5.000****	**1.642**	**.650**	**.824**
21-30	-.257	-.253	-.235	-.235
31-40	.226	.208	.220	.220
41-50	.145	.149	.161	.161
51-60	.311	.302	.314	.314
>60	0	0	0	0
Education	**4.003****	**1.413**	**.436**	**.377**
High school	-.383**	-.416**	-.396*	-.396**
Diploma	-.199	-.201	-.188	-.188
Bachelor	-.035	-.039	-.023	-.023
Postgrad or higher	0	0	0	0
Income	**10.408*****	**5.362*****	**5.522*****	**5.176*****
less than 20000	-1.023***	-1.035***	-1.030***	-1.030***
20001-40000	-.656***	-.656***	-.659***	-.659***
40001-60000	-.637**	-.637***	-.659***	-.659***
60001-100000	-.402*	-.395*	-.395*	-.395*
Over 100000	0	0	0	0
Have kids under 16 years in the household	**.662**	**.085**	**.077**	**.074**
Yes	-.090	.037	.034	.034
No	0	0	0	0
Smoking	**8.042*****		**3.768***	**3.760***
Daily	-.495**		-.565**	-.565**
Occasionally	-.642**		-.641**	-.641**
Not at all	0		0	0
Physical activity for at least 30 minutes	**2.710**		**0.246**	**0.242**
Every day	0.359		0.311	0.311
Weekly	0.208		0.190	0.190
Occasionally/never	0		0	0
Purchasing foods as a substitute for medicine	**4.201***		**2.119**	**2.273**
Yes	-.298*		-.216	-.224
No	0		0	.0
Taking dietary supplements	**2.786**		**.015**	**.004**
Yes	-.156		.012	.006
No	0		0	0
Talking about benefits of functional foods	**27.191*****		**17.556*****	**17.940*****
Yes	-.500***		-.427***	-.432***
No	0		0	0
Health condition	**.190**			**.910**
Non-disease	-.041			-.105
Disease	0			0
Adjusted R^2		**.085**	**.142**	**.142**

Table 6.5: ANOVA results of one-way main effects with *F*-values and parameter estimates of factor 4 (Belief in efficacy of functional foods)

Independent variable	Factor 4 Belief in efficacy of functional foods			
	One-way main effect	Model 1	Model 2	Model 3
Gender	**6.781***	**8.128****	**3.287**	**3.078**
Female	-.249*	-.282**	-.178	-.171
Male	0	0	0	0
Age group	**2.941***	**1.417**	**.584**	**.095**
21-30	-.345*	-.322	-.354*	-.354*
31-40	-.380*	-.350	-.390*	-.390*
41-50	-.231	-.185	-.233	-.233
51-60	-.018	-.011	-.051	-.051
>60	0	0	0	0
Education	**.203**	**.565**	**.186**	**.151**
High school	.027	.033	.035	.035
Diploma	.011	.006	.021	.021
Bachelor	.100	.113	.100	.100
Postgrad or higher	0	0	0	0
Income	**1.414**	**1.337**	**.732**	**.841**
less than 20000	-.274	-.282	-.268	-.268
20001-40000	.091	.091	.088	.088
40001-60000	.021	.021	.065	.065
60001-100000	.010	.005	-.006	-.006
Over 100000	0	0	0	0
Have kids under 16 years in the household	**10.152*****	**6.220***	**4.720***	**4.834***
Yes	.352	.329*	.274*	.275*
No	0	0	0	0
Smoking	**4.271***		**2.626**	**2.695**
Daily	-0.362		-.432	-.432
Occasionally	-0.479		-.495	-.495
Not at all	0		0	0
Physical activity for at least 30 minutes	**9.816*****		**5.895****	**5.847****
Every day	.730***		.823***	.823***
Weekly	.652***		.704***	.704***
Occasionally/never	0		0	0
Purchasing foods as a substitute for medicine	**9.020****		**2.284**	**1.880**
Yes	-.437**		-.227	-.205
No	0		0	.0
Taking dietary supplements	**21.362*****		**10.223*****	**9.353****
Yes	-.428***		-.312***	-.297**
No	0		0	0
Talking about benefits of functional foods	**27.817*****		**9.690****	**8.927****
Yes	-.501***		-.321**	-.306**
No	0		0	0
Health condition	**22.741*****			**6.631***
Non-disease	.434***			.284*
Disease	0			0
Adjusted R^2		**.039**	**.138**	**.149**

Table 6.6: ANOVA results of one-way main effects with *F*-values and parameter estimates of factor 5 (Sceptical views in functional foods)

Independent variable	Factor 5 Sceptical views in functional foods			
	One-way main effect	Model 1	Model 2	Model 3
Gender	**8.351****	**6.594***	**3.888***	**3.837**
Female	.276**	.253*	.200*	.199
Male	0	0	0	0
Age group	**2.016**	**2.403***	**2.132**	**2.069**
21-30	.165	.176	.170	.170
31-40	-.103	-.165	-.163	-.163
41-50	.143	.154	.151	.151
51-60	-.168	-.136	-.134	-.134
>60	0	0	0	0
Education	**.192**	**.153**	**.060**	**.071**
High school	.001	.013	.022	.022
Diploma	-.059	-.039	-.034	-.034
Bachelor	-.079	-.054	-.044	-.44
Postgrad or higher	0	0	0	0
Income	**.709**	**.799**	**.787**	**.739**
less than 20000	.018	.011	-.023	-.023
20001-40000	-.149	-.149	-.142	-.142
40001-60000	.107	.107	.114	.114
60001-100000	-.019	-.010	-.014	-.014
Over 100000	0	0	0	0
Have kids under 16 years in the household	**.029**	**.241**	**.506**	**.503**
Yes	.019	.064	.093	.092
No	0	0	0	0
Smoking	**1.399**		**1.626**	**1.644**
Daily	0.262		.261	0.261
Occasionally	-0.112		-.125	-0.125
Not at all	0		0	0
Physical activity for at least 30 minutes	**4.165***		**2.832**	**2.827**
Every day	-.398*		-.461*	-.461*
Weekly	-.174		-.246	-.246
Occasionally/never	0		0	0
Purchasing foods as a substitute for medicine	**5.705***		**1.120**	**1.069**
Yes	.347*		.164	.161
No	0		0	.0
Taking dietary supplements	**4.741***		**2.061**	**1.986**
Yes	.205*		.145	.143
No	0		0	0
Talking about benefits of functional foods	**14.177*****		**10.137*****	**9.955****
Yes	.366***		.339***	.337**
No	0		0	0
Health condition	**1.651**			**.141**
Non-disease	-.120			-.043
Disease	0			0
Adjusted R^2		**.015**	**.065**	**0.063**

6.3.3 Socio-demographics and intention to consume functional foods

Factor analysis was performed on the 9 variables that dealt with the respondents' intentions to consume general functional foods and also specific functional food designed for either arthritis or CHD. The results from this analysis are presented in Table 6.7. The KMO statistic for the variables was 0.810 indicating that factor analysis could be performed on the data set and the communalities (h^2) ranged from 0.529 to 0.917. The data could be summarised by two factors. The first principal components contributed to about 42% of the total variation of intention to consume specific functional foods and the second components contributed to about 32% of intention to consume general functional foods. The means of the variables ranged from 4.93 to 5.50 (the variables had been assessed on a series of 7-point scales). The relatively high mean values of both factors indicated that respondents in general tended to have positive intentions to consume both general functional foods and functional foods designed for specific diseases. However, it was interesting to observe that purchase intention scores were not quite as high for the new CHD product as they were for the anti-arthritis product (difference not significant). It was interesting to observe for both the anti-CHD and anti-arthritis products that the scores were far more positive for a nebulous new product than they were for a product that contained a compound that was known to prevent each of the diseases. The score was 5.48 for the nebulous anti-arthritis product versus 4.95 for the product with glucosamine, and 5.50 for the nebulous anti-CHD product versus 5.10 for one that contained plant sterols. Either the people were not sure or did not believe in the effective of the mentioned compound in preventing the respective diseases.

Table 6.7: Intention to consume functional foods and specific functional foods: mean, SD, communality, and factor loading

Variable	Mean	SD	h2	Factors	
				1	2
If a new food product - treated Arthritis, I would purchase such a product	5.08	1.70	.740	.857	
If a new food product-treated the symptoms of CHD, I would purchase such a product	4.99	1.72	.685	.816	
If a new food product - helped prevent arthritis, I would purchase such a product	5.48	1.41	.677	.798	
Glucosamine -added into the foods, I would purchase such a product	4.95	1.64	.647	.788	
If a new food product - helped prevent CHD, I would purchase such a product	5.50	1.41	.661	.780	
Plant sterol-added into the foods, I would purchase such a product	5.10	1.50	.529	.642	.342
I intend to eat/drink functional foods in the next few months	5.01	1.87	.897		.934
I aim to eat/drink functional foods for my healthy lifestyle	4.93	1.83	.913		.933
I want to eat/drink functional foods	5.01	1.75	.917		.926
Reliability					
Rotation Sums of Squared Loadings				42.263	31.800

Kaiser-Meyer-Olkin Measure (0.810)

Two new dependent variables were calculated from the factor scores and then ANOVA was used to see how these two dependent variables were related firstly by socio-demographic variables (Model 1, and then by socio-demographics and health behaviours (Model 2) and finally by socio-demographics, health behaviours, and health condition (Model 3). Factor 1 was defined as consumers' intention to consume functional foods 'designed to treat a specific disease', whilst factor 2 was a unique factor and could be defined as people's intentions to consume 'functional foods in general'.

The one-way effects in Table 6.8 showed that the intention to consume disease specific functional foods to help treat or prevent arthritis or coronary heart disease was associated with age, education, talking about functional foods and health condition. Young participants, participants with higher education, those who talked about functional foods and the disease groups were less inclined to consume functional foods with special ingredients to help prevent/treat arthritis and/or CHD. The fact that young respondents were disinclined to consume these specialist functional foods is not surprising given the fact that both diseases tend to develop in middle age and then progressively worsen as people age.

When all the socio-demographic factors were considered together in Model 1 (Table 6.8) less than 10% of the variance was explained. Respondents who intended to consume specific functional foods were the elderly with lower education. In Model 2 with the addition of the health behaviour variables, the same socio-demographic variables were significant, and in addition, people who talked about the benefits of functional foods to others had less intention to consume specific functional foods. In Model 3 CHD or arthritis symptoms were added to Model 2 resulting in a slightly better model (R^2= 0.11), It showed that those with symptoms were less likely to purchase functional foods and age and education were no longer significant. It was interesting that respondents with existing arthritis or CHD symptoms had less intention to consume functional foods designed for their specific chronic diseases. This may have been due to the fact that these people could not see how foods would work when specialist medicines had trouble controlling their conditions.

Table 6.9 shows the intention to consume general functional foods (factor 2) was associated with gender, all health behaviour factors, and health condition. Interestingly, males had higher intentions to consume functional food products than females. Participants who were smoking, not doing exercise, purchasing food as a substitute for medicine, taking dietary supplement, talking about benefits of functional foods, and had arthritis/CHD all had less intentions to consume general functional foods.

Gender remained the only significant variable in Model 1, and explained approximately 5% of the variance. There were strong relationships between all health behaviour variables and intention to consume functional foods in Model 2 (R^2 = 0.24). Males, non-users of dietary supplements and non-smokers were respondents most intending to consume general functional foods. Those who purchased food as a substitute for medicine and talked about functional foods to others were less likely to consume general functional foods. In Model 3, there was no impact of arthritis/CHD symptoms on general functional food intention, and all health behaviour variables and gender remained significant.

Table 6.8: ANOVA results of one-way main effects with *F*-values and parameter estimates of intention to consume specific functional foods

Independent variable	Specific functional foods consumption intention			
	One-way main effect	Model 1	Model 2	Model 3
Gender	**.016**	**.001**	**.267**	**.402**
Female	.012	.020	.052	.063
Male	0	0	0	0
Age group	**9.679*****	**6.210*****	**4.853****	**2.057**
21-30	-.504**	-.482**	-.481**	-.481**
31-40	-.814***	-.793***	-.792***	-.792***
41-50	-.244	-.214	-.220	-.220
51-60	-.101	-.071	-.070	-.070
>60	0	0	0	0
Education	**5.980****	**2.842***	**2.978***	**2.198**
High school	.405**	.391**	.403**	.403**
Diploma	.226	.218	.210	.210
Bachelor	-.068	-.048	-.048	-.048
Postgrad or higher	0	0	0	0
Income	**.980**	**1.102**	**.856**	**1.234**
less than 20000	-.109	-.109	-.106	-.106
20001-40000	.156	.156	.147	.147
40001-60000	.182	.182	.167	.167
60001-100000	.070	.071	.062	.062
Over 100000	0	0	0	0
Have kids under 16 years in the household	**.924**	**.478**	**.321**	**.312**
Yes	.107	-.089	-.074	-.072
No	0	0	0	0
Smoking	**1.244**		**.721**	**.649**
Daily	.243		.210	.210
Occasionally	-.127		-.119	-.119
Not at all	0		0	0
Physical activity for at least 30 minutes	**.780**		**.134**	**.186**
Every day	.171		.208	.208
Weekly	.070		.119	.119
Occasionally/never	0		0	0
Purchasing foods as a substitute for medicine	**3.830**		**1.082**	**.687**
Yes	-.289		-.162	-.127
No	0		0	0
Taking dietary supplements	**2.130**		**.254**	**.075**
Yes	-.138		-.051	-.027
No	0		0	.0
Talking about benefits of functional foods	**10.767****		**7.821****	**6.885****
Yes	-.320**		-.299**	-.276**
No	0		0	0
Health condition	**44.327*****			**15.708*****
Non-disease	.594***			.448***
Disease	0			0
Adjusted R^2		.072	.083	.115

Table 6.9: ANOVA results of one-way main effects with *F*-values and parameter estimates of intention to consume general functional foods

Independent variable	General functional food consumption intention			
	One-way main effect	Model 1	Model 2	Model 3
Gender	**19.102*****	**18.868*****	**8.164****	**7.975****
Female	-.413***	-.423**	-.261**	-.258**
Male	0	0	0	0
Age group	**1.915**	**1.613**	**2.714***	**3.087***
21-30	-.195	-.186	-.164	-.164
31-40	.127	.103	.125	.125
41-50	-.181	-.193	-.179	-.179
51-60	.065	.030	.052	.052
>60	0	0	0	0
Education	**1.234**	**1.210**	**2.298**	**2.226**
High school	-.075	-.068	-.075	-.075
Diploma	.034	.033	.050	.050
Bachelor	-.213	-.211	-.196	-.196
Postgrad or higher	0	0	0	0
Income	**1.897**	**1.638**	**1.040**	**1.011**
less than 20000	-.191	-.191	-.222	-.222
20001-40000	.196	.196	.191	.191
40001-60000	-.135	-.135	-.140	-.140
60001-100000	-.081	-.086	-.087	-.087
Over 100000	0	0	0	0
Have kids under 16 years in the household	**.084**	**.282**	**.228**	**.234**
Yes	.032	.069	.056	.069
No	0	0	0	
Smoking	**6.090****		**5.128****	**5.173****
Daily	-.486**		-.491**	-.491**
Occasionally	-.477**		-.471*	-.471**
Not at all	0		0	0
Physical activity for at least 30 minutes	**3.826***		**.790**	**.762**
Every day	.460*		.459**	.459**
Weekly	.333		.311	.311
Occasionally/never	0		0	0
Purchasing foods as a substitute for medicine	**21.457*****		**7.205****	**6.812****
Yes	-.669***		-.375**	-.365**
No	0		0	0
Taking dietary supplements	**25.349*****		**6.919****	**6.515***
Yes	-.464***		-.239**	-.233*
No	0		0	0
Talking about benefits of functional foods	**90.046*****		**60.759*****	**59.595*****
Yes	-.856***		-.749***	-.742***
No	0		0	0
Health condition	**5.672***			**1.554**
Non-disease	.221*			.129
Disease	0			0
Adjusted R^2		.052	.244	.245

6.4 Discussions

6.4.1 Dimension of attitudes to functional foods

The five dimensions of attitudes to functional foods that were extracted from the attitude data of the 474 Palmerston North respondents were similar to the original theoretical constructs in section 4.4.3. Means of attitude variables ranged from 2.98-5.75 and standard deviations ranged from 1.23-1.92. In general, respondents had an overall positive attitude to functional foods (statement 1-6 with mean scores ranging from 5.00-5.56), even though evidence suggests that respondents were also sceptical about the functional food concept and the benefits of functional foods (statement 25-27, mean scores ranged from 3.37-4.88).

According to the results, all socio-demographic factors, health behaviours, and health conditions are related to dimensions of attitudes but only some are related to intention to consume functional foods. Five dimensions of attitudes were identified. However, cost and taste, variables that you would expect to be important in functional food consumption were excluded from the analysis because their factor loadings were less than the prescribed minimum. Some studies (Manstead and Eekelen, 1998; Tavousi *et al.*, 2009) have been able to separate perceived behavioural control from self-efficacy. However, in this study, statements from both constructs ended up in the same factor. This was to be expected according to (Ajzen, 2002), the original developer of the TPB theory who argues that both self-efficacy and controllability are facets of the same construct.

The findings from this study suggest that there is a multi-faceted relationship between socio-demographic factors and the dimensions of peoples' attitudes towards functional foods. Highly educated subjects (bachelor degree and above) did not believe in the personal benefits of functional foods. People that are more educated may not see functional food as a magic bullet. Education was seen to be highly significant for factor 2 (belief in the personal benefit of functional foods) but not on factor 4 (belief in the efficacy of functional foods). The fact that this socio-demographic variable did not load significantly onto both belief factors suggests that educated people did not believe that functional foods were as efficacious as claimed and needed significantly more proof before they would change their minds. Alternatively, they might be of the opinion that they were already taking the necessary steps to prevent the development of the disease, and as a consequence, did not see any worth in consuming functional foods. This result was contrary to the findings of Childs and Poryzees (1998) who found that the belief in the nutraceutical promise implicit with certain functional foods tended to increase with educational level. Tuorila *et al.* (2001) found that as educational attainment increased so peoples' phobia about trying new food products such as functional foods tended to decrease. On the other hand, other international research reported similar findings to this study where compared to respondents with lower-educational level, well-educated respondents gave greater credence to the idea that functional foods had medicinal properties, but were less inclined to consume functional foods as part of their daily, healthy diet (Urala and Lähteenmäki, 2004). Therefore, well-educated consumers were less likely to accept functional foods as a part of their healthy diet, even though they accepted the medicinal effects of them. Furthermore, Verbeke (2006) stated that the majority of his respondents, particularly the better-educated, refused to accept functional foods even if they tasted good.

A high proportion of respondents (48%)[7] felt that functional foods were expensive, so it was not surprising to see consumers with high household incomes more likely to intimate that they could purchase functional foods if they wanted to (self-efficacy).

In this study, gender also had a significant effect on attitudes to functional foods and belief in their efficacy. Males had a more positive attitude to functional foods and belief in their efficacy than females. A previous study (Ares and Gámbaro, 2007) reported that both males and females had positive attitudes towards functional foods with different functional food mediums. Urala and Lähteenmäki (2004) found that males were prepared to trade off taste for a functional food that really worked. Moreover, the same researchers reported that females did not accept functional foods as a healthy diet option because they did not believe that using functional foods could help repair their unhealthy diet, whereas males did. However, Tuorila *et al*. (2001) reported that males were more neophobic about new foods than were females. Moreover, women believed that foods and nutrition played a more important role in their health than it did for men (Food Insight, 2000). Additionally, numerous studies have indicated that males were less interested in a healthy diet than

[7] The question about cost of functional foods was dropped out. However, 48% of participants 'agree' and 'strongly agree' with the statement "Functional foods cost more than other foods".

women (Ralph *et al.*, 1996; Roininen *et al.*, 1999). It seems that women see functional foods as different from health or nutritious foods.

The presence of young children in the household appeared to positively influence consumers' beliefs in the efficacy of functional foods. These findings tend to corroborate the findings of Gelperowic and Beharrell (1994) who found that children in the households positively affected peoples' intentions to consume functional foods, though they had no actual proof to show that these positive attitudes to purchase had actually been translated into purchase decisions. Moreover, Colavito (1996) found that children in a household tended to have a major impact on their parents' attitudes to diet and health.

The ANOVA results showed health behaviours were significantly correlated with the dimensions of attitude (i.e. factor components), especially talking about the benefits of functional foods. It is noteworthy that respondents who did not talk about functional foods had a positive response to all the measured attitudes dimensions. Talking with other people about the benefits of functional foods appeared to create, or be in response to, negative views in the minds of respondents. This could indicate that existing functional foods on the market were performing badly and those people who had tried them and found them wanting were passing on their views to anyone prepared to listen to them. The more knowledge they had about them the less inclined they were to consume them. If this is the case then it has serious implications for the functional foods industry in New Zealand. Clearly, the industry needs to regain the confidence of its consumers. This can only be done by producing functional foods that actually do what the manufacturers claim they do. This in turn can only be achieved if the industry undertakes expensive efficacy trials to scientifically prove that the foods do what they claim to do. As shown in the previous chapter, these results should be presented as the documentary by the scientist if consumers are to believe the results.

Respondents with existing arthritis and/or CHD were less likely to believe in the benefits of functional foods. This finding is a concern for the food industry as it shows that people who could most benefit from the production of a disease specific functional food would be the people least inclined to purchase the product. Perhaps people with a specific disease are more likely to rely on medicine than a functional food. If this is indeed the case then perhaps, the functional foods industry should concentrate on the development, production, and marketing of functional foods that have the ability to prevent/minimise the development of specific diseases as apposed to treatment, as the general consumers would be more inclined to buy these types of functional food. Moreover, the target market is likely to be far larger, thus offering food companies bigger returns on their investments.

Cost and taste were identified by the focus group participants as being major barriers to the consumption of functional foods. However, the principal component analysis of the attitude data suggested that cost and taste were not major barriers to the consumption of functional foods. Neither variable had a loading in excess of 0.5 on any of the five factors suggesting that neither was important. In retrospect, this was not surprising in view of the fact that both taste and cost are multi-item constructs and cannot thus be encapsulated by a single term, as was the case with this study. The principal component analysis suggested, however, that concerns about dosage and inadequate knowledge about functional foods made them sceptical about consuming functional foods. These results were supported by other study of Lo'pez-Azpiazu *et al*., (1999) who reported that the main barriers to the consumption of a healthy diet were willpower, price and the unpleasantness of a food. Moreover, there were a number of barriers to the consumption of functional foods and the most important of these was the perceived risks associated with their consumption (Frewer *et al.*, 2003). Knowledge was also stated as one of the key motivations to the purchase or consumption of functional foods (IFIC, 1999). Therefore, lacking of knowledge about functional foods could lead consumer to feel hesitate to purchase them.

6.4.2 Intention to consume functional foods

Means of intention statements ranged from 4.93-5.50 and standard deviations ranged from 1.41-1.87. In general, respondents tended to have positive intention to consume general functional foods and specific functional foods.

In this study, the intention to consume functional foods could be divided into two different concepts: intention to consume functional foods in general and the intention to consume functional foods related to a specific disease (CHD and arthritis). Whereas age and education were related to intention to consume specific functional foods, only gender was linked to consumption of functional foods in general.

Previous studies (Bech-Larsen and Grunert, 2003; Gilbert, 1997; Poulsen, 1999) have indicated that females were more likely to purchase functional foods than males and that females were more concerned with their health (Ralph *et al.*, 1996; Roininen *et al.*, 1999). Whereas, this study showed that males were more likely to intend to consume general functional foods than females. This may be explained, in part, by the fact that the males had a higher belief in the efficacy of functional foods and had a more positive attitude to functional foods than females. However, it should be noted that male numbers in this study were rather small (35%), so those who chose to participate may be those who were functional food consumers or at least had an interest in the topic. None of the other socio-demographic variables was related to intent to purchase. It is surprising, since in other studies age was found to be related to increased intention (Gilbert, 1997; IFIC, 2002; Poulsen, 1999) and high income (Childs and Poryzees, 1998). The higher income groups had higher belief intensity about the abilities of certain substances in natural foods to prevent disease than the low-income groups.

Middle-aged (41-60 year-olds) and elderly (>60 year-olds) respondents were most likely to consume specific functional foods for arthritis and CHD. This is not surprising because the burdens of arthritis and coronary heart disease are found in older age groups. This was supported by a survey carried out in America (IFCF, 2000), where it was found that 65% of middle aged and older consumers (aged 55 and older) were using functional foods to target a specific health concern compared to younger groups. Younger consumers were not ready to trade taste for health and did not accept functional foods as a healthy diet option (Urala and Lähteenmäki, 2004). The higher consumption by older adults was despite the elderly (66-80 years) reporting that they were more neophobic to new food products than other age groups (Tuorila *et al.*, 2001). In addition, lower education was associated with increased intention to consume specific functional foods. Interestingly the relationship of both age and education with this intention was explained by disease symptoms.

Most of the health related behaviours were associated with intention to consume functional foods in general, while only talking about functional foods was related to intention to consume specific functional foods. Clearly, people view functional foods specific to a condition differently than the general concept.

In this survey, the health condition had a strong negative relationship with peoples' intention to consume functional foods that are targeted to these conditions, i.e. people with either CHD or arthritis were less inclined to consume functional foods than people without the diseases. This is in spite of the fact that evidence exists to show that functional compounds such as the stannols and sterols that are added to margarine actually reduce cholesterol levels in blood by at least 10%. Either these people believe that the functional ingredients do not work and that they would rather depend on medication to treat their condition, and/or they need more proof to demonstrate their efficacy, and/or they are not prepared to change their eating patterns/lifestyle. However, the study also showed that people with either CHD or arthritis had a low intention to consume these specific functional foods and this was consistent with them being less likely to believe in their efficacy.

6.5 Conclusions

The analysis of the attitude data showed that the attitudes could be grouped into five distinct factors and these factors coincided with theoretical dimensions of attitudes (TPB and TRA). Different dimension each related to different socio-demographic variables for example, income related to self-efficacy. Cost of functional foods was apparently not correlated with any of the attitude dimensions and, as a consequence, was not extracted in the factors, as was the case with taste. This was probably due to the fact that these two items were included as single-item constructs and not as multi-item constructs as should have been the case. This was unexpected as most literature and the results from the focus group clearly indicated that cost and taste should have been correlated with questions relating to barriers to the consumption of functional foods.

None of the socio-demographic variable was correlated to all of the attitudes dimensions. However, they were all significantly correlated with at least one of the dimensions of attitudes. This suggests that any promotional material designed to stimulate the sales of functional foods would need to address each of the five attitude dimensions. Whereas, if a specific socio-demographic group is to be targeted, then women would have to be one of the most important groups that should be targeted because women had more negative attitudes and were more sceptical about functional foods. They would need to be shown that the functional foods did what manufacturers claimed they did by scientifically designed independent studies. They would probably also require educational advertising to convince them that the foods did what they are supposed to do. Other groups would need to have promotional material that addressed other specific attitude dimensions.

Intentions to consume general and specific functional foods also were not correlated with all socio-demographic variables. It is possible that people were thinking about different functional foods when responding to questions about general functional foods. However, the focus group members indicated that functional foods were viewed by some as unnatural foods. This could possibly explain why women had negative views about functional foods even though they said that nutrition was a major consideration in their food purchase decisions (results from Chapter 5).

The results highlighted the significant impact that talking about functional foods had on all five attitudinal dimensions to functional foods and intention to consume general and specific functional foods. The relationship was consistently negative with all five attitudinal dimensions. However, it was unclear as to whether people became more negative as a consequence of talking to others about functional foods or whether they talked to other people because they had very negative views about functional foods. This issue needs to be explored in a future study. This result has some important implications for the food industry if the views of this non-representative sample are held by the New Zealand population.

Taking dietary supplements also had a negative relationship with intention to consume general functional foods and belief in their efficacy. The people taking dietary supplements did not believe that functional foods were efficacious, these may have been the people who wanted the functional benefits delivered in pill form rather than in a food. Moreover, the result in Chapter 5 showed that 35% of participants reported taking dietary supplements every day. If this attitude to functional foods is held by the whole New Zealand food buying population then a sizeable proportion of the population will not buy functional foods.

The analysis also showed that people who either had the symptoms of arthritis and/or CHD did not believe in the efficacy of functional foods and had lower intention to consume disease specific functional foods than the healthy respondents had.

Chapter 7

A COMPARISON OF THE THEORY OF REASONED ACTION AND THE THEORY OF PLANNED BEHAVIOUR ON THEIR ABILITY TO PREDICT PEOPLES' INTENTIONS TO CONSUME FUNCTIONAL FOODS

7.1 Introduction

The purpose of this portion of the study was to identify the model(s) that best fitted the data collected from the 474 Palmerston North respondents. Three models are compared to establish which model is the best (accounting for the greatest proportion of the variance in the data) at predicting peoples' intentions to consume functional foods. Two of the models, the Theory of Reasoned Action and the Theory of Planned Behaviour have been used to evaluate peoples' intentions and consumption behaviour of food and even some functional foods. The third model, a slight modification to the Theory of Planned behaviour has been used in a number of non-food comparative studies, but to the researchers knowledge never been used for peoples' intentions to consume foods, let alone functional foods (Chang, 1998; Madden *et al.*, 1992). A traditional reflective approach to model development was adopted for this study where it was "assumed that variations in the scores on measures of a construct were a function of the true score, plus error", i.e., that the underlying construct caused the observed variation in the measures (Jarvis *et al.*, 2003). According to the same authors, this approach is suitable for such constructs such as attitudes and purchase intention, i.e., the very things that were being assessed in this study.

