UNIVERSITY OF SOUTHERN QUEENSLAND AUSTRALIA

FACTORS INFLUENCING THE LIKELIHOOD OF DIETARY COMPLIANCE AMONGST PEOPLE WITH DIABETES

A thesis submitted by

Elizabeth Andrews

For the award of

Doctor of Philosophy

2017

ABSTRACT

Diabetes is one of the greatest health pandemics to impact the global health system and despite concerted efforts by governments to manage and control it there is little respite from its rapid progression. At this point there is no known cure for diabetes, however many of its negative health impacts can be controlled or prevented through formal therapy, dietary modification and exercise. Of these, dietary modification is considered an important first step for positive diabetes management and therapy outcomes.

Unfortunately, despite this knowledge and support provided by the health system to better manage dietary lifestyles, many people with diabetes are unable to carry out dietary modification regimens. Factors such as individual cognition; environmental factors; and biological factors (Nam et al. 2011; Schiøtz 2012) have been found to influence dietary behaviour among people with diabetes. Of these, cognitive factors are considered to be the major driving force influencing health behaviours (Bandura 1986; Frewer et al. 1996). The present study through literature review has found cognitively driven factors such as self-efficacy, food risk perception, food related lifestyles and usage of social support groups as key drivers found to influence the likelihood of dietary compliance amongst people with diabetes. However, up to date there are still inconclusive results from studies testing these factors (Nam et al. 2011; Schiøtz 2012), therefore the present study has attempted to close these research gaps by empirically testing these constructs in the present model.

The analysis in this study was conducted in three Phases: I, II and III i.e. Analysis I, II and III, to which 3 models were tested and presented as Alternative Model 1, 2 and 3 respectively. The results for all three phases reveal that self-efficacy is a key factor to influence both social support usage and dietary compliance. Phases I and II revealed no significant mediation relationship between the usage of social support and the cognitive constructs in the model and dietary compliance which contradicts literature (Antonovsky 1974; Thoits 1985). Phase III was conducted to re-examine the Social Support Groups Usage construct and to test its role as a key driver in the model. Phase III showed a strong relationship between social support usage and the constructs of self-efficacy, food risk perception and food related lifestyles. Mixed outcomes were also found in some causal relationships in all three models from this study which supports literature (Bandura 1986; Frewer et al. 1996; Grunert, Brunsø &

Bisp 1993), in that cognitive factors are multi-dimensional, situational and guided by a range of factors.

Using a social marketing framework, the findings of this study are translated into likely useful recommendations for the health system and relevant diabetes support groups in Australia. A constant challenge for those working within the social marketing domain is understanding the motivations that drive food choice behaviour, this understanding is essential for the creation of effective message strategies to generate dietary behaviour modification (Luca & Suggs 2013). Therefore, by understanding the factors that influence dietary compliance amongst people with diabetes, this study will not only have impact for those working in the health care sector but it will also extend current literature in social marketing in support of health care marketing.

Keywords

Self-efficacy, social support, dietary compliance, dietary modification, social marketing

CERTIFICATION OF THESIS

This thesis is entirely the work of Elizabeth Andrews except where otherwise acknowledged. The work is original and has not previously been submitted for any other award, except where acknowledged.

Student and supervisors signatures of endorsement are held at USQ.

Associate Professor Jane Summers

Principal Supervisor

Dr. Frances Woodside

Associate Supervisor

Dr. Derek Ong Lai Teik

Associate Supervisor

ACKNOWLEDGEMENTS

I firstly thank Almighty God for His abundant blessings, protection and constant presence during the course of my work and all the days of my life.

I would like to thank my supervisors Associate Professor Dr. Jane Summers, Dr. Frances Woodside and Dr. Derek Ong Lai Teik for their dedication, support and valuable advice given to me throughout my research journey and for which I am forever greatful. I would like to thank Diabetes Australia and AH Diabetes Toowoomba for their kind assistance in working with me on this research and all the participants of the survey.

I would like to dedicate this thesis to my beloved parents Mr. P.G. Andrews (Late) & Mrs. Mary Andrews who have been my pillars of strength, love and constant inspiration in my life. To my mother, my best friend, thankyou for being my counsellor, the voice of reason and great motivator in my life and throughout this journey. To my brother, Paul Linus Andrews, thank you for being a calm and dependeable shoulder to lean on, and your constant care and support throughout my work. Thank you to my dear sis-in law Mary (Susan) George for your prayers, motivtion and encouragement. Special thanks to the George family (Uncle, Auntie and Alice) for your constant prayers, care and concern during the course of my work.

To my dearest best friends Nazman (Sunil/Sean) Kler and Derek Ong, thank you both for your enthusiasm, positivity and encouragement through out my research journey. Nazman you have always been my dependable, strong and caring friend. Derek thank you for your invaluable guidance, advice and for encouraging me to do my best. Cheers, for many more years of friendship. I would also like to thank everyone who has in some way helped me through my research journey. Special thanks to Faezeh for your kind assistance and support.

I would like to thank the Australian Commonwealth Government contribution through the Research Training Program (RTP) Fees Offset scheme during my research. Thank you to the University of Southern Queensland, School of Management and Enterprise, faculty of BELA for your academic, technical and administrative support through out my research.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF DIAGRAMS

List of Equations

LIST OF PUBLICATIONS

Journal Article

Ong, LT & Andrews, E 2011, ‘A Study of Service Expectations and Perceptions of Customers in the Fitness Industry in Malaysia: Bundling and Enhancing Marketing Intelligence’, *Journal of Management and World Business Research*, vol.8, no. 1, pp 26-38.

Conference Attended:

ANZMAC Conference 2014, Griffith University (Doctoral and Competitive Papers)
November 29th to December 3rd 2014 (Track 15: Food marketing)

Paper title**:** Factors impacting food decision making amongst consumers with special dietary needs in the purchase of processed packaged foods in supermarkets.

Paper submission, pending acceptance

ANZMAC Conference 2017: 4th – 6th December 2017
RMIT Melbourne
(Track 13: Social Marketing)
Paper Title: Factors Influencing Dietary Compliance amongst Australian Diabetics.

Other related activity

Radio interview with Belinda Sanders on the morning show at Australian Broadcasting Corporation (ABC) Southern Queensland, Toowoomba on April 26th 2017.
Key Theme: Discussed the impact of diabetes burdens and costs to Australia, the importance of diet and exercise to minimise health risks as well as how this study could contribute towards policy and practice to better manage and control diabetes burdens. MP3 Link is provided: (double click to listen in)

DIABETES - ELIZABETH ANDREWS.MP3

LIST OF ABBREVIATIONS

ANCOVA	Analysis of Covariance
AVE	Average Variance Extracted
BSE	Bovine Spongiform Encephalopathy
CBSEM	Covariance Based Structural Equation Modeling
CMV	Common Method Variance
CR	Composite Reliability
DSM	Diabetes Self-Management
DSMQ	Diabetes Self-Management Questionnaire
DV	Dependent Variable
EBPQ	The Eating Behaviour Patterns Questionnaire Scale
EFA	Exploratory Factor Analysis
FRL	Food Related Lifestyles
GFI	Goodness of Fit Index
GMO	Genetically Modified Organism
GOF	Goodness of Fit
IV	Independent Variable
JRDF	Juvenile Diabetes Research Foundation
KMO	Kaiser-Meyear-Olkin Measure of Sampling Adequacy
LISREL	Linear Structural Equations
MOS	Medical Outcomes Study
NDSS	National Diabetes Service Scheme
PFRI	Perceived Food Risk Scale
R2	Squared Multiple Correlations
R2	excl R-Square Excluded
R2	incl R-Square Included
SEM	Structural Equation Modeling
SBMI	Strategic Business Management & Improvement (USQ)
SmartPLS	Smart Partial Least Squares
SPSS	Statistical Packages for Social Sciences
SRMR	Standardised Root Mean Square Residual
T2D	Type 2 Diabetes
USQ	University of Southern Queensland
WHO	World Health Organization

CHAPTER 1: INTRODUCTION

1.1 Background

Managing the socio-economic burdens associated with the exponential global growth of diabetes diagnosis, poses one of the greatest challenges to the modern health systems. Global estimates for diabetes are around 422 million people and rising (World Health Organisation 2016). Currently approximately 1.7 million Australians are living with diabetes and by 2025 these projections are expected to increase to around 2.9 million people (Diabetes Australia 2016: Lee et al. 2013).

Whilst there is no known cure for diabetes, many of the negative health impacts can be successfully minimised through formal therapy, dietary modification and exercise (Basu et al. 2012; Holt & Kumar 2015). In particular, dietary modification is considered an important first step and crucial for positive diabetes management and therapy outcomes (Diabetes Australia 2016). Despite this knowledge and extensive support and education provided by the health system, medical experts report that many people with diabetes are unable or unwilling to practice recommended dietary modification (World Health Organisation 2016; Diabetes Australia 2016).

Even though there have been attempts to understand the issues underlying food choice behaviour by people with diabetes, there are still many questions which remain unknown. Three main factors have been found to influence dietary compliance in people with diabetes: individual cognition; environmental factors; and biological factors (Nam et al. 2011; Schiøtz 2012). Of these, cognitive factors are considered to be the major driving force influencing health behaviours (Bandura 1986; Frewer et al. 1996). In spite of this, empirical testing of the pattern of relationships between these factors has not been consistently examined and results remain inconclusive in terms of prediction. This contradiction in the literature about the importance of and the role played by individual cognition food related behaviour provides the rationale for further exploration in this study (Nam et al. 2011; Schiøtz 2012). In addition, no known previous studies have empirically tested a predictive model of the likelihood of dietary compliance for those with diabetes that includes the main cognitive factors proposed by literature (Antonovsky 1974; Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993).

Understanding the motivations that drive food choice behaviour is essential for the creation of effective message strategies to generate behavioural change and is a constant challenge for those working within the social marketing domain (Carins & Rundle-Thiele 2014; Dietrich et al. 2015; Luca & Suggs 2013). Therefore, by understanding the factors that influence dietary compliance amongst people with diabetes, this study will not only have an impact on those working in the health care sector but it will also extend current literature in social marketing in support of health care management.

Source: Developed for this study

Figure 1.1. Chapter Content

1.2 Research Questions and Objectives

The main question of this research (RQ) is:

RQ. *What are the factors that influence the likelihood of dietary compliance amongst people with diabetes?*

This research question is developed from the extant literature (Antonovsky 1974; Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993) which proposes that individual cognition plays an important role in the dietary choice of people with diabetes. In spite of this general agreement, gaps in our knowledge still exist in relation to exactly how individual cognition impacts dietary choice behaviour (Basu et al. 2013; Hinder & Greenhalgh 2012; Lamichhane et al. 2012; Nam et al. 2011). In this study the construct of individual cognition is comprised of the factors: self-efficacy, food risk perception, food related lifestyle and social support groups and to which this understanding is still not clearly known, this study will aim to close research gaps and extend the knowledge in this enquiry. Therefore, the following research objectives (RO) and Research Questions (RQ) i.e. Table: 1.1., are proposed.

Table 1.1: Research Objectives and Research Questions.

No.	Research Objectives (RO)	Research Questions (RQ)
1.	To examine if Self-Efficacy influences the Likelihood of Dietary Compliance amongst people with diabetes.	Does Self-Efficacy influence the Likelihood of Dietary Compliance amongst people with diabetes?
2.	To examine if Food Risk Perception influences the Likelihood of Dietary Compliance amongst people with diabetes.	Does Food Risk Perception influence the Likelihood of Dietary Compliance amongst people with diabetes?
3.	To examine if Food Related Lifestyles influences the Likelihood of Dietary Compliance amongst people with diabetes.	Does Food Related Lifestyles influence the Likelihood of Dietary Compliance amongst people with diabetes?
4.	To examine if Social Support Groups Usage influences the Likelihood of Dietary Compliance amongst people with diabetes.	Does Social Support Groups Usage influence the Likelihood of Dietary Compliance amongst people with diabetes?
5.	To examine if Self-Efficacy influences Social Support Groups Usage amongst people with diabetes.	Does Self-Efficacy influence Social Support Groups Usage amongst people with diabetes?
6.	To examine if Food Risk Perception influences Social Support Groups Usage amongst people with diabetes.	Does Food Risk Perception influence Social Support Groups Usage amongst people with diabetes?
7.	To examine if Social Support Groups Usage mediates the relationship between Food Risk Perception and the Likelihood of Dietary Compliance amongst people with diabetes.	Does Social Support Groups Usage mediate the relationship between Food Risk Perception and the Likelihood of Dietary Compliance amongst people with diabetes?
8.	To examine if Social Support Groups Usage mediates the relationship between Self-Efficacy and the Likelihood of Dietary Compliance amongst people with diabetes.	Does Social Support Groups Usage mediate the relationship between Self-Efficacy and the Likelihood of Dietary Compliance amongst people with diabetes?

Source: Developed for this study

1.3 Justification for the Research

There are three main grounds on which this research is justified. Firstly, from a theoretical perspectives this research will provide empirical evidence to address the contradiction in the extant literature (Cha et al. 2014; Nam et al. 2011; Schiøtz 2012) in relation to the pattern of relationships between factors known to be relevant in influencing dietary choice for people with diabetes. Secondly, from a health management and education perspective, the results of this research will provide important information about the factors that both support and hinder the likelihood of dietary compliance behaviour for people with diabetes. This information can then be used to develop practical solutions for education design and communication approaches that will have a positive impact on diabetes health risks. Finally, from a societal standpoint, results of this study will allow those who support people with diabetes (professionals and family or friends) to have richer understanding of the issues that contribute to both good and poor dietary choices and thus to be more impactful in how they support and influence people with diabetes (Miller et al. 2014; Muchiri, Gericke, & Rheeder 2016; Strom & Egede 2012). These contributions will now be discussed in turn.

1.3.1 Theoretical Contribution

This study will make four contributions to theory namely in the area of self-efficacy, risk perception, food lifestyles and social support.

Literature has shown that individual cognition is an important component in understanding general health management behaviour (Antonovsky 1974; Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993). However, it is not yet known what role individual cognition plays in relation to the health behaviour of people with diabetes. Whilst there is some evidence (Gao et al. 2013; Kirwan et al. 2013; Song et al. 2014) of a relationship between self-efficacy and eating behaviour, the direction and strength of this relationship is contested. Similarly, researchers (Keller et al. 2012; Shreck et al. 2014; Tse et al. 2012) have reported mixed outcomes in the relationship between risk perception and food choice amongst people with diabetes. This study will therefore examine if these aspects of cognition impacts food related behaviour amongst people with diabetes.

Lifestyle studies (Cockerham 2005; Grunert, Brunso & Bisp 1993; Hustad & Pessemier 1971) have shown that individuals who are concerned about their health tend to choose healthier lifestyle habits such as cooking and shopping for healthy food and this has been found to have a positive impact on weight control and general health. Whilst this finding appears to be self-evident, other studies (Boyland & Whalen 2015; Major et al. 2014) have indicated that food choice behaviour is not always consistent with healthy lifestyle habits and attitudes. External factors such as tempting advertisements, the influence of others, cultural factors and special occasion eating have all been shown to play a role in food choice and can result in less desirable food behaviour even for those who otherwise exhibit good food choice habits (Boyland & Whalen 2015; Carins & Rundle-Theile 2013; Major et al. 2014). To date no study has provided empirical examination of the impact of food related lifestyle factors on dietary choice behaviours for those living with diabetes. This study therefore extends the literature in both the lifestyle and health management domains and will provide empirical confirmation of the contention that food lifestyle behaviours play a role in the likelihood of dietary compliance for those living with diabetes.

Social support groups have been consistently shown to be an important influence in health outcomes for people with lifestyle health issues such as obesity, smoking, alcohol and drug use (Antonovsky 1974; Thoits 1985). In spite of the general agreement of the importance of this factor, there is inconsistency (Piette et al. 2014; Schiøtz et al. 2012; Tovar et al. 2015) in the exact role and influence of social support groups on health outcomes with both positive (Baek, Tanenbaum & Gonzalez 2014; Ku & Kegels 2015) and negative (Chew, Khoo, & Chia 2015**;** Fisher et al. 2014; Muchiri, Gericke, & Rheeder 2016) influences being reported. The results of this study will add to clarity to this debate by empirically testing the role of social support groups on the likelihood of dietary compliance for those with diabetes

These four contributions to theory will ultimately provide empirical evidence on the causal relationships between compliance with those with diabetes. In addition to these contributions, health practitioners and those working in health policy and management can also benefit from the outcomes of this research as presented in the next section.

1.3.2 Contribution to Practitioners

The Australian government spends around $14.6 billion annually to manage diabetes and this figure is expected to increase exponentially over the next few years if the trends continue (Diabetes Australia 2016; Lee et al. 2013). This increase is in spite of a range of intervention and preventative programs that have been initiated by the Australian health system (Dunbar et al. 2014) and there seems to be little respite from the growing financial and economic costs on the health system and on society (Guariguata et al. 2014; Lee et al. 2013; Rashwani et al. 2014).

At the same time a number of governmental efforts in collaboration with social marketing practitioners (Dunbar et al. 2014; Guariguata et al. 2014; Rashwani et al. 2014) to educate the public on healthy living, diet and exercise and ways to minimise diabetes health risks have been introduced in Australia over the years. Unfortunately, even these efforts seem to have little impact in limiting the progression of diabetes and its health risks (Dietrich et al. 2015; Penny & Kirk 2015). Many reasons have been cited as barriers to successful health intervention programs to manage the increase in diabetes progression with the most commonly cited ones being, lack of resources and understanding of the complex behaviours and perceptions of health behaviour of people with diabetes (Lefebvre 2000; Luca & Suggs 2013; Novelli 1997) These factors have in turn lead to limitations in the development of sustainable and value enhancing health intervention programs for people living with diabetes (Dietrich et al. 2015; Luca & Suggs 2013).

The key to resolving some of these health service gaps is for those in the health system including social marketers to actively engage in formative research, build theory into practice and working collaboratively with researchers in the area of health (Lefebvre 2000; Luca & Suggs 2013; Novelli 1997). In doing so health related behaviour modification initiatives will not only have a sustainable impact on people with diabetes but will close the health service gaps through behavioural segmentation profiling, tailor-made programs and value enhancing services (Dietrich et al. 2015; Kubacki & Rundle-Thiele 2016). Thus, the results of this study will provide valuable information about attitudes and behaviours of people with diabetes in relation to their dietary choices. This in turn, will inform the development of information, education and support systems that will have a greater chance of success in terms of dietary compliance for those with diabetes.

1.3.3 Contributions to Society

A major concern of diabetes is its serious implication on society as it burdens people on many levels such as health, financially and socially (World Health Organisation 2016; Lee et al. 2013). Diabetes is the leading cause of blindness, kidney failure and limb amputations in Australia, which then leads to other social problems such as inability to work or be productive (Diabetes Australia 2016). At the same time diabetes does not only impact those with the disease, but also is a great burden and cost to family and/or carers of people with diabetes. Families or friends who act as carers or who are providing social support to people with diabetes cite being depressed, fed up or overwhelmed when providing support to their loved ones and/or friends with diabetes (Henry et al. 2013; Song et al. 2014).

Additionally, diabetes is also a leading cause of depression, feeling suicidal and low self-esteem with those living with the disease (Baek, Tanenbaum & Gonzalez 2014; Wardian & Sun 2014). Some of these factors have been found to negatively impact diabetes self-management and hence may increase health risks for people with diabetes (Baek, Tanenbaum & Gonzalez 2014). A number of studies (Keller et al. 2012; Schiøtz et al. 2012; Tovar et al. 2015) have reported that low self-efficacy, poor food judgements, poor dietary lifestyles and poor quality social support have negatively impacted dietary modification practices amongst people with diabetes. However, due to the complex nature of human cognition and the varied outcomes in studies examining it, the present study aims to provide empirical evidence to close these research gaps and to identify the factors which influence dietary compliance amongst people with diabetes. The “Quick facts” in Figure 1.2, provides a summary of how diabetes has impacted Australia. These facts reveal the serious implications that diabetes has on individuals and society on many levels. Therefore, the urgency to contain and limit the progression of diabetes is imperative before diabetes and its health risks escalate even further.

Quick facts about diabetes:

An estimated 280 Australians develop diabetes every day. That's one person every five minutes! ;

Around 1.7 million Australians have diabetes. This includes all types of diagnosed diabetes (1.2 million known and registered) as well as silent, undiagnosed type 2 diabetes (up to 500,000 estimated);

More than 100,000 Australians have developed diabetes in the past year;

For every person diagnosed with diabetes there is usually a family member or carer who also 'lives with diabetes' every day in a support role. This means that an estimated 2.4 million Australians are affected by diabetes every day;

Diabetes is a leading cause of blindness, kidney disease and limb amputations in Australia;

People with diabetes are more likely to suffer from depression and anxiety;

Total annual cost impact of diabetes in Australia is estimated at $14.6 billion

Figure 1.2: Diabetes Quick Facts *(Source: Diabetes Australia https://www.diabetesaustralia.com.au/diabetes-in-australia)*

1.4 Methodology

The present study will be undertaken with a positivist paradigm in which an objectivist orientation is held (Guba & Lincoln 1994) and will therefore entail a deductive approach to the relationship between theory and research [i.e. theory testing] (Bryman & Bell 2015). This means that a practical approach emphasising quantification in the data collection and data analysis processes will be undertaken for this study (Guba & Lincoln 1994).

A theoretical framework will be developed from literature review and a conceptual model established (Chapter 2, Section 2.8). The conceptual model will be tested using an anonymous on-line and printed survey (Chapter 3). The main data analysis will be conducted using factor analysis and PLS-SEM. Rigorous techniques and protocols (i.e. reliability and validity testing etc.) will be conducted (chapter 4) during the analysis process to ensure the model is substantively meaningful, has a good fit with the data and is parsimonious (Kline 2011, p. 8).

A usable sample of respondents was from a cross-section of the population will be collected in numeric format and analysed using quantitative procedures (Gray 2014). The data set will be entered into Statistical Package for the Social Sciences (SPSS) version 22 to analyse numerical data. After data cleaning the data will be put into a Structural Equation Model (SEM) procedure and then imported into the SMART PLS software for analysis.

1.5 Delimitations and Scope of the Research

The main delimitations in this study are geographical and methodological and is explained next.

~***Geographical limitations***. The first delimitations of this study is geographical, as this study explores dietary compliance behaviour of people with diabetes in Australia. Whilst, this study would most likely contribute to a better understanding of dietary compliant behaviour in this region, perhaps a wider understanding of this particular enquiry may have added even greater insights into this study. A global or regional study may provide the opportunity for multi-cultural and/or comparative studies and thus likely strengthen the empirical evidence and provide further theoretical knowledge specifically in the area of health behaviour and social marketing.

~***Methodological Implications***. This research uses a mono-research method through statistical testing. Although this method is considered justifiable (Carey 2013; Denzin & Lincoln 1994; Howe 1998) as the use of rigorous procedures would likely ensure the model is a good fit, other methods such as a mixed method or focus groups may have provided further detail on the cognitive characteristics of the sample from this research thus providing a wider understanding of the causal relationships in the model and its relationship with dietary behaviour (Denzin & Lincoln 1994; Pallant 2013).

Whilst these factors may have delimited the study, in both cases there is potential and scope for future research opportunities to examine and expand the current model further.

1.6 Operational Definitions

Key concepts and operational definitions of the constructs developed for this research are as follows:

Diabetes. Diabetes is a disease generally caused by high levels of glucose in the blood, mainly due to the inability of the body to produce insulin or not being able to use insulin effectively, or both (Diabetes Australia 2016). Diabetes is categorised as Type 1, 2 or gestational (Holt & Kumar 2015). Type 1 diabetes is a lifelong auto-immune disease and is believed to be caused by the interaction of genetic and environmental factors, whilst Type 2 diabetes although may involve a genetic component, is considered a lifestyle disease and is largely preventable by living a healthy lifestyle (Holt & Kumar 2015). Gestational diabetes occurs during pregnancy when higher than normal blood glucose is found in the body. In any case it is recommended that all categories of people with diabetes should aim to live a healthy life such as diet and exercise (Diabetes Australia 2016).

Dietary compliance. Compliance refers to the degree of cooperation and agreement between formal diabetes therapists or physicians and patient and/or clients in the management of diabetes regimens, with the patient's/client's understanding of and adherence to these regimens as well as the patient reporting back to the physician on their recommended regimens (German 1988). With regards to dietary compliance people with diabetes are advised to follow recommended dietary guideline to control blood sugar levels, weight and hypertension among others (Diabetes Australia 2016). In this research dietary compliance is operationalised as the Likelihood of Dietary Compliance (i.e. the dependant variable) as a factor to examine the level of dietary compliance among people with diabetes.

Cognition. Individual cognition involves complex networks of individual motives, forethought and beliefs which are crucial in guiding health related behaviour (Bandura 1986; Frewer et al. 1996; Lorig et. al 2001). Based on literature (Antonovsky 1974; Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993) key cognitive factors such as self-efficacy, food risk perceptions, food lifestyles and usage of social support groups are examined to determine the extent in which they influence dietary compliance amongst those diagnosed with diabetes.

Risk perception. Perception is generally defined as the perceived probability, likelihood and/or susceptibility to harm (Slovic 1987; Tversky & Kahneman 1974; Weber, Blais & Betz 2002). It has been suggested (Brewer et al. 2004) that those with higher risk judgements tend to exhibit health protective behaviour by avoiding risk factors including unhealthy food. In this study those with higher risk perception are considered to be those who avoid risky food choices and/or those who make careful food judgements and vice versa.

Food Related Lifestyle. Individual lifestyles are daily habits which form as a result of individual choices and their exposure to their environment **(**Cockerham 2005; Grunert, Brunso & Bisp 1993; Hustad & Pessemier 1971). In this study food related lifestyle is considered a combination of individual choices and environmental factors which guide food lifestyle behaviour such as meal preparation, shopping and social interactions and how these factors influence the dietary lifestyles of people with diabetes (Grunert, Brunso & Bisp 1993).

Self-efficacy. Self-efficacy involves self- judgement of an individual's capacity to accomplish goals and to influence life events (Bandura 1986). Self-efficacy theory (Bandura 1986) postulates that individuals with higher levels of self-efficacy are better able to cope and persevere in distressful and/or challenging situations. Perceived self-efficacy on the other hand is a person's ability to influence situations which affect their lives and is therefore considered the foundation of human motivation, personal accomplishments and psychological well-being (Bandura 1997: 2006). This study will examine whether self-efficacy influences dietary behaviour among people with diabetes.

Social Support Groups Usage. Social support is a function which provides a range of support such as emotional, financial, and physical (Cobb 1976; Shumaker & Brownell 1984). Social support groups are considered a structural environmental factor and is either formal (physician, nurse etc.,) or informal (family, friends etc.,) [Schiøtz e al. 2012; Song et al. 2014]. On the other hand, social support usage is generally guided by cognitive processes such as individual perceptions, attitudes, beliefs and experiences which may hinder or promote its usage (Fisher et al. 2015; Schiøtz e al. 2012; Song et al. 2014). Since social support groups usage has been found to positively improve diabetes health behaviour, (Fisher et al. 2015), this study will examine this suggestion.

Social Marketing. Social marketing is an approach to develop and promote campaigns (e.g. health, environment, social change etc.) aimed at targeting audiences to voluntarily accept, reject, modify or abandon behaviour for the benefit of individuals (Andreasen 1995; 2002; Carins & Rundle-Thiele 2013; Lefebvre 2000). Pirani & Reizes (2005) explain that social marketing processes include formative research, audience segmentation, marketing mix development and evaluation. The findings of this study is translated using a social marketing framework which will likely provide recommendations for the relevant diabetes support systems to provide the necessary support and care to help people better manage their diabetes.

1.7 Theses Outline

The structure of the thesis is shown in Figure 1.3

Figure 1.3: Structure of the Thesis

1.8 Chapter Summary

This chapter provided an overview of the key themes and direction of this study and provides the context with which this study aims to explore. It introduces the research objectives and outlines the research methods to be undertaken. This chapter explained the justification for the research which is based on theoretical, practical and societal issues. Finally, key operational and delimitations were presented. Next, Chapter 2, will present the literature review and theoretical framework of this study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

An overview of this study is presented in Chapter 1, of this thesis. This chapter introduces the theoretical foundation on which this study is based upon and conceptualised. Key overarching psycho-social theories namely, Social Cognition Theory (i.e. Bandura 1986; Bandura & McClelland 1977); Risk Perception Theory (i.e Kahneman, Slovic & Tversky 1982) Lifestyle Theory (i.e. Weber 1949; Kelly 1955; Adler 1927) and Social Support Theory (i.e. Antonovsky 1974; Thoits 1985) provided the theoretical understanding relevant for this study. Additionally, other relevant psycho-social theories namely, Self-Efficacy Theory (i.e. Bandura 1986); Food Risk Perception Theory (i.e. Frewer et al. 1996) and Food Related Lifestyle Model (i.e. Grunert, Brunsø & Bisp 1993) was used to formulate the proposed conceptual framework for this study. Additionally, the aforementioned theories were applied into this study to explain the relationship between the independent variables of namely, Self-Efficacy, Food Risk Perception, Food Related Lifestyles (FRL), Social Support Groups Usage, and the dependent variable of the Likelihood of Dietary Compliance amongst people with diabetes.

Relevant literature was reviewed and forms the basis of this discussion whereby: key research issues and problems were identified; key theories and concepts were applied and a hypotheses generated. Literature from various disciplines such as marketing e.g. Andreasen (2002); Kotler & Zaltmen (1971); health sciences e.g. Basu et al. (2012); Diabetes Australia (2016); National Health and Medical Research Council (2015); RACGP (2013) and psycho-social sciences e.g. Antonovsky (1974); Bandura (1986); Frewer et al. (1996) amongst others were reviewed to provide a better understanding of the physiological, biological and the psycho-social make-up of diabetes and its related issues. The prevalence and rapid progression of diabetes; its' growing cost and burden to society; and the researchers' own interest in the discipline of social marketing has prompted the researcher to pursue this study. It is hoped that the outcome from this research will likely contribute to literature, policy and practice. Most importantly, this study may provide practical solutions through social marketing initiatives to improve dietary self-management practices amongst people with diabetes and therefore, likely limit the growing health risks and costs associated with diabetes.

A total of 10 major sections are included in this chapter as presented in Figure 2.1 below. The chapter begins with a brief overview of the intended study i.e. section 2.1, followed by section 2.2 which explains the research context and the justification to conduct the study in Australia. Section 2.3 defines dietary compliance, which is the dependent variable to be examined in this study. The following section, 2.4 explains the key factors found to influence dietary compliance. Section 2.5 presents the explanation of the key independent variables to be examined namely, Self-efficacy, Food Risk Perception, Food Related Lifestyle (FRL) and Social Support Groups Usage and the justification for its application into this study. Section 2.6, introduces the key psycho-social theories (i.e. Antonovsky (1974); Bandura (1986); Frewer et al. (1996); Grunert, Brunsø & Bisp (1993); Thoits (1985) underpinning each construct whereby the conceptual framework is built upon. Section 2.7 discusses the integration of theory into practice i.e. the Social Marketing context.

The next section, 2.8 presents the Preliminary Conceptual Framework which explains the predicted construct inter-relationships and its influence on the dependent variable of the Likelihood of Dietary Compliance amongst people with diabetes. Section 2.9, i.e. the Hypotheses Development, presents a number of emerging research questions and hypotheses which are postulated to explain the factors influencing the Likelihood of Dietary Compliance amongst people with diabetes. Finally, section 2.10 concludes with an overview of the key themes and major outcomes of the overall discussion of this chapter. Figure 2.1, provides the outline for Chapter 2.