The Theory of Reasoned Action (TRA) and the Theory of Planned Behaviour (TPB) have been used widely in predicting consumers' intentions to undertake some change in behaviour or the purchase of a service or product (Sheppard *et al.*, 1988). The Theory of Planned Behaviour (Ajzen, 1988, 1991) has been used successfully by a number of researchers to examine consumers' behaviour towards a range of products and services, including food (Armitage and Conner, 2001; Arvola *et al.*, 2008; Conner and Armitage, 1998; Conner *et al.*, 2001; Conner, 2002; Hansen *et al.*, 2004; Sparks and Shepherd, 1992). The food studies include organic food purchasing (Arvola *et al.*, 2008), dietary supplement use (Conner *et al.*, 2001), health-related eating behaviour (Ajzen and Timko, 1986; Povey *et al.*, 2000), fat intake reduction (Paisley *et al.*, 1995), fish consumption in Vietnam (Tuu *et al.*, 2008) and intentions to purchase specific functional foods such as omega-3 fatty acids (Patch *et al.*, 2005a). Two meta-analysis studies have shown that there is strong experimental support for the TPB and its application to the modelling of consumers' intentions to purchase a range of products (Armitage and Conner, 2001; Christian, 2003). A review of 185 independent studies showed that TPB accounted for 27 percent of the variance in subsequent behaviour and 39 percent of the variance in behaviour intentions (Armitage and Conner, 1999).

The Theory of Reasoned Action has been used successfully in several food studies including one to predict the choice of flavoured milks (Shepherd *et al.*, 1991), another to predict milk consumption by women (Brewer *et al.*, 1999), and finally fast food consumption (Bagozzi *et al.*, 2000).

The third model considered in this chapter is a modification to the theory of planned behaviour. The improvement is a recognition that subjective norms influence peoples' attitudes to a product or behaviour and this causal path link between the subjective norms and attitudes was made (Chang, 1998; Hansen *et al.*, 2004) and is shown in Figure 7.1.

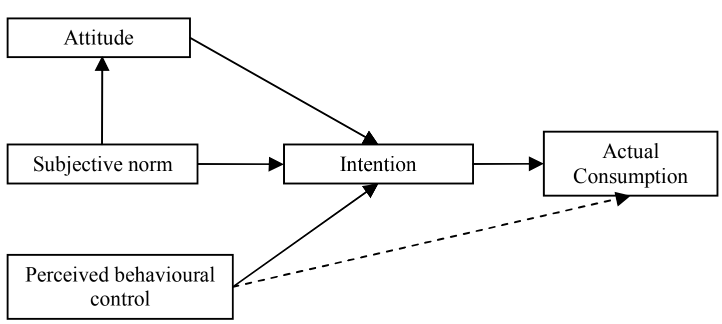


Figure 7.1: Hypothesised relationships among constructs according to the modified theory of planned behaviour model

7.2 Data Analysis

For this chapter, only the variables based on the theory of reasoned action and the theory of planned behaviour are included in the analysis. Only four factors could be used because the constructs or factors had already been defined in these two models (refer to original model of TRA and TPB). These factors or constructs are direct attitudes to functional foods, subjective norms, perceived behavioural control, and intention to consume functional foods.

Firstly, the frequencies, means and standard deviations for each of the observed variables were determined to ensure that the data for each observed variable was reasonably normally distributed. Skewness and kurtosis were examined for normality of the dataset, since Maximum likelihood (ML) was employed in the study on the assumption that the majority of the data included in the model had multivariate normality. There was no strong skewness and kurtosis in the dataset so ML could be employed and there was no need for adaptations to be made to the data.

Exploratory factor analysis (EFA) was performed on the data. This consisted initially of Principal Axis Factoring with Direct Oblimin Rotation. This was performed on the data with the aim of obtaining a set of underlying dimensions to the data. These underlying dimensions were examined to confirm that the data could be summarized by the same number of underlying constructs as were prescribed by either the Theory of Reasoned Action or Theory of Planned Behaviour. Next, the variables that had loaded onto each of the factors were checked to ensure that the variables that were supposed to be loaded onto each of these theoretical constructs for either the theory of Reasoned Action or Theory of Planned Action had in fact load onto them. Variables (items) that failed to meet the various loading, cross-loading and primary component loading requirements (as defined in Chapter 4) were then eliminated and a final factor analysis solution was obtained by re-running the routine with the eliminated variables. This final solution was then used in any subsequent analysis. After exploratory factor analysis was accomplished, confirmatory factor analyses (CFA) and structural equation modelling (SEM) were performed with LISREL 8.80 (Jöreskog and Sörbom, 1997).

7.3 Results

7.3.1 Item analysis

This part of the study deals with 17 questions based on the theory of reasoned action and theory of planned behaviour about direct attitudes to functional foods, subjective norms, perceived behavioural control to consume functional foods, and finally intention to consume general functional foods. The means and standard deviations of individual items (questions or variables) were determined. They are presented in Table 7.1.

Table 7.1: Theory of planned behaviour items (mean and S.D.)

Questions		Mean[1]	S.D.[2]
Attitudes to functional foods (ATT)[3]			
ATT1	Worthless-valuable	5.57	1.41
ATT2	Harmful-beneficial	5.47	1.57
ATT3	Unenjoyable-enjoyable	5.02	1.36
ATT4	Negative-positive	5.55	1.32
ATT5	Bad-good	5.56	1.40
ATT6	Unnatural-natural	5.00	1.59
ATT7	Difficult- convenient	5.01	1.38
Subjective norms (SN)			
SN1	My family thinks I should eat/drink functional foods	3.79	1.95
SN2	My friends or colleagues think I should eat/drink functional foods	3.26	1.75
SN3	My doctor thinks that I should eat/drink functional foods	3.71	1.90
Perceived behavioural control (PBC)			
PBC1	If I wanted to, I could easily eat/drink functional foods	5.97	1.23
PBC2	I can afford to try new food products such as functional foods	5.22	1.60
PBC3	I feel confident to buy functional foods	5.12	1.44
PBC4	I know where to buy functional foods	5.51	1.49
Behavioural Intention to consume functional foods (BIFF)			
BIFF1	I intend to eat/drink functional foods in the next few months	5.01	1.87
BIFF2	I aim to eat/drink functional foods for my healthy lifestyle	4.94	1.83
BIFF3	I want to eat/drink functional foods	5.02	1.75

[1] Item means are based on 7-point rating scale (1 = totally disagree, 7 = totally agree).
[2] Standard deviations
[3] Attitudes were measured based on a 7-point rating scale (1=worthless, 7=valuable)

The means for the various direct attitude questions on functional foods ranged from 5.00 – 5.57 (slight to moderate agreement with questions) with standard deviations (SDs) ranging from 1.32 – 1.59. The means for the subjective norm questions ranged from 3.26 to 3.79 (slightly disagreeing to neither agreeing or disagreeing with the statements), with SDs ranging from 1.75 – 1.95; higher standard deviation for each question than was the case for the direct attitude questions. The means for the perceived behavioural control questions ranged from 5.12 – 5.97 (slight to moderate agreement) and the SDs ranged from 1.23 to

1.60). Finally, the means of the behavioural intention to consume functional food questions ranged from 4.94-5.01 (slight agreement) with, and the SDs ranged from 1.75-1.87).

Overall, the respondents had a moderately positive set of attitudes to functional foods. However, there was no pressure from either relatives or colleagues or health professionals for them to consume these foods. On the whole, there did not appear to be anything to stop them from consuming functional foods, but there appeared to be internal pressure for them to actually purchase such products. The high standard deviations for all constructs suggests that these views were polarised in the sample with some agreeing with the statements and others disagreeing with the statements with the effect that the means for these questions fell in between the two extremes, i.e. neither agree or disagree with the statements.

7.3.2 Item reliability

The questions were analysed to evaluate how well each item contributed to the overall theoretical constructs. To examine the reliability and validity of the items, firstly each set of items representing the constructs was examined for their corrected item-total correlations. These correlations along with their Cronbach alpha coefficients of each factor are presented in Table 7.2. The correlated item-total correlations ranged from 0.484 to 0.908.

Most of the corrected item-total subscale correlations were greater than 0.40 as shown in Table 7.2. The individual items clearly belonged to each of the constructs and were good indicators of the factors that they were associated with.

The Cronbach's alpha coefficients, a measure of whether a question can be removed from a factor without the factor losing any of its meaning (i.e., failure to account for a substantial proportion of the variance of the data explained by a particular factor), are also shown in Table 7.2. These coefficients indicate the relative contribution of an item to the construction of a scale for measuring a particular factor. They were all in the acceptable range.

Table 7.2: Corrected item-total correlation, Cronbach's alpha if item deleted and coefficient for each factor

Items	Corrected item-total correlation	Cronbach's Alpha if item deleted
Attitudes to functional foods (ATT)		
ATT1	0.690	0.910
ATT2	0.731	0.907
ATT3	0.740	0.906
ATT4	0.863	0.894
ATT5	0.846	0.894
ATT6	0.728	0.907
ATT7	0.646	0.915
Subjective norms (SN)		
SN1	0.636	0.724
SN2	0.622	0.739
SN3	0.659	0.698
Perceived behavioural control (PBC)		
PBC1	0.493	0.730
PBC2	0.682	0.623
PBC3	0.569	0.688
PBC4	0.484	0.741
Behavioural Intention to consume functional foods (BIFF)		
BIFF1	0.881	0.942
BIFF2	0.908	0.921
BIFF3	0.906	0.924

7.3.3 Exploratory factor analysis of the data for the theories of planned behaviour and reasoned action

A Kaiser-Meyer-Olkin measure of sampling adequacy of 0.914 suggested that the data were suitable for factor analysis. Exploratory factor analysis was conducted with principal axis factoring and oblique rotation (direct oblimin). ATT1 (worthless-valuable) was removed from the first factor because it had a high cross-loading on two of the factors.

An exploratory factor analysis of the remaining 16 items revealed that three factors had eigenvalues greater than one. A four-factor solution, however, was chosen to comply with the requirements of the theory of planned behaviour. According to Cattell (1978) the eigenvalue rule tends to underestimate the number of factors when there are a few variables to be factor analysed and to overestimate the number of factors when there are too many variables. The four-factor solution is presented in Table 7.3. All factor loadings less than 0.30 have been omitted from the table for ease of visualisation and interpretation.

Table 7.3: Factor loadings obtained from the exploratory factor analysis

	Extraction	Factor			
		1	2	3	4
ATT2	.602	.800			
ATT3	.597	.659			
ATT4	.841	.894			
ATT5	.871	.988			
ATT6	.582	.665			
ATT7	.479	.568			
SN1	.678		.838		
SN2	.666		.843		
SN3	.499		.606		
PBC1	.362			.429	
PBC2	.699			.641	
PBC3	.444			.530	
PBC4	.405			.681	
BIFF1	.827				-.826
BIFF2	.890				-.918
BIFF3	.910				-.898
Cronbach's alpha		0.910	0.795	0.755	0.951
Eigenvalues		7.385	1.769	1.639	.894
Percentage of variance		46.154	11.057	10.242	5.586
KMO = .914					

Note: This principal components, obliquely rotated (Direct Oblimin) forced 4-factor solution, and explained 73.04% of the total variance. Rotation converged in 6 iterations. Loadings <0.30 are not shown.

Table 7.4: Relationship among the factors in the exploratory factor analysis (Factor correlation matrix)

Latent variables	1	2	3	4
1 (ATT)	1.000			
2 (SN)	.371	1.000		
3 (PBC)	.385	.186	1.000	
4 (BIFF)	-.644	-.448	-.541	1.000

The direct oblimin rotation method was examined for fit and interpretation. The solution with four factors yielded more meaningful results, as well as a good fit based on the residual correlations. The four-factor solution accounted for 73.04% of the total variance. The factor correlation matrix is presented in Table 7.4. The factors in the theory of planned behavioural model are independent variables and include attitudes to functional foods (ATT), subjective norm (SN), and perceived behavioural control (PBC). The dependent factor in the model, i.e. intention to consume functional foods (BIFF), is factor 4 in Tables 7.3 and 7.4. Latent variables of the same names were established for subsequent analysis by using the respective factor scores of the variables in each factor.

7.3.4 Confirmatory factor analysis

7.3.4.1 The reliability and validity of the constructs

Squared multiple correlations of each indicator, composite reliability, and variance extracted are some of the test statistics that can be used to measure the construct reliability in structural equation modelling. The output of LISREL supplies the R^2 of each indicator. The composite reliability and variance extracted can be calculated by using the formulas shown in section 4.6.3.1.

The structural equation paths were estimated for each model to test the proposed models. The detail of SEM was explained in section 4.6.3.2. To investigate which model best explained the sample covariance, nested-model comparisons were conducted (refer to e.g. Chang, 1998; Hansen *et al.*, 2004). The theory of reasoned action was nested within the theory of planned behaviour by setting the path to zero from perceived behavioural control to behavioural intention.

The composite reliability and variance extracted for the data in this study for each construct are depicted in Table 7.5. The composite reliabilities of the four constructs used in this study ranged from 0.763 to 0.951, which are greater than the minimum acceptable value of 0.70. The extracted variance values of the constructs ranged from 0.456 to 0.867, and they are mostly larger than the minimum requirement for a reliable construct (0.50). Taking into consideration that the variance extracted for the PBC was 0.456, and if rounded to a single decimal place would be 0.5, it can be considered to be reliable. The Cronbach's alpha value of each factor (latent variable) in this study ranged from 0.755 to 0.951, indicating that the questions in each factor were reliable indicators of the factor or construct. In summary, the sixteen observed variables (questions) and four factors (constructs) can be considered to be reliable according to the criteria for the three statistical tests that were used.

Table 7.5: λ_i, ε_i, composite reliability and variance extracted of each constructs

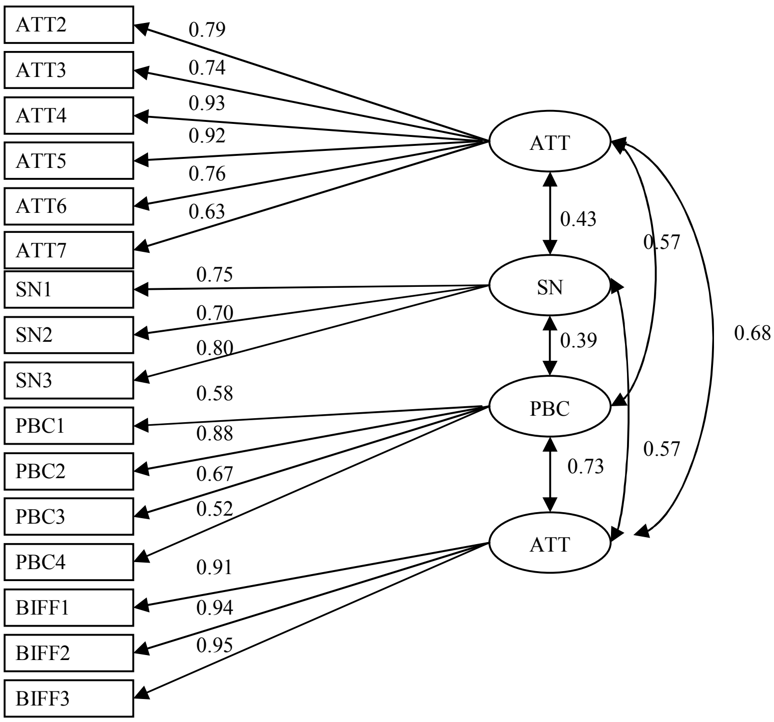
Variable name	λ_i^a	ε_i^b	Composite reliability	Variance extracted	Cronbach's alphas
Attitudes to functional food (ATT)			0.914	0.642	0.910
ATT2	0.79	0.38			
ATT3	0.74	0.45			
ATT4	0.93	0.13			
ATT5	0.92	0.16			
ATT6	0.76	0.43			
ATT7	0.63	0.60			
Subjective norm (SN)			0.796	0.566	0.795
SN1	0.75	0.43			
SN2	0.70	0.51			
SN3	0.80	0.36			
Perceived behavioural control (PBC)			0.763	0.456	0.755
PBC1	0.58	0.67			
PBC2	0.88	0.23			
PBC3	0.67	0.55			
PBC4	0.52	0.73			
Intention to eat/drink functional foods (BIFF)			0.951	0.867	0.951
BIFF1	0.91	0.18			
BIFF2	0.94	0.11			
BIFF3	0.95	0.11			

[a] the standardised loading of each indicator (manifest variable)

[b] the error variance associated with each indicator

7.3.4.2 Model-fitting procedure Assessment of the fit and unidimensionallity of the model

The purpose of this portion of the study was to identify the model(s) that best fitted the data collected from the 474 Palmerston North respondents. Three models are compared to establish which model is the best (accounting for the greatest proportion of the variance in the data) at predicting peoples' intention to consume functional foods. Two of the models, the Theory of Reasoned Action and the Theory of Planned Behaviour have been used to evaluate peoples' intention to consume functional foods and their consumption of some functional foods. The third model, a slight modification to the Theory of Planned Behaviour has been used in a number of non-food comparative studies (Chang, 1998; Madden *et al.*, 1992), but to the researchers knowledge never been used for peoples' intention to consume functional foods, let alone functional foods. The CFA model is shown in Figure 7.2.



(χ^2 = 397.93, df = 98 (p = 0.000); Normed χ^2 = 4.07; RMSEA = 0.080; NNFI = 0.97; GFI = 0.90; AGFI = 0.87; and CFI = 0.97)

Figure 7.2: Confirmatory factor analysis model

7.3.5 Structural equation modelling

With structural equation modelling a hypothetical model is set down on paper and a series of variables are postulated to influence an independent variable in some way. In the simplest scenario, the independent variables are all assumed to be independent and not correlated and so one ends up with a picture of the hypothesised model that is not unlike simple multiple regression where you have a dependent variable that is influenced to varying degree by a series of independent variables. Structural path modelling has the advantage in this kind of study especially where the independent variables may not be completely independent of one another, compared to say regression. It can cope with models that become quite complex and so it can have arrows linking one or more of the variables in some quite complex fashions.

In Table 7.6, three models have been compared using structural equation modelling with LISREL. Model 1 is based on the theory of reasoned action. It includes ten observed variables, which have been combined to produce three latent variables, i.e. variables created from the factor scores of each question associated with each of the factors. For this model the path from planned behaviour control (PBC) to behavioural intention (BI) was set to zero (Chang, 1998; Hansen *et al.*, 2004). Using maximum likelihood estimation, the model provides a reasonable fit to the data. It explained 55% of the variation in behavioural intention to consume functional foods.

In the case of model 2, the theory of reasoned action (model 1) was nested within model 2 (theory of planned behaviour). Model 2 has 16 observed variables incorporated into the model and there are four latent variables in the model as opposed to the three in model 1. These sixteen observed variables, allocated to 4 latent variables, represent the four constructs that are normally associated with the theory of planned behaviour. This model explained 57% of the variance.

Model 3 was evaluated because it has been suggested that the theory of planned behaviour model could be improved if a causal path link between the subjective norms and attitudes was made (Chang, 1998; Hansen *et al.*, 2004). This model explains 61% of the variance.

Table 7.6: Chi-square and other fit indices of the models

Recommended level	Minimum fit criteria	Null model	Model 1 – TRA	Model 2 – TPB	Model 3 – TPB (SN→ATT)
$\chi 2$	-	1132.85	707.59	604.37	492.90
df	-	104	102	101	100
$\Delta\chi 2$			425.26*	103.22*	111.47*
Normed $\chi 2$	-	10.89	6.94	5.98	4.93
RMSEA	<.08 (<.05)	0.145	0.112	0.103	0.091
GFI	$\geq$.90	0.77	0.84	0.86	0.88
AGFI	>.80		0.79	0.81	0.84
NNFI	>.90 (>.95)		0.94	0.95	0.95
CFI	>.90 (>.95)		0.95	0.96	0.96
R^2			0.55	0.57	0.61

Notes: Model 1 = the theory of reasoned action model; model 2 – TPB is the theory of planned behaviour model and model 3 – TPB = the modified theory of planned behaviour model
* significant difference ($p<0.05$) to the null model
Normed $\chi^2 = \chi^2$/df; RMSEA=Root Mean Square Error of Approximation ;
GFI=Goodness of Fit Index; AGFI=Adjusted Goodness of Fit Index; NNFI=Non-Normed Fit Index;
CFI=Comparative Fit Index;

LISREL starts with what it calls a null model and then compares the other models with this null model to identify the model that best explains the covariance in the data. The results are summarised in Table 7.7. The following goodness of fit results were collected: χ^2, Normed χ^2; RMSEA; NNFI; GFI; AGFI; and CFI.

The RMSEA fit values were 0.145 for the null model and improved with the theory of reasoned action model (0.112) and again with the planned behaviour model (0.103) and was best for the modified planned behaviour model (0.091). An RMSEA value of 0 implies a perfect fit and values between 0 – 0.05 indicate a close fit. According to these results neither model was a particularly good fit to the data as all RMSEA values were greater than the $\leq$ 0.05 recommended value for RMSEA (Browne and Cudeck, 1993). The GFI values ranged from 0.84 to 0.88 (Table 7.9). These values should be close to and above 0.90 if the fit of the data to the model is good (Bollen and Long, 1993). The non-normed fit index (NNFI) values of the models were all above the minimum recommended value of 0.9 indicating a good fit of the data to the models. The CFI values of the four models were all above 0.95 (Bentler, 1990). These results show that the fit of the data to the theory of planned action model was better than for the null model. The normed chi-square (χ^2/df), i.e., this ratio should lie between 1- 5 for a good fit of the data to the model (Wheaton *et al.*, 1977) and only Model 3 met this criterion.

Considering all the fit indices together, the data showed an improved fit with the basic planned behavioural model compared to the null and theory of planned action models. When the TPB is modified with a path from subjective norms to attitudes, i.e. the subjective norms had an influence over attitudes, the data showed the best fit compared to the other three.

In view of the fact that the modified planned behaviour model (Model 3) showed the best fit to the data the following results are confined to this model. It explained 61% of the variation in behavioural intention to consume functional foods.

The significance of the paths to the various latent variables was investigated and these results are presented in Table 7.7 and in diagrammatic model form in Figure 7.3. The aim of the analysis was to show that the hypothesised paths are significant and to also determine which of the paths had the most impact on the dependent variable. The analysis showed that all the paths to the latent variables were significant at an α level of 0.01 and that the main predictor of whether the respondents would consume functional foods was the latent variable 'perceived behavioural control' (0.50, p<0.01). The subjective norm (SN) also had a significant direct effect on behavioural intention (BIFF) (0.31, p<0.01).

The direct effect of attitudes on BIFF was also significant (0.39, $p<0.01$). The indirect effect of SN on BIFF through attitudes is the product of the two paths (0.43 x 0.39 = 0.17, $p<0.01$).

Table 7.7: The causal relationships for the model based on the theory of planned behaviour

Relationship between two constructs	Structural equation coefficients	*t*-value*
Attitude → Behavioural Intention	0.39**	9.22
Subjective norm → Behavioural Intention	0.31**	6.90
Perceived behaviour control → Behavioural Intention	0.50**	9.46
Subjective norm → Attitude	0.43**	7.84

* *t*-value higher than 1.96 indicates significance at the 5% level, ** significant at 1% level

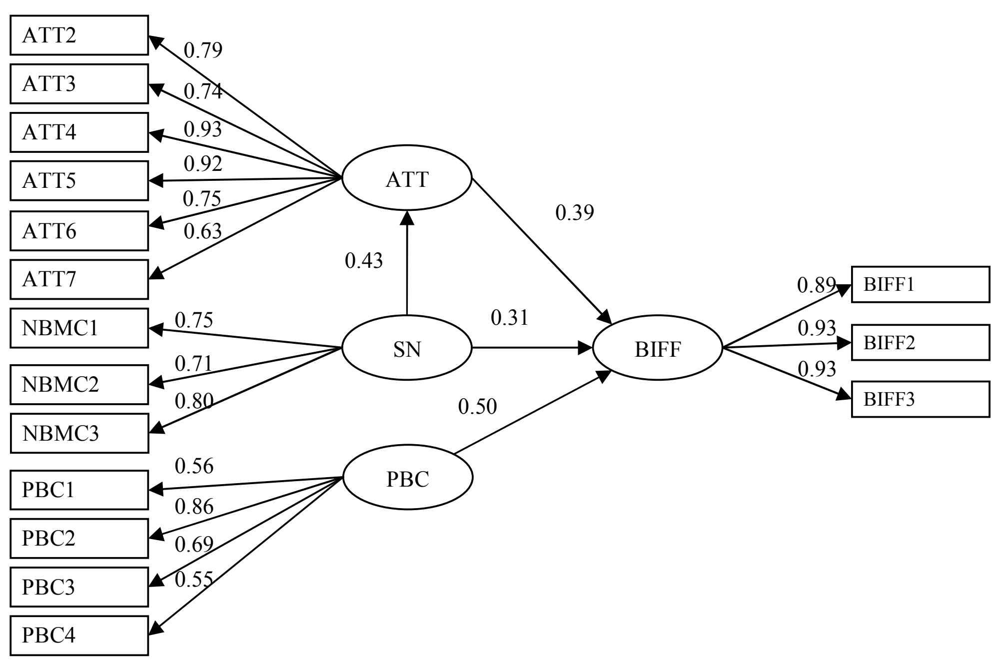


Figure 7.3: Modified planned behaviour model (model 3) with standardised solution.

7.4 Discussions

The purpose of this portion of the study was to examine the abilities of the theory of reasoned action and the theory of planned behaviour to predict the Palmerston North consumers' intentions to consume functional foods. The analysis showed that the theory of planned action could explain up to 55% of the variance in the data, and that the model was a reasonably good fit to the data. However, the theory of planned behaviour and particularly the modified planned behaviour model suggested by Madden, Ellen and Ajzen (1992) was a better fit to the data and could explain 61% of the variance in the data.

In a comparison between the theory of reasoned action and the theory of planned behaviour for 10 behaviours representing a range of attitudes with respect to control over performing the behaviour, Madden *et al*. (1992) reported that perceived behavioural control in the theory of planned behaviour had intensified the prediction of behavioural intention and behaviour. As a consequence, the theory of planned behaviour was shown to be marginally better at predicting behaviour than the theory of reasoned action (35% of the variance compared to 37% for the theory of planned behaviour).

This study showed that subjective norms had a positive and significant effect on peoples' attitudes and as a consequence on their behavioural intentions to consume functional foods. The linkage of subjective norms with attitudes was not present in the original models of either reasoned action or planned behaviour (Ajzen, 1991). However, some studies have shown that attitudes and subjective norms depend on each other (Fishbein and Ajzen, 1975). In other studies, researchers have found a significant relationship between subjective norms and attitudes (Chang, 1998; Choo *et al.*, 2004; Hansen *et al.*, 2004; Tarkiainen and Sundqvist, 2005). Tarkiainen and Sundqvist (2005) found that there was a relationship between subjective norms and attitudes towards buying organic food based on the extension of the theory of planned behaviour (TPB).

In chapter 6, it was shown that if people talked to others about functional foods then they tended to have rather sceptical views about the efficacy of the functional foods. Even people who were consuming these functional foods tended to have sceptical views. It was therefore not surprising to see that subjective norms had a significant impact on both attitudes and as a consequence an indirect effect on intentions to consume functional foods as well as a direct impact on these intentions. It is difficult to tell from the survey data whether the people were talking to their peers or whether they were just chance conversations. However, as pointed out in the earlier chapter the data has some important ramifications for the food industry. It is clear that existing consumers of functional foods are quite sceptical about them and their scepticism possibly intensifies the more they talk about them. However, this supposition would need to be proved in a further study. Their scepticism is obviously being communicated to their peers which can only be bad for the functional food industry.

Figure 7.3 shows the proposed model for the modified theory of planned behaviour and the importance of the various latent variables in predicting whether consumers were likely to consume functional foods. The results suggest that peoples' intentions to consume functional foods were influenced by perceived behaviour control, subjective norms, and their attitudes to functional foods. Perceived behaviour control was the most significant latent variable controlling intentions to consume, followed by attitudes and then finally subjective norms. Subjective norms, however, had an indirect influence over peoples' intentions to consume functional foods as well as a direct influence because they influenced peoples' attitudes to these products, consequently, one could possibly argue that the subjective norms, if both the direct and indirect impacts are considered, had the greatest impact on respondents' intentions to consume function foods. Another study has shown that attitudes are more important in controlling peoples' intentions to buy or do things (Guerrero *et al.*, 2000) than subjective norms and perceived behavioural control.

A number of studies have examined consumer food choice and modelled the behaviour with the theory of reasoned action (McCarthy *et al.*, 2003; Thompson *et al.*, 1994) and have found that attitudes were more important than the subjective norm in predicting behavioural intention. Moreover, Arvola *et al*. (2008) reported that attitudes had a stronger explanatory power when predicting peoples' intentions to purchase organic foods in the UK, Italy and Finland when using the theory of planned behaviour to model the data. A study by Donald and Cooper (2001) has also shown that attitudes are more important in determining behaviour than social controls, i.e. subjective norms, something that the present study also showed, unless we consider its direct and indirect effects on intention to consume.

In contrast, the study of Choo *et al* (2004) found that the main factor in understanding new food purchasing decisions of Indian consumers was social norms and not attitudes. This differences in the results could possibly be explained by the fact that people in Asia are influenced far more in what they do by their relatives, friends and society than people in European countries, i.e., the differences are due to differences in culture. This would be interesting to follow-up in a future study where a comparative study could be carried out to ascertain what effect culture had on peoples' intentions to purchase functional foods.

In this study, even though functional foods are not actually new in the marketplace, a high proportion of participants were sceptical about the products. Thompson, Haziris, and Alekos (1994) reasoned that because food purchases are typified as normal behaviour one would expect attitudes to be more important in determining peoples' intentions to consume functional foods than social norms. However, this study showed that attitudes were not the most important determinant of the respondents' intentions to consume functional foods. Instead, the study showed that PBC was the main direct determinant influencing peoples' intentions to consume functional foods. Sjoberg *et al.* (2003) also showed that PBC was the most important influence to explain consumers' intentions to consume fruit and vegetable, followed by attitudes and subjective norms. In the current study a high proportion of the respondents were firstly quite well off and secondly well educated. It is possible that this combination of socio-demographics meant that these individuals felt in control of the situation, i.e. they could afford to buy a product if it achieved what it claimed to do and they had the ability to assess the veracity of any claims made for the products – they were in control of their purchase intentions.