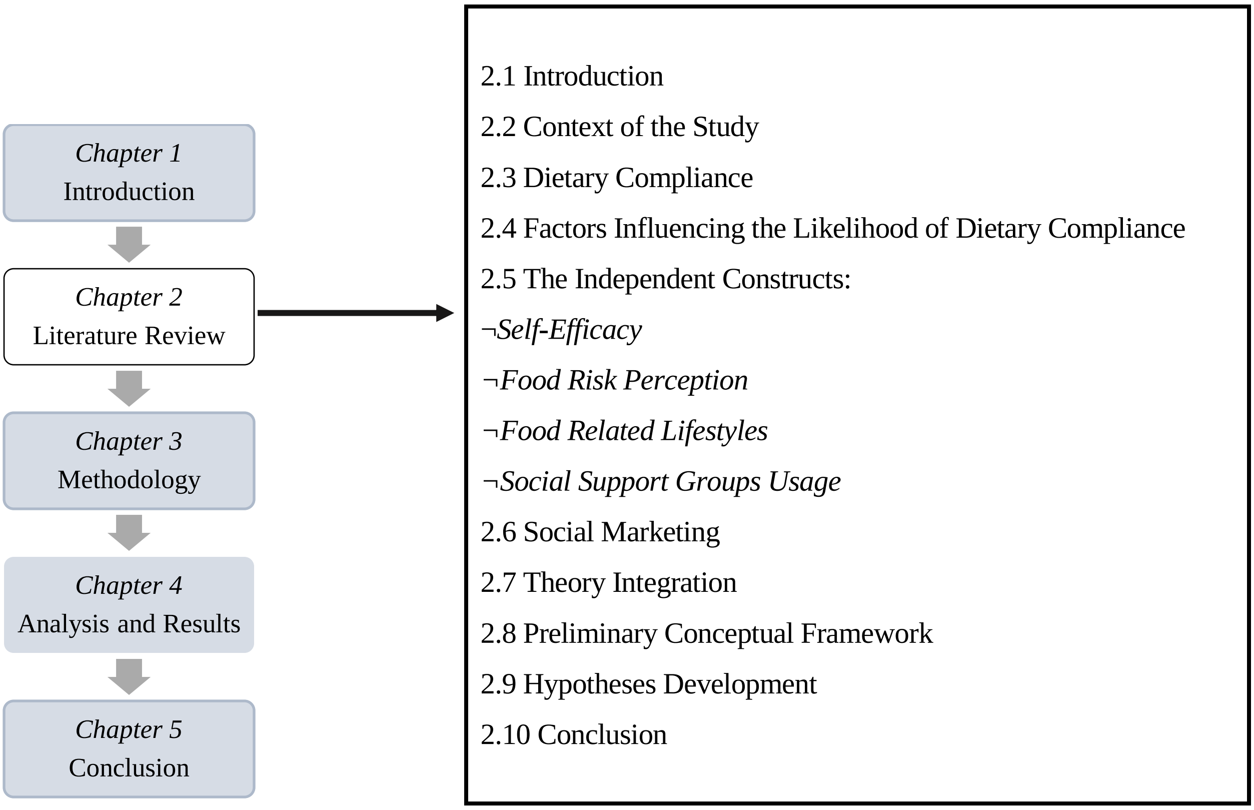


Figure 2.1: Outline of Chapter 2

2.2 The Australian Context

Despite various global strategies and intervention programs introduced thus far to limit the progression of diabetes and its related health risks; there seems to be little respite from the rapid advancement of this disease (Dunbar et al. 2014; Guariguata et al. 2014; Harries et al. 2016; WHO 2015). As of 2015, an estimated 415 million people have been diagnosed with diabetes globally and these numbers are projected to grow to approximately 642 million by 2040 (IDF 2017). This trend is equally discouraging in Australia with an estimated 1.7 million Australians currently diagnosed with diabetes (Diabetes Australia 2016). Diabetes also carries a socio-economic cost with an estimated AUD$14.6 billion spent annually in Australia to treat, manage and support those with the disease (Diabetes Australia 2016). Unfortunately, according to Baker IDI (2012), by the year 2025, these estimates are projected to grow to approximately 3 million in Australia. What is equally concerning is that there is also a growing number of undiagnosed people with Type 2 diabetes in Australia, which are estimated to be in the range of 250,000 to 500,00 individuals (Diabetes Australia 2016).

Data indicates that one in four Australian adults are currently living with diabetes or are at risk of developing this disease within the next five to ten years (Diabetes Australia 2016). A number of factors such as biology, physiology and lifestyle practices have been found to be the likely cause of the prevalence of diabetes (Australian Institute of Health and Welfare 2013). However, most experts (e.g. Alkerwi et al. 2012; American Diabetes Association 2017; RACGP 2013) agree that amongst these factors, diet is considered a crucial factor to likely influence the growth and severity of diabetes. This is mainly due to the continued consumption of high fats, processed foods and sugary items which increases diabetes related health risks such as heart disease and obesity amongst others (Baker IDI 2012; RACGP 2013). Specifically, for people with diabetes poor diet management may result in higher blood glucose levels, weight gain and increased blood pressure levels, all of which may adversely affect their overall health and well-being (American Diabetes Association 2017). Hence, precautionary measures such as diet and exercise in conjunction with formal therapy is an important step towards limiting the advancement of diabetes and other health risks (American Diabetes Association 2013; Diabetes Australia 2016; RACGP 2013).

As a result, apart from formal therapy a range of disease prevention and health promotion initiatives have been introduced globally to encourage positive lifestyle practices such as diet and exercise amongst people with diabetes (Alkerwi et al. 2012; Chew, Khoo, & Chia 2015; George et al. 2016). Furthermore, given that lifestyle modification initiatives have shown positive results (e.g. George et al. 2016; Ku & Kegels 2015; Wu et al. 2013) in health outcomes amongst people with diabetes, therefore it is important to initiate and promote such measures.

2.3 Dietary Compliance

Optimal diabetic therapy includes at a minimum, prescribed formal management regimens such as regular physician consultations, medication adherence and dietary management American Diabetes Association 2013; Australian Institute of Health and Welfare 2013). In addition people with diabetes generally carry out a range of diabetic self-management (DSM) regimens ranging from complying with formal medical therapy, diet and exercise and self-blood glucose monitoring (Australian Institute of Health and Welfare 2013**;** Baker IDI 2017; RACGP 2013). Dietary self-management regimens for people with diabetes generally involve following recommended diets; managing and monitoring blood sugar levels with food intake and regular exercise amongst others (Australian Institute of Health and Welfare 2013; National Health and Medical Research Council 2015).

Lamichhane et al. (2012) pp. 217, explains that "*Dietary modification is a crucial factor in the management of obesity, hypertension, blood lipids, and diabetes and to achieve optimal health outcomes. Further, diet is an integral component of medical nutrition therapy for persons with diabetes, to maintain optimal metabolic outcomes and to prevent and treat chronic complications"* Researchers e.g. Basu et al (2013) have found that sugary foods have been positively associated with the development of insulin resistance amongst people with diabetes and that the longer individuals are exposed to sugary foods the greater the prevalence of diabetes

The aforementioned factors show that poor diet is directly linked to detrimental health effects for people with diabetes and therefore finding more impactful ways to address this problem through education and information are essential. Therefore, medical experts in the field of diabetes management (e.g. National Health & Medical Research Council 2015; RACGP 2013) agree that compliance with recommended dietary guidelines are important to minimize the adverse effects of poor food management on health amongst people with diabetes.

German (1988, pp.57) defines the term compliance to denote *"the degree of cooperation and agreement between clinician and patient in the management of regimens, characterized by the patient's understanding of and adherence to these regimens, including appropriate reporting back to the clinician"*

This suggests that optimal diabetic therapy involves physicians and people with diabetes working together amicably to manage a range of diabetes related issues. However, experts (e.g. Albright & Gregg 2013; Ahola & Groop 2013; Deeb et al. 2015) point out that the onus is also on people with diabetes to follow and adhere to these recommended dietary regimens for the overall betterment of their health and well-being. Table 2.1, provides the recommended daily dietary guidelines by the Australian Government in its "Eat for Health" initiative for the general public (National Health and Medical Research Council 2015). This dietary guideline has been recommended by Diabetes Australia (2016) as a general guide for people with diabetes to follow. However, it is still recommended for people with diabetes to consult with their physician and a professional dietician for a tailor-made dietary guideline suited for their individual dietary needs (Diabetes Australia 2016).

Table 2.1: Recommended Daily Dietary Guidelines

Recommended Diet	Foods to Avoid or Limit
It is recommended for individuals to consume foods from these main food groups every day:- **Fruits-a variety of medium to small sized fruits;** **Grain (cereal) foods, mostly wholegrain and/or high cereal fibre varieties, such as breads, cereals, rice, pasta, noodles, polenta, couscous, oats, quinoa and tofu, nuts and seeds, and legumes/beans, barley;** **Lean meats and poultry, fish, eggs;** **Dairy: Milk, yoghurt, cheese and/or their alternatives, mostly reduced fat (reduced fat milks are not suitable for children under the age of 2 years)** **And drink plenty of water.**	Limit intake of foods containing saturated fat, added salt, added sugars and alcohol. Limit intake of foods high in saturated fat such as many biscuits, cakes, pastries, pies, processed meats, commercial burgers, pizza, fried foods, potato chips, crisps and other savoury snacks. Replace high fat foods which contain predominantly saturated fats such as butter, cream, cooking margarine, coconut and palm oil with foods which contain predominantly polyunsaturated and monounsaturated fats such as oils, spreads, nut butters/pastes and avocado. Low fat diets are not suitable for children under the age of 2 years. Limit intake of foods and drinks containing added salt. Read labels to choose lower sodium options among similar foods. Do not add salt to foods in cooking or at the table. Limit intake of foods and drinks containing added sugars such as confectionary, sugar-sweetened soft drinks and cordials, fruit drinks, vitamin waters, energy and sports drinks. Limit alcohol intake. For women who are pregnant, planning a pregnancy or breastfeeding, not drinking alcohol is the safest option.

Source: adapted from the Australian Dietary Guideline (National Health and Medical Research Council 2015).

In spite of the research, medical evidence and experience of diabetic educators about the importance and positive impact of good diet in the management and treatment of diabetes, there remain barriers and challenges associated with understanding and promoting dietary compliance amongst people with diabetes (Alkerwi 2012; Brown et al. 2013; Islam et al. 2014; Vest et al. 2013). Firstly, it is generally a challenge for physicians to monitor or gauge the dietary activities (e.g. cooking, shopping, eating habits etc.) of their patients outside of clinical consultations (Ahola & Groop 2013; Brown et al. 2013; Vest et al. 2013). Secondly, this is further exacerbated when some people with diabetes are not necessarily forthright about reporting their dietary regimens during clinical consultations (Deeb et al. 2015; Patra et al. 2014). The aforementioned situations may hamper physicians from fully comprehending food related behaviour amongst people with diabetes and therefore, likely prevents people with diabetes from receiving optimal therapy and support from their practitioners (Archer 2014; Deeb et al. 2015). Limitations such as these may hamper proper dietary management and regulation practices which are likely to result in greater health risks amongst people with diabetes (Archer 2014; Conklin et al. 2014; Wong et al. 2014).

People with diabetes on the other hand, perceive dietary compliance regimens to be a struggle to manage and carry out and therefore are at times reluctant to engage in such efforts (Hinder & Greenhalgh 2012; Schiøtz e al. 2012). A number of factors such as socio-demographic variables, individual cognition and biological factors amongst others are thought to either positively or negatively influence dietary management practices amongst people with diabetes (Fisher et al. 2014; Gallagher et al. 2012; Vesta et al. 2013).

As a result, up to date there are still some uncertainties and questions regarding the factors which likely influence dietary compliance amongst people with diabetes (Bhattacharya 2012; Hinder & Greenhalgh 2012; Taylor et al. 2014). Therefore, researchers (e.g. Basu et al. 2013; Dwyer et al. 2012; Falguera et al. 2012; Holands 2016; Rijswijk & Frewer 2012; Vandelanotte 2016) recommend further exploratory studies to generate wider evidence and information regarding food related behaviour. As such, this study may be useful as it will provide additional information to fill these research gaps and answer some uncertainties found thus far. The next section provides further explanation of the key factors which have been found to influence dietary behaviour amongst people with diabetes. Additionally, the following discussion will show that food related behaviour is both complex and yet important especially if these factors possibly contribute towards the betterment of health and well-being amongst people with diabetes.

2.4 Factors influencing Dietary Compliance amongst People with diabetes

Food related behaviour is complex and is related to a number of factors. For example, Mak et al. (2012, pp. 928-929) have classified three broad categories found to either directly or indirectly influence food related behaviour which is summarised as follows:-

- *Individual* (e.g. socio-cultural, psychological, and physical factors);
- *Food* itself (e.g. sensory appeal and appearance) and;
- *Environment* (e.g. cultural, social, economic and physical influences)

A number of studies (e.g. Bhattacharya 2012; Igumbor et al. 2012; Lysey et al. 2013; Werle, Trendel & Ardito 2013) have shown that extrinsic and /or external environmental factors play a major role in impacting dietary behaviour amongst people with diabetes. For example, extrinsic factors such as taste, price and convenience amongst others are commonly found to influence food choice and food decision making amongst people with diabetes (Bhattacharya 2012; Falguera et al. 2012; Igumbor et al. 2012; Islam et al. 2014). Table 2.2, below provides an overview of literature proposing a range of external and/or environmental factors which are generally found to influence food consumption amongst people with diabetes.

Table 2.2: Key extrinsic and environmental factors influencing dietary behaviour amongst people with diabetes.

No.	Key Extrinsic/environmental Factors influencing food behaviour	Literature	Remarks
1.	Sensory appeal-Taste	Bhattacharya (2012); Hinder & Greenhalgh (2012); Nam et al. (2011)	- Taste has been found to either positively or negatively influence food choice amongst people with diabetes. -Unhealthy foods are considered unappealing and tasteless by people with diabetes. -Habits and preference for sugary and salty foods makes it difficult for people with diabetes to modify behaviour.
2.	Income/Economic conditions	Igumbor et al. (2012); Islam et al. (2014)	- People with diabetes from lower income groups have been found to consume unhealthy food due to its affordability.
3.	Price	Fukunaga et al. (2011); Hinder & Greenhalgh (2012); Igumbor et al. (2012)	- Unhealthy food is preferred over healthier food options due to its affordability as compared to healthier foods which are perceived to be pricier options amongst people with diabetes.
4.	Convenience	Igumbor et al. (2012); Lysy et al. (2013).	- Easy access to unhealthy food options leads to higher consumption of unhealthy foods amongst people with diabetes.
5.	Education/Knowledge	Nam et al. (2011); Schiøtz et al. (2012)	- People with diabetes from lesser educated backgrounds have been found to make poorer food choices as compared to educated individuals. -Knowledge is not a significant factor to influence healthy eating.

~Justification for examining the cognitive variables of Self-efficacy, Food Risk Perception, FRL & usage of Social Support Groups in this study. Whilst the aforementioned external factors are commonly found to influence food choice amongst people with diabetes, on the other hand they may not provide sufficient understanding about the deep rooted behaviours guiding food consumption amongst people with diabetes (Bhattacharya 2012; Hinder & Greenhalgh 2012; Vest et al. 2013). This is because extrinsic factors generated from research may not necessarily reveal aspects of human nature such as motives, behaviours and attitudes surrounding food decision making (Bhattacharya 2012; Hinder & Greenhalgh 2012). Additionally, a growing number of studies (e.g. Dwyer et al. 2012; Falguera et al. 2012; Ku & Kegels 2015; Walker et al. 2014) have indicated that individual cognition is a major driving force in guiding either good or bad food choices amongst individuals. Thus, the cognitively driven aspects of food behaviour warrants further attention. Therefore, examining the underlying cognitive processes associated with food decision making amongst people with diabetes is likely an effective approach for researchers to uncover food related behaviour amongst people with diabetes. Further to this scholars (Bandura 1986; Cockerham 2005; Ryan, Kuhl & Deci 1977) have also suggested that a holistic approach involving the examination of both external and cognitive factors will most likely provide a wider perspective on the complex nature of health related behaviour.

Taking on this cue, this study aims to develop a sound understanding of dietary behaviour by examining individual cognition and its influence on food behaviour amongst people with diabetes. Specifically, this study will examine the cognitive constructs (i.e. the independent variables) of Self-Efficacy, Food Risk Perception, the Food Related Lifestyles (FRL) and usage of Social Support Groups and its influence on the (i.e. dependent variable) of the likelihood of dietary compliance amongst people with diabetes. Furthermore, the examination of factors such as food related lifestyles and social support groups in this study will likely provide further evidence on the role external factors (e.g. shopping, advertising, family, and friends amongst others) may play to influence dietary behaviour amongst people with diabetes (Antonovsky 1974; Grunert, Brunsø & Bisp 1993). Therefore, the justification for examining the aforementioned constructs in this study is that firstly, they have been well established in a number of literature (e.g. Antonovsky 1974; Bandura 1986; Fife-Shaw & Rowe 1996; Grunert et al. 2011; Thoits 1985) to influence health behaviour. Secondly, the aforementioned cognitive constructs have been found to play a vital role in guiding food behaviour specifically amongst people with diabetes (e.g. Cembalo et al. 2015; Loskutova et al. 2016; Muchiri, Gericke, & Rheeder 2016; Shreck et al. 2014; Walker et al. 2014). These independent variables will now be discussed in more detail.

Table 2.3 provides an overview of the theoretical and social marketing and the health system managerial gaps found through literature review. This study aims to close these gaps through the proposed research questions proposed in this study.

Table 2.3: Summary of Theory Contribution and Social Marketing/Health System Managerial Gaps in Diabetes Dietary Health Care

Social Marketing Practical/Managerial Gaps	Theoretical Gaps	Research Question	Study Aims
Gap 1: Embedding Cognitively Driven Health Campaigns: • Social marketing campaigns such as weight control and blood glucose management have been introduced by social marketers and the health system (Andreasen 1994; Gupta, Tyagi & Sharma 2015); • However, there is a lack in communication and support initiatives by social marketers to embed cognitively driven diabetes health campaigns as a tool to enhance dietary behaviour for people living with diabetes (Luca & Suggs 2013). • Individual decision making is generally driven by key cognitive drivers such as self-efficacy (Bandura 1977; Bandura 2004), therefore its application into social marketing messages is vital for likely improving dietary modification for people living with diabetes.	• Studies (Cha et al. 2014; Walker et. Al 2014) indicate that self-efficacy is a key factor to improve dietary behaviour amongst those living with diabetes. • On the other hand research (Gao et al. 2013; Song et al. 2014) also shows there is minimum to weak evidence of the influence of self-efficacy on dietary behaviour	**RQ1**: Does Self-Efficacy influence the Likelihood of Dietary Compliance amongst people with diabetes?	• The main aim of RQ1, is to close current research gaps by further examining the relationship between self-efficacy and the likelihood of dietary compliance amongst those with diabetes. • In doing so, this study could likely provide useful information for social marketers to promote positive self-efficacious behaviour for dietary modification purposes amongst people with diabetes.

Gap 2: Knowledge on Managing Food Risk: • Health communication initiatives by social marketers specifically on how to manage and practice better food judgements for people living with diabetes is currently lacking (Tse et al. 2012; Shreck et al. 2014). • Hence, this gap should be further explored and examined to improve poor dietary choices and decision making amongst people with diabetes.	• Studies (Brewer 2004; Frewer et al. 1996) indicate those with higher risk judgements show greater health protective behaviour, thus will chose to avoid risky situations (i.e. poor food choices). • Those with high perceived risk of harm will likely take precautionary measures to reduce risk to self (i.e. proper diet) [Weisntein 1993; Sutton 1987]. • At the same time research (Shreck et al. 2014; Tse et al. 2012), shows that food risk perception is not significant or rather weak as a factor to minimise the effects of diabetes.	**RQ2**: Does Food Risk Perception influence the Likelihood of Dietary Compliance amongst people with diabetes?	• The aim of RQ2, is to further investigate the food risk perception construct and its role on dietary compliance amongst those living with diabetes. • A better understanding about the food risk perception construct can inform social marketers about the factors which impede proper food choice and decision making amongst people with diabetes. • This wold help social marketers to deliver effective health messages about making better food choices for people with diabetes.

Gap 3: Managing Lifestyle Activities and Diabetes. • Evidence (Choi, Ng & DiNitto 2013; Conklin et al. 2014) suggests that up till now it is a struggle for those with diabetes to juggle daily lifestyle habits such as food preparation, shopping and eating and also managing their diabetes. • This shows there is not enough support or understanding provided by social marketers and/or the health system in providing sufficient education and/or information to effectively manage their dietary lifestyle (Luca & Suggs 2013; Penny & Kirk 2015; Reeve & Jones 2016).	• People with diabetes who aim to improve their quality of life/health will take precautions such as diet, exercise and weight control (Waki et al. 2015); • On the other hand the lifestyle construct is very complex and therefore difficult to examine and therefore up to date cannot entirely be determined as a factor to influence dietary behaviour for those living with diabetes (Choi, Ng & Dinitto 2013; Conklin et al. 2014).	**RQ3:** Does Food Related Lifestyles influence the Likelihood of Dietary Compliance amongst people with diabetes?	• RQ3's objective is to examine whether food related lifestyles play a significant role in dietary compliance amongst people with diabetes. • This understanding would likely inform social marketers about how lifestyle factors (e.g. social settings, advertising, shopping habits) [Grunert, Brunso & Bisp 1993] impacts food related behaviour amongst those with diabetes. • Hence, sustainable social marketing initiatives which aims to improve quality of life by encouraging those with diabetes to engage in healthier lifestyle habits can be introduced.

Gap 4: Usage of Social Support Groups in Managing Diabetes: • The utilisation of social support groups has been shown to improve a range of diabetes health behaviour (Sherbourne & Stewart 1991; Song et al. 2014); • However, up to date there is limited attention given by social marketers and the health system on its utilisation as a likely tool to improve dietary behaviour amongst people with diabetes (Archer 2014; Luca & Suggs 2013). • Additionally, the poor provision of support by both formal (e.g. physician) and informal (e.g. family, friends) for people with diabetes has shown to negatively impact diabetes therapeutic outcomes for people with diabetes (Archer 2014; Luca & Suggs 2013). • This is mainly due to poor understanding, knowledge and education on proper handling and giving of support by social support groups to those with diabetes (Pronk & Remington 2015; Reeves & Jones 2016). • This highlights a major gap in this area of diabetes healthcare and support (Archer 2014; Pronk & Remington 2015; Reeves & Jones 2016).	• Mixed results either promoting (Nam et al. 2011; Singh, Cinnirella & Bradley 2011) or disproving (Muchiri, Gericke & Rheeder 2016) the influence of social support groups usage in diabetes health behaviour have been found thus far. • Therefore, up to date, it has been a challenge by scholars (Nam et al. 2011; Simmons et al. 2015) to determine its role in diabetes health modification behaviour.	**RQ4:** Does Social Support Groups Usage influence the Likelihood of Dietary Compliance amongst people with diabetes?	• The aim of RQ4, is to confirm the notion that the usage of social support groups influences the likelihood of dietary compliance amongst those with diabetes. • The outcome from RQ4, could be used as a basis to introduce social marketing campaigns which encourages the use of social support groups for people struggling to manage their dietary modification practices (Archer 2014). • Additionally, educational and knowledge based campaigns targeting communities and various support groups on how to provide positive support towards those with diabetes can encourage the use of social support groups (Archer 2014; Penny & Kirk 2015; Pronk & Remington 2015)

• Steps such as research, knowledge gathering and implementation of effective strategies should be undertaken by social marketers and the health system to close these managerial gaps (Archer 2014; Carins & Rundle-Thiele 2013; Reeves & Jones 2016).			
Gap 5, 6, 7 & 8: Individual Cognition and the Usage of Social Support Groups: • Research and application of cognitively driven motives such as self-efficacy and its role in the usage of social support groups has not yet been effectively developed by social marketers (Gao et al. 2013; Song et al. 2014; Tarra et al. 2015). • Human cognition plays a fundamental role in driving individual decision making and choices including the usage of social support groups (Bandura 1997). • Therefore, there has been a call by experts (Bandura 2006; Walker et al. 2014), to utilise the concept of understanding and applying cognitively driven motives in the area of health behaviour such as using social support in improving diabetes management. • An important method which can help close this gap is to apply theory and research into social marketing practices (Mayer &	**Theoretical Gaps: RQ's 5 through 8:** • Mixed results (Cha et al. 2014; Fisher et al. 2014) have been found in the direct relationship between self-efficacy and the usage of social support groups	**RQ's 5 through 8:** **RQ5**: Does Self-Efficacy influence Social Support Groups Usage amongst people with diabetes?	***Note:*** The aims of RQ's 5 through 8 are explained as follows: i. To examine the direct effect via RQ's 5 & 6: • The main objectives of RQ's 5 & 6 is to investigate the direct effect of individual cognition i.e. self-efficacy and food risk perception on social support usage ii. To examine the indirect effect via RQ's 7 & 8: • i.e. the role of social support groups as a mediator between the individual cognition of food risk perception (RQ7) and self-efficacy (RQ8) on the likelihood of dietary compliance

Sparrowe 2013; Luca & Suggs 2013; Tarra et al. 2015) so that sustainable social marketing initiatives can be developed to improve diabetes care and support.			Each outcome from the analysis of RQ's 5 through 8 can close the managerial gaps of social marketers and the health system by: • Providing insights into the relationship between individual cognition and its role on the usage of social support groups amongst those with diabetes. • As a result campaigns highlighting the need to use social support to manage poor self-efficacy or poor food risk judgements can be introduced. • This can provide people living with diabetes the additional support to help them better cope and achieve positive dietary goals. • The understanding that social support may act as a mediator as per RQ,s 7 & 8, could be transformed into social marketing messages as follows: • To promote the usage of social support groups to help those with diabetes improve their dietary practices.

	• Both significant (Shreck et al. 2014) and weak (Keller et al. 2012; Shreck 2014) research outcomes have been shown thus far in explaining the direct effect of food risk perception on the usage of social support groups.	**RQ6**: Does Food Risk Perception influence Social Support Groups Usage amongst people with diabetes?	
	• The role of social support as a mediator between food risk and dietary behaviour has not been clearly determined due to the varying research outcomes presented so far (Tovar et al. 2015; Vest et al. 2012).	**RQ7:** Does Social Support Groups Usage mediate between Food Risk Perception and the Likelihood of Dietary Compliance amongst people with diabetes?	
	• The indirect effect of the usage of social support groups between self-efficacy and dietary behaviour is still debatable (Kirwan et al. 2013) and therefore still remains unknown.	**RQ8:** Does Social Support Groups Usage mediate between Self-Efficacy and the Likelihood of Dietary Compliance amongst people with diabetes?	

2.5 The independent variables: Self-efficacy, Food Risk Perception, FRL & usage of Social Support Groups

Thus far, it has been established (e.g. Antonovsky 1974; Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993; Thoits 1985) that cognitive factors such as Self-efficacy, Food Risk Perception, FRL and usage of Social Support Groups have been found to influence health related behaviour. Scholars (e.g. Alkerwi et al. 2012; Falguera et al. 2012; Rauber et al. 2015) suggest that poor dietary management is a leading cause of diabetes and other health risks such as heart disease, hypertension and obesity amongst others. Unfortunately, despite the adverse health risks attributed to poor diet, people with diabetes persistently consume processed foods, sugary foods and fatty foods amongst others (Basu et al. 2013; Bilotta et al. 2012b; Conklin et al. 2014; Dunbar et al. 2014; Holsten et al. 2012; Ng et al. 2014).

Bandura (1986) explains that human cognition involves complex networks of individual motives, forethought and beliefs which are crucial in guiding health related choices amongst individuals. Following this many researchers (e.g. Bhattacharya 2012; Hinder & Greenhalgh 2012; Nam et al. 2011; Schiøtz e al. 2012) have found that cognitive factors such as self-efficacy, food perceptions and lifestyle values play an important role in food related beahviour amongst people with diabetes. Other researchers (e.g. Fisher et al. 2014; Heinrich, Schaper and de Vries 2015; Gao et al. 2013) suggest that the examination of cognitive behaviours will likely provide opportunities for better health promotion and disease prevention initiatives amongst people with diabetes.

With the understanding that human cognition plays an important role in food related behaviours, key psycho-social theories (e.g. Antonovsky 1974; Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993; Thoits 1985) have been referred to in this study as a strong foundation to better understand dietary compliant behaviours amongst people with diabetes. As a result key constructs namely, self-efficacy, food risk perception, food related lifestyle and usage of social support groups have been identified as factors found to influence the likelihood of dietary compliance amongst people with diabetes (Antonovsky 1974; Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993; Thoits 1985). Additionally, the researcher has found that at the point of writing this thesis; the aforementioned constructs have yet to be examined together in a single study to investigate their possible influence on the likelihood of dietary compliance amongst people with diabetes.

Therefore, examining the combination of the aforementioned constructs in this study will provide new insights, added knowledge and relevant feedback on whether these factors influence the likelihood of dietary compliance amongst people with diabetes. The following i.e. Table 2.4, provides an overview of literature on the key constructs to be examine in this study and provides an overview of how each construct influences food behaviour

Table 2.4: Findings from Literature on the Factors Influencing the Likelihood of Dietary Compliance amongst People with diabetes

No.	Key factors	Literature	Summary of Key Findings
1.	Self- Efficacy	Bandura (1997); Fisher et al. (2014); Gao et al. (2013).	Approach to healthy eating is based on individual willingness to change/modify lifestyle or behaviour. Self-efficacy behaviour is not only based on individual cognition but rather is equally influenced by a variety of external/socio-demographic factors which interact to either positively or negatively influence self-efficacy efforts. Higher levels of self-efficacy positively relates to better dietary management amongst people with diabetes. Lower self-efficacy levels are associated with poor dietary management amongst people with diabetes.
2.	Food Risk Perception	Dwyer et al. (2012); Falguera et al. (2012); Fife-Schaw & Rowe (1996); Hackworth et al. (2013); Rijswijk & Frewer (2012); Shreck et al. (2014); Tse et al. (2012)	Those who perceive food as a potential risk or threat to health are likely to avoid risky (unhealthy) food options. Individual food choice is based mainly on their risk judgement (risk estimation) of food or how food impacts their health. Poor food judgement is likely associated with poor diet quality amongst people with diabetes. A combination of individual food perception and external factors such as socio-demographic variables are likely to either positively or negatively influence FRP.
3.	Food Related Lifestyle	Brunsø & Grunert (1995); Bhattacharya (2012); Hinder & Greenhalgh (2012)	Food lifestyle modification has been associated with improved diet and well-being amongst people with diabetes. Poor food lifestyle habits have been found to negatively impact health and well-being amongst people with diabetes. Food lifestyle behaviour is mostly influenced by a combination of cognitive and wider socio-demographic factors.
		Antonovsky (1974); Baek, Tanenbaum & Gonzalez	Social support has been found to positively influence health and well-being amongst individuals. Higher levels of social support usage correlates with better diabetes self-management outcomes. Lower levels of social support usage correlates with poorer diabetes self-management outcomes.

4.	Social Support Groups Usage	(2014); Fisher et al. (2014); Thoits (1985); Walker et al. (2014)	A number of cognitive factors such as perception and self-efficacy have been found to influence the type and level of social support usage amongst people with diabetes. Other external or socio-demographic factors have been found to influence the type and level of social support usage amongst people with diabetes.

The major findings from literature as summarised in Table 2.4, shows that food related behaviour is influenced by the aforementioned factors and may either hinder or promote positive dietary behavior. However, up to date there are inconsistencies in opinion and results in studies examining these factors (e.g. Fisher et al. 2015; Nam et al. 201; Schiøtz e al. 2012; Walker et al. 2014). Therefore, this study would likely uncover further evidence to close these research gaps, which is further explained in the following section.

2.5.1 Self-efficacy

Self-efficacy is considered an important cognitive factor denoting confidence in an individual's ability to accomplish goals or complete tasks in challenging situations (Bandura 1997).

Perceived self-efficacy is a person's ability to influence situations which affect their lives and is therefore considered the foundation of human motivation, personal accomplishments and psychological well-being (Bandura 1996: 2004). Bandura (1994) posits that self-efficacy regulates human functioning through cognitive, motivational, affective and selective processes, thereby contributing to individual social adaptation and behavioural change goals. The self-efficacy construct has been examined in a number of studies over time (e.g. Bandura, Adams & Beyer 1977; Bandura, Adams, Hardy & Howells 1980; Fisher et al. 2014; Loskutova et al. 2016; Walker et al. 2014) to determine its role in health related behavior. Therefore, scholars (i.e. Bandura 2004; Bandura & McClelland 1977; Deci & Ryan 2011; Ryan & Deci 2000) agree that individual self-efficacy is considered an important factor to facilitate health goals amongst individuals.

Self-Efficacy Theory is developed within the framework of Social Learning Theory (Bandura & McClelland 1977) and Social Cognition Theory (Bandura 1986) and has contributed towards understanding a range of health related behaviour. According to Self-Efficacy Theory (i.e. Bandura 1986) individual motivational behaviour (i.e. the ability for individuals to seek out, explore and learn for the purpose of self-development and self-regulation) is key to the success of self-regulation practices. Therefore, self-efficacy is considered an important mechanism to motivate the regulation of behavioural and lifestyle modification goals amongst individuals (Fisher et al. 2014; Jang & Yoo 2012; Wu et al. 2013). According to Bandura (1986), self-efficacy beliefs affect human functioning in a number of ways and determines the success or failure in individual goal achievement. Figure 2.2, represents Bandura's (1994) concept of individual self-efficacy beliefs affecting human regulation. Bandura (1994) proposes that each self-efficacy belief factor (i.e. cognitive, motivational, affective and selective processes) influences goal achievement and self-regulation behaviour amongst individuals.