One would expect other factors such as consumers' perceived barriers and benefits to consuming functional foods to have an influence over peoples' intentions to consume functional foods and that these should be taken into consideration when developing models to predict peoples' intentions to consume functional foods. In the next chapter, these variables are included in the modified planned behaviour model.

7.5 Conclusions

The study showed that the attitudes were generally quite positive to functional foods ranging from scores of 5.0-5.6 on the 7 point category scale suggesting that they should be intent to consume functional foods. Whereas the subjective norm variables were slightly negative (3.26 – 3.79) suggesting that participants might not be influent by people in their social network, standard deviations of subjective norm variables ranged from 1.75 to 1.95. The perceived behavioural control variables had mean score ranging from 5.12 to 5.97 (slight to moderate agreement) and SD ranged from 1.25 to 1.60. Finally, the means for the behavioural intention ranged from 4.94-5.01 (slight agreement) with SD ranging from 1.75-1.87. The range of the standard deviations for each set of constructs was broadly similar suggesting that opinions were not too different for all constructs.

The analysis showed that the modified TPB model (the TPB with a direct path between subjective norms and attitudes) explained the highest proportion of the variance in the data and best predicted the respondents' intention to consume functional foods (61%), whereas the TPB and TRA models accounted for 57% and 55%, respectively. It suggested that a direct path between subjective norms and attitudes increased the fit indices. All theoretical constructs (determined by the theories of reasoned action and planned behaviour) were significantly related to intention to consume functional foods. Therefore, the modified model will be used in the next chapter to predict and understand consumers' intention and behaviour to consume functional foods.

Chapter 8

INTENTIONS AND ACTUAL BEHAVIOUR TO CONSUMPTION FUNCTIONAL FOODS OF PEOPLE WITH AND WITHOUT ARTHRITIS

8.1 Introduction

Arthritis and coronary heart disease are extremely common in New Zealand. Arthritis affects 16.2% of the total population aged 15 or over (Access Economics Pty Limited, 2005) and coronary heart disease caused 23% of all deaths in 1999 (Hay, 2001).

In the previous chapter, the Theory of Reasoned Action (TRA) and the Theory of Planned Behaviour (TPB) were compared using Structural Equation Modelling (SEM) to ascertain which model best explained the variance in the data collected from 474 participants. The study showed that a modified TPB model better explained the variance in the data using a number of fit indices. In this chapter, this modified planned behaviour model will be used to predict the general functional foods consumption behaviour of arthritis and non-arthritis sufferers. The aim will be to assess whether the model uses the same theoretical constructs for each group in the SEM derived models and which group's variance is best explained by the modified model.

The modified TPB model will be extended with some constructs from the Health Belief Model, i.e., perceived benefits, perceived barriers, perceived severity of the disease and perceived susceptibility to the disease. The first modification to the modified TPB model will be to add perceived benefits and perceived barriers (in Chapter 8). The second modification to the model will be to include perceived benefits, perceived barriers and also perceived severity and susceptibility when modelling the respondents' intentions to consume specific functional foods (in Chapter 9). These factors have been shown to be very important determinants of peoples' health behavioural intentions and actual behaviour. It was expected that these variables would be very important in determining peoples' intentions and actual behaviour to consume specific functional foods designed to treat/ameliorate arthritis. It was also felt that people suffering from arthritis would be more likely to consume a specific functional food designed to treat arthritis than people with the disease. A number of hypotheses for this section of the study are enunciated below.

8.2 Effects of consumers' attitudes, subjective norms and control belief on consumers' intentions to consume functional foods

The analysis in chapter 7 showed that attitudes, subjective norms and perceived behavioural control all had a significant ($p \leq 0.05$) impact on behavioural intentions to consume functional foods in general. Furthermore, the study showed that subjective norms had a significant ($p \leq 0.05$) effect on attitudes. In this chapter, this relationship was hypothesised to exist for both people with arthritis and without.

Hypothesis 1;

H1(a), Subjective norms would be positively associated with attitudes for consumers without symptom of arthritis; and

H1(b), Subjective norms would be positively associated with attitudes for consumers with symptoms of arthritis disease.

8.2.1 The predictability of attitudes, subjective norms and perceived behavioural control in behavioural intention

Attitudes, subjective norms, and perceived behavioural control were expected to have a direct influence on the respondents' intentions to consume functional food in both groups.

Hypothesis 2;

H2(a): Attitudes to functional foods will be positively associated with intention to consume functional foods of people without arthritis.

H2(b): Attitudes to functional foods will be positively associated with intention to consume functional foods of people with arthritis.

Hypothesis 3;

H3(a) : Subjective norms will be positively associated with intention to consume functional foods of people without arthritis.

H3(b): Subjective norms will be positively associated with intention to consume functional foods of people with arthritis.

Hypothesis 4;
H4(a): Perceived behavioural control will be positively associated with intention to consume functional foods of people without arthritis.
H4(b): Perceived behavioural control will be positively associated with intention to consume functional foods of people with arthritis.

8.2.2 Perceived behavioural control, behavioural intention and purchase behaviour
There are two roles of PBC in the prediction of behaviour in the TPB (Ajzen, 1991). The contribution of PBC to predict behaviour through intention (PBC → behaviour) is the first role. The second role is the interaction of the intention and PBC (intention x PBC → behaviour); when an individual performs a particular behaviour, since they emphasise the same intensity of intention, individuals with a lower level of PBC are less likely to try to perform the target behaviour compared to those with a higher PBC. In several studies, PBC has been found to be an important factor in the prediction of college student drinking intentions (Wolfe and Higgins, 2008) and using internet purchasing (George, 2004).

Hypothesis 5;
H5(a): Perceived behavioural control will have an effect on consumer's (without arthritis) consumption behaviour of functional foods.
H5(b): Perceived behavioural control will have an effect on consumer's with arthritis consumption behaviour of functional foods.

The Theory of Planned Behaviour suggests that people's intentions to purchase, do, eat, i.e., act, are a very strong predictor of peoples' actions. The model suggest that attitudes, subjective norms and perceived behavioural control all primarily influence peoples' intentions to act in some way and that it is the strength of the intentions that finally drive people's behaviour to act in a specific way. However, a number of researchers have argued against the idea of placing behavioural intentions between attitudes, subjective norms and perceived behavioural control and actual behaviour. They argue that there is a direct causal relationship between attitudes and behaviour, subjective norms and behaviour, and perceived behavioural control and behaviour (Albrecht and Carpenter, 1976; Armitage and Conner, 2001; Bentler and Speckart, 1979). Nevertheless, behavioural intention has been validated as a mediator in various study conditions (Armitage and Conner, 2001; Bagozzi and Yi, 1989; Bonfield, 1974; Ryan, 1982). In a meta-analysis, Sheppard *et al.*(1988) found a frequency-weighted average correlation between intentions and behaviour of 0.53, with wide variations across measures of intentions and types of behaviour. Approximately 75% of all people who had said that they were definitely going to buy a product actually went ahead and did so (refer to Chandon *et al.*, 2005). Consequently, it was postulated for this study, that peoples' intentions to consume functional foods would influence peoples' actual purchases of functional foods.

Hypothesis 6;
H6(a): Intention to consume functional foods will be positively associated with consumer's (without arthritis) consumption behaviour of functional foods.
H6(b): Intention to consume functional foods will be positively associated with consumer's with arthritis consumption behaviour of functional foods.

Figure 8.1 shows the model based on the modified theory of planned behaviour with hypothesised relationships among constructs.

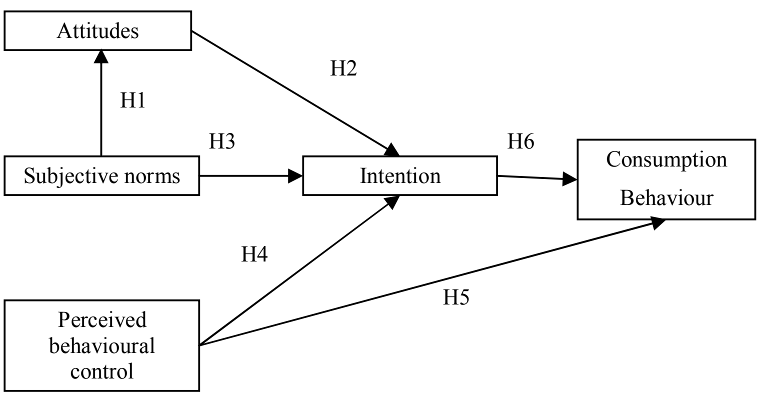


Figure 8.1: Hypothesised relationships among constructs according to the modified theory of planned behaviour model

8.2.3 Additional factors for an extended model

The health belief model is another model used to describe health related behaviour. Because the question was asked about functional foods in general, variables such as perceived severity and susceptibility are perhaps not as relevant as perceived benefits and barriers to functional food consumption. Thus, the decision was made to include perceived benefits and perceived barriers into an extended TPB model when predicting intentions and actual purchase behaviour of specific functional foods designed to treat/ameliorate specific diseases.

8.2.3.1 Perceived benefits

Some researchers propose that consumers' willingness to use functional foods is best predicted by considering the perceived benefits that they perceive they will get from consuming these functional foods (Urala and Lähteenmäki, 2004). These benefits are mainly related to the healthiness of the foods and the well-being that will result from the consumption of these functional foods. The study of Urala and Lähteenmäki (2003) showed that consumers connected functional foods with health and feelings of well-being. There are two potential roles of perceived benefits, firstly to influence intention to consume functional foods directly and secondly to influence attitude.

Hypothesis 6;
H6(a): Perceived benefits will be positively associated with intention to consume the food by the non- arthritis group.
H6(b): Perceived benefits will be positively associated with intention to consume the food by the arthritis group.

Hypothesis 7;
H7(a): Perceived benefits will be positively associated with attitudes by the non-arthritis group towards functional food.
H7(b): Perceived benefits will be positively associated with attitudes by the arthritis group towards functional food.

8.2.3.2 Perceived barriers

The results from several studies indicate that the barriers to the consumption of functional foods are also important influences of consumption. Barriers identified are: peoples' preferences; the cost of the foods; a lack of knowledge about functional foods; and an uncertainty about whether they are getting the right dose of active ingredients in a serving of the functional foods (Patch *et al.*, 2005b; Poulsen, 1999). The focus group results of this study (Chapter 3) also supported the above conclusions. In addition, those who were more knowledgeable about functional foods were more likely to be accepting of them (Labrecque *et al.*, 2006).

Taste and cost of foods are important factors governing consumers' food choice (Urala and Lähteenmäki, 2003). According to these researchers, even though consumers have a favourable perception of the benefits of functional foods, they will not buy them if they are dissatisfied with their taste and cost. There are two potential roles of perceived barriers, firstly to influence intention to consume functional foods directly and secondly to influence attitude. Unfortunately, both taste and cost were improperly prescribed in this study. The two constructs were included in the model as uni-dimensional items instead of as multi-item constructs. They were added as uni-dimensional constructs to minimise the length of the questionnaire.

Hypothesis 8;
H8(a): Perceived barriers will be negatively associated with consumer's intentions to purchase functional foods of the non-arthritis group.
H8(b): Perceived barriers will be negatively associated with arthritis consumer's intentions to purchase functional foods by the arthritis group.

Hypothesis 9;
H9(a): Perceived barriers will be negatively associated with the non-arthritis consumer's attitudes.
H9(b): Perceived barriers will be negatively associated with the arthritis consumer's attitudes.

The hypothesised relationships among constructs are shown in Figure 8.2.

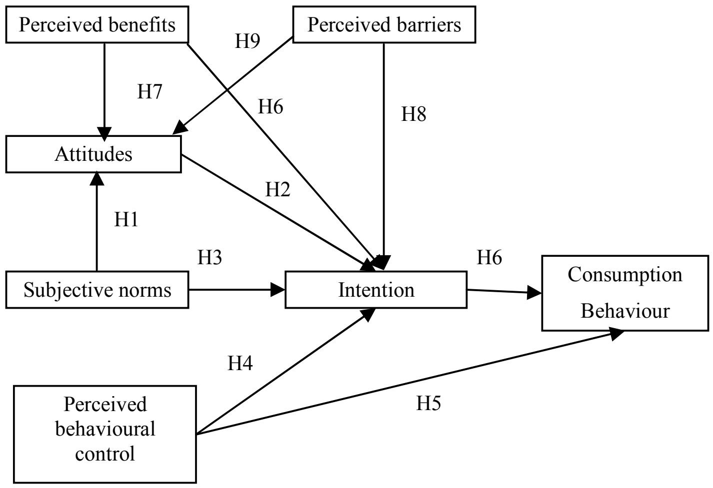


Figure 8.2: Hypothesised relationships among constructs based on the extended theory of planned behaviour model

8.3 Results

8.3.1 The samples

An examination of the 474 completed questionnaires showed that 276 respondents had no symptoms of either arthritis or CHD. These people were included in the non-arthritis group. There were 152 participants included in the arthritis group. The intention had been to include a group of people with CHD symptoms in the analysis, however, only 46 participants with symptoms of CHD or indicators of the disease such as high cholesterol and high blood pressure were willing to participate in the survey. These 46 participants have been excluded from the analysis in this chapter because there were not enough respondents in this group to enable us to use confirmatory factor analysis to prove the above mentioned hypotheses. This left 152 respondents who stated that they had symptoms of arthritis and signs of the disease such as stiffness.

The characteristics of the respondents are presented in Table 8.1. Both groups were female dominated, 62.68% for the non-arthritis group and 71.71%for the arthritis group. The majority of the respondents in the non-arthritis group were under 50 (78%), whilst more than 60% of participants in the arthritis group were over 50.

Table 8.1: Characteristic of respondents

		Non-arthritis group (N=276) %	Arthritis group (N=152) %
Gender	Female	62.68	71.71
	Male	37.32	28.29
Age	21-30	33.94	8.55
	31-40	21.90	5.26
	41-50	22.99	21.71
	50 up	21.17	64.47
Education	Up to high school	26.30	44.30
	Diploma	22.22	24.83
	Bachelor	26.67	18.12
	Postgrad or higher	24.81	12.75
Income	Less than 20000	14.67	14.38
	20001-30000	14.67	26.03
	30001-40000	16.99	16.44
	60001-100000	35.52	34.25
	Over 100000	18.15	8.90

8.3.2 Items

The means and the mean differences for the various items (survey questions) between the non-arthritis and the arthritis group are presented in Table 8.2.

Table 8.2: Items (mean, S.D. and mean difference)

Item		Mean [a] (S.D. [b])		
		Non-arthritis group (N=276)	Arthritis group (N=152)	Mean difference
Attitudes to functional foods (ATT)				
ATT2	Harmful-beneficial	5.33 (1.51)	5.54 (1.67)	0.31*
ATT3	Unenjoyable-enjoyable	4.85 (1.32)	5.26 (1.35)	0.42**
ATT4	Negative-positive	5.43 (1.29)	5.70 (1.33)	0.29
ATT5	Bad-good	5.40 (1.40)	5.79 (1.36)	0.41**
ATT6	Unnatural-natural	4.79 (1.54)	5.31 (1.58)	0.53**
ATT7	Difficult- convenient	4.86 (1.30)	5.22 (1.41)	0.41**
Subjective norms (SN)				
SN1	My family thinks I should eat/drink functional foods	3.53 (1.92)	4.07 (1.96)	0.62**
SN2	My friends or colleagues think I should eat/drink functional foods	3.00 (1.71)	3.51 (1.71)	0.61**
SN3	My doctor thinks that I should eat/drink functional foods	3.33 (1.82)	4.02 (1.85)	0.90**
Perceived behavioural control (PBC)				
PBC1	If I wanted to, I could easily eat/drink functional foods	5.91 (1.24)	6.06 (1.21)	0.14
PBC2	I feel confident to buy functional foods	5.03 (1.41)	5.16 (1.50)	0.22
PBC3	I know where to buy functional foods	5.41 (1.55)	5.68 (1.33)	0.25
PBC4	I can afford to try new food products such as functional foods	5.24 (1.53)	5.09 (1.76)	-0.05
Behavioural intention to consume functional foods (BI)				
BIFF1	I intend to eat/drink functional foods in the next few months	4.74 (1.90)	5.31 (1.79)	0.66**
BIFF2	I aim to eat/drink functional foods for my healthy lifestyle	4.65 (1.88)	5.29 (1.66)	0.69**
BIFF3	I want to eat/drink functional foods	4.80 (1.77)	5.26 (1.66)	0.53**
Consumption behaviour (CB)[c]				
CF	How often do you eat/drink functional foods?	4.85 (1.68)	5.35 (1.30)	0.48**

a Item means are based on 7-point rating (1 = totally disagree, 7 = totally agree).
b Standard deviations
c Item means are based on 6-point rating scale (1=never, 6=everyday)
d Mean comparison was done by *t*-test.
* $p < 0.05$, ** $p < 0.01$

An examination of the means for questions targeting peoples' attitudes towards functional foods shows that people with arthritis generally had more positive attitudes to functional foods than the non-arthritis group: 5.22-5.79 for the arthritis sufferers compared to 4.79 - 5.43 for the non-arthritis group (Table 8.2). Subjective norm scores ranged from 3.51-4.07 for the respondents in the arthritis group and ranged from 3.00-3.53 for the respondents in the non-arthritis group. The means for each of the variables between the two groups were found to be significantly different ($p<0.05$) except for the means of the perceived behavioural control items. The mean difference between the two groups for their behavioural intentions and consumption behaviour of functional foods too were significantly different ($p<0.05$). The arthritis group had significantly ($p<0.05$) higher scores for intentions to consume functional foods and actual behaviour than the non-arthritis group. However, the standard deviations for the intention and behaviour items amongst the non-arthritis group were larger than for the arthritis group. This suggests that opinions were more divided amongst the non-arthritis group than the arthritis group

8.3.3 Reliability, validity and multicollinearity of constructs

Exploratory factor analysis was first used to ensure that the data fell into the correct number of underlying factors as were prescribed by the respective theories and that the variables loaded onto the correct factors. Items (questions/variables) were eliminated if they failed to meet the loading requirements prescribed by Hair (1998). Then confirmatory factor analysis was employed for each group to see whether there was a strong relationship between the observed variables for the respective groups (non-arthritis and arthritis) and their underlying latent variables (Table 8.3). The analysis showed that there was a good fit between the developed model (latent variables) as shown by the Chi square values (χ^2), root mean square error of approximation (RMSEA), goodness of fit index (GFI) and comparative fit index (CFI). The respective values for the non-arthritis and arthritis group were: $\chi^2 = 343.30$ (df = 110, p= 0.000), RMSEA = 0.088 and GFI = 0.87, CFI = 0.96, for the non-arthritis group; and $\chi^2 = 184.00$ (df = 110), RMSEA = 0.067, and GFI = 0.87, CFI = 0.98 for the arthritis group. According to theory the RMSEA, GFI and CFI should be <0.08, >0.90, >0.90 respectively. An examination of Table 8.3 shows the *t*-value for each item was greater than 1.96, which shows that they were statistically significant at $p<0.05$. Moreover, the standardised factor loadings ranged from 0.51 to 0.94 for the non-arthritis group, and 0.51 to 0.96 for the arthritis group (Table 8.3). Hence, all observed variables were significantly related to their constructs, validating the hypothesised relationships among the observed variables and latent variables.

The R^2 value were used to estimate the reliability of each item. R^2 values greater than 0.50 provide an acceptable reliability (Bollen, 1989b). The squared multiple correlations for the 17 observed variables of both groups are presented in Table 8.3. The results show that the three items (ATT7, PBC1 and PBC4) did not meet the R^2 criterion (0.50) in the non-arthritis group, and two items (PBC1 and PBC4) did not meet the minimum acceptable value for R^2 in the arthritis group. Even though the R^2 value of ATT7 in the arthritis group was over the acceptable level of 0.5, as both groups were going to be compared, and to make the degrees of freedom of both groups equal, ATT7 (difficult – convenient) was removed from the arthritis group. Although, the statistical analysis suggested that ATT7, PBC1, and PBC4 should not be included in the model, theory required that PBC1 (if I wanted to, I could easily eat/drink functional food) should be included in the model as it is a main indicator of perceived personal control. So only ATT7 and PBC4 (I know where to buy functional foods) were removed in the revised model.

The results of the revised model are revealed in Table 8.4. All *t*-values of the items are above 1.96 and the R^2 values are over 0.29 indicating that there was convergent validity. After the model variables had been revised, the model fit indices showed a much better fit (χ^2 = 189.90 (df = 81), RMSEA = 0.070 and GFI = 0.92, CFI = 0.98, for the non-arthritis group; and χ^2 = 115.58 (df = 81), RMSEA = 0.053, and GFI = 0.91, CFI = 0.99 for the arthritis group. The GFI, CFI, NNFI of both groups were greater than the recommended minimum levels of 0.90, and the RMSEA value was lower than the maximum allowed value of 0.08. The normed Chi-square values were 2.344 and 1.427 for the non-arthritis group and the arthritis group, respectively, which both fell within the recommended cut-off point of < 3.

Table 8.3: CFA: Parameter estimates, standard error, critical ratio and R^2 for the proposed model

Item	The non-arthritis group (N = 276)					The arthritis group (N=152)				
	Unstandardised factor loading	Standardised factor loading	S.E.[a]	*t*-value[b]	R^2	Unstandardised factor loading	Standardised factor loading	S.E.[a]	*t*-value[b]	R^2
Attitudes										
ATT2	1.00	0.79	-	-	0.62	1.00	0.80	-[c]	-	0.64
ATT3	0.86	0.68	0.07	12.14	0.46	0.97	0.78	0.09	10.78	0.61
ATT4	1.19	0.94	0.06	20.00	0.89	1.13	0.91	0.08	14.13	0.82
ATT5	1.15	0.91	0.06	16.43	0.83	1.13	0.90	0.08	14.13	0.82
ATT6	0.91	0.72	0.07	13.00	0.51	0.97	0.78	0.09	10.78	0.60
ATT7	0.64	0.50	0.07	9.14	**0.25**	0.92	0.74	0.09	10.22	0.55
Subjective norms										
SN1	1.00	0.71	-	-	0.51	1.00	0.83	-	-	0.69
SN2	0.93	0.67	0.10	9.30	0.44	0.94	0.78	0.10	9.40	0.60
SN3	1.10	0.79	0.11	10.00	0.62	0.90	0.75	0.10	9.00	0.56
Perceived behavioural control										
PBC1	1.00	0.54	-	-	**0.29**	1.00	0.60	-	-	**0.36**
PBC2	1.57	0.84	0.19	7.89	0.65	1.53	0.92	0.19	8.05	0.86
PBC3	1.21	0.65	0.16	7.56	0.42	1.11	0.66	0.16	6.94	0.44
PBC4	0.95	0.51	0.15	6.33	**0.26**	0.84	0.51	0.16	5.25	**0.26**
Behavioural intention										
BIFF1	1.00	0.91	-	-	0.83	1.00	0.87	-	-	0.76
BIFF2	1.02	0.93	0.04	25.50	0.87	1.10	0.96	0.06	18.33	0.93
BIFF3	1.03	0.94	0.04	25.75	0.89	1.06	0.93	0.06	17.67	0.86
Consumption behaviour [d]										
	1.00	-	-	-	-	1.00	-	-	-	-

Fit indices (the non-arthritis group) : χ^2 = 343.30 (p=0.000), df = 110, χ^2/df =3.121, GFI = 0.87, AGFI = 0.82, CFI = 0.96, NNFI = 0.95, SRMR = 0.073, RMSEA = 0.088.

Fit indices (the arthritis group) : χ^2 = 184.00 (p=0.000), df = 81, χ^2/df = 2.272, GFI = 0.87, AGFI = 0.83, CFI = 0.98, NNFI = 0.98, SRMR = 0.058, RMSEA = 0.067.

a. Standard error (S.E.) = an estimate of the standard error of the covariance
b. Based on one-tailed tests, *t*-values greater than 1.65 are significant at p<0.05; *t*-values greater than 2.33 are significant at p<0.01.
c. Constrained to fixed value (1.00).
d. Error variances of this path were set to zero;

Table 8.4: Parameter estimates, standard error, critical ratio and R^2 for the revised model

Item	The non-arthritis group (N = 276)					The arthritis group (N=152)				
	Unstandardised factor loading	Standardised factor loading	S.E.[a]	*t*-value[b]	R^2	Unstandardised factor loading	Standardised factor loading	S.E.[a]	*t*-value[b]	R^2
Attitudes										
ATT2	1.00	0.79	-[c]	-	0.62	1.00	0.81	-	-	0.66
ATT3	0.85	0.67	0.07	12.14	0.44	0.94	0.76	0.09	10.44	0.58
ATT4	1.20	0.95	0.06	20.00	0.90	1.12	0.91	0.08	14.00	0.82
ATT5	1.15	0.91	0.07	16.43	0.83	1.13	0.92	0.08	14.13	0.84
ATT6	0.91	0.72	0.07	13.00	0.51	0.94	0.76	0.09	10.44	0.58
Subjective norms										
SN1	1.0	0.71	-	-	0.51	1.0	0.83	-	-	0.69
SN2	0.93	0.67	0.10	9.30	0.44	0.94	0.78	0.10	9.40	0.60
SN3	1.10	0.79	0.11	10.00	0.62	0.90	0.75	0.10	9.00	0.56
Perceived behavioural control										
PBC1	1.0	0.54	-	-	0.29	1.0	0.62	-	-	0.38
PBC2	1.50	0.81	0.19	7.89	0.65	1.45	0.90	0.18	8.06	0.80
PBC3	1.21	0.65	0.16	7.56	0.42	1.08	0.67	0.16	6.75	0.45
Behavioural intention										
BIFF1	1.0	0.91	-	-	0.83	1.0	0.87	-	-	0.77
BIFF2	1.02	0.93	0.04	25.50	0.86	1.10	0.96	0.06	18.33	0.93
BIFF3	1.04	0.94	0.04	26.00	0.89	1.06	0.93	0.06	17.67	0.86
Consumption behaviour[d]										
	1.00	-	-	-	-	1.00	-	-	-	-

Notes: Fit indices (the non-arthritis group): χ^2 = 189.90 (p=0.000), df = 81, χ^2/df = 2.344, GFI = 0.92, AGFI = 0.88, CFI = 0.98, NNFI = 0.97, SRMR = 0.056, RMSEA = 0.070.
Fit indices (the arthritis group): χ^2 = 115.58 (p=0.007), df = 81, χ^2/df = 1.427, GFI = 0.91, AGFI = 0.86, CFI = 0.99, NNFI = 0.99, SRMR = 0.040, RMSEA = 0.053.
a. Standard error (S.E.) = an estimate of the standard error of the covariance
b. Based on one-tailed tests, *t*-values greater than 1.65 are significant at p<0.05; *t*-values greater than 2.33 are significant at p<0.01.
c. Constrained to fixed value (1.00).
d. Error variances of this path were set to zero.

Table 8.5 depicts the results of the composite reliability and average variance extracted (AVE). To test the reliability of the constructs, the composite reliability, and the AVE have been reported instead of Cronbach's alpha (internal consistency of measures). The composite reliability of the individual constructs was above the threshold level of 0.70 and the extracted variance (AVE) was greater than the recommended minimum of 0.50 as recommended by Hair and colleagues (1998). The correlation matrixes (in appendix C) show that the correlations within the same constructs were higher than the correlations with the other constructs, which indicated that the constructs were showing convergent validity.

Table 8.5: Standardised estimates, *t*-value, composite reliability, and variance extracted for modified TPB model of measurement models

Parameters	Non-arthritis group (N=276)			Arthritis group (N=152)		
	Standardised estimates[a, b]	Composite reliability[b]	AVE[c]	Standardised estimates	Composite reliability[b]	AVE[c]
Attitudes		0.906	0.661		0.919	0.696
ATT2	0.79 (-[e])			0.81 (-[e])		
ATT3	0.67 (11.81)			0.76 (10.55)		
ATT4	0.95 (18.65)			0.91 (13.60)		
ATT5	0.91 (17.71)			0.92 (13.81)		
ATT6	0.72 (12.87)			0.76 (10.63)		
Subjective norms		0.767	0.524		0.829	0.618
SN1	0.71 (-[e])			0.83 (-[e])		
SN2	0.67 (9.06)			0.78 (9.35)		
SN3	0.79 (9.66)			0.75 (9.05)		
Perceived behavioural control		0.709	0.455		0.778	0.545
PBC1	0.54 (-[e])			0.62 (-[e])		
PBC2	0.81 (7.92)			0.90 (8.04)		
PBC3	0.65 (7.34)			0.67 (6.77)		
Behavioural intention		0.948	0.860		0.945	0.853
BIFF1	0.91 (-[e])			0.87 (-[e])		
BIFF2	0.93 (26.21)			0.96 (18.89)		
BIFF3	0.94 (27.24)			0.93 (17.47)		
Consumption behaviour [d]	1.00 (-[e])	-	-	1.00(-[e])	-	-

Notes: a. *t*-values of the constructs presented between brackets. *t*-values greater than 1.96 are significant at p<0.05; *t*-values greater than 2.58 are significant at p<0.01.
b. Composite reliability was calculated based on the equation 7.2 provided in the chapter 7.
c. The average variance extracted (AVE) was calculated based on the equation 7.2 provided in the chapter 7
d. Error variances of this path were set to zero.
e. Constrained to fixed value (1.00).

The correlations among the latent variables in Table 8.6, ranged from 0.30 to 0.67 for the non-arthritis group, and 0.34 to 0.81 for the arthritis group. Overall, the correlations among the variables of the arthritis group were stronger than the non-arthritis group. The variability, i.e., dispersion of the variables, seemed to be greater for the non-arthritis group than the arthritis group. Most of the correlations were moderately high and ranged from 0.40 to 0.60. Some of correlations between the latent variables were high (over 0.60). The highest correlations were between PBC and BI (ρnormal=0.72 and ρarthritis=0.81). According to (Bagozzi *et al.*, 1991) discriminate validity among constructs is accomplished when the construct correlation differs significantly from 1. Using this criterion it would appear that all the constructs were significant (p<0.01), as each correlation was less than 1 at the 0.05 level.