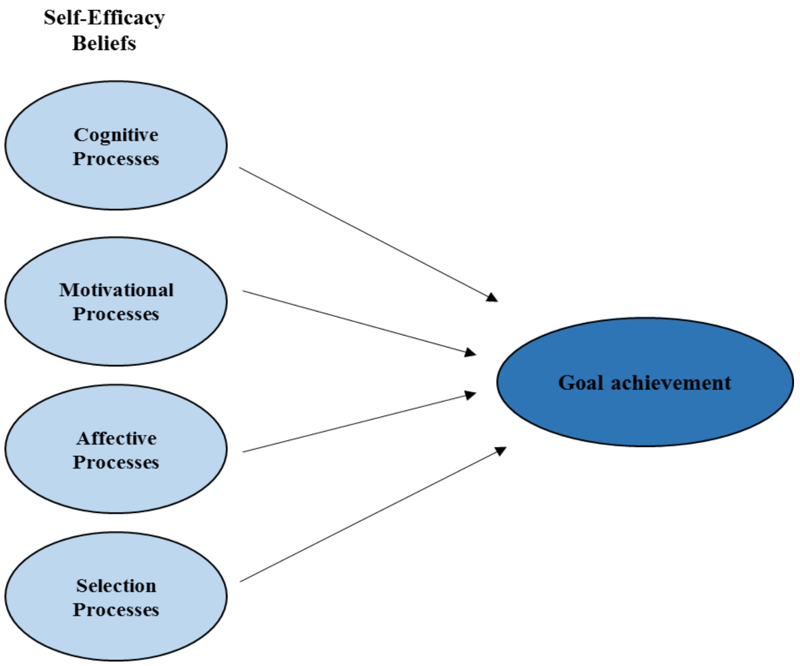


Figure 2.2: Self-efficacy Beliefs Affecting Human Regulation
Adapted from (Bandura 1994 pp.71-81)

A summary of Bandura's (1994) Self-efficacy Beliefs concept is provided below:

1. Cognitive processes - determine self-judgement capabilities of individuals, in that the stronger the perceived self-efficacy the higher the commitment to accomplish goals;

2. Motivational processes - involve individual forethought which regulates motivation and guides an individual's course of action, including anticipating the future outcomes of their actions. Those who are highly motivated are likely to persevere in difficult circumstances as compared to those with lower motivation;

3. Affective processes - is the ability of individuals to exercise control during stressful situations. Those who are unable to cope with impending threats will likely exhibit high levels of stress therefore hindering their goal achievements;

4. Selection processes - involve the choices individuals make that determine their future direction. Individuals with high self-efficacy will choose to persevere in their life course regardless of the challenging situation ahead of them; whilst individuals with low self-efficacy may choose to avoid difficult circumstances.

The aforementioned self-efficacy concept proposed by Bandura (1994) highlights the importance of personal efficacy beliefs; in that self-efficacy is likely to affect individual life choices, personal goal achievements, quality of life and level of perseverance during tough situations. Bandura (1997) has attempted to show the importance of self-efficacy in determining positive self-regulation behaviours through a number of studies. For example, Bandura, Adams & Beyer (1977); Bandura, Adams, Hardy & Howells (1980) in their empirical research on the impact of self-efficacy behaviour on therapeutic changes, found positive correlations between therapeutic changes in behaviour and self-efficacy. The results of their study confirms the view that self-efficacy is crucial for positive therapeutic health outcomes. Other studies by Bandura et al. (1977) found that self-efficacy is a strong predictor of behaviour as compared to either outcome expectations or past performance; and that those with high levels of self-efficacy were better able to cope in distressful or challenging situations.

Similarly a number of recent studies (e.g. Fisher et al. 2014; Loskutova et al. 2016; Walker et al 2014) have shown that self-efficacy positively correlates with better diabetes self-management outcomes. Likewise, Fisher et al. (2014); Walker et al. (2014) confirm that higher levels of self-efficacy positively relates to improved dietary compliance amongst people with diabetes. Meanwhile studies (e.g. Fisher et al. 2014; Gao et al. 2013; Kim et al. 2014) show that lower levels of self-efficacy is associated with poor dietary compliance amongst people with diabetes.

Self-efficacy Theory (i.e. Bandura 1997) suggests that in order for individuals to change behavior and/or to follow recommended regimens, individuals must first be initially motivated to change or modify their behaviour. Studies related to self-motivation (i.e. Bandura 2004; Bandura & McClelland 1977; Deci & Ryan 2011; Ryan & Deci 2000) have found that poor self-determination, lack of goal setting and minimum goal seeking behaviour could undermine positive behavioural and lifestyle changes amongst individuals. This can also be found in a number of studies (e.g. Fisher et al. 2014; Ku & Kegels 2015; Robertson et al. 2013) supporting the view that poor motivation, low self-esteem and low self-efficacy are generally barriers to improving health and well-being amongst people with diabetes. Therefore, researchers (e.g. Robertson et al. 2013; Wu et al. 2013) suggest that in order to promote lifestyle changes amongst people with diabetes, efforts to encourage positive self-efficacy should be introduced as part of diabetes health promotion and therapy initiatives.

However, the relationship between self-efficacy and its influence on positive dietary outcomes amongst people with diabetes remain uncertain (Gao et al. 2013; Kirwan et al. 2013). According to Bandura (1997), the self-efficacy construct is complex and can vary across individuals and situations. This could explain the diverse and uncertain research outcomes generated so far with regards to self-efficacy and its influence on health behaviour. For example, Song et al. (2012) in their study amongst Korean Americans with Type 2 diabetes, found that self-efficacy was positively associated with age and diabetes duration; and negatively associated with unmet needs of social support. At the same time, the same study by Song et al. (2012) reported that lower self-efficacy was positively associated with females from smaller family units. Therefore, the study by Song et al. (2012) shows that self-efficacy is a complex construct likely guided or influenced by diverse variables and situations surrounding people with diabetes. Hence, the examination of the self-efficacy construct in this study could possibly provide further evidence to either support or disprove its bearing on the likelihood of dietary compliance amongst people with diabetes. Outcomes from this study may reinforce the need for social marketers to promote positive self-efficacy behaviour campaigns to improve dietary practices amongst people with diabetes.

2.5.2 Risk Perception

Risk related theory (i.e. Slovic 1987; Tversky & Kahneman 1974; Weber, Blais & Betz 2002) have pointed to the relatively strong role perception plays in human functioning. Perception is generally defined as the perceived probability, likelihood and/or susceptibility to harm (Slovic 1987; Tversky & Kahneman 1974; Weber, Blais & Betz 2002). Additionally, perception is considered an important cognitive factor to influence a variety of individual behaviours such as motives, goal setting and goal achievement (Slovic 1987; Tversky & Kahneman 1974; Weber, Blais & Betz 2002). Perception also forms the basis of individual forethought and purposive action (Blais & Betz 2002; Brewer et al. 2000; Knox 2000; Slovic 1987). Further to this, Slovic (1987) explains that individuals have the capacity to change their environment as well as respond to it, and that it is this function which either promotes or reduces risk behaviour amongst individuals. Therefore, the risk perception construct is an important basic cognizant step taken by individuals in making decisions which either benefit or jeopardise life choices (Slovic 1987; Tversky & Kahneman 1974; Weber, Blais & Betz 2002; Brewer et al. 2000).

Table 2.5, below provides a summary of the key risk perception theoretical perspectives and their application for practice over time. These risk perception theoretical perspectives have in part provided an important foundation in the development of the conceptual framework presented in this study.

Table 2.5: Summary of Risk Perception Theory and its application over time

No.	Theoretical Perspective	Theory/Model	Theorist	Description/context
1.	Perceived Risk in Uncertainty & Adversity	Perceived Risk of Uncertainty and Adverse Consequences	Bauer (1960)	Defined risk within two dimensions namely perceived risk under uncertainty and adverse consequences
2.	Theories of Rational Choice/ Quantitative Risk	Gaming Theory Expected Utility Theory/Prospect Theory	Kahneman & Taversky (1979); Von Neuman & Morgenstern (1944)	Strategic thinking and decision making within the context of conflict. Public perception of risk is constructed rationally-with associated, costs and benefits.
3.	Individual Differences Approach	Technological Risk Theory	Frewer et al. (1996); Slovic (1987); Starr (1966)	Focuses on the effect of cognitive influences on risk through psychometric measures Psychometric model of risk perception (i.e. optimistic bias) Concentrated mostly on food risk perception
4.	Sociological Theory of Risk	Social Risk Theory	Freudenburg (1992)	Holds that a vast array of social meanings surrounds risk perception. Studies risk within a wider social context
5.	Cultural Theory of Risk	Cultural Risk Theory	Plutzer, Maney & O'Connor (1998)	Works on the premise that risk perception is based on culturally formed ideas. Food is entrenched in the social & cultural practices of people and holds symbolic significance.
6.	Psychometric Approach to Risk Perception of Everyday Food Hazards	Perceived Food Risk Index (PFRI)	Fife-Schaw & Rowe (1996)	Extended on the works of Slovic et al. (1980); Sparks & Shepard (1994) Analysed risk perception in the domain of food
7.	Risk Protective Behaviour	Theory of Risk Perception & Health	Brewer et al. (2004)	Explains the relationship between perceived risk and protective health behaviour

~Food Risk Perception. Early proponents of risk perception (i.e. Slovic 1987; Tversky & Kahneman 1974; Von Neuman & Morgenstern 1944) began investigating risk perception based on a variety of environmental and technological risk factors such as environmental hazards, chemical risks, bio-hazard risks and nuclear power risks. In contrast there have been limited studies that have considered food risk perception, due to the fact that food choice behavior was generally considered a low-risk activity (Knox 2000). Those studies that do exist occurred in the early 1980s and focused on perceptions of food hygiene (Knox 2000).

A paradigm shift in risk research emerged in the 1980's whereby food risk research gained momentum (Knox 2000). This shift was as a result of a bout of global food scares [i.e. salmonella poisoning, bovine spongiform encephalopathy (BSE) and chicken flu avian/bird flu and fish contamination] (Abbot & Pearson 2004; de Souza Lima et al. 2000; Knox 2000). Most recently the debates on the issue of Genetically Modified Foods (GMO's) and its negative impact on the environment, the food-chain and human well-being have to a certain extent caused some changes in public perception towards food (Clark, Rayan & Kerr 2014). As a result these food scares began to undermine public confidence in food manufacturers and government regulatory bodies and increased public awareness on food related issues (Knox 2000). Hence, these events have triggered a wider interest amongst researchers to pursue and explore food related studies (Dwyer et al. 2012; Fife-Schaw & Rowe 1996; Frewer et al. 1996; 1998; Grunert, Brunsø & Bisp 1993; Knox 2000; Seligman et al. 2012).

Additionally, researchers also began to examine food risk perception within the context of health and well-being (Brewer 2004; Dwyer et al. 2012; Holsten et al. 2012; Knox 2000; Shreck et al. 2014). Whilst food is considered an important element for human sustainability and survival (i.e. Dwyer et al. 2012; Fife-Schaw & Rowe 1996; Frewer et al. 1996), paradoxically it can also pose a serious threat to the health and well-being of individuals [i.e. obesity, heart disease, diabetes, hypertension etc.] (Dehghan, Asghari-Jafarabadi & Salekzamani 2015; Evert et al. 2014; Speight et al. 2012). Therefore, from a health perspective, it is important to investigate the relationship between food risk perception and its influence on eating behaviour amongst people with diabetes (Dehghan, Asghari-Jafarabadi & Salekzamani 2015; Tse et al. 2012).

However, the food risk perception construct is a challenge for researchers to examine as it is complex, varies from person to person and at times unpredictable (Brewer et al. 2004; Shreck et al. 2014; Knox 2000; Weber, Blais & Betz 2000). Knox (2000 pp. 107), describes risk as *"a "fuzzy" concept, which has yet to be described or explored in all its facets."* The aforementioned quote from Knox (2000) is echoed by other researchers (e.g. Hinder & Greenhalgh 2012; Ramirez, Kulinna & Cothran 2012; Shreck et al. 2014), who agree that a deeper understanding of the various layers of individual situations, conditions and contexts which likely drive risk perception needs to be further examined. Further to this, researchers, (e.g. Fife-Schaw & Rowe 1996; Shreck et al. 2014) explain that although risk studies have been widely examined there is still limited research focusing on food related risk and that findings across food risk studies remain ambiguous.

Fife-Shaw & Rowe (1996, pp. 487-488) propose that studies focused on food risk perception is necessary as this construct is unique from other forms of risk perception (i.e. nuclear weapons, chemical hazards etc.) in a number of ways and explain these differences which are summarised as follows:-

1. Most individual food choices are personal or depended on other trusted people such as family members, whist chemical hazards are externally formed or driven by formal agencies (i.e. governments, work settings etc.), thereby chemical hazards risks are not likely in control by the general public;

2. Individual food choices are generally habitual in nature;

3. Foods tend to provide some immediate gratification for individuals (e.g. nutritional, reducing hunger, sensory appealing such as taste);

4. Eating is generally not perceived as hazardous to the individual except in serious food scare situations;

5. Most food hazards are not directly visible to individuals and therefore the negative consequences of consuming poor food choices may not be immediately apparent (apart from food poisoning or an individual's understanding of the effect of food on their health).

According to Perceived Food Risk Index Model (i.e Fife-Shaw & Rowe 1996) individuals tend to react towards a potential food risk with a minimum sense of urgency as compared to a chemical risk for example as food is part of an individual's normal daily living. This means that individuals may disregard the importance of food risks and therefore, minimise the potential harm certain foods could have on their health, in turn causing them to continually consume unhealthy food options (Keller et al. 2012).

Other aspects of risk theory (i.e. Brewer et al. 2004; Frewer et al. 1996; Weinstein) such as optimistic bias and health protective behaviour provides further perspectives on individual risk decisions. Frewer et al. (1996); Weinstein (1982) explains that optimistic bias occurs when individuals perceive others at greater health risk than themselves and therefore may underestimate or disregard the potential health risk in their own lives. Unfortunately, risk estimations such as these may be a barrier to positive health behaviour (Frewer et al. 1996; Keller et al. 2012). For example, Keller et al. (2012 pp. 241) in their description of risk perception state that, *"risk judgements may be biased in systematic ways in that people may over – or underestimate an environmental risk. This in turn, may result in inappropriately high levels of concern or disregard for the risk. Measures of precaution may, thus be over-valued or neglected."* This could explain why in some circumstances people with diabetes continue to engage in risky food consumption behaviour regardless of the potential negative affect of risky foods on their health. Unfortunately, underestimating the potential harm of risky foods (i.e. optimistic bias) on individual health such as sugary snacks, processed foods and fatty foods amongst others can be detrimental to the health of people with diabetes (Carins & Rundle-Theile 2013; Tse et al. 2012). Additionally, optimistic bias may also hinder individuals from taking necessary precautionary measures such as diet and exercise which is equally important for the overall health and well-being amongst people with diabetes (Keller et al. 2012).

Another concept of risk perception is highlighted in a model proposed by Brewer et al. (2004) - the Risk Protective Behaviour model. In this model higher risk judgements about practices that will cause harm to self will encourage greater health protective behaviour amongst individuals. Other scholars (e.g. Weinstein 1993; Sutton 1987) also support the view that a high perceived risk of harm will likely encourage individuals to take action to reduce risk levels. Additionally, Shreck et al. (2014) have shown that risk perception involving health protective behaviour acts as an important barrier against unhealthy eating practices amongst people with diabetes. However, health behaviour theorists (i.e. Brewer et al. 2004; Sutton 1987; Weinstein 1993) explain that whilst empirical studies suggest positive relationships between individual perceived risk and subsequent health protective behaviour, this particular relationship is generally reported as weak and/or not significant in empirical studies. In addition empirical studies have once again, provided inconsistent results when examining risk perception and dietary compliance amongst people with diabetes. With some showing positive relationships (e.g. Shreck et al. 2014) and others indicating negative ones (Lamichhane et al. 2012; Tse et al. 2012).

Tse et al. (2012) in their study on youths with type 1 diabetes, found obese youths had negative outcome expectations for healthful eating; poor diet quality and poor glycaemic control compared to those in the normal weight range. Tse et al. (2012) attributes the risky eating behaviour among the obese subjects to poor food knowledge, poor food judgement and poor self-efficacy. Taken together, this indicates that in some cases, the health protective behaviour amongst people with diabetes may be overpowered by a variety of intrinsic barriers such as low food risk perception, low self-efficacy and underestimation of food risks (Keller et al. 2012; Shreck et al. 2014; Tse et al. 2012). Whilst individual perceptions of food risk generally are cognitively driven (i.e. Brewer 2004; Shreck et al. 2014; Knox 2000), evidence presented by researchers (e.g. Chlebowy, Hood & LaJoie 2013; Hackworth et al. 2013; Palladino et al. 2012) suggests that food risk perception is also likely influenced by wider socio-cultural and/or socio-demographic factors. This is further explained in the Cultural Risk Theory (i.e. Plutzer, Maney & O'Connor 1998), which posit that food is deeply rooted in the social and cultural practices of people and holds symbolic meaning to individuals and thus are likely to influence risk judgements amongst individuals.

Hence, the ubiquitous nature of food risk perception shows the need to further examine this construct and its possible influence on the likelihood of dietary compliance amongst people with diabetes in this study. Additionally, further research such as this may provide new perspectives in characterizing the risk construct specifically within the food domain (Fife-Shaw Rowe 1996; Shreck et al. 2014). Outcomes from the examination of the food risk construct in this study, will possibly provide a better understanding of the situations and contexts that influences food risk perception amongst people with diabetes. Furthermore, this study may reveal whether food risk perception works to either benefit or hinder the likelihood of dietary compliance amongst people with diabetes. At the same time contributions towards practice from this study will likely include introducing social marketing campaigns aimed at improving food judgements and health protective behaviour amongst people with diabetes (Carins & Rundle-Theile 2013; Dunbar et al. 2014; Luca & Suggs 2013; Tse et al. 2012).

2.5.3 Lifestyle Theory

Lifestyle Theory (i.e. Askegaard 1993; Grunert, Brunso & Bisp 1993; Cockerham 2005; Hustad & Pessemier 1971) posit that daily lifestyle habits are formed through the navigation of individual cognition and its interaction with wider social environments. Kesic & Piri-Rajh (2003 pp. 162), describe lifestyle as follows "*the concept of lifestyle has been developed to measure behavior as a function of inherent individual characteristics that have been shaped through the social interaction of psychological and sociological factors and past experience."* Therefore, from the aforementioned description it can be surmised that lifestyles involve the interaction between an individual and his or her external environment working together to influence lifestyle behaviour and actions.

The lifestyle construct is important to examine as lifestyle practices such as poor dietary habits have been found to influence the growth and prevalence of diabetes (Alkerwi 2012; Australian Institute of Health and Welfare 2013). Additionally, food lifestyle studies may unearth barriers to positive food modification which are likely useful for diabetes support agencies to address and improve. For people with diabetes, apart from formal therapy, lifestyle modification activities such as exercise, eating a balanced diet and maintaining body weight are crucial for optimal health outcomes (National Health and Medical Research Council 2015). A number of studies (e.g. Ku & Kegels 2015; Miller et al. 2014 Waki et al. 2015) have shown that people with diabetes who engage in healthy dietary lifestyle modification show positive health outcomes such as improved glycaemic levels and good weight control amongst people with diabetes. On the other hand, poor lifestyle practices have been found to negatively impact the health and well-being of people with diabetes in a number of ways such as weight gain, poor glycaemic control and hypertension amongst others (Australian Institute of Health and Welfare 2013). Therefore, it is vital for people with diabetes to be educated and motivated to carry out lifestyle modification practices such as diet and exercise to limit the adverse effects of poor dietary choices on their health and well-being.

- ***Food Related Lifestyle Model (FRL).*** Due to the context of this study (i.e. dietary compliance), food related lifestyle behaviour amongst people with diabetes is examined. As mentioned, poor food lifestyle habits have been shown to be a major contributor to the growth of diabetes and its related health risks (Baker IDI 2016; Evert et al. 2014; RACGP 2013). Lifestyle theories, (e.g. Bordieu 1984: Cockerham 2005; Weber 1949; Weber 1978) provide useful information to better understand individual habits, choices and decision making which in turn will guide lifestyle behaviour.

In spite of the breadth of research in this domain, there is still room for additional work, with some researchers, (e.g. Dwyer et al. 2012; Fife-Schaw & Rowe 1996; Frewer et al. 1996; 1998; Grunert, Brunsø & Bisp 1993) claiming that food related lifestyle research is underrepresented and warrants further examination, particularly research of a rigorous empirical nature (Anderson & Golden 1984; Brunsø & Grunert 1995; Lastovicka 1982).

The FRL model has been classified as an analytical tool to glean consumer food behaviour; and is unique in that it integrates the principles of the means end chain theory (Grunert, Brunsø & Bisp 1993; Olsson & Reynolds 1983). As such the FRL model provides a strong structure for researchers wanting to carry out a thorough analysis of food related behavior and this is why this particular construct will be adopted in this study (Grunert, Brunsø & Bisp 1993; Olsson & Reynolds' 1983). Figure 2.3 presents the Cognitive Structure Model developed for the FRL model as proposed by Brunsø & Grunert (1995).

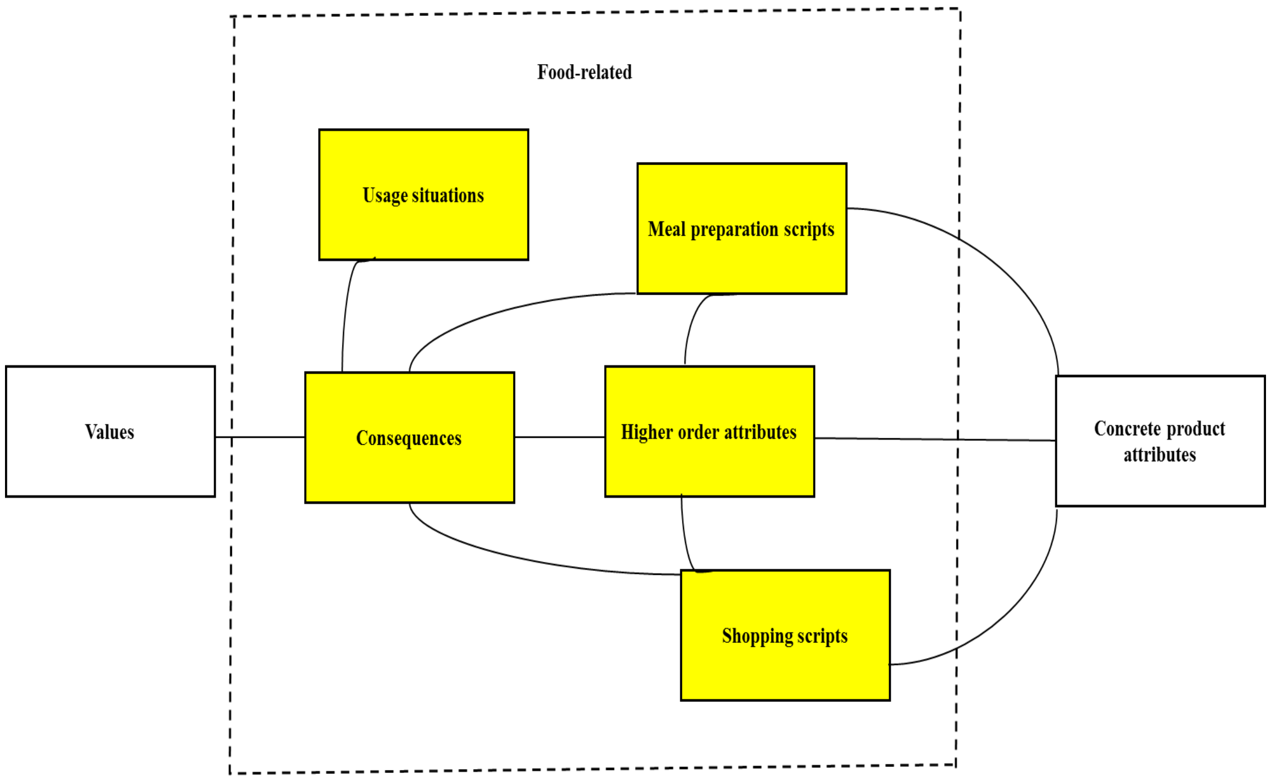


Figure 2.3: A Cognitive Structure Model for Food-Related Life Style

Source: Brunsø & Grunert (1995, pp. 476).

The FRL model (i.e. Figure 2.3) has since been used in a variety of food related literature (e.g. Grunert et al. 2011; Nie & Zepeda 2011; Cembalo et al. 2015). The FRL model is a valid tool which examines a range of cognitive structures in the form of "scripts" (e.g. *shopping, meal preparation, higher order attributes, usage situations and desired consequences*) which are found to influence food lifestyles (Grunert, Brunsø & Bisp 1993, pp. 476). It is also applicable within diverse cultural settings thereby enabling extensive analysis of diverse socio-cultural situations (Grunert, Brunsø & Bisp (1993). Each cognitive script proposed by the FRL model (i.e. Grunert, Brunsø & Bisp 1993, pp.476) is summarised below:

1. Shopping: Relates to how individuals shop for food (e.g. impulse buying or extensive deliberation; attitude towards advertising; specialty shops; importance of product information etc.).

2. Meal preparation: Refers to how bought food items are transformed into meals (e.g. preparation time, social event, family involvement etc.)

3. Higher-order product attribute: Refers to the specific attributes associated with a food item (e.g. healthy, nutritious, natural, and convenient).

4. Usage situation: Relates to how food is perceived through-out the day (e.g. how is food perceived when eaten alone versus with family or friends?).

5. Desired consequences: Refers to expectations and/or relative importance of the meal (e.g. is nutrition more important than eating in a social gathering?)

The "scripts" as presented in the FRL model is applicable to this study as it examines a wide range of personal and situational factors which are likely to influence the ways in which people with diabetes plan, organise and carry out their daily dietary activities. According to Grunert, Brunsø & Bisp (1993), researchers using this construct will not only be able to examine the cognitive behavior of their intended subjects but they will likely be able to determine whether individual cognitive behaviour influences their daily lifestyle actions and habits. Therefore, by examining the FRL construct in this study the researcher will likely be able to examine whether cognitive behaviour (e.g. self-efficacy or risk perception) is reflected in lifestyle habits such as cooking, shopping etc. to either promote or hinder the likelihood of dietary compliance amongst people with diabetes.

As outlined earlier, understanding food behaviour is complex as there are a wide range of factors which influence dietary lifestyles amongst people with diabetes (Bhattacharya 2012; Falguera et al. 2012; Hinder & Greenhalgh 2012). For example, apart from individual cognition, environmental factors such as cultural diversity, socio-economic conditions and demographic characteristics also influence food lifestyle amongst people with diabetes (Boyland & Whalen 2015; Werle, Trendel & Ardito 2013). Other external cues such as food advertisements have also been found to influence food lifestyles amongst people with diabetes (Boyland & Whalen 2015; Carins & Rundle-Theile 2013; Dillen, Papies & Hofmann 2013). For example, Boyland & Whalen (2015) report that the persuasive and engaging nature of food advertising can act to overpower an individual's ability to participate in dietary compliant lifestyles. Similarly, the FRL advertising cognitive script is adapted as one of the items in this study to examine whether advertising has a bearing on food compliant behaviour amongst people with diabetes.

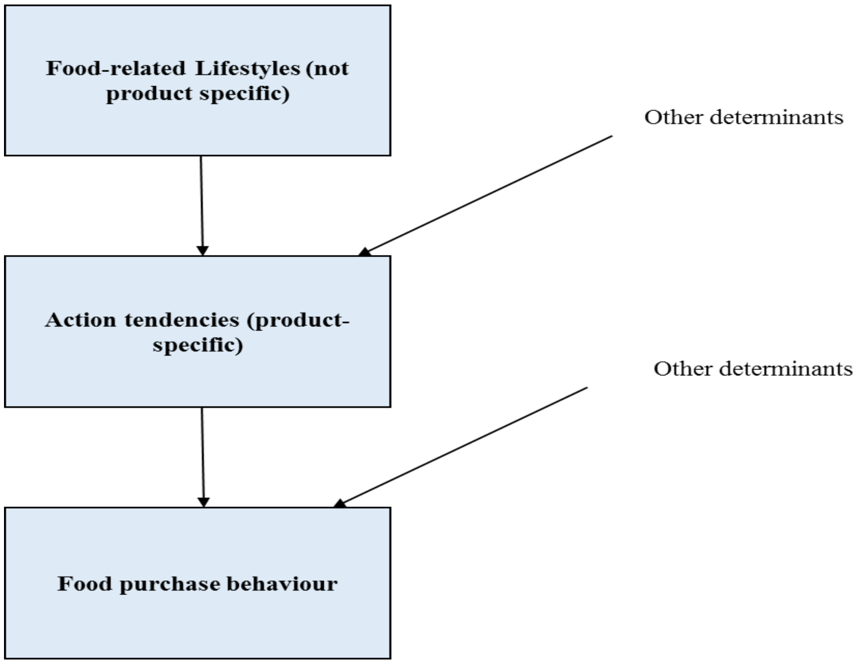


Figure 2.4: Food-related lifestyle, action tendencies and behaviour

(Source: Grunert, Brunsø & Bisp's (1993, pp.16)

Figure 2.4, illustrates the various inter-personal and external factors which are likely to influence food related lifestyles amongst individuals. The causal model presented in Figure 2.4, shows the complex nature of food lifestyle behaviour and may be the reasons why it is still not well understood by researchers (Falguera et al. 2012; Hinder & Greenhalgh 2012). Table 2.6, below provides further evidence showing the multiple factors that likely influence food lifestyles amongst people with diabetes and shows that food related lifestyles is multi-dimensional, complex and situational. However, the examination of food lifestyles is still important as eating behaviour to a large extent has been found to influence the growth of diabetes and its related health risks (Alkerwi et al. 2012; Australian Institute of Health and Welfare 2013). Rothman et al. (2009 pp. S1), emphasizes this importance by stating, "*Thus, conversations must begin to occur between investigators who are examining questions regarding food choice and eating practices but are approaching the issue from different perspectives and from different levels of analysis. Moreover, this conversation must facilitate the integration of research into practice."*

Therefore, a deeper understanding of the FRL construct in this study may provide evidence of its possible role on the likelihood of dietary compliance amongst people with diabetes. Most importantly, the outcomes from the FRL analysis would possibly provide information for the purpose of introducing dietary lifestyle modification initiatives targeted at people with diabetes (George et al. 2016; Sussman et al. 2015). As such this study is relevant as it may provide further opportunities to investigate complex constructs such as the FRL to likely close research gaps and contribute to both literature and practice within the context of this research scenario.

Table 2.6: Extrinsic factors influencing food lifestyle behaviour amongst people with diabetes

No.	Extrinsic factors influencing food lifestyles	Literature	Summary of Key Findings
1.	Gender	Conklin et al. (2014); Dyson et al. (2011); Mathew et al. (2012)	- Males: concerned about how food compliance impacts their lifestyle & find food lifestyle modification an inconvenience. - Females: concerned about weight gain and how food impacts their health
2.	Culture & Ethnicity	Bhattacharya (2012); Falguera et al. 2012 Hinder & Greenhalgh (2012); Nam et al. (2011); Werle, Trendel & Ardito (2013)	- Culture influences individual's beliefs, attitudes and behaviours related to food choice and consumption. - Inter-cultural differences between individuals can impact food decisions
3.	Age	Alkerwi et al. (2012);Bibeau et al. (2012); Lamichhane et al. (2012)	- Younger individuals/youths found to consume unhealthy food choices as compared to adults due to peer pressure. - Adults seen to make poor nutritional choices/longer experience with food-habits harder to change - prefer taste to nutritional value.
4.	Income (Price/Cost)	Dinca-Panaitescu (2011); Bibeau et al.(2012); Fukunaga et al. (2011); Hinder & Greenhalgh (2012);Igumbor et al. (2012); Islam et al. (2014); Seligman et al. (2012)	- Individuals within lower income brackets tend to purchase or consume unhealthy food options; - Food choices are made on the grounds of cost rather than nutritional value. - Unhealthy options cheaper and easily available. - Prevalence of diabetes & increased diabetes related health risks linked to lower income groups.

5.	Education	Nam et al. (2011); Shiotz et l. (2012)	- Educated individuals were found to choose healthier food options. - Knowledge does not necessarily lead to food risk-reducing behaviour.
6.	Household composition	Bilotta et al. (2012) Conklin et al. (2014); Holsten et al. (2012); Ng et al. (2014); Rasmussen et al. (2011)	- Those living in households with children found it difficult to maintain dietary compliance due to presence of sweet snacks for children & were tempted to eat sweet snacks - Mothers with Type 1 diabetes found it difficult to manage their diets as they often had to finish their children's left over food. - Households with children purchased less caloric foods as compared to households with adults only. - Those living alone were unable to manage their diet and or control of their blood sugar levels.
7.	Geography/location	Basu et al. (2013); Igumbor et al. (2012).	- Location and easy reach of stores/fast-food outlets influences unhealthy food lifestyles.
8.	External cues: Media/Advertising	Boyland & Whalen (2015); Carins & Rundle-Theile (2013); Dillen, Papies & Hofmann (2013)	- Advertising & other media channels are likely to encourage poor food lifestyles through persuasive and aggressive advertising of unhealthy food options. - Food advertising promoting snack food or processed food as convenient, cheap and easy to prepare may encourage poor food lifestyle habits. - Food advertising can trigger appetitive cues and thus hamper healthy dietary self-regulation lifestyles amongst people with diabetes.