The various latent variables were checked to see if multicollinearity existed between any of the variables by carrying out a correlational analysis (see Table 8.6). According to Hair *et al*. (1998) multicollinearity problems exist in the data if the correlations between variables is $\geq$0.90. Moreover, multicollinearity can also be established by estimating the item variance inflation factor (VIF) using the following equation:

$$VIF_j = \frac{1}{1-R_j^{\ 2}}$$

According to Hair *et al.* (1998) if the VIF value is greater than 5 the variables are highly correlated (multicollinearity). Therefore, in this study a value of 5 was used to indicate high multicollinearity between variables. The greatest pairwise correlation among the independent factors was 0.81 (the correlation between BI and PBC of the arthritis group). As no correlations between variables exceeded 0.90 and the largest VIF was 2.78, which was lower than the cut-off value of 5 it can be safely concluded that no multicollinearity problems existed in the collected data.

Table 8.6: AVE and Correlations between latent variables after CFA

Latent variable [a]	AVE [b]	Attitudes	Subjective Norms	Behavioural Control	Behavioural Intention	Consumption Frequency
Attitudes	0.661/0.696	-	0.43 (0.07)	0.65 (0.06)	0.64 (0.08)	0.34 (0.07)
Subjective norms	0.524/0.618	0.38 (0.05) [c]	-	0.37 (0.05)	0.57 (0.08)	0.31 (0.08)
Behavioural control	0.455/0.545	0.55 (0.04)	0.38 (0.03)	-	0.81 (0.08)	0.37 (0.06)
Behavioural intention	0.860/0.853	0.67 (0.06)	0.51 (0.05)	0.72 (0.05)	-	0.58 (0.09)
Consumption behaviour	-	0.34 (0.05)	0.33 (0.05)	0.30 (0.04)	0.59 (0.07)	-

Note: a. Correlations of the non-arthritis group are below the diagonal, correlations of the arthritis group are above the diagonal

b. Non-arthritis group/Arthritis group

c. Standard errors

8.3.4 The structural relationships

The hypothesised relationships among the variables in the proposed model (Figure 8.1) were analysed using structural equation analysis with maximum likelihood estimation to estimate parameters. The results showed that neither the data from the non-arthritis group nor the data from the arthritis group fitted the above model particularly well as evidenced by the various goodness of fit measures for the respective data sets. The values for the non-arthritis group were as follows: normed χ^2 = 2.885, RMSEA=0.083, GFI=0.89 and SRMR=0.17; whilst the respective values for the arthritis group were: normed χ^2 = 1.951, RMSEA=0.079, GFI=0.89 and SRMR=0.17. It was clear that the model needed to be improved so that a better fit for the respective data sets could be found. Criteria established by Hair *et al*. (1998) were used to improve the model. The advice of Byrne (1998), i.e., that the most parsimonious model that fitted the data should be selected, was also followed. This was accomplished by using LISREL8.0.

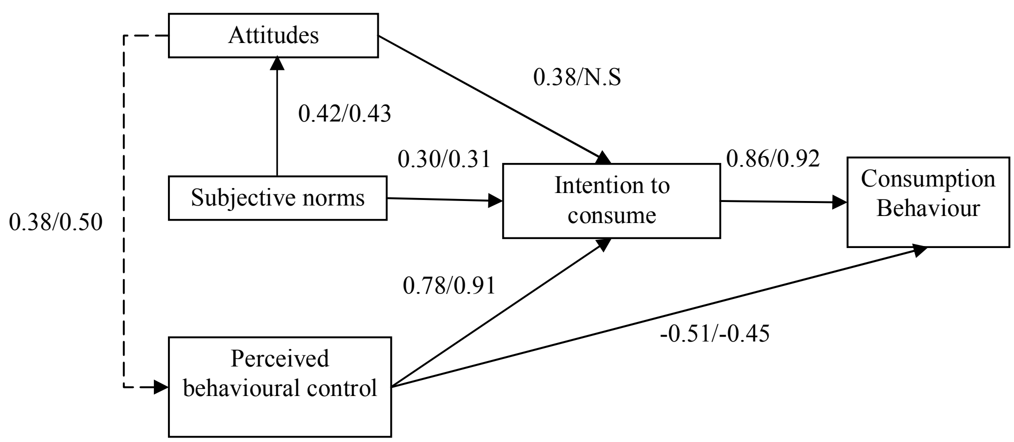


Figure 8.3: The model with coefficients for the non-arthritis group/ arthritis group

Table 8.7: Fit indices to the modified TPB of the non-arthritis and arthritis groups (Figure 8.3)

Fit indices	Non-arthritis group	Arthritis group
χ^2	200.89	117.71
df	84	84
Normed χ^2 (χ^2/df)	2.392	1.401
GFI	0.91	0.91
CFI	0.98	0.99
AGFI	0.87	0.87
NNFI	0.97	0.99
SRMR	0.060	0.044
RMSEA	0.071	0.052

An examination of the modification index of Hair *et al*. (1998) suggested that a significant relationship existed between attitudes and perceived behaviour control. Therefore, the original model was further revised by adding a path between attitudes and perceived behavioural control. After the revision, the model showed a good fit for both groups (Figure 8.3, Table 8.7). The chi-square of the model was 200.89 (N=276) for the non-arthritis group, and 117.71 for the arthritis group (N=152) with 84 degrees of freedom (p=0.000). However, the chi-square did not appear to be an appropriate measure of goodness-of-fit due to the large sample size. Larger sample sizes produce larger chi-square values and this can sometimes lead to type I errors. Other fit indices are used in the study to measure goodness-of-fit. The respective values for the RMSEA values were 0.071, and 0.052 for the normal, and the arthritis group, respectively, which is within the recommended level (0.08). GFI and CFI for the non-arthritis group were 0.91 and 0.98 respectively, and for the arthritis group were 0.91 and 0.99, respectively. All GFI and CFI values were above the recommended level of 0.90 (Bollen, 1989a).

This modification to the model developed from the data is supported by the underlying theory behind the TPB (Ajzen, 1988, 1991). The structure of the conceptual TPB model supports the expectation that attitudes, subjective norm and perceived behavioural control have a direct and positive effect on the intentions of consumers to consume products such as the functional foods included in this study. The assumption that actual consumption behaviour is directly associated with intention to consume is also supported by the data. However, the perceived behavioural control showed a negative association with actual consumption behaviour, which was not expected from theory. According to the theory, there should be a positive association between perceived behavioural control and actual consumption behaviour. There is no apparent reason for this negative value. However, this negative β-weighting can be partly explained by the very low correlations among variables of the PBC construct. The unpredictable responses from the participants is difficult to explain i.e. some respondents had high PBC but did not take action to buy functional foods, whereas, others had low PBC scores but did consume functional foods.

This further modified TPB model is much better at predicting intention than consumption. For the non-arthritis group, the predictors accounted for 38.0% of the variance associated with behaviour frequency to consume functional foods, whereas in the arthritis group they explained 36.0%. The predictors explained 66.0% for the non-arthritis group and 74.0% for the arthritis group of the variance in the respondents' intentions to consume functional foods respectively.

According to Bollen (1989b), the unstandardised factor loading can be used to compare validity results across different samples, whilst standardised structural coefficients should be utilised when comparing the validity of different observed variables based on data from the same sample. Following Bollen's (1989b) advice the unstandardised structural coefficients of the models were measured in their original metric and are presented in Table 8.8 for the non-arthritis group and Table 8.9 for the arthritis group. It can be seen from Table 8.8 that the standardised coefficient of intention to consume functional foods of the non-arthritis group demonstrates that perceived behaviour control (0.47) had the strongest direct effect on intention to consume functional foods. The direct effect of perceived behavioural control on intention to consume functional foods was greater than the effect of the subjective norms (0.24), by approximately 2 times.

The results of the structural equation modelling (SEM) for the participants who had no symptom of arthritis showed that actual consumption behaviour was significantly affected ($p<0.01$) by all hypothesised paths and intention was also significantly affected by all paths ($p<0.01$). The SEM results for the participants who had reported symptoms of arthritis showed that there were significant effects for all paths ($p<0.05$) except H5a (perceived behavioural control associated with consumption).

Table 8.8: Unstandardised structural coefficients and standardised structural coefficients (non-arthritis group)

Hypothesis	Relationship between two constructs of the non-arthritis group (N=276)	Unstandardised structural coefficient	Standardised structural coefficient	*t*-value	Hypothesis testing
Antecedents of consumption intention ($R^2 = 0.66$)					
H2a	Subjective norm → consumption intention	0.30	0.24	4.34	Supported
H3a	Attitude → consumption intention	0.38	0.33	5.15	Supported
H4a	Perceived behavioural control → consumption intention	0.78	0.47	5.79	Supported
Antecedents of consumption frequency ($R^2 = 0.38$)					
H5a	Perceive behavioural control → Consumption behaviour	-0.51	-0.27	-2.85	Not Supported
H6a	Consumption intention → Consumption behaviour	0.86	0.78	8.94	Supported
Antecedents of attitude ($R^2 = 0.15$)					
H1a	Subjective norm → Attitude	0.42	0.39	5.24	Supported
Antecedents of perceived behavioural control ($R^2 = 0.31$)					
-	Attitude → Perceived behavioural control	0.38	0.56	6.25	-

Note: Based on one-tail tests, *t*-values > 1.65 are significant at $p<0.05$; *t*-values greater than 2.33 are significant at $p<0.01$.

Table 8.9: Unstandardised structural coefficients and standardised structural coefficients (arthritis group)

Hypothesis	Relationship between two constructs of the arthritis group (N=152)	Unstandardised structural coefficient	Standardised structural coefficient	*t*-value	Hypothesis testing
Antecedents of consumption intention (R^2 = 74)					
H2b	Subjective norm → consumption intention	0.31	0.30	4.47	Supported
H3b	Attitude → consumption intention	0.10	0.09	1.07	Not Supported
H4b	Perceived behavioural control → consumption intention	0.91	0.65	5.84	Supported
Antecedents of consumption behaviour (R^2 = 0.36)					
H5b	Perceive behavioural control → Consumption behaviour	-0.45	-0.28	-1.95	Not Supported
H6b	Consumption intention → Consumption behaviour	0.92	0.80	5.07	Supported
Antecedents of attitude (R^2 = 0.19)					
H1b	Subjective norm → Attitude	0.43	0.44	4.73	Supported
Antecedents of perceived behavioural control (R^2 = 0.43)					
-	Attitude → Perceived behavioural control	0.50	0.65	5.98	-

Note: Based on one-tail tests, *t*-values > 1.65 are significant at $p<0.05$; *t*-values greater than 2.33 are significant at $p<0.01$.

For the arthritis group, behavioural intention to consume functional foods showed that perceived behavioural control had the greatest effect (0.65), followed by subjective norms (0.30) and attitudes with no significant effect. As illustrated in Table 8.8 and Table 8.9, subjective norms had a positive effect on attitudes for both the non-arthritis and arthritis groups at $p<0.05$ (0.56 for the non-arthritis group, and 0.65 for the arthritis group). As a result, the hypotheses H1a and H1b were both supported.

The analysis showed that the subjective norms had a direct positive effect on respondents' intentions to consume functional foods for both groups ($p<0.05$). Thus, H2a and H2b were both supported. Attitudes also had a positive effect on intentions to consume functional foods for both groups at $p<0.05$. As a result, H3a was supported but H3b was not supported. Furthermore, the perceived behavioural control had the strongest positive effect on respondents' intentions to consume functional food for both groups. Consequently, both H4a and H4b were both supported.

The actual consumption behaviour behavioural was strongly affected by the intention to consume functional foods. Behavioural intention to consume functional foods (βnormal = 0.78, βdisease = 0.80) had a major influence on how often respondents consumed functional foods. An examination of the standardised structural coefficients for the arthritis and non-arthritis models shows that the impact of perceived behavioural control for the arthritis group was approximately 1.2 times greater than it was for the non-arthritis group (0.47 versus 0.33), and had about a 7 times greater effect than attitudes (0.09 versus 0.65). However, perceived behavioural control only had a 2 times greater affect than subjective norm (0.30 versus 0.65) for the arthritis group and the non-arthritis group (0.24 versus 0.47). Intention to consume functional foods had a strongly positive effect on consumption behaviour at $p<0.05$ for both groups. Therefore, H6a and H6b were both supported.

A comparison of the total unstandardised effects for both the non-arthritis and arthritis groups on consumption behaviour of functional foods shows that the effects for consumption intentions were similar for both groups (Table 8.10). The PBC (0.39) for the arthritis group had a far greater effect on consumption behaviour than it did for the non-arthritis group (0.16). The effects of attitudes on consumption behaviour were higher for the non-arthritis group (0.39) than the arthritis group (0.28). The effects of the subjective norms were slightly higher for the non-arthritis group (0.48) than the arthritis group (0.40).

The total standardised effect in Table 8.10 showed that behavioural intention (BI) had the strongest relationship to consumption behaviour for both groups and the factor with least influence was perceived behavioural control (PBC) for the non-arthritis group and attitudes for the arthritis group.

Table 8.10: Total effects on consumption behaviour for the TPB model

Total effects on consumption behaviour	Non-arthritis group (N=276)				Arthritis group (N=152)			
	Direct effects	Indirect effects	Total unstandardised effects	Total standardised effect	Direct effects	Indirect effects	Total unstandardised effects	Total standardised effect
BI	0.86	-	0.86	0.78 (1)	0.92	-	0.92	0.80 (1)
PBC	-0.51	0.67	0.16	0.10 (4)	-0.45	0.74	0.39	0.24 (3)
Attitudes	-	0.39	0.39	0.31 (2)	-	0.28	0.28	0.23 (4)
SN	-	0.48	0.48	0.31 (3)	-	0.40	0.40	0.34 (2)

Notes: The ranking of each factor in explaining the endogenous latent variable is presented in brackets.

8.3.5 Discussion 1

This study indicated that intentions had a strong effect on consumption behaviour. The most important predictor of intention to consume functional foods was consumers' behavioural control for respondents both with and without arthritis symptoms. The average mean on the behavioural control scale was 5.39, which is high on a 7-point scale indicating that the respondents in this study felt they had a high control over their purchases of functional foods, but relatively high SD suggests a somewhat polarised response.

The theory of planned behaviour model had to be modified to better predict consumers' intention to consume functional foods. The initial analysis, shown in Figure 8.3 demonstrated that subjective norms had a positive effect on consumers' attitudes towards functional foods. The coefficients for the non-arthritis and arthritis groups were almost identical (0.42 and 0.43). These attitudes, in turn, were shown to influence consumers' perception of behavioural control for both groups, though the coefficient was higher for the arthritis group (0.50) than the non-arthritis group (0.38). Whilst attitudes influenced the non-arthritis group's intention to consume functional foods (0.38), they had no impact on the arthritis group's intention to consume functional foods. The impacts of the subjective norms on intentions to consume functional foods were the same for both groups. Perceived behaviour control had a large influence on respondents' intentions to consume functional foods in both groups as evidenced by the large coefficients for this factor 0.78 and 0.91 for the non-arthritis and arthritis groups, respectively. Finally, the influence of intention to consume functional foods on actual consumption behaviour was the same for both groups, It would appear therefore, that the TPB models for the two groups were very similar, with the exception of the influence of attitudes on the respective groups' intentions to consume functional foods, where attitudes of the arthritis group appeared to have no direct impact on the group's intentions to consume functional foods. However, an examination of Tables 8.8 and 8.9 and Figure 8.3 shows that attitudes had a significant effect on the respondents' perceived behavioural control beliefs which in turn strengthened the relationship between perceived behavioural control and intentions to consume functional foods. This relationship was evident for both the non-arthritis and arthritis groups. Explained variances of consumers' behaviour of TPB were 38% for non-arthritis group and 36% for arthritis group, respectively.

Since the hypotheses, H5a and H5b were 'not supported' because of the negative coefficient values for the path PBC to consumption behaviour this path was dropped in further developments of the Planned Behaviour model.

8.3.6 Extended TPB model

An extended TPB model was developed for each group with the intention of including the perceived benefits and perceived barriers in the model. The item means and standard deviations of the questions that fell into the sphere of 'perceived benefits' and 'perceived barriers' of functional foods are presented for each group in Table 8.11. The mean differences between the two groups of respondents are also presented in the table.

The results in Table 8.11 show that both groups had a similar pattern of mixed response to questions related to benefits and barriers. The mean of the two groups only significantly differed in three of the questions: worry about a balanced diet if consume functional foods, functional foods make it easier to follow healthy lifestyle, and expectation that functional foods do not taste good. The arthritis group appeared to be more positive towards the benefits of functional foods in relation to their diet and health, but also less positive in relation to taste expectation.

Table 8.11: Perceived benefits and perceived barriers (means, S.D., mean difference)

Item		Mean [a] (S.D. [b])		
		Non-arthritis group (N=276)	Arthritis group (N=152)	Mean difference[c]
Perceived benefits of functional foods (PBEN)				
PBEN1	I do not worry about eating a balanced diet, if I Eat/drink functional foods	2.73 (1.580)	3.28 (1.895)	0.55**
PBEN2	Functional foods make it easier for me to follow a healthy lifestyle	4.65 (1.763)	5.17 (1.464)	0.52**
PBEN3	I don't need to take dietary supplements if I Eat/drink functional foods	4.07 (1.610)	3.89 (1.751)	-0.18
PBEN4	I can reduce taking medication if I eat/drink Functional foods	3.89 (1.844)	4.09 (2.008)	0.20
Perceived barriers of functional foods (PBAR)				
PBAR1	I am unsure of the dosage of active ingredients in Functional foods	5.00 (1.659)	4.78 (1.684)	-0.22
PBAR2	It is difficult to see the benefits of functional Foods	4.05 (1.719)	3.85 (1.748)	-0.20
PBAR3	I don't have enough knowledge about functional Foods	4.70 (1.613)	4.55 (1.539)	-0.16
PBAR4	Eating/drinking functional foods would cause unpleasant side-effects	2.44 (1.380)	2.39 (1.595)	-0.05
PBAR5	Functional foods do not taste good	2.91 (1.369)	3.36 (1.657)	0.45**
PBAR6	Functional foods cost more than other foods	5.25 (1.421)	5.29 (1.463)	-0.04

Notes: a Item means are based on a 7-point Likert scale (1 = totally disagree, 7 = totally agree).

b Standard deviations

c Mean comparison was done by *t*-test.

** $p < 0.01$

Exploratory factor analyses were run separately for each group and the following questions were removed from the study: PBEN2, PBAR4, PBAR5 and PBAR6. They were removed from the study either because the questions appeared in a number of factors at about the same factor loading value or because they did not load on any of the factors and appeared as unique factors accounting for very small amounts of the variance in the data. Factor loadings for some perceived benefit items in Table 8.12 were slightly less than the recommended level (0.4), but these items were still included in the model because theory indicated that they should be retained. The Kaiser-Meyer-Olkin (KMO) measure was 0.535 for the non-arthritis group, and 0.559 for the arthritis group, indicating that the data could be satisfactorily factor analysed (Hair *et al.*, 1998). The two factors only explained

51.49% and 51.72% of the variance in the data of the non-arthritis and the arthritis groups, respectively.

Table 8.12: Factor loadings obtained from the exploratory factor analysis

	Factor*	
	1	2
PBEN1		0.396/0.572
PBEN3		0.312/0.464
PBEN4		0.758/0.535
PBAR1	0.764/0.622	
PBAR2	0.454/0.525	
PBAR3	0.435/0.419	
	Factor 1	Factor 2
Factor 1	1	
Factor 2	-0.003/0.174	1
Eigenvalues	1.59/1.70	1.50/1.40
Percentage of variance	26.43/28.35	25.06/23.37
KMO = .535 / 559		

* non-arthritis/arthritis

8.3.6.1 CFA Analysis

CFA was used to check the reliability and validity of the proposed latent factors. The CFA analyses were carried out with 9 latent variables included in the model, i.e. all the latent factors discussed to date as well as taste (PBAR5) and cost (PBAR6). These latter two variables were included in the model as single-item constructs as opposed to the multiple-item constructs (i.e. questions included in each latent variable) used for the other latent factors. In retrospect, this was a mistake. Taste and cost are known to be important determinants of whether people will buy a functional food (Urala and Lähteenmäki, 2003). In the focus group result, taste and cost were mentioned as the most important factors that influenced consumers' purchase of functional foods. According to the focus group results (Chapter3) and other researchers (Urala and Lähteenmäki, 2003), people will not buy a functional food if they do not like the taste of the product, even though they may know that it is quite efficacious. Cost was included because most people have an upper price for a product and will generally not pay for a product if it is priced above this maximum price, i.e., if it exceeds their value benefit threshold (Urala and Lähteenmäki, 2003).

The factors fitted the data well for both groups (χ^2/df=1.319/1.270, GFI=0.87/0.87, CFI=0.98/.98, NNFI=0.97/0.98, RMSEA=0.046/0.042). The reliability and convergent validity of the two variables are presented in Table 8.13. Even though, the factor loadings for taste and cost were lower than 0.50, and their reliabilities were lower than the critical cut-off value of 0.50, these factors were retained in the model because they are known to be very important factors that affect consumers' food choices (Urala and Lähteenmäki, 2003).

Table 8.13: Factor loading and AVE of the items as obtained from CFA

Item	Non-arthritis group (N=276)		Arthritis group (N=152)	
	Factor loading	AVE	Factor loading	AVE
Perceived benefits		0.248		0.267
PBEN1	0.62		0.60	
PBEN2	0.36(5.85)		0.44(8.03)	
PBEN3	0.48(5.40)		0.53(6.74)	
Perceived barriers		0.281		0.330
PBAR1	0.44		0.51	
PBAR2	0.70(2.87)		0.67(4.04)	
PBAR3	0.40(3.33)		0.38(3.79)	
Perceived Taste	1[a]		1	
Perceived Cost	1[a]		1	

a. Constrained to fixed value (1.00)

The correlation among the latent factors were medium to low, the highest correlation was between perceived barriers and behavioural intention (ρnormal = -0.60, ρarthritis = -0.65). This high degree of correlation could lead to multicollinearity problems. The VIFs were investigated in subsequent regression analyses with unweighted summated scores. The largest VIF value in the non-arthritis group was 1.73 and in the arthritis group was 1.56, indicating that there was no sign of multicollinearity (Parasuraman *et al.*, 2005).

Structural equation modelling was used on the data of both the non-arthritis and arthritis groups. The model with 9 included latent variables is shown in Figure 8.4. The goodness of fit indices are presented in Table 8.14. The goodness of fit indices for the models showed that the data fitted the models well. The GFI of the models for both groups was slightly lower than the minimum allowable level of 0.90, but they are still acceptable. The modification indices suggested adding the relationships between perceived benefits of functional foods and subjective norms, between perceived benefits and perceived behavioural control, between perceived barriers and between perceived behavioural control (the dashed lines).

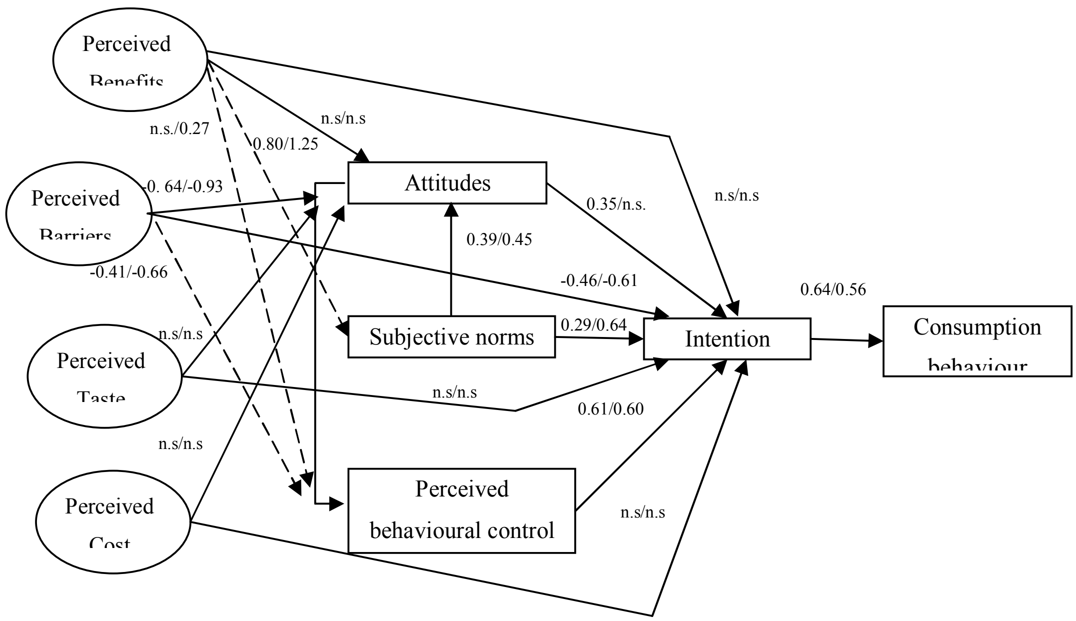


Figure 8.4: Coefficients of the extended model (non-arthritis group/arthritis group)

Table 8.14 Goodness of fit indices for the non-arthritis and arthritis groups

Fit indices	Non-arthritis group	Arthritis group
χ^2	554.89	314.24
Df	212	212
$\chi 2/df$	2.161	1.482
GFI	0.85	0.85
AGFI	0.81	0.85
NNFI	0.93	0.97
CFI	0.94	0.97
SRMR	0.091	0.10
RMSEA	0.077	0.057

Table 8.15 presents the unstandardised coefficients with their respective *t*-values. The *t*-values were used to test the hypotheses at the significance level of $p \leq 0.05$.

Table 8.15: Unstandardised structural coefficients, t-value and hypothesis teasing for additional factors

	The non-arthritis group (N=276)			The arthritis group (N=152)		
	Structural coefficient	t-value	Hypothesis testing	Structural coefficient	t-value	Hypothesis testing
H7: Perceived benefits → intention	-0.03	-0.13	Not supported	-0.07	-0.26	Not supported
H8: Perceived benefits → attitudes	-0.13	-0.52	Not supported	0.39	1.15	Not supported
H9: Perceived barriers → intention	-0.46	-1.87	Support	-0.61	-1.98	Support
H10: Perceived barriers → attitudes	-0.64	-2.47	Supported	-0.93	-2.95	Supported
H11: Perceived taste → intention	0.04	0.64	Not supported	0.07	1.36	Not supported
H12: Perceived taste → attitudes	-0.06	-0.72	Not supported	0.00	-0.07	Not supported
H13: Perceived cost → attitudes	-0.02	-0.35	Not supported	-0.1	-0.12	Not supported
H14: Perceived cost → attitudes	0.08	1.30	Not supported	0.11	1.44	Not supported
Perceived benefits → subjective norms	0.80	3.25	-	1.25	3.89	-
Perceived benefits → perceived behavioural control	0.06	0.54	-	0.27	1.80	-
Perceived barriers → perceived behavioural control	-0.41	-2.37	-	-0.66	-3.05	-

Note: based on one-tailed tests, coefficients with *t*-values greater than 1.65 are significant at $p<0.05$; *t*-values greater than 2.33 are significant at $p<0.01$.

The majority of the hypotheses were not supported. Perceived barriers to consume functional foods were shown to have strong and negative relationships with intention (H9) (β_{normal} = -0.46, $\beta_{arthritis}$ = -0.61) and with attitudes towards functional foods (H10) (β_{normal} = -0.64, $\beta_{arthritis}$ = -0.93). The hypotheses outlined in section 8.2.4.2 were supported. All other hypotheses related to this model (H7, H8, H11 - H14) were not supported. For example, neither perceived taste nor cost had a direct impact on attitudes or intention to consume functional foods in either group. However, this was not surprising given the fact that these constructs should have been added as multi-item constructs. For instance, it is difficult to define the taste of a product such as orange juice without resorting to such variables, as sweetness, saltiness, acidity, navel flavour etc. Three paths, which were not included in the original hypotheses, are seen to be significant.

Table 8.16: Total standardised and unstandardised of direct and indirect effects for extended model

	Non-arthritis group (N=276)				Arthritis group (N=152)			
	Direct effects	Indirect effects	Total unstandardised effects	Total standardised effect[a]	Direct effects	Indirect effects	Total unstandardised effects	Total standardised effect[a]
Total effects on actual behaviour								
BI	0.64	-	0.64	0.57 (1)	0.65	-	0.65	0.56 (1)
Attitudes	-	0.34	0.34	0.26 (3)	-	0.17	0.17	0.13 (6)
SN	-	0.31	0.31	0.23 (4)	-	0.27	0.27	0.23 (4)
PBC	-	0.39	0.39	0.21 (5)	-	0.45	0.45	0.28 (3)
Perceived benefits	-	*0.21*	*0.21*	*0.12 (6)*	-	*0.48*	*0.48*	*0.23 (5)*
Perceived barriers	-	*-0.77*	*-0.77*	*-0.31 (2)*	-	*-1.22*	*-1.22*	*-0.48 (2)*
Perceived taste	-	*0.01*	*0.01*	*0.004 (8)*	-	*0.05*	*0.05*	*0.04 (7)*
Perceived cost	-	*-0.04*	*-0.04*	*0.01 (7)*	-	*0.01*	*0.01*	*0.01 (8)*
Total effects on intention								
Attitudes	0.35	0.16	0.51	0.45 (2)	0.07	0.19	0.26	0.24 (5)
SN	0.29	0.20	0.49	0.40 (3)	0.37	0.05	0.42	0.41 (4)
PBC	0.61	-	0.61	0.37 (4)	0.69	-	0.69	0.50 (2)
Perceived benefits	*-0.03* [n.s.]	*0.36*	*0.33*	*0.20 (5)*	*-0.07* [n.s.]	*0.81*	*0.74*	*0.41(3)*
Perceived barriers	*-0.46*	*-0.75*	*-1.21*	*-0.54 (1)*	*-0.61*	*-1.27*	*-1.88*	*-0.86 (1)*
Perceived taste	*0.04* [n.s.]	*-0.03*	*0.01*	*0.01 (7)*	*0.07* [n.s.]	*0.00*	*0.07*	*0.08 (6)*
Perceived cost	*-0.02* [n.s.]	*-0.04*	*-0.06*	*0.03 (6)*	*-0.01* [n.s.]	*0.03*	*0.02*	*0.02 (7)*
Total effects on attitudes								
SN	0.39	-	0.39	0.35 (2)	0.20	-	0.20	0.21 (3)
Perceived benefits	*-0.13* [n.s.]	*0.31*	*0.18*	*0.12 (3)*	*0.39*	*0.25*	*0.64*	*0.38 (2)*
Perceived barriers	*-0.64*	-	*-0.64*	*-0.36 (1)*	*-0.93*	-	*-0.93*	*-0.49 (1)*
Perceived taste	*-0.06* [n.s.]	-	*-0.06*	*-0.07(4)*	*0.00* [n.s.]	-	*0.00*	*-0.01 (5)*
Perceived cost	*-0.08* [n.s.]	-	*-0.08*	*-0.02(5)*	*0.11* [n.s.]	-	*0.11*	*0.14 (4)*

Table 8.16 (Continued)

	Non-arthritis group (N=276)				Arthritis group (N=152)			
	Direct effects	Indirect effects	Total unstand ardised effects	Total standardised effect	Direct effects	Indirect effects	Total unstand ardised effects	Total standardised effect
Total effects on SN								
Perceived benefits	*0.80*	-	*0.80*	*0.61*	*1.25*	-	*1.25*	*0.72*
Total effects on PBC								
Attitudes	0.27	-	0.27	0.39 (2)	0.27	-	0.27	0.35 (2)
SN	-	0.11	0.11	0.14 (3)	-	0.05	0.05	0.07 (4)
Perceived benefits	*0.06* n.s.	*0.05*	*0.11*	*0.08 (4)*	*0.27*	*0.17*	*0.44*	*0.34 (3)*
Perceived barriers	*-0.41*	*-0.17*	*-0.58*	*-0.48 (1)*	*-0.66*	*-0.25*	*-0.91*	*-0.62 (1)*
Perceived taste		*-0.02*	*-0.02*	*-0.03 (6)*	-	*0.00*	*0.00*	*-0.00 (6)*
Perceived cost	-	*-0.02*	*-0.02*	*0.04 (5)*	-	*0.03*	*0.03*	*0.05 (5)*

Notes: a. The ranking of each factor in explaining the latent variable is presented in the brackets.

b. n.s. indicates not significant coefficient of direct effects from zero at the level 0.05 based on one-tailed test.

An examination of the total standardised effects shows some factors have similar impacts on the model for both the arthritis and non-arthritis group (Table 8.16). Behavioural intention had the largest effect on behaviour for both groups. The total standardised effect of the new added factor, perceived barriers of functional foods, had a strong negative impact on actual consumption of functional foods, and its effects were even stronger than attitudes, subjective norms and PBC in both the non-arthritis group (-0.31) and the arthritis group (-0.48). Perceived barriers also had the strongest effect on intentions, attitudes, and perceived behavioural control. The effect of barriers on intentions seemed to be particularly prominent in the arthritis group (-0.86). Interestingly, the indirect impact of perceived barriers to intention was even stronger than their direct effect.

Both models (non-arthritis and arthritis models) showed that there was a relationship between perceived benefits and subjective norms. Moreover, perceived benefits had a stronger impact on attitudes than subjective norms for the arthritis group. Although there is no direct effect of perceived benefits on intentions, the indirect effects are significant. The perceived benefits appeared to be more important to the intentions to consume functional foods for the arthritis group (0.74) than the non-arthritis group (0.33). They also had a stronger impact on the attitudes of the arthritis sufferers than the non-arthritis group's attitudes (0.64 versus 0.18, respectively).

As in the previous model, attitudes do not have as strong an impact on behaviour or intention for the arthritis group as for the non-arthritis group, but the effect of attitudes on PBC is similar for both groups. The extended model showed that the explained variance was 36% for the non-arthritis group and 33% for the arthritis group, respectively. Even though, the explained variance of the extended model of both groups were smaller than the original TPB model, the significant influences of perceived benefits and perceived barriers were shown in the models.

8.3.7 Discussion 2

When perceived barriers and perceived benefits were added to this modified TPB model the explained variance of consumption behaviour by this model was 36% for the arthritis group and 33% for the non-arthritis group – less than the modified TPB model without these variables. The explained variance for the arthritis group dropped from 38% to 36% for the arthritis group and from 36 to 33% for the non-arthritis group.

Clearly, adding the extra variables to the model resulted in a model that was less able to explain the variance in the data, i.e. a poorer fit to the data. However, even though the extended model did not improve the explanatory power of the model, perceived benefits and perceived barriers had a significant influence on other model constructs. Consequently, they are included in the model because they give a better understanding of the forces motivating consumers in their purchases of functional foods. For example, the barriers were shown to be significant (including uncertainty about dosage and limited knowledge). By knowing what the barriers are to the consumption of these foods, the manufacturers may be in a better position to overcome them and thus stimulate functional food sales. Therefore, stimulating consumers' knowledge about details related to specific functional food may decrease the influence that barriers have on the consumption of functional foods.

The study showed that perceived barriers to the consumption of functional foods had the most influence over the respondents' intentions to consume functional foods. The earlier chapters suggested that knowledge about the benefits of functional foods, and in particular, scepticism about their benefits, and a concern about the control of dosage were major barriers to the consumption of these foods. The results in chapter 6 showed that if people talked about these foods then they tended to become more sceptical.

The study tends to support the results of other researchers (Patch *et al.*, 2005a; Poulsen, 1999; Urala and Lähteenmäki, 2003) who have found that perceived barriers are a strong disincentive to the use or consumption of a product. Clearly, manufacturers of functional foods need to find out what barriers affect the consumption of their products by targeted disease groups such as arthritis sufferers if they are to be successful in the marketplace. Failure to identify potential barriers to the consumption of their products could have serious consequences according to the results of this study.

The model showed that perceived benefits had insignificant effects on attitudes and on intention, which was surprising. One would expect attitudes to be positively influenced by peoples' perceptions about the benefits of these functional foods. The perceived benefits did significantly influence subjective norms, which in turn influenced attitudes, so possibly this is the route for the influence of the benefits on attitudes, i.e., it was the respondents' peers who were supplying the information to alter attitudes. Maybe a large proportion of the respondents had no positive views about the benefit of these products and so there were no linkages between attitudes and perceived benefits. Perceived benefits were also significantly linked to perceived behavioural control for the arthritis group.

The combined model suggested that people suffering from arthritis were influenced more than the people without arthritis by the perceived benefits (advantages) and perceived barriers (disadvantages) of functional foods. The arthritis group had a greater intention to consume functional foods, but never carried this through to actual purchase of functional foods. Clearly, the barriers had a greater influence over their decisions than the benefits. It is possible that they were highly sceptical about functional foods ever doing what medicines could not achieve, and that is, cure or at least ameliorate the symptoms of the disease.

In this study, perceived taste had no significant effect on attitudes and intentions to consume functional foods. A previous study by Urala and Lähteenmäki (2004) showed that people were prepared to consume products such as cholesterol lowering margarine and milk drinks designed to lower blood pressure even though they were not enamoured by the taste. According to these researchers, the strong health message (benefits) associated with these products via television and other promotional activities overcame the consumers' reluctance to consume these products.

Perceived cost also showed no significant impact on attitudes and intentions. The results of the focus groups conducted in this study indicated that price was one of the most important barriers for participants on low incomes when choosing functional foods, but not so for wealthier respondents. However, the survey results imply that the participants decided to purchase functional foods due to their health benefits regardless of price. Cost is not always considered in the value package, especially if the health claims are clear (Patch *et al.*, 2005b). Therefore, it is not improbable that this analysis suggested that cost and taste showed no effect on intention to consume functional food. However, marketing research (Urala and Lähteenmäki, 2003) would suggest that they are important factors in the choice and purchases of food products by consumers and that the two factors should be retained in any model, though with caution. The most probable reason for the lack of importance of these constructs in the models is probably related to the fact that each of the constructs was defined as a single-item construct rather than as a multi-item construct. Each of these constructs is multi-faceted and cannot be defined adequately by not including them as multi-faceted items. Unfortunately, the constructs were included as single-item constructs in order to cut down the length of the survey form.

8.4 Conclusions

The modified TPB model from Chapter 7 was used initially to predict the consumption behaviour of people with and without arthritis. The analysis showed that the simpler TPB model (see Chapter 7) was not a particularly good model to predict the consumption behaviour of either the arthritis or the non-disease group (i.e,. poor fit indices). The modification index from LISREL suggested that an additional path from attitudes to planned behaviour control (PBC) needed to be added. This modification led to a model that better fitted the data and the explained variance of consumption behaviour in the arthritis group and non-arthritis group were 36% and 38%, respectively.

The behavioural intention was seen as being the most important independent variable in determining actual consumption behaviour in both groups. The total effects of PBC on consumption behaviour of the arthritis group was higher than the non-arthritis group, but the total effect of attitudes was greater for the non-arthritis group than the arthritis group. The relative importance of the various constructs was different in the model for both groups, suggesting that the model was not behaving in the same fashion for both groups, i.e. the importance of the various constructs was not consistent across both groups.

The extended model with perceived benefits and perceived barriers from the HBM model was very similar for both arthritis and non-arthritis sufferers. Perceived barriers had a negative influence on attitudes, intention, and perceived behavioural control. For the TPB model, perceived behavioural control had the strongest influence on intention to consume functional foods but when perceived benefits and barriers were added, perceived barriers appeared to be the strongest influence. This suggested that the barriers were having a significantly negative influence on consumption behaviour. Clearly, the industry has a major problem here and needs to counteract these negative barriers.

On the other hand, perceived benefits had a very low effect on intentions, attitudes, and perceived behavioural control. Examination of the total effect on actual consumption behaviour between the arthritis group and non-arthritis group showed that attitudes and subjective norms had a higher total effect for the non-arthritis group than the arthritis group. Nevertheless, taste and cost showed no significant effect, a similar result to that reported in Chapter 6.

Chapter 9

CONSUMERS' INTENTIONS TO CONSUME SPECIFIC FUNCTIONAL FOODS

9.1 Introduction

In this portion of the study, the aim is to examine how well the model developed in the previous chapter predicted respondents' intentions to consume specific functional foods for arthritis and coronary heart disease. The addition of perceived susceptibility and perceived severity to the model is also assessed for its ability to explain the variance in the data on intention to consume specific functional foods.

In chapter 7 of this study, a comparison was made between the theory of reasoned action and theory of planned behaviour to predict respondents' intentions to consume functional foods. The study showed that a modified TPB model was better than either the TRA or the original TPB model in predicting intentions. This modified model was then used in chapter 8 and compared with a model that combined elements of the health belief model with the modified TPB model to predict intention and actual purchase behaviour by people with and without arthritis. The model that combined elements of the HBM with the modified TPB model was not quite as good as predicting either intentions or consumption behaviour as the modified TPB model with path between subject norms and attitudes. However, it was retained because it offered better insights into the factors driving both intentions to consume and actual consumption than the simpler TPB model.

The intention is to use the above modified TPB plus a further modified model that included elements of the HBM to predict the intentions of the whole sample to consume specific functional foods designed to treat/ameliorate coronary heart disease (CHD) and arthritis. In the previous chapter, the model was used to predict the intention to consume general functional foods. Most studies that have modelled peoples' intentions to consume functional foods have generally dealt with a specific functional food, (e.g. omega-3 fatty acids (Patch *et al.*, 2005a), iron fortified soya sauce (Sun *et al.*, 2006)) rather than general functional foods. In this chapter it was hypothesised that both the severity of a disease and the susceptibility to a disease would influence peoples' willingness to purchase a specific functional food designed to treat that disease, and hence they should be included in the extended TPB model. It was expected that perceived susceptibility and perceived severity of CHD would affect their intentions to consume anti-CHD functional foods differently from anti-arthritic functional foods, because the outcomes were more severe for CHD (death) than arthritis. Due to the fact that a high proportion of New Zealanders die from CHD it was hypothesised that respondents would consider themselves to be more susceptible to this disease than the less well publicised disease of arthritis. As a consequence, it was expected that perceived susceptibility and perceived severity of CHD would have stronger effects on intention to consume anti-CHD than anti-arthritic functional foods.

9.2 Applications of TPB and HBM to health behaviours

Both the TPB and the HBM models have been used widely to predict health behaviour. The details of both models were explained in chapter 2. The TPB has been used to study peoples' intentions to purchase organic food (Arvola *et al.*, 2008), dietary supplement use (Conner *et al.*, 2001), health-related eating behaviour (Ajzen and Timko, 1986; Povey *et al.*, 2000), fat consumption reduction (Paisley *et al.*, 1995), and intention to purchase specific functional foods such as omega-3 enhanced foods (Patch *et al.*, 2005a). Whilst, the HBM also has been used successfully in studies involved with health behaviour to explain various behaviours including amount of fat in diets (Schafer *et al.*, 1995), folate intake from fortified grain products (Kloeblen and Batish, 1999), and prediction of individual's dietary quality and body mass (Sapp and Weng, 2007). All constructs (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy and cues to action) correlated with intention to follow a high folate diet (Kloeblen and Batish, 1999). Perceived threat of a high-fat diet had an effect on the percentage of calories from fat in the diet of husbands but not the wives (Schafer *et al.*, 1995).

The HBM provides a useful checklist for choosing the points to emphasize in any communication message especially those dealing with the importance of the perceived seriousness, susceptibility and preventability of the disease. However, as the HBM does not include the influence of social norms and peer influences we decided that we would combine the TPB and the HBM models and so end up with a model that included these variables. We also included perceived expense, into our model as it is known to determine peoples' propensity to buy goods (Kotler and Armstrong, 1999). There are only a few reported studies where the two models have been integrated to examine health related behaviours. Norman and Conner (1993) looked at attendance at health checks; van Hulten *et al.* (2003) looked at the determinants affecting how long patients were on benzodiazepine and finally Sun *et al.* (2006) used an integrated model to predict iron-fortified soy sauce consumption intention. The integrated model for this study is shown in Figure 9.1

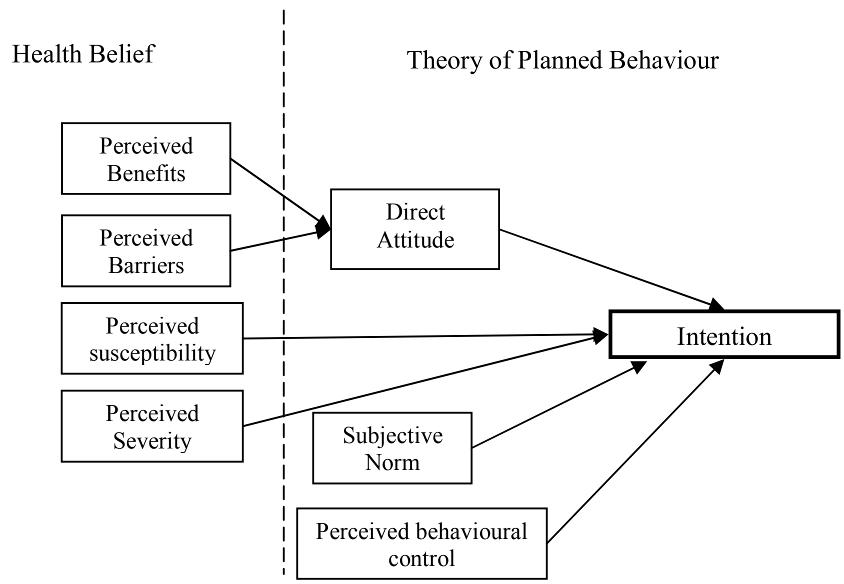


Figure 9.1: Combined model of Theory of Planned Behaviour model and the Health Belief Model

The list of variables that were included in the integrated model, together with an explanation of their meaning is provided in Table 9.1.

Table 9.1: List of variables and brief explanation

Variable	Theory of Planned Behaviour
Intention	Intention to consume specific functional food designed for arthritis or coronary heart disease
Direct attitude	Overall attitude about general functional foods
Normative belief	Perception of significant others approval or disapproval of behaviour
Direct perceived control	Confidence in the ability to consume functional foods
	Health Belief Model
Susceptibility	How likely to have arthritis or CHD
Severity	The perception of arthritis or CHD
Benefits	Probability of positive outcome of functional foods
Barriers	Probability of negative outcome of functional foods

9.3 Analysis Plan

In this chapter, data from the entire sample is used. SEM is used to assess the extended TPB (TPB + 2 HBM constructs), as developed in chapter 8, applied to intention to consume general functional foods and intention to consume disease specific functional foods; extended TPB with addition of perceived barriers and benefits. Perceived severity and susceptibility are then added to the model.

9.4 Results

9.4.1 Items and reliability

The means, standard deviations and Cronbach's alphas of the items used in the extended TPB are presented in Table 9.2. In general, the alpha values of the variables that form part of TPB exceeded 0.70. Cronbach's alphas of all constructs are over 0.70 except perceived benefits and perceived barriers.

The means for consumers' attitudes towards functional foods shows that they had positive attitudes to functional foods (5.00-5.57). The means of perceived behavioural control (5.12-5.97), perceived intention (4.94-5.02) to consume functional foods were also rather positive to functional food consumption. However, subjective norm scores (3.26-3.79), perceived benefits (2.98-4.91) and perceived barriers (3.95-4.88) showed slightly negative views to functional foods consumption.

Table 9.2 Items (means, and standard deviation, Cronbach's alpha)

Item		Cronbach's Alpha	Mean (N=474)	S.D.	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Direct attitudes towards functional foods		0.908				
ATT2	Harmful-Beneficial		5.46	1.56	0.735	0.896
ATT3	Unenjoyable-Enjoyable		5.02	1.36	0.694	0.903
ATT4	Negative-Positive		5.55	1.32	0.869	0.869
ATT5	Bad-Good		5.57	1.40	0.866	0.867
ATT6	Unnatural-Natural		5.00	1.59	0.708	0.902
Subjective norm		0.796				
SN1	My family thinks I should eat/drink functional foods		3.79	1.95	0.638	0.725
SN2	My friends or colleagues think I should eat/drink functional foods		3.26	1.75	0.624	0.7401
SN3	My doctor thinks that I should eat/drink functional foods		3.71	1.90	0.659	0.699
Perceived behavioural control		0.741				
PBC1	If I want to, I could easily eat/drink functional foods		5.97	1.23	0.493	0.737
PBC3	I feel confident to buy functional foods		5.12	1.44	0.637	0.568
PBC4	I know where to buy functional foods		5.51	1.49	0.583	0.638
Perceived benefits of functional foods		0.584				
PBEN1	I do not worry about eating a balance diet, if I eat/drink functional foods		2.98	1.76	0.374	0.511
PBEN3	Functional foods make it easier for me to follow a healthy lifestyle		4.91	1.68	0.404	0.470
PBEN4	I can reduce taking medication if I eat/drink functional foods		3.95	1.92	0.405	0.469
Perceived barriers of functional food		0.547				
PBAR1	I am unsure of the dosage of active ingredients in functional foods		4.88	1.67	0.432	0.324
PBAR2	It is difficult to see the benefits of functional foods		3.95	1.75	0.333	0.488
PBAR3	I don't have enough knowledge about functional foods		4.63	1.61	0.314	0.512
PBAR4	Functional foods do not taste good		3.11	1.54		
PBAR5	Functional foods cost more than other foods		5.24	1.45		
Intention to consume general functional foods		0.951				
INTG1	I intend to eat/drink functional foods in the next few months		5.01	1.87	0.881	0.942
INTG2	I aim to eat/drink functional foods for my healthy lifestyle		4.94	1.83	0.908	0.921
INTG3	I want to eat/drink functional foods		5.02	1.75	0.906	0.924

9.4.2 Health Belief Model constructs, items and reliability

Cronbach's alphas, means, and standard deviations and item-total correlations of HBM items are presented in Table 9.3. Cronbach's alpha of intention to consume arthritic and CHD functional foods were 0.861 and 0.821, respectively. Cronbach's alpha for the additional variables normally included in the HBM was 0.753 for perceived severity of arthritis, and 0.781 for perceived severity of CHD. These values were above 0.70. However, the alpha level of perceived susceptibility of arthritis (0.640) and CHD (0.635) were lower than the acceptable value (0.70) suggested by Nunnally (1978), but above the minimum guidelines (0.60) recommended by Hair *et al.* (1998) for perceived susceptibility of both diseases. Therefore, these constructs were included in the model. Item-total correlations of two of the perceived susceptibility items (SUSA4 and SUSC4) were lower than 0.30 and so these items were removed from the study.

Table 9.3: Additional items (mean, S.D., Cronbach's alphas)

Item		Cronbach's Alpha	Mean (N=474)	S.D.	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Perceived susceptibility of arthritis		0.640				
SUSA1	I am worried about getting arthritis		4.26	1.68	0.515	0.519
SUSA2	I will get arthritis sometime in my life		4.65	1.84	0.723	0.342
SUSA3	My family history suggests that I will get arthritis		4.00	1.94	0.575	0.459
SUSA4	My physical health makes it more likely that I will get arthritis		3.84	1.76	0.006	0.824
Perceived severity of arthritis		0.753				
SEVA1	If a doctor told me that I had arthritis, I would be:		5.39	1.34	0.498	0.724
SEVA2	If I had arthritis, it would change my life		5.09	1.59	0.632	0.648
SEVA3	If I had arthritis, it would limit my daily activities		4.86	1.65	0.586	0.677
SEVA4	The problems I would experience from arthritis would last a long time		5.57	1.40	0.495	0.725

Table 9.3 (continue)

Item		Cronbach's Alpha	Mean	S.D.	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Intention to purchase arthritic functional foods		0.861				
INTA1	If a new food product – treat Arthritis, I would purchase such a product		5.08	1.70	0.744	0.766
INTA2	If a new product – help prevent arthritis, I would purchase such a product		5.47	1.40	0.698	0.841
INTA3	Glucosamine-added into the foods, I would purchase such a product		4.95	1.64	0.746	0.792
Perceived susceptibility of coronary heart disease		0.635				
SUSC1	I am worried about getting CHD		4.26	1.77	0.598	0.415
SUSC2	I will get CHD sometime in my life		3.71	1.70	0.699	0.342
SUSC3	My family history suggests that I will get CHD		3.55	1.93	0.547	0.445
SUSC4	My physical health makes it more likely that I will get CHD		4.42	1.83	-0.051	0.844
Perceived severity of coronary heart disease		0.781				
SEVC1	If a doctor told me that I had CHD, I would be:		6.26	1.10	0.531	0.755
SEVC2	If I had CHD, it would change my life		5.90	1.29	0.600	0.718
SEVC3	If I had CHD, it would limit my daily activities		5.14	1.52	0.640	0.698
SEVC4	The problems I would experience from CHD would last a long time		5.61	1.38	0.585	0.726
Intention to purchase CHD functional foods		0.821				
INTC1	If a new food product – treat CHD, I would purchase such a product		4.99	1.72	0.676	0.749
INTC2	If a new product – help prevent CHD, I would purchase such a product		5.50	1.40	0.751	0.675
INTC3	Plant sterol-added into the foods, I would purchase such a product		5.09	1.50	0.599	0.815

After removal of SUSA4 and SUSC4, and re-analysis of the data the Cronbach's alphas of perceived susceptibility of arthritis (0.825) and CHD (0.848) were greater than the acceptable value as shown in Table 9.4. Even though Cronbach's alpha value for perceived benefits (0.584) and perceived barriers (0.547) of functional food consumption was lower than 0.70, these constructs were still retained in the model as it is a vital part of the health belief model and hypothesised to be an important determinant of whether people would eat functional foods or not.

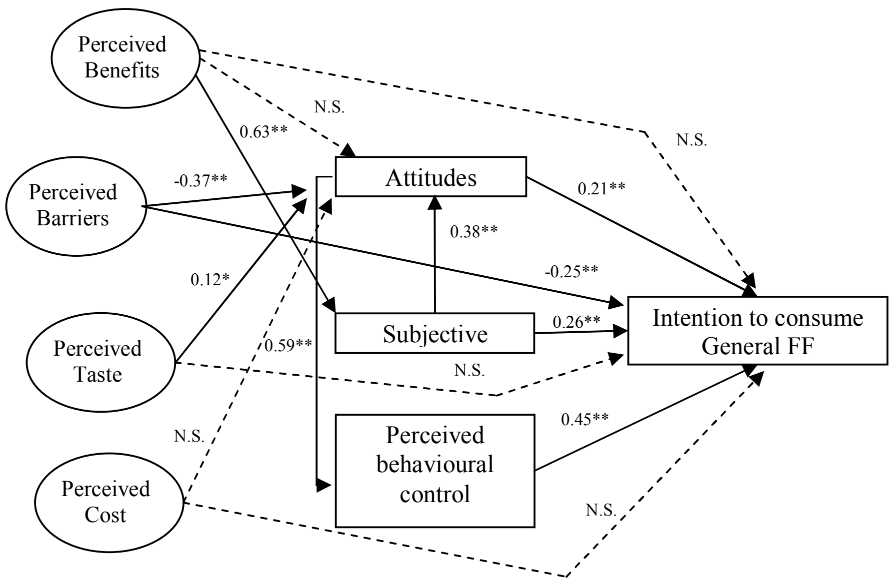
Table 9.4 Cronbach's alpha of each construct

Variable	Cronbach's Alpha	Mean	S.D.
Direct attitudes	0.908	5.31	1.46
Subjective norm	0.797	3.59	1.83
Perceived behavioural control	0.741	5.46	1.48
Perceived benefits of functional foods consumption	0.584	3.94	1.32
Perceived barriers of functional foods consumption	0.547	4.49	1.22
Intention to purchase functional food in general	0.951	4.99	1.73
Perceived susceptibility of arthritis	0.825	4.31	1.84
Perceived severity of arthritis	0.753	5.23	1.52
Intention to purchase anti-arthritic functional foods	0.861	5.17	1.60
Perceived susceptibility of CHD	0.848	3.84	1.83
Perceived severity of CHD	0.781	5.73	1.39
Intention to purchase anti-CHD functional foods	0.821	5.19	1.56

9.4.3 Model estimation

Structural equation modelling was conducted to determine the beta weights of the predictive equations in the model and to ascertain the amount of variance explained by the combined HMB and TPB model as shown in Figure 9.2. The values on each path are beta values and denote the importance of the influence of the proceeding variable on that variable and the stars denote the significance of the influence. The model fit indices suggest it is not a particularly good fit, so using the modification index of the LISREL programme the causal path between perceived benefits and subject norms was added.

The modification to the model improved the fit for general and specific functional foods but the explained variance for the model to predict intention to consume general functional foods was much higher than the model to predict actual consumption of specific functional foods.

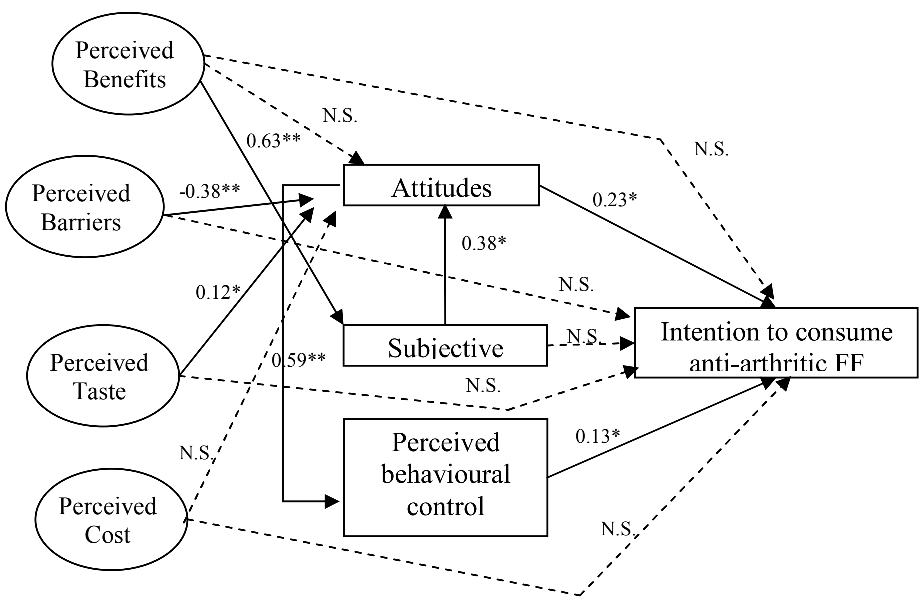


χ^2/df = 1.72, RMSEA = 0.051, GFI = 0.90, CFI = 0.98

(Explained variance of intention to consume general functional foods = 72%)

Figure 9.2 The result of path analyses for the combined TPB and HBM model to predict intention to consume functional food in general

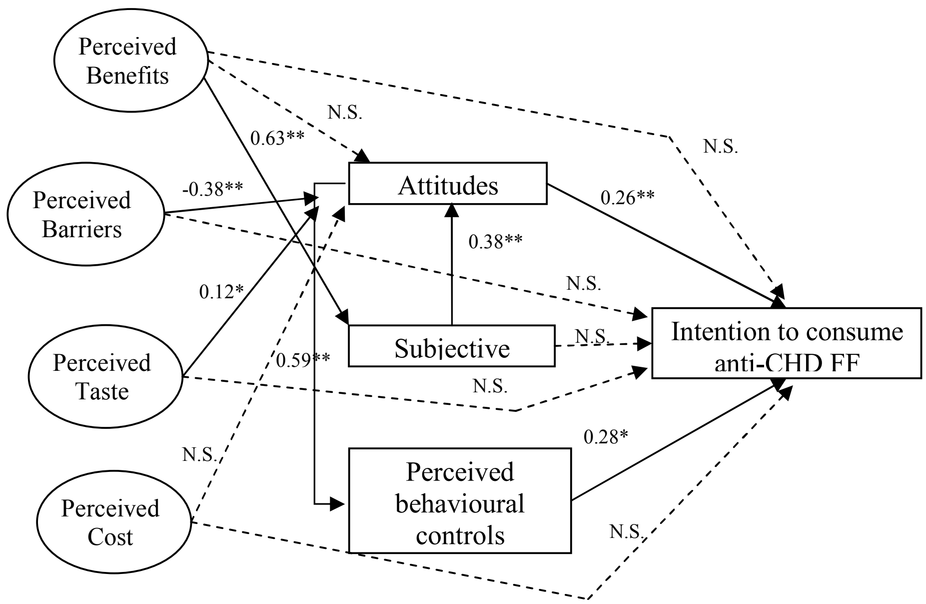
Note: Dash lines denote non-significant paths
* p<0.05, ** p<0.01



χ^2/df = 1.63, RMSEA = 0.02, GFI = 0.91, CFI = 0.95
(Explained variance of intention to consume anti-arthritic functional foods= 21%)

Figure 9.3 The result of path analyses for the combined TPB and HBM model to predict intention to consume anti-arthritic functional food

Note: Dash lines denote non-significant paths, * p<0.05, ** p<0.01



χ^2/df = 2.12, RMSEA = 0.063, GFI = 0.90, CFI = 0.96
(Explained variance of intention to consume anti-CHD functional foods = 31%)

Figure 9.4 The result of path analyses for the combined TPB and HBM model to predict intention to consume anti-CHD functional food

Note: Dash lines denote non-significant paths, * p<0.05, ** p<0.01

An examination of the combined model for functional food in general (Figure 9.2) showed that attitudes (β = 0.21, p<0.01), subjective norms β = 0.26, p<0.01) and perceived behavioural control β = 0.45, p<0.01) each had a direct and significantly (p≤0.01) positive impact on consumers' intention to consume functional foods in general. Whilst perceived barriers (β = -0.25 p<0.01) had a significantly negative impact on intentions. Perceived behavioural control showed the strongest influence on intention. Interestingly, taste had a moderately positive impact (p =0.05) on attitudes. This model explained 72% of the variance in the data.