2.5.4 Social Support Groups Usage

The “Buffer” Theory (i.e. Antonovsky 1974; Caplan 1974; Cassel 1976) and the Main or Direct Effect Theory (i.e. Thoits 1985) are major social support theory widely used in social support research. The “Buffer” theory (i.e. Antonovsky 1974) proposes that social support acts as a buffer to protect individuals from life stressors. Whilst the Direct Effect Theory (i.e. Thoits 1985) posit that social support provides an overall beneficial effect of support irrespective of stressful situations. Additionally, the “Buffer” Theory (i.e. Antonovsky 1974) examines the effects of stressful situations on the individual’s mental state or psychological well-being. For example, individuals who are unable to cope with a challenging situation tend to exhibit high levels of stress which in turn may negatively impact health and well-being (Antonovsky 1974: Fisher et al. 2014). Meanwhile, the Direct (Main) Effect Theory (Thoits 1985) assesses the level of an individual’s integration with a social support network and its effects on health and well-being. In this case individuals with high levels of social support are likely to be in better health than those with none or limited social support (Thoits 1985). Cohen & Wills (1985), suggest that both theories are important as they provide a framework to better understand health behaviour and for the application of health and well-being initiatives.

Studies over time (e.g. Callaghan & Morrisey 1993; Song et al. 2014; Strom & Egede 2012; Waki et al. 2015) also support the view that on-going interpersonal relationships are necessary in order for individuals to meet a variety of psycho-social, biological and functional needs. Shumaker & Brownell (1984 pp. 13) defines social support as “*an exchange of resources between at least two individuals perceived by the provider or the recipient to be intended to enhance the well-being of the recipient.”* Cobb (1976) defines social support as a function to provide information to individuals; that the individual is loved, cared for, valued and belongs to a mutually obliging social interaction network. Cohen & Wills (1985) supports Thoists (1985) view in that individuals with partners, friends and family who provide psychological and other resources are in better health compared to those with fewer social support mechanisms.

Social support groups are a multi-dimensional construct involving a number of support categories such as emotional, tangible, informational and interpersonal (Strom & Egede 2012). Callaghan & Morrisey (1993, pp. 203-205) page number categorises social support as

- *Structural*: e.g. marital status, size of support network, frequency of social interaction and;
- *Functional*: e.g. offering emotional, tangible or informational support.

Generally, social support groups are considered as *formal* [e.g. physicians, medical representatives, therapists etc.] or *informal* [e.g. family, friends, community etc.] (Song et al. 2014; Strom & Egede 2012). Whilst social support groups are considered a structural environmental factor (i.e. Schiøtz e al. 2012; Song et al. 2014), on the other hand, social support usage is generally guided by cognitive processes (Fisher et al. 2015). Hence, decisions guiding social support usage can vary ranging from individual perceptions, attitudes, beliefs and experiences concerning support (Song et al. 2014; Strom & Egede 2012). Many studies (Fisher et al. 2015; Miller & Di Matteo 2013; Miller et al. 2014) have shown that human cognition plays a vital role in social support usage. Psycho-social theorists (e.g. Bandura 1986; Frewer et al. 1996) propose that individual cognition are crucial aspects of human forethought which guide the initial decisions taken by individuals to either accept or reject a situation and/or action (e.g. decisions to use or reject social support groups). Furthermore, as social support usage has been found to improve health outcomes amongst people with diabetes (e.g. Ku & Kegels 2015; Margaret et al. 2016), it is equally important to examine the factors which may also deter its usage.

Researchers (e.g. Goodall et al. 2015; Holt & Kumar 2015; Margaret et al. 2016) report that when formal social support systems are used in conjunction with informal social support, improvements in both self-management regimens and medical outcomes are found amongst people with diabetes. Similarly a range of psychological issues such as emotional distress, depression and worry is improved with social support usage amongst people with diabetes (e.g. Baek, Tanenbaum & Gonzalez 2014; Wardian & Sun 2014). Additionally, Schiøtz et al. (2012) report that formal clinical consultation constitutes approximately less than two hours of consultation per patient annually. This may hinder people with diabetes from receiving optimal diabetes care especially if they require advice, counselling or emotional support from their physicians (Piette et al. 2014; Schiøtz et al. 2012; Vest et al. 2013). Hence, it is recommended that people with diabetes seek a range of additional social support systems to help them cope with their multiple needs (Baek, Tanenbaum & Gonzalez 2014). A number of studies have also shown that social support usage serves to mediate improved psychological and physical well-being amongst people with diabetes (Piette et al. 2014; Schiøtz et al. 2012; Tovar et al. 2015).

Although studies (e.g. Baek, Tanenbaum & Gonzalez 2014; Ku & Kegels 2015; Piette et al. 2014) have demonstrated that a greater level of social support usage correlates with better diabetes self-management outcomes, other studies (e.g. Chew, Khoo, & Chia 2015**;** Fisher et al. 2014; Muchiri, Gericke, & Rheeder 2016; Simmons et al. 2015) indicate otherwise. Similarly, mixed-results are also found in a number of systematic reviews showing positive outcomes (e.g. Heinrich, Schaper, & de Vries 2015; Strom & Egede 2012) and negative outcomes (e.g. Miller & Di Matteo 2013; Jang & Yoo 2012) on usage of social support groups and its influence on health and well-being amongst people with diabetes. Therefore, there are some uncertainties with regards to whether usage of social support groups influences self-management outcomes including dietary compliance amongst people with diabetes. This reinforces the need for studies such as this to close the research gaps found so far, specifically to examine to what extent this particular factor influences food choice behaviour amongst people with diabetes. Table 2.7, below highlights the diverse findings from a range of studies showing the relationship between social support group usage on both diabetes therapy and behavioural health outcomes.

Table 2.7: Major Findings from Literature on the Relationship between Social Support Group (SSG) usage and Diabetes Therapy & Behavioural Health Outcomes

No.	Literature	Major Findings on the Relationship between SSG usage and Diabetes Therapy & Behavioural Health Outcomes		Study Findings/Remarks
		****(✓) positive outcomes**	*****(X) negative outcomes**	
1.	Ku & Kegels (2015)	✓		**Study aim**: A cross-sectional study conducted in Luzon, Philippines, which measured factors that are associated with self-management practices of type 2 people with diabetes (T2D) from two different health systems. **Results**: T2D who received more supportive formal health care systems positively associated with improved self-care behaviour than those with limited formal health care.
2.	Kamimura et al. (2014)		**X**	**Study aim**: The study examined diabetic and non-diabetic free clinic patients and family member's outcomes upon receiving diabetes education programs. **Results:** People with diabetes who attended diabetes education programs or visited the diabetes clinic showed negative outcomes for diabetes self-efficacy.
3.	Miller et al. (2014)	✓		**Study aim:** A randomized controlled trial with two parallel interventions was introduced to examine comparison of a "Mindful Eating Intervention Program" to a Diabetes Self-Management Intervention amongst adult T2D (3 month duration) **Results**: Significant improvements were found in a number of diabetes self-care behaviour such as glucose levels, self-efficacy and diet with those who participated in both treatment programs.
4.	Fisher et al. (2014)		**X**	**Study aim:** The study examined the sources of diabetes distress (DD) in adults with T1D. **Results** indicate that firstly, people with diabetes felt higher levels of DD from family and friends as these support mechanisms were found to either over-involve ("policing") or under-involve with their diabetes support. Secondly, formal support (i.e. Physicians) generated high DD levels amongst the TID, due to insufficient help, support, and understanding from the diabetes physician and health-care team

5.	Gao et al. (2015)	✓		**Study aim:** The study examined the effects of self-care, self-efficacy, social support on glycaemic control in adults with T2D in Taiwan. **Results** show only social support and physician support were correlated with each other, suggesting that physicians are likely a main source of participants' social support. Physician support was also positively correlated with improved glycaemic levels.
6.	Simmons et al. (2015)		**X**	**Study aim:** The impact of community based peer support (CBPS) in T2D: a cluster randomised controlled trial of individual and/or group approaches was examined. **Results**: The CBPS undertaken over 8–12 months was associated with a small improvement in blood pressure but no other significant outcomes for self-efficacy and other diabetes related therapy.
7.	Baek, Tanenbaum & Gonzalez (2014)	✓		**Study aim**: Examined diabetes burden and diabetes distress (DD) and the buffering effect of social support in adults with T2D. **Results**: Greater support satisfaction was significantly associated with lower DD after controlling for burden, which according to the researchers suggests the findings support the stress-buffering hypothesis and that social support may protect against diabetes distress.
8.	Kirwan, Vandelanotte, Fenning & Duncan (2013)	✓	***X**	**Study aim:** A randomised controlled trial was introduced to examine diabetes self-management using smartphone application intervention for adults with type 1 people with diabetes (T1D) in Australia. **Results:** Significant improvements in blood glucose control were found in the intervention group compared to the control group. ***However, no significant changes were found in either group in relation to self-efficacy, self-care and quality of life over time.**
9.	Wardian & Sun (2014)	✓		**Study aim:** Hierarchical regression was conducted in four stages to examine factors associated with diabetes-related distress (DDS) and its implications for diabetes self-management. **Results:** Significant factors related to lower DDS were older age, lower BMI, higher self-efficacy, higher levels of health care provider support, and a healthy diet.
10.	Muchiri, Gericke, &		**X**	**Study aim**: A randomised controlled trial was introduced to examine the effect of a nutrition education (NE) programme on clinical status and dietary behaviours of adults with T2D in a resource-limited setting in South Africa.

	Rheeder (2016)			(The control group received education materials, whilst the intervention group received the same education materials and participated in eight weekly (2-2·5 h) group nutrition education sessions and follow-up sessions). **Results:** The NE programme did not significantly improve glycaemic control or other clinical outcomes. Significant improvements were found in the reduction of starchy food intake, however, the NE did not improve vegetable, fruit intake and improving meal balancing in the subjects.
11.	Waki et al. (2015)	✓		**Study aim**: To examine the support of ICT Technology (i.e. DialBetics - a Multimedia Food Recording Tool with FoodLog Smartphone-Based Self-Management) for T2D. **Results:** After a 3 month trial the technology support was found to be an effective tool with positive health and diet modification outcomes amongst the T2D participants.
12.	Lee, Lim & Koh (2015)		**X**	**Study aim**: Examines stigma in a group of workers receiving care in a Singapore diabetes outpatient clinic amongst T2D. **Results**: More than half of respondents cited work as a barrier to optimal diabetic control, according to the researchers, suggesting that poor workplace community support is a likely barrier to diabetes care. (Out of 125 participants who were recruited to participate in the survey, 53% (66) of respondents reported that work affected their diabetes management).
13.	Piette et al. (2014)	✓		**Study aim**: A randomized trial using a guided diabetes peer-support intervention program on T2D was examined. **Results**: Participants receiving increased peer support had improved glycaemic control and self-care.
14.	Chew, Khoo, & Chia (2015)		**X**	**Study aim**: A cross-sectional study conducted at a university primary care clinic in Kuala Lumpur, Malaysia to examine the prevalence of social support and its association with glycaemic control amongst T2D. **Results:** Social support was not associated with glycaemic control with adult T2D in the primary care setting
15.	Vaccaro et al. (2014)	✓		**Study aim**: A cross-sectional study was introduced to investigate how ethnicity, perceived family/friend social support (FSS), and health behaviors are associated with diabetes self-management (DSM) among T2D minorities. **Results**: Higher FSS scores were associated with higher DSM scores, independent of ethnicity, perceived (FSS) was associated with positive DSM among three ethnicities (i.e. Cuban, Haitian & African-Americans)

16.	Schiøtz et al. (2012)	✓	***X**	**Study aim:** Investigated the relationship between structural and functional social support (SS) and patient activation, diabetes-related emotional distress, perceived diabetes care, self-management behaviour and HbA(1c) levels amongst T2D (Danish population). Self-administered questionnaires were administered (N=2572) using Tobit and logistic regression models to test associations between constructs. **Results**: Frequent contact with family & friends was associated with more positive scores for a number self-management behaviours. ***(However, poor glucose control was found amongst cohabitating persons, suggesting barriers for SS)**
17.	Henry et al. (2013)		**X**	**Study aim:** The study investigated spousal undermining of dietary regimen in 129 patients with type 2 diabetes. **Results**: A total of 40 (i.e. 31%) participants reported that their spouses tempted them with forbidden foods; 15 (i.e. 12%) reported that their spouses conveyed disregard for their diabetic diet. Spousal tempting was associated with worse dietary adherence and spousal disregard with worse non-dietary adherence.
18.	Trief et al. (2013)	✓		**Study aim:** Examined the tele-medicine 5 year outcomes from the "IDEATel" project amongst Hispanic American and African-American People with diabetes. **Results**: Self-reported adherence improved for the treatment group compared to usual care. The tailored telemedicine intervention was effective in achieving improved adherence to diabetes self-care.
19.	Seiffge-Krenke et al. (2013)		**X**	**Study aim:** A longitudinal study was introduced to examine if restrictive parenting influences metabolic outcomes in German adolescents with diabetes. **Results**: Higher restrictive parenting correlates with poor diabetes support and decline in metabolic outcomes (i.e. poorer blood glucose outcomes).
20.	Wu et al. (2013)	✓		**Study aim:** A cross- sectional survey was introduced to examine self- efficacy, self-care behaviour, anxiety, and depression in Taiwanese with type 2 diabetes. **Results:** Participants who received health education**,** made regular clinical visits, underwent treatment and did not smoke demonstrated a high self-efficacy score.

+Note:
*****Positive associations are denoted by: (✓)***
******Negative and/or weak associations are denoted by: (X)***

The mixed results summarised in Table 2.6, shows that there is still no clear evidence to conclusively support the notion that usage of social support groups positively influence diabetic therapy and/or diabetic behavioural outcomes. Similarly, researchers (e.g. Miller & Di Matteo 2013; Strom & Egede 2012) have pointed out that the mechanisms by which social support group usage operates in is not yet well understood and therefore further empirical evidence is needed to address these uncertainties.

The complexity surrounding social support usage is further compounded with the influence of external factors such as socio-demographic factors (e.g. age, gender, income etc) which are also thought to influence social support group usage amongst people with diabetes (Nadia Islam et al. 2014; Song et al. 2014; Vest et al. 2013). Callaghan & Morrisey (1993, pp. 208) states that "*there is evidence which suggests that the effects of social support on health may be determined by age, sex, culture and personality traits."* Therefore, it would appear that social support: may be delivered through multiple channels; may provide different experiences for individuals; and may be perceived differently depending on situations and circumstances surrounding people with diabetes (i.e. Song et al. 2014; Strom & Egede 2012).

Hence, analysis of the social support groups usage construct in this study is important as it to provide evidence of the role that social support plays in influencing the likelihood of dietary compliance amongst people with diabetes. Additionally, outcomes from the social support analysis in this study will provide useful information to improve social support delivery mechanisms amongst various formal and informal social support groups (e.g. physicians, family, friends etc.,) for the overall betterment of the health and well-being amongst people with diabetes (Carins & Rundle-Thiele 2013; George et al. 2016)

2.6 Social Marketing

Social marketing is an approach to develop and promote campaigns (e.g. health, environment, social change etc.) aimed at targeting audiences to voluntarily accept, reject, modify or abandon behaviour for the benefit of individuals (Andreasen 1995; 2002; Carins & Rundle-Thiele 2013; Lefebvre 2000). Pirani & Reizes (2005) explain that social marketing processes include formative research, audience segmentation, marketing mix development and evaluation. According to Andreasen (2002), social marketing roots were first developed from the writings of sociologist i.e Webe (1951). Following this, social marketing principles within marketing were developed by Kotler & Levy (1969); Kotler & Zaltman (1971). These early developments of social marketing gradually became springboards for its application in the field of academia and in practice (Andreasen 2002; Harvey 1999; Manoff 1975).

Social marketing is unique to other conventional marketing approaches as it is mainly used for the benefit of society rather than for financial gain (Andreasen 1995; 2002; Carins & Rundle-Thiele 2013; Lefebvre 2000). Some of social marketing's earliest practical application circa 1980's-1990's, have been found in disease prevention programs such as agriculture; AIDS awareness campaigns, and educational development programs amongst others (Andreasen 2002). Following which, social marketing campaigns targeting behavioral change were introduced such as anti-smoking, anti-drunk driving and health related campaigns (Andreasen 2002; Harvey 1999; Manoff 1975). Recently modern applications of social marketing include the use of internet based platforms such as Facebook, blogs and mobile technology to encourage positive health behaviour and/or lifestyle modification amongst others (Choi & Dinitto 2013; Neves, Amaro & Fonseca 2013; Pal et al. 2013).