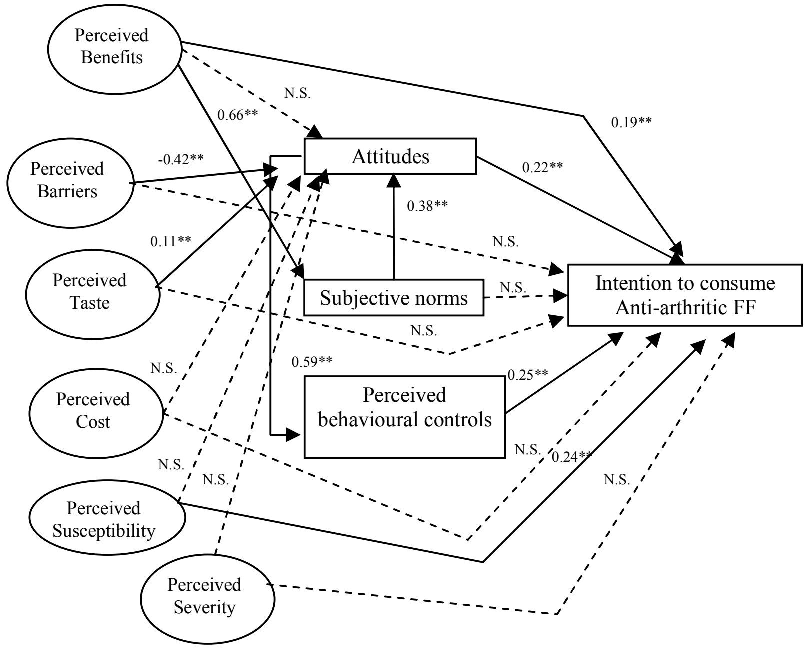
The model's predictive capability for anti-arthritis functional foods in Figure 9.3 was much less successful in predicting intention, with only 21% of variance explained. Only attitudes (β = 0.23, p<0.05) and perceived behavioural control (β = 0.13, p<0.01) had direct significant impacts on peoples' intention to consume anti-arthritis functional foods.

An examination of Figure 9.4 for the combined model used to predict peoples' intentions to consume anti-CHD functional foods shows it had a slightly better predictive capacity for anti-CHD foods with only 31% of variance explained. The only 2 components that directly influenced peoples' intentions to consume anti-CHD functional foods were attitudes ($\beta = 0.26$, $p<0.01$), and perceived behavioural control ($\beta = 0.28$, $p<0.01$).

9.4.4 Perceived susceptibility and severity on intention to consume specific functional foods

Perceived susceptibility and perceived severity of the diseases have been added to the models and the results are shown in Figure 9.5 to 9.6. The model showed improved capacity to predict intentions to consume both anti-arthritic and anti-CHD functional foods, with explained variances of intention to consume anti-arthritic functional foods increasing from 21% (Figure 9.3) to 37% (Figure 9.5) and anti-CHD functional foods increasing from 31% (Figure 9.4) to 43% (Figure 9.6).

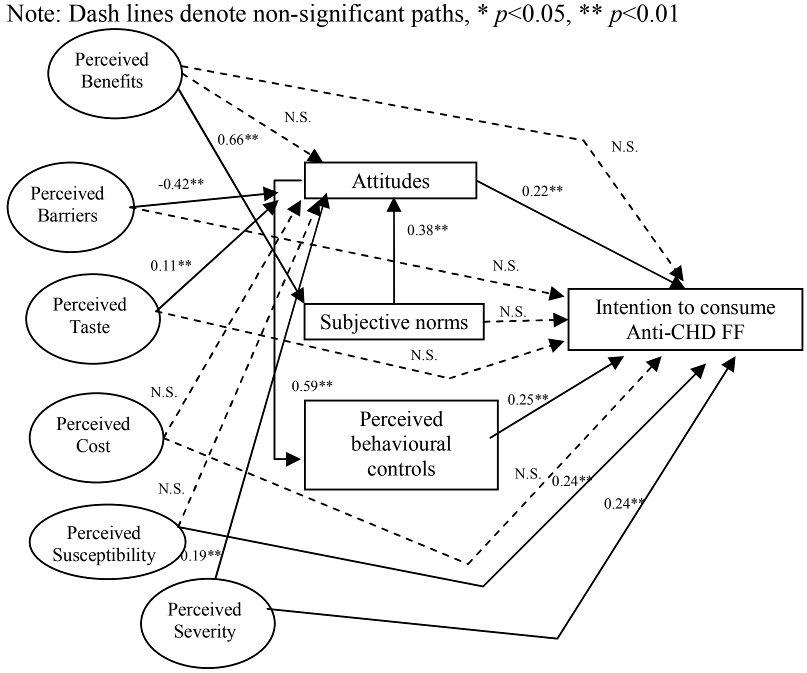
Perceived susceptibility to arthritis had a significant impact on intention to consume functional foods to prevent or treat arthritis (β=0.24) (Figure 9.5). Perceived benefits can be seen to have a significant direct influence, along with attitudes and perceived behavioural control on peoples' intentions to consume the anti-arthritis foods. Both perceived susceptibility (β= 0.24) and severity (β=0.24) also have a significant direct impact on intention to consume anti-CHD functional foods (Figure 9.6). Perceived benefits do not have a direct influence but the impact of attitudes and, perceived behavioural control on intention to consume anti-CHD functional foods is similar to that for anti-arthritic foods.



χ^2/df = 2.67, RMSEA = 0.059, GFI = 0.89, CFI = 0.94
(Explained variance of intention to consume anti-arthritic functional foods = 37%)

Figure 9.5 The result of path analyses for the combined TPB and HBM model to predict intention to consume anti-arthritic functional food

Note: Dash lines denote non-significant paths, * p<0.05, ** p<0.01



χ^2/df = 2.76, RMSEA = 0.061, GFI = 0.88, CFI = 0.94
(Explained variance of intention to consume anti-CHD functional food = 43%)

Figure 9.6 The result of path analyses for the combined TPB and HBM model to predict intention to consume anti-CHD functional food

Note: Dash lines denote non-significant paths, * p<0.05, ** p<0.01

9.5 Discussions

In this chapter we followed the advice of Achterberg and Miller (2004) who suggested that it was better, and probably a more effective approach, to combine theories and even develop new theories when dealing with nutritional issues as people are not always consistent in their behaviour when it comes to the consumption of food.

The explained variance of intention to consume functional food in general was 72%, whereas explained variance of intention to consume anti-arthritic functional foods and anti-CHD functional foods were 21% and 31%, respectively. The differences in predictive power of the models to predict the consumption of general foods compared to specific disease functional foods can probably be attributed to the fact that many of the attitude questions were targeted at general functional foods and not specific anti-disease foods.

When perceived susceptibility and perceived severity were added into the models, they improved the explained variances of intention to consume anti-arthritic functional foods from 21% to 37% and anti-CHD functional foods from 31% to 43%. The combined TPB and HBM model has been used to predict consumers' intentions to consume fortified-iron soy sauce in Guizhou, China. The combined model explained between 35-55% of the variance in their data (Sun *et al.*, 2006). The explained variance of the study of Sun et al. (2006) is slightly higher than was explained in this study. In addition Sun *et al.* (2006) suggested that further modifications to the integrated model are needed before it can adequately predict peoples' likelihood of purchasing or consuming functional foods.

In the current study, there were differences between the influences of perceived behavioural control and perceived severity to intention to purchase specific functional food designed for arthritis and coronary heart disease. The perceived severity of CHD impacted on the intention to consume anti-CHD functional foods, whilst perceived severity of arthritis did not impact on intention (Figure 9.5 and Figure 9.6). The β weightings for both CHD and arthritis suggest that the perceived susceptibility to both diseases had a significant impact on peoples' intentions to consume functional foods designed for people suffering from the two diseases. In addition, the mean score of CHD severity perception (5.73, SD=1.39) was slightly higher than the mean score of arthritis severity perception (5.23, SD=1.52), suggesting that heart disease would be considered as more severe disease than arthritis. This was probably because CHD can cause death whereas that is generally not the case for arthritis.

It is surprising to see the respondents' intention to consume anti-CHD functional foods is not higher than anti-arthritic functional foods. We would expect a greater intention to consume anti-CHD disease functional foods than anti-arthritis foods because there are already foods on the market to treat CHD and there have been numerous public health messages linking diet and CHD. Since consumers know that it can be prevented, and they think it is severe, intention is expected to follow. On the other hand, there is little information in the public arena that indicates that people can prevent the development of arthritis by functional foods. Some people may know that chondroitin and glucosamine ameliorate the symptoms of arthritis but there is no concrete anti-arthritis functional food product on the market in New Zealand. The two supplements come in pill form rather than in foods. Moreover, it is reported that consumers are more likely to accept well-known active ingredients than unfamiliar functional ingredients with rather advanced medical or nutrition knowledge (Bech-Larsen and Scholderer, 2007; Poulsen, 1999; Urala and Lähteenmäki, 2007).

Sun and colleagues (2006) found that their respondents' perception of the severity of iron deficiency anaemia and their perceived susceptibility to the condition had a significant influence on their intentions to consume iron-fortified soy sauce. Clearly, respondents were aware of the severity of CHD, but perception of severity was slightly less for arthritis.

The combined TPB and HBM models suggest that perceived severity was unimportant for the intention to purchase anti-arthritic functional foods but was significantly important for anti-CHD foods. One way of interpreting the findings is to suggest that people felt that they could do nothing to prevent themselves from developing arthritis, but could take steps to prevent the development of CHD, consequently they had some level of control when it came to the purchase of functional foods for CHD, but it was pointless for arthritic foods.

Attitudes are known to have a major impact on what people buy (Kotler and Armstrong, 1999), however, the β weightings in this study for both anti-CHD and anti-arthritis functional foods, whilst significant in both cases, were quite low (0.22), suggesting that attitudes played a minor, though significant role in peoples' intentions to purchase the functional foods. The low weighting may partly be due to the fact that the attitude questions were to general functional foods, not the disease specific ones specified for consumption intentions. Patch *et al.* (2005a) who measured peoples' intentions to consume omega-3-enriched novel foods by using the TPB model found that attitudes toward omega-3-enriched foods were highly significant in determining whether people would consume these foods. When perceived susceptibility and perceived severity are included in the model, the β-weightings of these two constructs were similar. Moreover, Kim *et al*. (2003), who used the TPB model to explain dairy product consumption by older adults, reported that attitudes toward eating dairy products and perceived behavioural control were significant determinants of intention, whereas subjective norms were not.

The perceived benefits of general functional foods were shown to have a significant direct influence over whether people would consume anti-arthritic functional foods, but not anti-CHD functional foods. Another study showed that perceived benefits had significant associations with intention (Urala and Lähteenmäki, 2004). In this study, perceived barriers and perceived cost of general functional foods had no direct impact on peoples' intentions to consume the anti-CHD and anti-arthritic functional foods. This is surprising because barriers had a very important influence on consumption of general functional foods.

Perceived taste had a minor (β−weighting = 0.12) indirect effect on intentions via attitudes showing that taste of functional foods appeared to be of little importance in the consumption of functional foods. This is in spite of the fact that the focus group members and some socio-demographic groups (wealthy and the young respondents) stated that taste was a most important consideration in their food purchase decisions. However, this might have changed if the survey had dealt with a specific flavoured functional food and the multi-faceted aspects of its flavour had been included in the study. However, people suffering from CHD and arthritis indicated that taste was not an important consideration in their purchase decisions of functional foods (Chapter 6). This may be the Listerine^{TM} principle where consumers expect things that are good for you to taste bad.

The integrated model that was used to predict peoples' intentions to consume functional foods in this chapter has one glaring omission. It failed to include cues to action that are an integral part of HBM. The reason for excluding this vital construct related to the fact that the respondents found the questions very difficult to answer in a number of pilots to the development of the final questionnaire and so they were dropped. The respondents could not imagine what the anti-arthritic foods would look like or taste like and so found the questions really hard to answer. As we were looking at both anti-CHD and anti-arthritic foods in our model to predict peoples' intentions to consume these foods using the TPB and HBM models we decided to drop this construct from the survey.

9.6 Conclusions

The analysis showed that the combined HBM and TPB model only explained 21% of the variance of the intention to consume anti-arthritic functional foods and 31% for the anti-CHD foods compared to 72% of general functional foods. The low explained variance for the specific functional foods was probably a result of the fact that the questionnaire was developed for general functional foods and not specific functional foods. Subjective norms and perceived barriers had a significant influence over respondents' intention to consume general functional foods but not for specific functional foods.

When perceived susceptibility and perceived severity were added to the combined TPB and HBM model, it resulted in an improvement in the explained variance of intention to consume anti-arthritic functional foods from 21% to 37% and for anti-CHD foods from 31% to 43%.

Perceived severity was insignificant for the anti-arthritic functional foods, but was significant for the anti-CHD functional foods. Perceived barriers had a strong direct relationship with intention to consume general functional foods, but only had an indirect effect, via attitudes, on the consumption intention of specific functional foods. Once again, perceived taste and cost were seen as insignificant for general functional foods and specific functional foods (see Chapter 6 and 8). Taste was seen to have a very slight influence on attitudes (β=0.12) for both general and specific functional foods.

In conclusion, the integrated model based on the Theory of Planned Behaviour and the Health Belief Model, proved to be the best model compared with the TRA, TPB and modified TPB models in predicting the respondents' intentions to consume both general and specific functional foods. However, the model was not as good at predicting respondents' intentions to consume specific disease functional foods as it was for general foods. This was probably due to the fact that the survey questions were not designed to deal with specific functional foods.

Chapter 10

CONCLUSIONS, LIMITATIONS AND IMPLICATIONS

10.1 Introductions

As little information was available on New Zealanders attitudes to, knowledge of and consumption of functional foods a study was conducted in Palmerston North, a city of almost 80,000 in the North Island of New Zealand, to find out this information from a group of consumers in this city. Apart from exploring the effects that a range of factors had on peoples' intentions and actual consumption of functional foods in Palmerston North, the study also assessed the effectiveness of a number of different models for their ability to predict peoples' intentions to consume and actual consumption of functional foods. The study proceeded in a systematic fashion with firstly the use of focus groups to explore the attitudes and views of consumers on functional foods, and then this information together with information gathered from the literature was used to develop a large questionnaire that was satisfactorily answered by 474 respondents. Initially, a random survey approach was used to gather respondents, but this had to be abandoned because of an exceedingly poor response, which was attributed to the rather complex survey form. As a consequence, a convenience sampling plan had to be adopted for various reasons outlined in Chapter 4. The survey instrument was designed to gather socio-demographic and health status information from the respondents as well as attitude data to functional foods and also multi-item construct information of importance to the theories of reasoned action and planned behaviour and finally the health belief model. Various statistical approaches were used in the analysis of the data and these included means, frequencies, ANOVA, factor analysis, confirmatory factor analysis and finally structural equation modelling. In this chapter, the conclusions of this study are presented first, then the studies limitations and finally the implications of the study.

10.2 Conclusions

This study explored the influence that a range of factors had on consumers' intentions to consume functional foods. Firstly, a literature review was conducted to find out what other research groups had found out about the factors that influenced peoples' intentions to not only consume functional foods and related products, but also the factors that influenced their actual purchases of functional foods and related products. The study proper commenced with a series of focus groups. The focus groups were used to explore the attitudes and views to functional foods, of a small group of consumers in the lower half of the North Island of New Zealand in 2005. The study showed that participants were unfamiliar with the concept and the term 'functional food', but they knew what they were once they had been shown some examples, and in many cases were actually consuming the example foods because of their superior taste or flavour without the participants being aware that they were functional foods and had obvious health benefits. However, in spite of this, they had rather negative views about functional foods. Some saw them as being unnatural foods. The major factors participants thought influenced functional food consumption were price, taste, health effect, and precise dosage of active ingredients. Other factors influencing their purchase decisions were their doubts about the efficacy of the ingredients to prevent or ameliorate disease, limited knowledge, and distrust of food manufacturers' claims.

The group discussion from this study showed that advertisements could influence and convince young females to purchase functional foods even though the participants stated that they placed little credence on the advertisements' message. It clearly had a subconscious effect on their decision making when selecting their food purchases. In addition, the results of this study suggested consumers trusted the advice they might get from their health professionals and certification by health organisations, (i.e. 'heart tick' from the New Zealand Heart Foundation). According to this study, participants felt that the people who were most likely to purchase functional foods were people who were firstly concerned about their health, had a high income, were well educated, regularly exercised, married, and had children in their household.

From a personal perspective, some participants preferred to take dietary supplements in a pill form instead of a food form because they thought that it would be cheaper per daily dose. As well, they would ingest the correct daily dosage, as pills would be easier to consume and more convenient than having to eat functional foods. The main barriers to their ever consuming functional foods were price, dosage of active ingredients and food preferences.

In conclusion, the term 'functional food' was unfamiliar to the panel members, but participants were familiar with the concept once they had been shown examples of functional foods. The term 'functional foods' is clearly a techno-jargon term that consumers have not adopted. Barriers and benefits of functional foods consumption were identified along with a profile of who they perceived to be the typical consumers.

The knowledge gained from the literature review and the focus groups was then used to design a questionnaire that was conducted in Palmerston North over the period of July – November 2006. The survey canvassed the views of over 600 respondents, 474 completed questionnaires were subsequently used in the analysis. Information was sought on a range of socio-demographic factors that had been found to be important in some health and functional food studies, as well as information on the individual's health status at the time of the survey. The study also sought the consumers' opinions on their concerns about health and disease, their attitudes towards functional foods, whether their peers and others were likely to influence their purchases of functional foods, their perceptions of the severity of CHD and arthritis, their perceived susceptibility to these two diseases, the perceived benefits and barriers to consuming functional foods, and finally their own attitudes, intent and behaviour related to the consumption of functional foods.

Chapter 5 showed that the survey sample was not a representative sample of the New Zealand population. It contained a high proportion of female respondents and the survey sample tended to be weighted heavily in favour of older respondents who were well educated and relatively wealthy. This was not surprising in view of the reluctance of many people to participate in the survey and the convenience sampling procedure that was adopted after the first 300 participants had been recruited. In this latter recruitment phase, attempts were made to recruit people with arthritis and heart disease as well as healthy individuals to obtain sufficiently large sub-groups for subsequent modelling.

The majority of the respondents reported that they had consumed functional foods (61%). They appeared to be accepting of the idea of the development of either an anti-CHD or anti-arthritic functional food. A majority preferred to have active ingredients against these diseases included in a food (69%), but could not agree on what food was the best vehicle. The most preferred vehicle for both the anti-arthritic and anti-CHD ingredients was a drink. However, a high proportion (31%) would prefer the active ingredients in pill form.

The other foods that they listed as possible vehicles for the active ingredients were staple foods that are commonly eaten on a daily basis. These survey results have quite restrictive constraints on the product developer, because it appears as though the respondents are saying that totally new products should not be developed for these functional foods, but instead products that are regularly consumed should be used as the delivery vehicle for the functional ingredients.

The respondents were asked to rank the reasons that would influence their purchase decisions for functional foods. Nutrition and health benefits received the highest ranking. This ranking suggested that functional food should taste good, be nutritious, and not cost too much more than existing products. The study also showed that the socio-demographic circumstances of the individual had a large bearing on what variables influenced their food choices. For instance, people on low incomes were most influenced in their food choices by the cost of the food, whereas, the wealthy were less influenced by cost or health issues, but were instead concerned that the food tasted good. Consumers who were aged over 30, on the other hand, whilst influenced by the other factors, tended to be influenced most in their food choices by the food's nutritional content. Female respondents were influenced by the nutritional content of the food, which is not surprising since most women want their families to be healthy and so try to make sure that they give them healthy, safe food. Men, on the other hand, were equally concerned about cost, enjoyment and nutritional content, and were not as concerned about nutrition as the women.

The study suggests that the new functional food should not be overly priced; otherwise, a sizeable market (low-income consumers) would not be able to afford the food. The wealthy would not worry too much about price so long as it tasted good and did what the manufacturers claim it did. If people consider functional foods to be nutritious, then women over 30 were most likely to consume them.

Scientists and documentaries were chosen as the most reliable sources of information, whilst advertisements and food manufacturers' claims were the least trustworthy information sources. The study also showed that peoples' perceptions of the trustworthiness of a source disseminating information about the efficacy of a new functional food product were dependent on their socio-demographic status. The well-educated respondents in this survey placed greater trust on material appearing in seminars/conferences than they did on the pronouncements of manufacturers or their advertisements. Very few people claimed to trust advertisement and food manufacturers but people with less education were more likely to be influenced by them.

Men tended to trust information from documentaries and scientists. Women, on the other hand, were more likely than males to believe manufacturers' claims and advertisements. The study, as a consequence, has major implications for the food manufacturer, that is, the manufacturer must sponsor scientific studies that will unequivocally demonstrate the efficacy of the new functional ingredient in the newly released food. Furthermore, the results from these studies should be reported in the documentary on the broadcast and at appropriate conferences. Failure to carry out the trials and to release the findings through the correct channels could have major impacts on the commercial success of the new products

In conclusion, older, highly educated women were overrepresented in the sample. Around 69% of the respondents preferred functional ingredients in food instead of pill. Overall, nutritional or health benefit was the most important factor affecting food choice, particularly for women and older respondents. Food manufacturer and advertisement were the least trustworthy source of information.

In Chapter 6, the relationships between dimensions of attitudes and socio-demographic factors, health behaviours and health status were explored. The study showed that the data could be summarised by five dimensions of attitude (general attitude to functional food consumption, belief in the personal benefits of consuming functional foods, self-efficacy, belief in the efficacy of functional foods, and scepticism towards the benefits from functional foods). The factor analysis that was performed on the 9 variables that dealt with the respondents' intentions to consume general functional foods and also specific functional food designed for either arthritis or CHD showed that the data could be summarised by two factors. The first was consumers' intention to consume functional foods 'designed to treat a specific disease', and the second people's intentions to consume 'functional foods in general'. This analysis showed that no single socio-demographic variable had a consistent effect across all attitude dimensions or purchase intentions. Instead, the socio-demographics tended to have a significant influence over one or at most two attitude dimensions. Women had more negative views about functional foods than men had and were less inclined to purchase them than men. The wealthy and well-educated respondents had rather sceptical views about functional foods than some of the other groups and too were less inclined to purchase them, even though they could afford them.

The large survey seemed to be at odds with the focus group study where people felt that the people most likely to purchase functional foods were people who were firstly concerned about their health, had a high income, were well educated, regularly exercised, married, and had children in their household.

Cost and taste of functional foods was apparently not correlated with any of the attitude dimensions and consequently was not extracted in the factors. This was unexpected as most literature, and the results from the focus group, clearly indicated that cost and taste should have been correlated with questions relating to barriers to the consumption of functional foods. The most likely reason why both cost and taste were seemingly unimportant to the various demographic groups probably relates to the way these two constructs were included in the survey. The two constructs were presented to the survey respondents as uni-item constructs, where as in reality they are multi-item constructs and cannot be adequately defined by a single descriptor. It is very difficult to define the multi-faceted aspects of taste for a nebulous functional food and in retrospect it might have been better if the consumers had been questioned on this matter with respect to specific functional foods already on the market rather than trying to generalise about all functional foods. Cost too is a multi-faceted construct and needs to consider the ticket price, the difference in price between the functional food and an identical food without the active ingredient, the wastage associated with the food, whether it is value for money to name just a few aspects of cost.

The results highlighted the significant impact that talking about functional foods had on all five attitudinal dimensions and intention to consume general and specific functional foods. The relationship was consistently negative, however, it was unclear as to whether people became more negative because of talking to others about functional foods or whether their peers conveyed a negative view that they subsequently adopted. This result has some important implications for the food industry if the views of this non-representative samples are held by the New Zealand population.

Taking dietary supplements had a negative relationship with intention to consume general functional foods and belief in their efficacy. The people taking dietary supplements did not believe that functional foods were efficacious. Supplement users may be the people who wanted the functional ingredients delivered in a pill rather than in a food. Moreover, the result in Chapter 5 showed that 35% of participants reported that they take dietary supplements every day.

The analysis also showed that people who either had the symptoms of arthritis and/or CHD did not believe in the efficacy of functional foods and had a lower intention to consume disease specific functional foods than the healthy respondents. This is worrying from the perspective of the food industry. As a consequence of this finding, rather than developing foods for people with specific diseases, people who are least inclined to buy the products, manufacturers should instead target the general population with functional foods that will prevent the development of diseases.

In conclusion, general attitudes were positive to functional foods except for some evidence of scepticism. The results from this chapter conflicted with the profile of functional users suggested by the focus group: highly educated people had less belief in the efficacy of functional foods, and women were more sceptical about functional foods and less intending to consume them. Talking about functional foods was negatively correlated to all dimensions of attitudes and intentions to consume specific and general functional foods. Respondents with symptoms of arthritis and/or CHD were less intending to consume specific functional foods to treat these conditions.

In Chapter 7, three models based on the theories of reasoned action (TRA) and planned behaviour (TPB) were compared to see which of the theories best predicted peoples' intentions to consume functional foods. The modified TPB, with a path from SN to attitude, was the best fit and explained the highest amount of the variance (61%). The results showed that the influence of perceived behaviour control, subjective norm and attitudes to functional foods were very important in determining whether respondents would consume functional foods or not. Perceived behavioural control was shown to be the most important direct determinant of whether people would consume functional foods. However, this result needs to be viewed cautiously as there were suggestions that this construct was poorly defined (negative path to intentions to consume functional foods). The items in this construct were modified from a study by Conner *et al* (2003) and modified so that they could be used to solicit the respondents' views of functional foods. For a future study it maybe necessary to develop the items for this construct from scratch so that the items better measure this construct.

In conclusion, the modified theory of planned behaviour with the path from subjective norms to attitudes was shown to be a better model for predicting respondents' likelihood of consuming functional foods than either the TPB or the theory of reasoned action.

In Chapter 8, the modified TPB model (from chapter 7) and a further modification to this TPB model that included two constructs from the health belief model (perceived benefits and perceived barriers) were used to predict the consumption behaviour of arthritis and non-arthritis respondents. The modified TPB model explained a greater proportion of the variance in the data for both the arthritis and non-arthritis groups than the extended TPB model, 38% versus 36% for the non-arthritis group and 36% versus 33% for the arthritis group. From a regression perspective, perceived barriers and perceived benefits should have been dropped from the model. However, they are theoretically relevant and had significant direct impacts.

Perceived barriers were the most important influencing factor on intention to consume functional foods. It negatively influenced attitudes, and intention to consume functional foods, which in turn was a significant determinant of actual behaviour. This suggested that the barriers were having a significantly negative influence on consumption behaviour. Perceived benefits had a significant positive effect on subjective norms and perceived behavioural control, but no direct effect on intentions or attitudes. For these reasons, the constructs should be included in the model.

As with chapter 6, two other potential barriers, i.e., cost and taste were once against shown to be unimportant in determining whether people would consume functional foods. They were excluded from the analysis because they failed to load onto any of the factors considered in this chapter. The reasons for their seeming unimportance have been dealt with earlier in this chapter.

In conclusion, the analysis showed that the modified TPB was similar for arthritis and non-arthritis groups, except attitudes had no direct effect on intention to consume functional foods for the arthritis group, but did for the non-arthritis group. When perceived barriers and perceived benefits were added, the PBC became less important in influencing the consumption behaviour of both groups. The strongest influence was perceived barriers.

In Chapter 9, the extended TPB model (from chapter 8) was used to predict respondents' intentions to consume general functional foods and also specific functional foods for arthritis and coronary heart disease. This model was better at predicting respondents' intentions to consume general functional foods than the modified TPB model used in Chapter 7, i.e. explained more of the variance (72% for the TPB model plus 2 HBM constructs and 61% for the modified TPB model). However, intentions to consume specific functional foods were poorly predicted by this model and only accounted for 21% of the variance in the data for arthritis foods and 31% for the anti-CHD functional food.

The chapter also investigated the predictive capability of a further model that included perceived susceptibility and perceived severity. This model was able to explain a greater proportion of the variance for the anti-arthritis and anti-CHD functional foods, 37% for the anti-arthritis food and 43% for the anti-CHD functional food.

Perceived barriers were very important to intention to consume general functional foods but not specific functional foods. Perceived susceptibility influenced intention to consume functional foods for both arthritis and CHD. Perceived severity of CHD influenced intention to consume anti-CHD functional foods but perceived severity was not directly related to intention for anti-arthritis foods.

In conclusion, the extended TPB model was better at predicting consumption of general functional foods than disease specific functional foods. The addition of the HBM constructs of perceived severity and perceived susceptibility to the model for disease specific functional foods increased the portion of variance explained.

Assessment of various models

In Chapter 7, the models based on the theory of reasoned action and planned behaviour were used to predict the respondents' intentions to consume general functional foods. The analysis showed that the TPB model better explained the variance in the data than the TRA model, though the differences in explanatory power were marginal (R^2 = 55% for TRA, and 57% for the TPB model). Moreover, the TPB model had superior fit indices than the TRA model.

The TPB model with the path linking subjective norms with attitudes (see the figure below) was suggested by the literature review. This model explained 61% of the variance in the data and had a better fit than either the TRA or original TPB model.

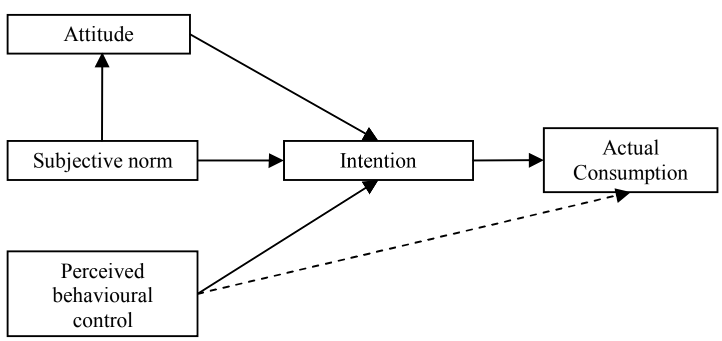


Figure 10.1: Hypothesised relationships among constructs according to the theory of planned behaviour model

In Chapter 8, the modified TPB model was used to explain the actual consumption behaviour of people suffering from arthritis and arthritis free respondents. The model could only explain a small portion of the respective groups' actual consumption behaviour (R^2 = 36% for arthritis sufferers and 38% for respondents without arthritis). A further model was evaluated that included two constructs from the health belief model. These constructs were perceived benefits of functional foods and perceived barriers of functional foods. Cost and taste were also included as a single question for each construct. Neither of the two was included in the factor analysis solution, but from the focus group discussions and other research works (Chang, 1998; Madden *et al.*, 1992) both variables were expected to be important in determining whether people would consume functional foods, so they were retained in the model (Figure 10.2).

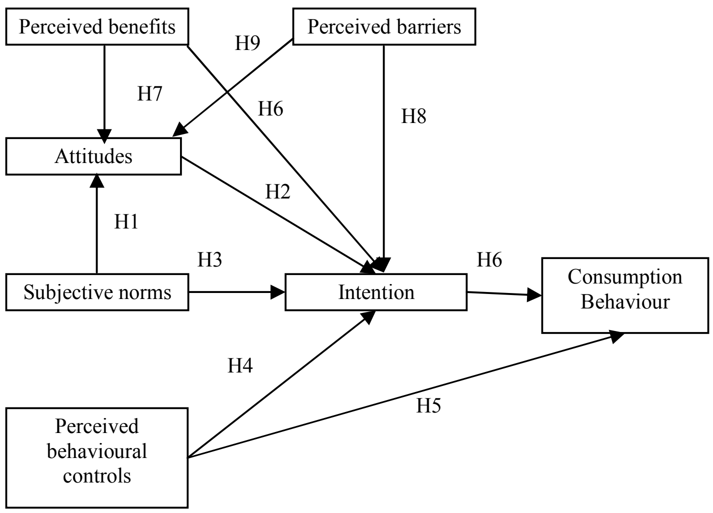


Figure 10.2: Hypothesised relationships among constructs based on the extended theory of planned behaviour model

Perceived barriers had a direct effect on intentions to consume functional foods and also an indirect effect via attitudes. Perceived benefits had no direct impact on intentions but influenced subjective norms and perceived behaviour control. Cost and taste were still insignificant influences. This was clearly a more complex model, but ended explaining less of the variance in the data than the above modified TPB model (R^2= 31% for arthritis compared to 36% for the modified TPB model and 36% for the disease free group compared to 38% for the modified TPB model). However, even though it explained a lower proportion of the variance it provided a greater insight into the factors that were influencing peoples' intentions to consume functional foods.

In Chapter 9, the extended TPB model from chapter 8 was found to be poor at predicting intention to consume specific functional foods. This model was further extended with perceived susceptibility and perceived severity, which improved the explained variance of the model (from 21% to 37% for anti-arthritic functional foods and from 31% to 43% for anti-CHD functional foods). This model is shown in Figure 10.3

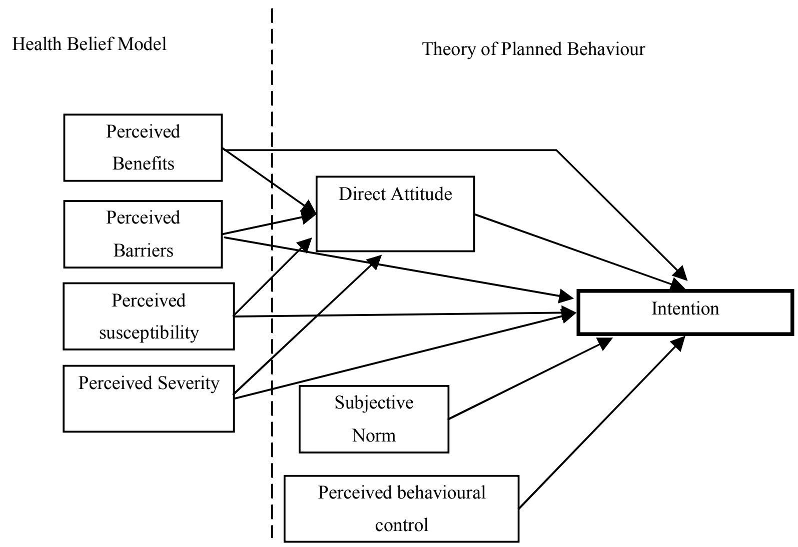


Figure 10.3: Combined model of Theory of Planned Behaviour model and the Health Belief Model

In conclusion, the various analyses showed that peoples' intentions to consume functional foods and their actual general functional food consumption were better modelled with models that included not only all the elements of the TPB model, but also included at least perceived benefits and barriers from the HBM model. Intention to consume functional foods for specific diseases are best modelled by also including perceived susceptibility and perceived severity.

10.3 Research limitations and recommendations

This study had some major limitations, which related to the data collection and interpretations of results. These limitations are as follows.

1. Some of the focus groups and all of the large survey participants were recruited from Palmerston North, New Zealand. All participants were volunteers, and only 80 were drawn randomly. A convenience-sampling plan was used to get the required number of arthritis and CHD sufferers in the sample. Unfortunately,

people were hard to recruit because of the difficulties people had with answering the survey. Consequently, the survey tended to be biased towards the well-educated and well-off portion of the socio-demographic spectrum and by people over 50 years of age. The survey was also over-represented by female respondents as they were more inclined to answer the survey than male members of the Palmerston North population. Consequently, the sample is not a true representation of the Palmerston North population, let alone the New Zealand population.

2. The existence of arthritis and coronary heart disease in the respondents was based on self-reporting, but the associated clinical characteristics were unknown. As a result, the severity, course or diagnosis of the condition could not be assessed, which may have some influence on the results of the study.

3. Questions referring to constructs of the TPB and HBM referred to the general concept of functional foods, not foods specific for the diseases of interest in this study. Specific questions about attitudes, subjective norms, perceived behavioural control, perceived benefits and barriers of functional foods specific to the disease should be included in any future questionnaire.

4. Certain limitations regarding the measurement of the constructs also need to be addressed. Perceived barriers to consumption of functional foods contained several questions, however, when factor analysis was employed; some important items were excluded based on statistical analysis criteria and procedures (taste and cost). Therefore, with some constructs a single factor (perceived cost and perceived taste) was used to represent the construct in the combined model of TPB and HBM. The use of a single question to represent the construct could inflate the strength of the relationships among constructs or in this case deflate the importance of the variable in a construct. In any further research, more than one question to fully encompass cost and taste of functional foods needs to be included in the questionnaire.

5. In this study the constructs of perceived behavioural control were rather similar to the constructs of perceived barriers. Therefore, they were used as the same constructs. However, some researchers argue that they are different constructs.

Therefore, it needs to be considered in further study to use them as separated constructs.

6. A reflective measurement model was used in this study. The justification of this approach was based on the literature (Jarvis *et al.*, 2003) and others who suggested that this sort of measurement model was best used where attitudes and intentions were being modelled. However, in retrospect, it may been more appropriate to use the alternative measurement model, ie., formative measurement model, as the literature suggests that it is a better measurement model for validating the content of constructs which was one of the objectives of this study.

10.4 Implications for the food industry

The study showed that attitudes, subjective norms and perceived behavioural control influenced peoples' decisions to purchase functional foods. The food industry has some serious marketing to do if it is to increase sales of functional foods in New Zealand. Currently people have little idea of the concept and some see them as being unnatural foods (focus groups). A number actually consume functional foods without being aware that they are doing so (focus groups) The people with either the money to buy them (the well educated and wealthy), and the women who control what food comes into the household all have negative views about the foods and are sceptical about their efficacy. Moreover, if people talk about functional foods with friends and acquaintances, the message that is transferred appears to be negative and thus dissuading people from purchasing functional foods. It would also appear as though the respondents felt too that the most influential people in their lives were likely to try and dissuade them from purchasing foods rather than encouraging their purchase.

Clearly, the industry needs to ramp up its promotion of these products. It needs to tell people that they are actually consuming functional foods, because many of the respondents were actually consuming them, but were unaware of the fact. However, it cannot use conventional promotion techniques such as advertisements, educational advertising etc. because the respondents view these sources of information as being untrustworthy. They need to start research studies that scientifically prove that the ingredients do what they are supposed to. This information needs to be released at conferences and then scientists involved in the work need to communicate with the general public via documentaries and

TV and radio news programmes. The industry also needs to provide health professionals with the refereed papers to convince them about the efficacy of the functional foods so that they in turn will start recommending that their patients consume these functional foods.

From this study, the results showed that perceived barriers to functional foods consumption were shown to be significantly important determinants of whether people would consume functional foods. New Zealanders were sceptical about both the term "functional food" and whether there are real benefits to be obtained from consuming them. This scepticism is the barrier industry must address because it appears to be a larger influence than any other factors. Talking to others about functional foods negatively influences all attitudes dimension and intention to consume functional foods. They may talk about functional food in a negative way or share their sceptical views about them. Somehow, food manufacturers must help consumers to have a more favourable attitude to functional foods, gain more understanding about the concept of functional foods and help them become confident in consuming functional foods.

Clearly, manufacturers need to ascertain these attitudes to find out whether their products will be purchased by consumers. It is important to find out whether the attitudes are generally positive or negative, if there is polarisation of attitudes, this information too is important to the food manufacturer preparing to produce new functional food products.

The analysis showed that on average the overall view of the respondents was slightly to moderately in favour of functional foods. However, the views appeared to be polarised with some thinking negatively about functional foods and others being quite positive. Income was the main socio-demographic factor related to self-efficacy, so perhaps there is a need on the part of manufacturers to convince consumers that functional foods are not expensive, or at least that they offer value for money.

The study also showed that once people developed a chronic disease such as arthritis and coronary heart disease then they were very unlikely to purchase disease specific functional foods and instead relied on medicines for the condition. This finding has two implications for the food industry. The first is to suggest that they should avoid producing pharmo-foods because they are unlikely to be purchased. The second implication is that companies should develop functional foods that are designed to prevent or slow down the development of a disease, as the people who are likely to purchase these products are people who want to avoid the disease. These are likely to be people who take good care of their health by exercising regularly and controlling what they eat.

The study also showed that a proportion of consumers (31%) would really prefer to have the ingredients in pill form because of their convenience and the fact that consumers know what they are getting in each pill, something they cannot be too sure of with a functional food. However, a majority preferred to have the ingredients in a food and the most preferred food was a drink that was consumed on a regular basis. Other food choices were cereals, spreads, bread, muesli bars and pasta. In other words, the consumers wanted the ingredients added to existing food staples. This is quite restrictive as far as the food industry is concerned because it limits the foods that can be used as a delivery vehicle for the functional foods. It is clear that the respondents wanted to eat a food that could deliver the daily dose of active ingredients and was something that they consumed on a daily basis.

The final implications for the food industry in New Zealand relate once again to the barriers that are preventing the respondents from consuming functional foods. The survey showed that a reasonably high proportion of the women were quite sceptical about functional foods, this is in spite of the fact that the women said that nutrition and health were important determinants of food choice. Perhaps a reasonably high proportion of New Zealand women see nutrition as more a whole foods approach, and not something that is manufactured. This would all suggest that food manufacturers should concentrate on using foods as vehicles for functional foods that are seen by women to fit well with current nutrition recommendations. More research about perception of consuming functional foods needs to be carried out to help better identify how they overcome the barriers especially the scepticism (Jarvis *et al.*, 2003; Poulsen, 1999).

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APPENDIXES

Appendix A

A1. Focus group consent form

Massey University
COLLEGE OF SCIENCES

INSTITUTE OF FOOD, NUTRITION
AND HUMAN HEALTH
Te Kura Hangarau o
Kai-oranga-ā-tangata
Private Bag 11 222
Palmerston North
New Zealand
T 64 6 350 4336
F 64 6 350 5657
www.massey.ac.nz

The Determination of Consumer Attitudes Towards Functional Foods and in Particular to Anti-arthritic Functional Foods

PARTICIPANT CONSENT FORM

This consent form will be held for a period of five (5) years

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree/do not agree to the interview being audio taped.

I agree to not disclose anything discussed in this Focus Group

I agree to participate in this study under the conditions set out in the Information Sheet.

Signature: ______________________________ **Date:** __________

Full Name - printed ______________________________

Revised 23/01/04 — Format for Participant Consent Form — Page 1 of 1

A2. Focus group confidentiality agreement form

Massey University
COLLEGE OF SCIENCES

INSTITUTE OF FOOD, NUTRITION
AND HUMAN HEALTH
Te Kura Hangarau o
Kai-oranga-ā-Hangata
Private Bag 11 222
Palmerston North
New Zealand
T 64 6 350 4336
F 64 6 350 5657
www.massey.ac.nz

The Determination of Consumer Attitudes Towards Functional Foods and in Particular to Anti-arthritic Functional Foods

CONFIDENTIALITY AGREEMENT

I .... (Full Name - printed)

agree to keep confidential all information concerning the project "The Determination of Consumer Attitudes Towards Functional Foods and in Particular to Anti-arthritic Functional Foods".

I will not retain or copy any information involving the project.

Signature: ______________________________ **Date:** ____________

Format for Confidentiality Agreement

Revised 23/01/04 Page 1 of 1

A3. Authority for the release of tape transcripts form

Massey University
COLLEGE OF SCIENCES

INSTITUTE OF FOOD, NUTRITION
AND HUMAN HEALTH
Te Kura Hangarau o
Kai-oranga-ā-tangata
Private Bag 11 222
Palmerston North
New Zealand
T 64 6 350 4336
F 64 6 350 5657
www.massey.ac.nz

The Determination of Consumer Attitudes Towards Functional Foods and in Particular to Anti-arthritic Functional Foods

AUTHORITY FOR THE RELEASE OF TAPE TRANSCRIPTS

This form will be held for a period of five (5) years

I agree that the edited transcript and extracts from this may be used by the researcher, Duljira Sukboonyasatit in reports and publications arising from the research.

Signature: ____________________________ **Date:** ____________

Full Name - printed ____

Revised 23/01/04 Format for Authority for Release of Tape Transcripts Page 1 of 1

A4. Focus group information sheet

The Determination of Consumer Attitudes Towards Functional Foods and in Particular to Anti-arthritic Functional Foods

INFORMATION SHEET

My name is Duljira Sukboonyasatit. I am studying a Ph.D. at the Institute of Food Nutrition and Human Health. My study is under the supervision of Dr. Brian Wilkinson, Dr. Janet Weber (Massey University), and Associated Professor Tipvanna Ngamsak (Khonkaen University, Thailand).

You are allocated into the groups with people in the same gender and the range of age. There are 6 participants in this group. Refreshments will be provided and you will also receive $20.00 to cover your costs. This group discussion will take about 90 minutes. The data from the tape will be transcribed and analysed to design a questionnaire for the postal survey.

Participant's Rights
You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any particular question;
- withdraw from the study in anytime;
- ask any questions about the study at any time during participation;
- provide information on the understanding that your name will not be used unless you give permission to the researcher;
- be given access to a summary of the project findings when it is concluded.
- I also understand that I have the right to ask for the audio/video tape to be turned off at any time during the interview.

Project Contacts
If you have any questions, please contact Duljira Sukboonyasatit, telephone number is 06-3505799 extension 7266, email address D.Sukboonyasatit@massey.ac.nz or Dr. Brian Wilkinson (ext 7585, B.Wilkinson@massey.ac.nz) or Dr. Janet Weber (ext 4403, J.L.Weber@massey.ac.nz).

Compulsory Statements
Committee Approval Statement

> This project has been reviewed and approved by the Massey University Human Ethics Committee, PN Application 04/182. If you have any concerns about the conduct of this research, please contact Professor Sylvia V Rumball, Chair, Massey University Campus Human Ethics Committee: Palmerston North, telephone 06 350 5249, email humanethicspn@massey.ac.nz

A5. Questionnaire for focus group

QUESTIONNAIRE FOR FOCUS GROUPS

Instruction: Please could you answer all of the following questions completely and please do not discuss your answers with anyone else whilst you are completing the questionnaire.

I would like you to answer each of the questions by ticking the box that is closest to how you feel about the topic that is being covered with each question. For instance I might be asked the following question

Consuming rolled oats every morning will lower your blood cholesterol.

O O O O O O O

Totally disagree — Neither Agree nor Disagree — Totally agree

Having done some reading around the subject I would probably tick the 'totally agree' box. I would now like you to answer each of the following questions in the same way

---

1. I cannot obtain all the food compounds that I need from food alone.

O O O O O O O

Totally disagree — Neither Agree nor Disagree — Totally agree

2. I have taken dietary supplement (vitamin or mineral) or herbal supplement within the last month?

O Yes O No

3. I choose some foods for health protection.

O O O O O O O

Totally disagree — Neither Agree nor Disagree — Totally agree

4. I choose some foods for disease prevention.

O O O O O O O

Totally disagree — Neither Agree nor Disagree — Totally agree

5. I buy some food products for their health benefits.

O O O O O O O

Totally disagree — Neither Agree nor Disagree — Totally agree

6. My food choices really are affected by my health concerns.

O O O O O O O

Totally disagree | Neither Agree nor Disagree | Totally agree

7. Health concerns of my family members affect my food buying decision.

O O O O O O O

Totally disagree | Neither Agree nor Disagree | Totally agree

8. I eat food products for benefits beyond their basic nutritional content.

O O O O O O O

Totally disagree | Neither Agree nor Disagree | Totally agree

9. Consumption of certain foods can allow me to reduce or avoid reliance on medication.

O O O O O O O

Totally disagree | Neither Agree nor Disagree | Totally agree

10. Have you ever heard of fortified food?

O Yes O No

11. Please describe your understanding the term "fortified food" as much as possible

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………………………………………………………………………………
……………………………………………………………………………………………

12. Have you ever heard of functional foods?

O Yes O No

13. Please describes your understanding the term "functional food" as much as possible

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A6. Focus group discussion guide

Introduction:
Hello everyone. My name is Duljira Sukboonyasatit and I'm the moderator for today's group discussion. Miss Chanapha will be my assistant to record the tape and VDO. Our purpose today is:

- To discuss your concerns and understandings about food, health and nutrition

Please feel free to make any negative or positive comments about any of the things that we will be discussing today. This is a free flowing discussion and there are no right or wrong answers.

Before we get started, here are some rules;

1. CONFIDENTIALITY. Everything that you say here will be kept strictly confidential. Nothing said in this group will ever be associated with any individual name. We would also ask that you similarly maintain the confidentiality of what is said in the group.
2. VOLUNTARY PARTICIPATION. Your participation in this group is entirely voluntary. You may stop participating at any time. You do not have to answer any questions that you do not wish to answer. You may withdraw from the group at anytime with no consequences. The consent forms provide information regarding confidentiality and the voluntary nature of participation. If you haven't already done so, please sign the consent form and pass it to Miss Chanapha.
3. AUDIO-TAPING. It is normal to audio-tape in this kind of group discussion to get the accurate information. Does anybody have objection for audio-tape?
4. THANKS. Thank you for coming along to participate in the session. Your contribution will be greatly appreciated. I have a $20 petrol voucher to compensate for the time you have given up for this study.

Rules:

1. Please speak one at a time and loud and as clearly as possible
2. Avoid side conversations with your neighbours.
3. We need to hear from everyone in the course of the discussion, but you don't have to answer every question.
4. Feel free to respond directly to someone who has made a point. You don't have to address your comments to me to get them on the table.
5. Say what is true for you. Don't let the group sway you and don't "sell out" to group opinion.

SELF-INTROS:
Please introduce yourself to the group and tell us a little bit about yourself such as occupation, hobbies etc.

Part 1 - Health concern

I have 2 phrases on the clipboard that possibly represent the extremes in how people view food.

Show the clipboards "You are what you eat" and "Food is your enjoyment"

1. What I would like to do is look at one phrase at a time. Let's start with the phrase "You are what you eat"

1.1 What does that mean to you?

1.2 What sort of person would use this phrase as a guiding principle for their food consumption?

1.3 What income bracket would they fall into?

1.4 Are they likely to be well educated or what?

1.5 Do they take vitamin and mineral supplements? Why and why not?

1.6 Are they concerned about their health? Do they do exercise regularly?

2. For the second phrase "Food is your enjoyment"

2.1 What does that mean to you?

2.2 What sort of person do you think follow this view?

2.3 What income bracket would they fall into?

2.4 Are they likely to be well educated or what?

2.5 Do they take supplement? Why and why not?

2.6 Are they concerned about their health? Do they do exercise regularly?

3. We have looked at possibly the two extremes in people's approach to food. Are there any other people that don't fit into the continuum? If so who and what are their characteristics?

4. Which of the groups in you opinion is more likely to buy foods that might improve their health?

Part 2 - Understanding and knowledge about fortified foods

1. Have you ever heard about foods, which have added vitamins and minerals?

2. I would like everyone to name any foods that you buy that have extra nutrient added to them.

(If participants do not come up with any sample of this kind of food or few samples, show them the samples.)

Here, I have a few examples of foods that fall into this category with me and I should like to show them to you: iodised salt, fortified calcium milk, corn flake cereal, bread (with fibre, vitamin A, D), juice (Vitamin C) and please pass them round

3. Do you think these foods should be supplemented with vitamins and minerals? Why or why not?
4. I have taken the nutritional or health claims from each of the packs and would like to get your views on what each of the claims mean to you.

Let's start from the iodised salt pack; the following claim is made. What in you opinion does such a phrase mean to you? (fact or marketing word)

On the fortified calcium milk pack, what in you opinion does such a phrase mean to you?

On the corn flake cereal pack, what in you opinion does such a phrase mean to you?

On the bread pack, what in you opinion does such a phrase mean to you?

On the juice pack, what in you opinion does such a phrase mean to you?

Having seen all these products and examined each of the claims how could we best define what fortified food means to the people in the street?

5. Is it a good idea to add extra nutrients to foods?

6. If so, what foods should have added vitamins or minerals? And why?
7. From the phrases on the clipboard, which sort of person would consume each of these foods? And why?
8. Would you choose these foods?
9. I need a term or a sentence to describe this food for my survey questionnaire, how would you define the term?

Part 3 - Understanding and knowledge of functional foods
There are food products on the market added health benefits and I have a few examples of foods to show you: Logical margarine or pro-activ®, tomato sauce or juice (with lycopene), yoghurt (with acidophilus bacteria), smoothie (with spirulina) and please pass them around.

1. From the phrases on the clipboard, which sort of person would consume each of these foods? And why?

2. I have taken the nutritional or health claims from each of the packs and would like to get your views on what each of the claims mean to you.

   2.1 Let's start from the margarine pack. The following claim is made. What in you opinion does such a phrase mean to you?
   2.2 On the tomato sauce pack, what in you opinion does such a phrase mean to you?
   2.3 On the yoghurt pack, what in you opinion does such a phrase mean to you?
   2.4 On the smoothie pack, what in you opinion does such a phrase mean to you?
   2.5 Having seen all these products and examined each of the claims how could we best define what functional food means to the people in the street?

3. Would you choose these foods?

4. Have you ever heard the term "functional food? What does it mean?

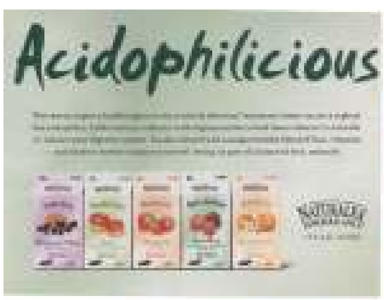
5. I need a term or a sentence to describe this food for my survey questionnaire, how would you define the term?

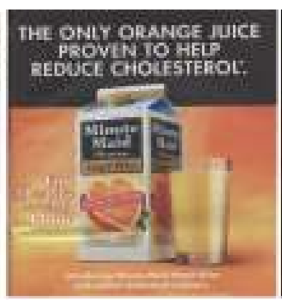
D. Closing comments
1. Do you have any additional comments?
2. Thank you very much for your participate and I have a $20 petrol voucher to compensate for your time.

A6. Focus group functional food samples

Fortified food samples

Functional food samples





Arthritic-functional food samples

Appendix B

B1. Survey Cover Letter

Massey University
COLLEGE OF SCIENCES

INSTITUTE OF FOOD, NUTRITION
AND HUMAN HEALTH
Te Kura Hangarau o
Kai-oranga-a-tangata
Private Bag 11 222
Palmerston North
New Zealand
T 64 6 350 4336
F 64 6 350 5657
www.massey.ac.nz

14 July 2006

Dear participants,

My name is Duljira Sukboonyasatit and I am a student at Massey University in the Institute of Food Nutrition and Human Health. I am conducting a research project for my PhD thesis. For my research I want to learn more about the attitudes, beliefs, and purchasing intentions of people towards foods that have health benefits over and above their normal nutritional content.

I am writing to you to ask for your help in this survey. Enclosed is a questionnaire, which I would be grateful if you would answer and return in the prepay envelope provided. Please could you complete the questionnaire as soon as possible and send it back to me by the **14th August 2006**.

The questionnaire is anonymous and the information you provide will be held in confidence and seen only by the researchers and those involved with the computer data entry. The final research report will be based on a summary of the information collected. Results will be published in academic and professional journals but no individuals will be able to be identified. The number pre-printed on a questionnaire cover is for data entry and for the grocery vouchers draw purposes.

We anticipate it should take about 25 to 30 minutes to complete the questionnaire. We appreciate that this is eating into your leisure time and so we are offering three $100 grocery vouchers as a form of compensation. The 3 lucky names of the people whose completed questionnaire will be drawn and the winners will be notified by letter.

"This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor Sylvia Rumball, Assistant to the Vice-Chancellor (Ethics & Equity), telephone 06-350-5249, email humanethicspn@massey.ac.nz".

Thank you for considering participating in my survey. I hope you find it interesting. If you would like to find out the results of my study please indicate this on the provided slip. If you have any questions we can be contacted at 350-5799 ext 7266 (Duljira) or 7585 (Dr Wilkinson) or D.Sukboonyasatit@massey.ac.nz

Yours sincerely,

Duljira Sukhoonyasatit

Survey Information Sheet

B2. Information sheet and instructions

Hello,

Thank you for helping to participate in this survey intended to help understand peoples' intention to purchase functional foods.

The survey consists of 6 sections and it is vital that you fill in each section completely. The first section asks some questions about your views of food and health. The second section deals with aspects about health and disease. The third section seeks your thoughts on functional foods. The fourth section continues with the theme of functional foods, but is more market related. The fifth section asks you some further questions about functional foods and the last part asks you a number of personal questions.

Most questions require you to tick a box or rate your answer by circling a number from 1 to 7. Please only circle one number per question. The following is an example of this type of question.

I am likely to purchase functional foods.

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

If you think it is strongly agree, you would circle 7 but if you only slightly agree, you would circle 5. If you strongly disagree with the statement, you would circle 1. If you are unsure about your answer, circle 4.

This research is being carried out under the supervision of Dr. Brian Wilkinson, Dr. Janet Weber (Institute of Food Nutrition and Human Health, Massey University), and Assoc Prof Tipvanna Ngamsak (Food Technology Department, Khonkaen University, Thailand). If you have any questions we can be contacted at 350-5799 ext 7266 (Duljira) or 7585 (Dr Wilkinson) or D.Sukboonyasatit@massey.ac.nz

"This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor Sylvia Rumball, Assistant to the Vice-Chancellor (Ethics & Equity), telephone 06 350 5249, email humanethicspn@massey.ac.nz".

Thank you for taking time to read this information sheet and to complete the questionnaire.

B3. Survey Questionnaire

Information sheet and instructions
Questionnaire on the functional foods

Dear participants,

My name is Duljira Sukboonyasatit and I am a student at Massey University in the Institute of Food Nutrition and Human Health. I am conducting a research project for my PhD thesis. I aim to study the attitudes, beliefs, and purchasing intentions of people towards foods that have health benefits over and above their normal nutritional content that is functional food.

The questionnaire is anonymous and the information you provide will be held in confidence and seen only by the researchers and those involved with the computer data entry. The final research report will be based on summarised information and results will be published in academic and professional journals but no individual will be identified. It is assumed that filling out the questionnaire implies consent to participate.

The survey consists of 6 sections and it is vital that you fill in each section completely. The first section asks some questions about your views of food and health. The second section deals with aspects about health and disease. The third section seeks your thoughts on functional foods. The fourth section continues with the theme of functional foods, but is more market related. The fifth section asks you some further questions about functional foods and the last part asks you a number of personal questions.

We anticipate it should take about 25 to 30 minutes to complete the questionnaire. We appreciate that this is eating into your leisure time and so I am offering three $100 grocery vouchers as a form of compensation. The 3 lucky names of the people who have completed the questionnaire will be drawn and the winners will be notified by letter.

Most questions require you to tick a box or rate your answer by circling a number from 1 to 7. Please only circle one number per question. The following is an example of this type of question.

I am likely to purchase functional foods.

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

If you think it is strongly agree, you would circle 7 but if you only slightly agree, you would circle 3. If you strongly disagree with the statement, you would circle 1. If you are unsure about your answer, circle 4.

This research is being carried out under the supervision of Dr. Brian Wilkinson, Dr. Janet Weber (Institute of Food Nutrition and Human Health, Massey University), and Assoc Prof Tipvanna Ngamsak (Food Technology Department, Khonkaen University, Thailand). If you have any questions we can be contacted at 350-5799 ext 7266 (Duljira) or 7585 (Dr Wilkinson).

“This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University’s Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor Sylvia Rumball, Assistant to the Vice-Chancellor (Ethics & Equity), telephone 06 350 5249, email humanethicspn@massey.ac.nz".

Thank you for taking time to read this information sheet and to complete the questionnaire.

Section I Your views on food and health

Please circle one number which best represents your feelings about the following statements.

1.1 I believe that food and nutrition play a great role in maintaining or improving overall health
Strongly disagree **1 2 3 4 5 6 7** **Strongly agree**

1.2 I cannot obtain all the nutrients that I need from food alone
Strongly disagree **1 2 3 4 5 6 7** **Strongly agree**

1.3 I buy foods to treat or reduce the risk of a specific health condition
Strongly disagree **1 2 3 4 5 6 7** **Strongly agree**

1.4 I believe that certain foods reduce the risk of disease
Strongly disagree **1 2 3 4 5 6 7** **Strongly agree**

1.5 I consume at least one food because of the health benefits I believe it provides
Strongly disagree **1 2 3 4 5 6 7** **Strongly agree**

1.6 I look at the nutrition panel on a food pack to help decide whether to buy a product
Strongly disagree **1 2 3 4 5 6 7** **Strongly agree**

1.7 Please tick the box that most applies to you.

How often do you take dietary supplements such as vitamins, minerals, medicinal herbs etc.?
☐ Every day
☐ 2 to 3 times a week
☐ Once a week
☐ 2 to 3 times a month
☐ Once a month
☐ Not at all (go to question 1.9)

1.8 Approximately, how much do you spend on dietary supplements each week?
$………………

1.9 How often do you eat/drink functional foods (foods that provide health benefits such as yoghurt with bifidus culture, orange juice with added vitamin C, margarine with cholesterol lowering additives (Logical®, ProActiv®, Benical®), Cereal product with high fibre, milk with added calcium etc.)?
☐ Every day
☐ 2 to 3 times a week
☐ Once a week
☐ 2 to 3 times a month
☐ Once a month
☐ Not at all (go to Section II)

1.10 Approximately, how much do you spend on functional foods each week? $……………

Section II Your concerns about health and disease

Please circle one number which best represents your feelings about the following statements.

2.1 When you think about the following conditions, how severe a problem do you think it would be?

(1) Coronary heart disease

Extremely minor **1 2 3 4 5 6 7** **Extremely severe** ☐

(2) Arthritis

Extremely minor **1 2 3 4 5 6 7** **Extremely severe** ☐

2.2 I am worried about getting arthritis

Not worried **1 2 3 4 5 6 7** **Very worried** ☐

2.3 I will get arthritis sometime in my life

Unlikely **1 2 3 4 5 6 7** **Likely** ☐

2.4 My family history suggests that I will get arthritis

Definitely not **1 2 3 4 5 6 7** **Definitely** ☐

2.5 My physical health makes it less likely that I will get arthritis

Strongly disagree **1 2 3 4 5 6 7** **Strongly agree** ☐

2.6 If a doctor told me that I had arthritis, I would be;

Not concerned **1 2 3 4 5 6 7** **Very concerned** ☐

2.7 If I had arthritis, it would change my life

Definitely not **1 2 3 4 5 6 7** **Definitely** ☐

2.8 If I had arthritis, it would limit my daily activities

Strongly disagree **1 2 3 4 5 6 7** **Strongly agree** ☐

2.9 The problems I would experience from arthritis would last a long time

Strongly disagree **1 2 3 4 5 6 7** **Strongly agree** ☐

2.10 I am worried about getting coronary heart disease

Not at all worried **1 2 3 4 5 6 7** **Very worried** ☐

2.11 I will get coronary heart disease sometime in my life

Unlikely **1 2 3 4 5 6 7** **Likely** ☐

2.12 My family history suggests that I will get coronary heart disease

Unlikely **1 2 3 4 5 6 7** **Likely** ☐

2.13 My physical health makes it less likely that I will get coronary heart disease

Strongly disagree **1 2 3 4 5 6 7** **Strongly agree** ☐

2.14 If a doctor told me that I had coronary heart disease, I would be;
Not concerned 1 2 3 4 5 6 7 **Very concerned**

2.15 If I had coronary heart disease, it would change my life
Definitely not 1 2 3 4 5 6 7 **Definitely**

2.16 If I had coronary heart disease, it would limit my daily activities
Strongly disagree 1 2 3 4 5 6 7 **Strongly agree**

2.17 The problems I would experience from coronary heart disease would last a long time
Strongly disagree 1 2 3 4 5 6 7 **Strongly agree**

Section III Your attitudes towards functional foods.

The word "functional foods" in this questionnaire refers to any foods that provide health benefits over normal nutrition such as yoghurt with bifidus culture, orange juice with added vitamins/minerals, margarine with cholesterol lowering additives (Logical®, ProActiv®, Benical®), cereals with high fibre and Milk with added calcium.

Please circle one number which best represents your feelings about the statements.

3.1 Eating/drinking functional foods would help prevent chronic disease
Unlikely 1 2 3 4 5 6 7 **Likely**

3.2 Eating/drinking functional foods would help me to be healthy
Unlikely 1 2 3 4 5 6 7 **Likely**

3.3 Eating/drinking functional foods would stop me from getting ill
Unlikely 1 2 3 4 5 6 7 **Likely**

3.4 I do not worry about eating a balanced diet, if I eat/drink functional foods
Unlikely 1 2 3 4 5 6 7 **Likely**

3.5 I get pleasure from eating/drinking functional foods
Unlikely 1 2 3 4 5 6 7 **Likely**

3.6 Functional foods make it easier for me to follow a healthy lifestyle
Unlikely 1 2 3 4 5 6 7 **Likely**

3.7 I don't need to take dietary supplements if I eat/drink functional foods
Unlikely 1 2 3 4 5 6 7 **Likely**

3.8 I can reduce taking medication if I eat/drink functional foods
Unlikely 1 2 3 4 5 6 7 **Likely**

3.9 Eating/drinking functional foods would cause unpleasant side-effects
Unlikely 1 2 3 4 5 6 7 **Likely**

3.10 Functional foods cost more than other foods

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

3.11 I am unsure of the dosage of active ingredients in functional foods

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

3.12 It is difficult to see the benefits of functional foods

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

3.13 I trust the health claims made by food manufacturers about functional foods

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

3.14 Functional foods do not taste good

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

3.15 I do not have enough knowledge about functional foods

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Section IV Views of others about eating/drinking functional foods

Please tick the box that most applies to you.

4.1 I know someone who is eating/drinking functional foods for their health benefits

☐ Yes ☐ No

4.2 I have talked about the health benefits of functional foods with someone who is eating/drinking them

☐ Yes ☐ No

4.3 I have talked to a health professional about functional foods

☐ Yes ☐ No

4.4 Which sources of information would convince you to buy functional foods? Please rank the following sources 1-6 in order of importance (where 1 is the most important). Use each number only ONCE.

…………. Documentary

…………. Advertisement

…………. Interview with scientist

…………. Seminar/conference

…………. Food manufacturer

…………. Pharmacy

Please circle one number which best represents your feelings about the statements.

4.5 My family thinks I should eat/drink functional foods
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

4.6 Generally, I want to do what my family thinks I should do
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

4.7 My friends or colleagues think I should eat/drink functional foods
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

4.8 Generally, I want to do what my friends/colleagues think I should do
Unlikely 1 2 3 4 5 6 7 Likely

4.9 My doctor thinks that I should eat/drink functional foods
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

4.10 Generally, I want to do what my doctor thinks I should do
Unlikely 1 2 3 4 5 6 7 Likely

Section V Factors that may help you in eating/drinking functional foods

Please circle one number which best represents your feelings about the statements.

5.1 If I wanted to, I could easily eat/drink functional foods
Unlikely 1 2 3 4 5 6 7 Likely

5.2 Eating/drinking functional foods does me no harm
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

5.3 Eating/drinking functional foods makes some people dependent
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

5.4 Eating/drinking functional foods make me feel in control of my health
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

5.5 I can afford to try new food products such as functional foods
Unlikely 1 2 3 4 5 6 7 Likely

5.6 I feel confident to buy functional foods
Unlikely 1 2 3 4 5 6 7 Likely

5.7 I know where to buy functional foods
Strongly disagree 1 2 3 4 5 6 7 Strongly agree

5.8 I intend to eat/drink functional foods in the next few months
Definitely not 1 2 3 4 5 6 7 Definitely

5.9 I aim to eat/drink functional foods for my healthy lifestyle

Definitely not **1 2 3 4 5 6 7** **Definitely**

5.10 I want to eat/drink functional foods

Definitely not **1 2 3 4 5 6 7** **Definitely**

5.11 Overall, I think that eating/drinking functional foods would be

Worthless	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Valuable**
Harmful	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Beneficial**
Unenjoyable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Enjoyable**
Negative	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Positive**
Bad	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Good**
Unnatural	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Natural**
Difficult	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Convenient**

5.12 I am likely to eat/drink functional foods to prevent me from getting coronary heart disease

Unlikely **1 2 3 4 5 6 7** **Likely**

5.13 If a new food product was developed that included compounds that have been scientifically proven to treat the symptoms of coronary heart disease, I would purchase such a product

Definitely not **1 2 3 4 5 6 7** **Definitely**

5.14 If a new food product was developed that included compounds that have been scientifically proven to help prevent coronary heart disease, I would purchase such a product

Definitely not **1 2 3 4 5 6 7** **Definitely**

5.15 If a new food product was developed that included compounds that have been scientifically proven to treat the symptoms of some types of arthritis, I would purchase such a product

Definitely not **1 2 3 4 5 6 7** **Definitely**

5.16 If a new food product was developed that included compounds that have been scientifically proven to prevent the symptoms of some types of arthritis, I would purchase such a product

Definitely not **1 2 3 4 5 6 7** **Definitely**

5.17 Glucosamine has scientifically been proven to relieve the symptoms of some types of arthritis, if it is added into the foods, I would purchase such a product

Definitely not **1 2 3 4 5 6 7** **Definitely**

5.18 If one or more anti-arthritis compounds that had been scientifically proven to treat the symptoms of some types of arthritis were added to a food, what sort of food would be most appropriate for such a product? (Please choose only one)

- ☐ **A drink**
- ☐ **Breakfast cereal**
- ☐ **Bread**
- ☐ **Dairy product**
- ☐ **Pasta**
- ☐ **Spread**
- ☐ **Snack bar**
- ☐ **I would prefer to take it in a pill form**
- ☐ **Other (please specify) ……………………………………………………**

Section VI Demographic information

Please tick the box that most applies to you.

6.1 What is your gender?

☐ Female ☐ Male

6.2 Which one of the categories best describes your age?

☐	☐	☐	☐	☐	☐	☐
21-30	31-40	41-50	51-60	61-70	71-80	>80

6.3 Which of the following ethnic groups do you belong to?

- ☐ New Zealand European
- ☐ New Zealand Maori
- ☐ Other European
- ☐ Pacific Islander
- ☐ Asian
- ☐ Other (please specify)..………

6.4 What is your highest educational qualification?

- ☐ Up to High School qualification
- ☐ Diploma/New Zealand certificate
- ☐ Bachelor degree
- ☐ Postgraduate or higher

6.5 Which one of the following best describes your occupation?

- ☐ Education/researcher
- ☐ Manager/ Tradesperson
- ☐ Farmer
- ☐ Office and administrator
- ☐ Unemployed / Student / Retired
- ☐ Other (please specify)………………

6.6 What is your marital status?

- ☐ Single
- ☐ Married / living with partner
- ☐ Separated, divorced or widowed

6.7 Do you have children under age 16 living in your household?

- ☐ Yes
- ☐ No

6.8 What category does your household's gross annual income fall into?

- ☐ Less than $20,000
- ☐ $20,001 - $40,000
- ☐ $40,001 - $60,000
- ☐ $60,001 - $100,000
- ☐ Over $100,000

6.9 In my household;

- ☐ I am the primary food purchaser
- ☐ I often purchase food
- ☐ I seldom purchase food for the household

6.10 Are you currently purchasing any foods/beverages primarily as a substitute for taking medicine?

☐ Yes ☐ No

6.11 When you purchase foods at the supermarket how important are the following factors in determining what you will buy. Please rank the following factors 1-7 in order of importance (where 1 is the most important). Use each number only ONCE.

………………… Brand

………………… Cost

………………… Nutritional or health benefits

………………… Enjoyment of consuming

………………… Advertising

………………… Availability in the market

………………… Convenience to buy

6.12 Do you smoke cigarettes?

- ☐ Yes, daily
- ☐ Yes, occasionally
- ☐ Not at all

6.13 How often are you involved in physical activity for at least 30 minutes?

- ☐ Every day
- ☐ 2-3 times a week
- ☐ Once a week
- ☐ 1-3 times a month
- ☐ Less than once a month
- ☐ Not at all

Appendix C

C1. Correlation matrix of constructs

Table 0.1: Correlation matrix of constructs of functional food consumption behavioural of non-arthritis group (Chapter 8)

	B	ATT2	ATT3	ATT4	ATT5	ATT6	SN1	SN2	SN3	PBC1	PBC2	PBC3
B	1.000											
ATT2	.591	1.000										
ATT3	.578	.864	1.000									
ATT4	.562	.869	.890	1.000								
ATT5	.257	.442	.487	.498	1.000							
ATT6	.309	.562	.547	.614	.531	1.000						
SN1	.332	.538	.584	.643	.731	.660	1.000					
SN2	.338	.487	.520	.589	.764	.627	.882	1.000				
SN3	.361	.481	.555	.587	.537	.555	.713	.665	1.000			
PBC1	.296	.383	.385	.405	.222	.254	.305	.266	.248	1.000		
PBC2	.205	.286	.295	.305	.175	.250	.257	.243	.166	.482	1.000	
PBC3	.302	.425	.445	.474	.224	.307	.302	.278	.255	.574	.549	1.000
BIFF1	.226	.469	.362	.425	.300	.437	.407	.354	.275	.228	.179	.191
BIFF2	.155	.303	.275	.210	.196	.212	.186	.119	.194	.046	-.008	.013
BIFF3	.309	.577	.567	.566	.392	.415	.436	.358	.385	.267	.207	.332

Table C.1 (Continue)

	BIFF1	BIFF2	BIFF3
BIFF1	1.000		
BIFF2	.365	1.000	
BIFF3	.444	.488	1.000

Table 0.2: Correlation matrix of constructs of functional food consumption behavioural of arthritis group (Chapter 8)

	CB	ATT2	ATT3	ATT4	ATT5	ATT6	SN1	SN2	SN3	PBC1	PBC2	PBC3
CB	1.000											
ATT2	.510	1.000										
ATT3	.562	.839	1.000									
ATT4	.527	.816	.895	1.000								
ATT5	.223	.374	.456	.450	1.000							
ATT6	.315	.437	.477	.493	.617	1.000						
SN1	.318	.509	.594	.580	.686	.690	1.000					
SN2	.292	.422	.502	.505	.782	.652	.832	1.000				
SN3	.276	.442	.556	.583	.556	.642	.679	.685	1.000			
PBC1	.312	.450	.520	.452	.276	.313	.320	.284	.352	1.000		
PBC2	.183	.348	.350	.336	.278	.171	.213	.298	.297	.653	1.000	
PBC3	.220	.398	.403	.414	.252	.295	.327	.365	.312	.600	.602	1.000
BIFF1	.193	.446	.465	.479	.269	.303	.409	.354	.357	.182	.154	.223
BIFF2	.337	.642	.717	.674	.456	.481	.583	.479	.448	.337	.157	.270
BIFF3	.242	.510	.475	.488	.252	.303	.398	.367	.360	.204	.147	.234

Table C.2 (Continue)

	BIFF1	BIFF2	BIFF3
BIFF1	1.000		
BIFF2	.536	1.000	
BIFF3	.484	.600	1.000

Table 0.3: Correlation matrix of constructs of intention to consume specific arthritic functional foods

	Att1	Att2	Att3	Att4	Att5	Att6	Att7	S1	S2	S3
Att1	1.000									
Att2	.566	1.000								
Att3	.540	.560	1.000							
Att4	.649	.716	.671	1.000						
Att5	.608	.768	.639	.866	1.000					
Att6	.570	.543	.589	.703	.675	1.000				
Att7	.508	.466	.663	.558	.540	.531	1.000			
SN1	.418	.242	.282	.313	.279	.290	.279	1.000		
SN2	.372	.212	.234	.248	.268	.217	.240	.541	1.000	
SN3	.459	.235	.312	.315	.313	.284	.274	.587	.570	1.000
P1	.403	.291	.396	.410	.358	.305	.384	.217	.176	.205
P2	.181	.146	.152	.168	.071	.121	.248	.066	-.007	.035
P3	.545	.415	.436	.486	.396	.405	.431	.291	.192	.311
P4	.347	.257	.327	.327	.270	.255	.310	.182	.127	.236
SUA1	.182	.104	.160	.134	.164	.100	.130	.216	.156	.189
SUA2	.145	.051	.145	.071	.101	.110	.099	.156	.170	.166
SUA3	.142	.075	.149	.094	.139	.089	.120	.207	.220	.200
SEA1	.156	.136	.070	.118	.166	.008	.089	.043	-.009	.048
SEA2	.078	.032	.030	.027	.033	-.067	.052	.078	.004	.018
SEA3	.034	.002	-.031	-.017	.005	-.078	.007	.066	.052	.014
SEA4	.142	.116	.072	.060	.095	.031	.119	.041	.158	.100
BEN1	.635	.340	.379	.409	.388	.362	.359	.358	.328	.414
BEN2	.692	.426	.445	.511	.487	.440	.384	.395	.306	.424
BEN3	.467	.273	.292	.302	.282	.365	.206	.300	.262	.311
BEN4	.223	.036	.075	.056	.086	.184	.131	.286	.224	.293
BEN5	.521	.309	.548	.400	.359	.430	.409	.409	.274	.398
BEN6	.673	.389	.494	.480	.445	.446	.422	.424	.380	.448
BEN7	.173	.079	.113	.118	.100	.059	.159	.208	.211	.177
BEN8	.295	.071	.134	.158	.130	.185	.137	.233	.204	.268
BAR1	-.162	-.143	-.111	-.094	-.091	-.178	-.126	-.055	-.021	-.034
BAR2	-.418	-.272	-.289	-.336	-.285	-.337	-.203	-.196	-.147	-.240
BAR3	-.197	-.198	-.191	-.125	-.176	-.206	-.181	-.005	.012	-.030
INT1	.333	.167	.268	.233	.248	.277	.300	.210	.171	.232
INT2	.377	.261	.342	.316	.315	.261	.292	.172	.163	.224
INT3	.371	.227	.273	.264	.283	.313	.319	.253	.221	.256

Table C.3 (continued)

	P1	P2	P3	P4	SU1	SU2	SU3	SE1	SE2	SE3	SE4
P1	1.000										
P2	.321	1.000									
P3	.474	.490	1.000								
P4	.404	.361	.584	1.000							
SUA1	.038	-.027	.017	.070	1.000						
SUA2	.042	-.089	.019	.078	.634	1.000					
SUA3	.091	-.118	.039	.042	.495	.703	1.000				
SEA1	.179	.046	.036	.050	.382	.179	.168	1.000			
SEA2	.097	.034	.002	.079	.241	.178	.099	.513	1.000		
SEA3	.041	.048	-.048	.040	.198	.120	.110	.355	.542	1.000	
SEA4	.108	.023	.085	.087	.259	.374	.276	.328	.394	.461	1.000
BEN1	.327	.176	.410	.277	.222	.176	.187	.176	.108	.066	.129
BEN2	.292	.111	.448	.267	.193	.136	.141	.131	.071	.032	.098
BEN3	.144	.085	.257	.105	.098	-.027	.068	.102	.067	.009	-.031
BEN4	.009	.011	.059	-.018	.111	.033	.065	.016	-.037	.023	.050
BEN5	.317	.155	.447	.279	.131	.091	.105	.005	.015	-.030	-.016
BEN6	.352	.132	.455	.309	.159	.080	.137	.071	.029	-.016	.043
BEN7	.084	-.025	.111	.108	-.019	-.008	.051	.012	.071	.053	.031
BEN8	.100	.003	.123	.094	.096	-.047	.043	.043	-.042	.041	-.078
BAR1	-.042	-.065	-.230	-.116	.033	-.006	.027	.161	.069	.124	.152
BAR2	-.210	-.077	-.328	-.251	-.040	-.067	-.068	.028	.029	.065	.043
BAR3	-.194	-.114	-.298	-.284	.032	.035	.003	.013	.160	.093	.076
INT1	.116	.102	.197	.122	.380	.332	.289	.201	.088	.062	.184
INT2	.250	.157	.254	.208	.328	.273	.247	.288	.211	.128	.268
INT3	.143	.100	.232	.131	.343	.292	.301	.202	.105	.075	.190

Table C.3 (continued)

	BEN1	BEN2	BEN3	BEN4	BEN5	BEN6	BEN7	BEN8	BAR2	BAR3	BAR4
BEN1	1.000										
BEN2	.740	1.000									
BEN3	.570	.587	1.000								
BEN4	.227	.232	.303	1.000							
BEN5	.493	.556	.449	.222	1.000						
BEN6	.579	.644	.501	.306	.688	1.000					
BEN7	.191	.224	.168	.236	.205	.228	1.000				
BEN8	.303	.276	.356	.309	.276	.347	.267	1.000			
BAR2	-.088	-.080	-.080	-.023	-.150	-.109	.067	-.008	1.000		
BAR3	-.310	-.377	-.264	-.022	-.340	-.393	-.011	-.135	.345	1.000	
BAR4	-.144	-.199	-.063	.019	-.192	-.239	.071	.067	.323	.194	1.000
INT1	.304	.306	.187	.236	.270	.333	.042	.130	.001	-.077	-.029
INT2	.297	.300	.146	.147	.273	.345	.126	.121	.013	-.122	.007
INT3	.315	.335	.190	.154	.269	.361	.033	.159	-.056	-.129	-.057

Table C.3 (continued)

	INT1	INT2	INT3
INT1	1.000		
INT2	.667	1.000	
INT3	.726	.628	1.000

Table 0.4: Correlation matrix of constructs of intention to consume specific for coronary heart disease functional foods

	Att1	Att2	Att3	Att4	Att5	Att6	Att7	S1	S2	S3
Att1	1.000									
Att2	.566	1.000								
Att3	.540	.560	1.000							
Att4	.649	.716	.671	1.000						
Att5	.608	.768	.639	.866	1.000					
Att6	.570	.543	.589	.703	.675	1.000				
Att7	.508	.466	.663	.558	.540	.531	1.000			
SN1	.418	.242	.282	.313	.279	.290	.279	1.000		
SN2	.372	.212	.234	.248	.268	.217	.240	.541	1.000	
SN3	.459	.235	.312	.315	.313	.284	.274	.587	.570	1.000
P1	.403	.291	.396	.410	.358	.305	.384	.217	.176	.205
P2	.181	.146	.152	.168	.071	.121	.248	.066	-.007	.035
P3	.545	.415	.436	.486	.396	.405	.431	.291	.192	.311
P4	.347	.257	.327	.327	.270	.255	.310	.182	.127	.236
SUC1	.123	.055	.031	.069	.096	.025	.086	.171	.165	.174
SUC2	.074	.035	.023	.034	.051	-.002	.047	.102	.160	.162
SUC3	.071	.012	.011	.020	.024	-.006	.056	.093	.069	.136
SEC1	.094	.084	.077	.105	.159	-.015	.149	.050	.047	.071
SEC2	.088	.036	.082	.098	.114	.023	.136	.054	-.004	.044
SEC3	.048	.015	.080	.070	.088	.016	.139	.060	.086	.086
SEC4	.068	.067	.078	.049	.091	-.018	.145	.041	.102	.109
BEN1	.635	.340	.379	.409	.388	.362	.359	.358	.328	.414
BEN2	.692	.426	.445	.511	.487	.440	.384	.395	.306	.424
BEN3	.467	.273	.292	.302	.282	.365	.206	.300	.262	.311
BEN4	.223	.036	.075	.056	.086	.184	.131	.286	.224	.293
BEN5	.521	.309	.548	.400	.359	.430	.409	.409	.274	.398
BEN6	.673	.389	.494	.480	.445	.446	.422	.424	.380	.448
BEN7	.173	.079	.113	.118	.100	.059	.159	.208	.211	.177
BEN8	.295	.071	.134	.158	.130	.185	.137	.233	.204	.268
BAR1	-.162	-.143	-.111	-.094	-.091	-.178	-.126	-.055	-.021	-.034
BAR2	-.418	-.272	-.289	-.336	-.285	-.337	-.203	-.196	-.147	-.240
BAR3	-.197	-.198	-.191	-.125	-.176	-.206	-.181	-.005	.012	-.030
INT1	.360	.178	.248	.290	.303	.354	.293	.199	.203	.294
INT2	.372	.227	.264	.325	.330	.283	.267	.154	.169	.252
INT3	.438	.312	.349	.411	.368	.325	.367	.256	.226	.316

Table C.4 (continued)

	P1	P2	P3	P4	SU1	SU2	SU3	SE1	SE2	SE3	SE4
P1	1.000										
P2	.321	1.000									
P3	.474	.490	1.000								
P4	.404	.361	.584	1.000							
SUA1	.065	.012	.055	.055	1.000						
SUA2	.007	-.006	.035	.013	.711	1.000					
SUA3	.040	.040	.061	.028	.529	.709	1.000				
SEA1	.193	.107	.061	.138	.255	.120	.121	1.000			
SEA2	.117	.039	.017	.115	.181	.056	.081	.552	1.000		
SEA3	.144	.041	.005	.071	.200	.155	.124	.398	.499	1.000	
SEA4	.126	.049	.048	.065	.297	.260	.203	.368	.413	.602	1.000
BEN1	.327	.176	.410	.277	.113	.080	.050	.123	.147	.158	.165
BEN2	.292	.111	.448	.267	.119	.102	.067	.134	.114	.100	.086
BEN3	.144	.085	.257	.105	.067	.020	.000	.006	.094	.080	.016
BEN4	.009	.011	.059	-.018	.153	.057	.032	-.041	.003	.084	.018
BEN5	.317	.155	.447	.279	.037	.024	.027	.032	.032	.075	.020
BEN6	.352	.132	.455	.309	.127	.082	.070	.049	.089	.087	.014
BEN7	.084	-.025	.111	.108	.087	.058	.023	.039	.048	.026	.013
BEN8	.100	.003	.123	.094	.144	.038	.019	-.001	.022	.073	.002
BAR1	-.042	-.065	-.230	-.116	.138	.033	-.002	.166	.129	.127	.133
BAR2	-.210	-.077	-.328	-.251	.037	.014	-.072	.060	.023	.082	.131
BAR3	-.194	-.114	-.298	-.284	.080	.004	-.021	.019	.118	.018	.087
INT1	.174	.125	.242	.151	.355	.288	.273	.160	.135	.165	.134
INT2	.263	.206	.289	.226	.355	.235	.219	.348	.225	.181	.194
INT3	.351	.211	.394	.248	.257	.145	.153	.260	.219	.209	.176

Table C.4 (continued)

	BEN1	BEN2	BEN3	BEN4	BEN5	BEN6	BEN7	BEN8	BA1	BA2	BA3
BEN1	1.000										
BEN2	.740	1.000									
BEN3	.570	.587	1.000								
BEN4	.227	.232	.303	1.000							
BEN5	.493	.556	.449	.222	1.000						
BEN6	.579	.644	.501	.306	.688	1.000					
BEN7	.191	.224	.168	.236	.205	.228	1.000				
BEN8	.303	.276	.356	.309	.276	.347	.267	1.000			
BAR1	-.088	-.080	-.080	-.023	-.150	-.109	.067	-.008	1.000		
BAR2	-.310	-.377	-.264	-.022	-.340	-.393	-.011	-.135	.345	1.000	
BAR3	-.144	-.199	-.063	.019	-.192	-.239	.071	.067	.323	.194	1.000
INT1	.292	.307	.205	.253	.216	.319	.032	.168	-.014	-.138	-.002
INT2	.257	.298	.127	.108	.218	.323	.072	.137	-.011	-.081	-.003
INT3	.359	.411	.237	.183	.329	.427	.110	.163	-.009	-.230	.028

Table C.4 (continued)

	INT1	INT2	INT3
INT1	1.000		
INT2	.701	1.000	
INT3	.514	.600	1.000