Social marketing initiatives not only benefit society at large but also contribute towards policy and practice (Dunbar et al. 2014). For example, between the years of 2004-2006 the Australian state of Victoria in collaboration with the AusDiab program for Type 2 diabetes secured important policy changes in terms of healthcare reforms which benefitted people with diabetes in the region (Dunbar et al. 2014). Other initiatives in Australia such as the Life! Prevention program and AUDRISK provided key frameworks for policy changes to improve health and well-being amongst people with diabetes and the community (Dunbar et al. 2014). Importantly, positive correlations have been found between social marketing campaigns and health outcomes (Dunbar et al. 2014; George et al. 2016). For example, George et al. (2016) introduced a healthy eating campaign to counter obesity and diabetes targeted at African Americans and Hispanic adults living in two lower income communities in the U.S (i.e. Central Brooklyn and East New York). The outcomes of these studies revealed that the healthy eating campaign was positively associated with increased motivation to improve diet and overall health behaviour amongst the targeted group (George et al. 2016). Meanwhile, on a global scale, social marketing initiatives such as the Diabetes Self-Management Education (DSME) programs have been introduced for the purpose of educating and improving self-management practices amongst people with diabetes (Dunbar et. al. 2014; Patra et al. 2014).

However, whilst such initiatives have been effective in some cases, researchers (e.g. Guariguata et al. 2014; Rashwani et al. 2014) opine that the growth and scale of social marketing strategies to promote positive health lifestyle and behaviour modification amongst people with diabetes may not be sufficient. The main contention for this view is that there seems to be little improvement in lifestyle or behaviour modification outcomes amongst individuals judging from the alarming progression of diabetes and its related health risks up to date (IDF 2015; Rashwani et al. 2014). Additionally, poor diabetes management also incurs growing costs and burdens to society due to diabetes related health risks such as macular disease, limb amputations and kidney failure amongst others (Diabetes Association 2015). It is therefore crucial to educate and inform society on the importance of positive lifestyle modification behaviour to limit the advancement of diabetes and its related health risks. Experts (e.g. Conklin et al. 2014; Pechmann et al. 2016; Nurkkala et al. 2015) propose that a multi-pronged approach taking into consideration formal therapy, social marketing initiatives and informal support systems are generally effective measures which most likely limit the growth of diabetes and its related health burdens.

Unfortunately social marketing efforts are at times hindered by a number of extrinsic and intrinsic factors (Carins & Rundle-Theile 2013). One such extrinsic barrier faced by social marketers is the strong competition from commercial advertisers who are potentially vying for the same target audience (Andreasen 2002; Carins & Rundle-Theile 2013). For example, Carins & Rundle-Thiele (2013) report that in Australia approximately AUD $400 million is spent by commercial advertisers on food advertising per year, one-third of which is spent promoting unhealthy foods such as processed confectionery foods, sugary deserts, sugary biscuits and processed canned foods amongst others. Most commercial advertisers with higher advertising budgets are likely able to afford visually appealing and attractive advertisements on a larger sale (Boyland & Whalen 2015; Carins & Rundle-Theile 2013; Pechmann & Catlin 2016).

Comparatively, social marketing organisations may be afforded lower budgets which may limit opportunities for aggressive or appealing campaigns (Carins & Rundle-Theile 2013). Unfortunately, commercially attractive food advertisements may have a strong bearing on individual food consumption by manipulating their attitudes, beliefs and reactions towards either healthy or unhealthy food choices (Major et al 2014; Pechmann & Catlin 2016). Additionally, unhealthy food advertisements may tempt people with diabetes to habitually consume unhealthy food items, which in the long run may be detrimental to the health and well-being of people with diabetes (Boyland & Whalen 2015; Boyland et al. 2016).

Some studies (e.g. Llauradó et al. 2015; Major et al. 2014) show that commercial advertisements which stigmatizes individuals such as by ridiculing weight gain have also been found to impede positive health goals amongst individuals. This is because advertising which promote negative stereotypes affects the emotional state of individuals such as causing worry, distress, low self-efficacy and fear of rejection, all of which are likely to impede positive lifestyle modification (Major et al. 2014; Pechmann & Catlin 2016). For example, Major et al. (2014) explains that whilst stigmatising advertisements should ideally motivate those (i.e. overweight individuals) who fear ostracism to in fact have better diet control, their study indicate otherwise. These findings show that the actions by commercial advertisers not only hinder social marketing health initiatives but may seriously jeopardise positive dietary efforts and practices amongst people with diabetes (Boyland & Whalen 2015; Carins & Rundle-Theile 2013; Major et al. 2014; Pechmann & Catlin 2016).

Individual cognition is also found to be a likely barrier towards successful social marketing campaigns and may in fact be one of the major challenges for social marketers to contend with (Llauradó et al. 2015; Nurkkala et al. 2015; Pechmann & Catlin 2016). This is because whilst social marketing campaigns are generally effective in creating public awareness, on the other hand they do not necessarily have a huge impact on modifying the attitudes and behaviour of the target audience (Llauradó et al. 2015; Major et al. 2014). For example, a number of studies (i.e. Boyland & Whalen 2015; Dunbar et al. 2014; Major et al. 2014; Nurkkala et al. 2015) indicate that individuals with low-self efficacy, poor self-determination or who are unwilling to modify behaviour may not respond to or act upon lifestyle modification initiaives. Therefore, the challenges associated with fully comprehending the intricate non-tangible aspects of human cognition makes it difficult for social marketers to deliver effective social marketing campaigns aimed at the various needs and wants of people with diabetes (Llauradó et al. 2015; Major et al. 2014).

The aforementioned barriers to effective social marketing initiatives show that much is still needed to both understand and improve social marketing policy and practice for diabetes related issues. This suggests there is an urgent need to address the barriers to effective social marketing efforts so that they can contribute towards the betterment of health and well-being amongst people with diabetes. Regardless of the aforementioned barriers, many researchers agree (e.g. Dunbar et al. 2014; George et al. 2016; Pechmann et al. 2016) that social marketing initiatives are still considered an important mechanism to help improve self-management and lifestyle modification practices amongst people with diabetes. Additionally, another important factor found to improve social marketing initiatives is the integration of research into practice (i.e. Mayer & Sparrowe 2013; Winett 1995). Furthermore, social marketing proponents (e.g. Lefebvre 2000; Luca & Suggs 2013; Winett 1995) agree that effective social marketing campaigns tend to integrate theories and models for the purpose of improved health initiatives.

Taking on this cue, this study, integrates key psycho-social theories (e.g. Antonovsky 1974: Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993; Thoits 1985) into the framework of this study to possibly allow the formulation of sustainable future social marketing campaigns and communication approaches aimed at positive dietary modification behaviour amongst people with diabetes. The following discussion i.e. Section 2.7, provides further detail and explanation of the concept of theory integration into practice. This section will provide evidence of how theory can be an essential component for practitioners to consider when building frameworks for social marketing initiatives and strategies.

2.7 Integrating Theories within the Context of Social Marketing

Theories and models serve as important frameworks for the design and evaluation of intervention programs (Glanz & Rimer 2005; Hastings 2007; Luca & Suggs 2013). Additionally, scholars (Lefebvre 2000; Mayer & Sparrowe 2013; Winett 1995) find that the application of one theoretical perspective to a study may limit a deeper understanding of a particular phenomenon. Therefore, experts (e.g. Mayer & Sparrowe 2013) suggest the integration of two or more theoretical perspectives to provide richer insights into a field of study. From a practical perspective, theory integration will enable social marketers to develop sustainable health promotion and disease prevention initiatives amongst others for the benefit of a target audience (Lefebvre 2000; Mayer & Sparrowe 2013; Winett 1995).

In order to integrate two or more theories and/or models there needs to be a level of commonality between the theories in which a similar explanatory account is shared between the theories (Mayer & Sparrowe 2013). In the context of this study, four streams of Psycho-Social theoretical perspectives (i.e. Self-Efficacy Theory-Bandura (1986); Food Risk Perception Theory-Frewer et al. 1996); Food Related Lifestyle Model-Grunert, Brunsø & Bisp (1993) and Social Support Theory-Antonovsky (1974); Thoits (1985) are integrated to explain the likelihood of dietary compliance amongst people with diabetes within the context of social marketing. Combining theoretical perspectives from these diverse perspectives will allow for a richer understanding of the likelihood of dietary compliance amongst people with diabetes than what each theory could offer independently, thus providing better quality social marketing strategies and implementation programs for diabetic related campaigns and communication (Lefebvre 2000; Mayer & Sparrowe 2013; Winett 1995).

According to Mayer & Sparrowe (2013), four main approaches to theory integration can be applied as follows:-

1. Single phenomenon with two or more theoretical perspectives;
2. One phenomenon with seemingly disparate theoretical perspectives;
3. Applying one theory to the domain of another theory;
4. Streams of research sharing a similar explanatory account.

For the purpose of this study the first approach i.e. the single phenomenon with two or more theoretical perspectives is applicable. In this case, the single phenomenon examined by all streams of research is the dependent variable namely, the likelihood of dietary compliance. According to Mayer & Sparrowe (2013) there are two key methods of integrating theory within this approach:-

- Firstly, the researcher takes two or more theoretical perspectives to explain the same phenomena using different viewpoints from various theories;
- Secondly, in using this approach a common dependent variable amongst the theoretical perspectives is needed to operationalize the integration of the intended theories.

The following summary provides an overview of the conditions suitable for theory integration within the context of this study as suggested by Mayer & Sparrowe (2013):-

1. All four streams of research share the same single explanatory account in terms of investigating cognitive factors (i.e. independent variables) on the likelihood of dietary compliance (i.e. dependent variable). In this case each theory provides evidence of the influence of cognitive variables on the dependent variable.
2. In this case each theory provides evidence of the influence of cognitive variables on the dependent variable. Table 2.8, below provides a summary of this condition with regards to this study:

Table 2.8: Explanatory account shared by each theory

Key Psycho-Social Theory	Explanatory Account of Each Research Stream
Self-Efficacy Theory (Bandura 1986)	Self-efficacy is a cognitive construct involving self- judgement of an individual's capacity to accomplish goals; involves the initiation and motivation to modify behaviour for health and well-being.
Food Risk Perception Theory (Frewer et al. 1996)	Food Risk Perception is a cognitive construct which involves the judgement of food based on individual perceptions of food risk and its impact on food choice and food compliant behaviour.
Food Lifestyle Model (Grunert, Brunsø & Bisp 1993)	Food related lifestyle involves cognitive behaviour such as habits, thoughts, beliefs and attitudes towards food and its relation to daily living such as cooking, shopping, meal preparation, socialisation etc.
Social Support Theory (Antonovsky 1974; Thoits 1985)	Social support usage influences health behaviour through a range of psycho-social factors such as perception, self-efficacy, emotional status amongst others & at the same time human cognition may also influence the decision to either use or reject social support usage.

3. These streams of research fall within the domain of social-psychology and have the same elements of discussion (i.e. both individual cognitive factors and wider socio-demographic factors are found to influence health behaviour) across them on the dependent variable of the likelihood of dietary compliance.

4. The integration of theory rests on the over-arching major Psycho-Socio Theories of:

> Social Cognition Theory- i.e. Bandura (1986); Bandura & McClelland (1977); Risk Theory- i.e. Kahneman, Slovic & Tversky (1982); Lifestyle Theory- i.e. Weber (1949); Kelly (1955); Adler (1927); and Social Support Theory- i.e. Antonovsky (1974) Thoits (1985) and other relevant sub-theories of;
> Self-Efficacy Theory- i.e. Bandura (1986); Food Risk Perception Theory-i.e. Frewer et al. (1996); Food Related Lifestyle Model-i.e. Grunert, Brunsø & Bisp (1993).

Taken together the integration of the aforementioned theories provides an in-depth understanding of the relationship between individual cognition and wider social contexts and its possible role on the likelihood of dietary compliance amongst people with diabetes.

Additionally, Mayer & Sparrowe (2013) explains that the integration of theory will enable researchers to elicit novel insights, answer relevant research questions and modify concepts where necessary thus providing for optimum outcomes for policy and practice. Similarly, Lefebvre (2000), suggests that social marketers need to expand their knowledge and should be encouraged to use divergent theoretical frameworks for the betterment and advancement of social marketing practice and policy. Social marketers generally adopt traditional marketing mix principles (i.e. product, price, promotion, place & positioning) in their practice (Andreasen 1995; 2002; Carins & Rundle-Thiele 2013; Lefebvre 2000). However, the adoption of traditional commercial marketing strategies may not be applicable for some social marketing initiatives due to the non-commercial nature of its practice (Carins & Rundle-Thiele 2013). Additionally, the presence of non-tangible factors such as emotions, feelings and attitudes of the target market is a challenge to examine (Carins & Rundle-Thiele 2013; Lefebvre 2000). Thus, theory integration adopted from sound psycho-social perspectives and its application within the marketing mix strategies will provide a strong framework for the understanding and development of social marketing health and disease prevention initiatives (Andreasen 1995; 2002; Carins & Rundle-Thiele 2013; Lefebvre 2000).

The summary below provides an overview of the marketing mix strategies within the context of social marketing which is applicable for behaviour and lifestyle modification initiatives including food modification behaviour amongst people with diabetes.

- **Product**: Apart from pamphlets and other such promotional strategies the product in social marketing often includes a solution to a problem and the benefits individual's value from social marketing campaigns (Andreasen 1995; 2002; Carins & Rundle-Thiele 2013; Lefebvre 2000; Winett 1995).
- **Price**: generally includes intangible costs such as embarrassment, inconveniences and stress associated with behavioural modification processes (Grier & Bryant 2005; Winett 1995).
- **Place**: includes accessibility of services, physical location of support organisations, comfort etc. (Andreasen 1995; Grier & Bryant 2005; Winett 1995).
- **Promotion**: refers to a variety of strategies to attract the intended audience through appealing advertising, public relation announcements and printed materials amongst others (Carins & Rundle-Thiele 2013; Lefebvre 2000).

The benefits of theory integration within this study is presented in Table 2.9 below, whereby the integration of key theoretical psycho-social perspectives (i.e. self-efficacy, risk perception, food related lifestyles and social support group usage) is adopted into key social marketing strategies which can be implemented for diabetic dietary behaviour modification initiatives.

Table 2.9: Integrating Theories in the Context of Social Marketing: Dietary Modification Programs amongst People with diabetes.

No.	Key Theories	Explanatory Variables: Independent Variables (IV)	Common theme found among theories: Each theory presents a cognitive construct influencing the Likelihood of Dietary Compliance (LDC)	Common (extrinsic factors) found to influence IV & LDC	Common Dependent Variable Examined.	Application of Marketing Mix Strategies for Dietary Modification Programs amongst People with diabetes
1.	Self-Efficacy Theory (Bandura 1986)	Self-Efficacy (SE)	SE is a cognitive construct involving self-judgement of an individual's capacity to accomplish goals; involves the initiation & motivation to modify eating behaviour (Bandura 1986)	Socio-demographic factors are found to influence self-efficacy & health behaviour (Bandura 1986)	LDC	Key theoretical perspective: Self-efficacy levels determine the success or failure of diabetic dietary compliance (Bandura 1986). Marketing mix strategies targeting low-self efficacy or the encouragement of self-efficacy initiatives could be introduced:- For example: **Product mix**: information about the benefits versus the costs of behaviour modification could be highlighted in the product offering (i.e. through pamphlets, brochures & services from diabetic support organisations (Carins & Rundle-Thiele 2013). **Price mix:** Social marketing campaigns aimed at minimising costs such as embarrassment, low-self-efficacy, and inconveniences associated with dietary modification activities through positive reinforcement campaigns and motivational support could be introduced (Carins & Rundle-Thiele 2013). **Place:** People with diabetes with low self-efficacy require motivational support in managing their diabetes. Providing easy & affordable diabetic support facilities would encourage people with diabetes to use these facilities & support (Huang et al. 2015). **Promotion:** Segmentation strategies aiming at relevant demographic segments that require motivational advertising and communication to improve self-efficacy goals can be introduced (Carins & Rundle-Thiele 2013).

2.	Food Risk Perception Theory (Frewer et al. 1996)	Food Risk Perception (FRP)	FRP is a cognitive construct which involves the judgement of food based on individual perceptions of food risk & its impact on health (Brewer et al. 2004; Frewer et al. 1996)	Socio-demographic factors are found to influence risk perception & food related behaviour (Brewer et al. 2004; Frewer et al. 1996)	LDC	Theoretical perspective: Food risk perception (i.e. underestimation of risky food on health could undermine LDC) (Frewer et al. 1996) Examples of marketing mix strategies include: **Product mix**: information about the risks to health of poor food choices can be highlighted through pamphlets, brochures & services from diabetic support organisations (George et al. 2015) **Price mix**: SM initiatives reinforcing the importance of avoiding risky foods & changing the perception of people with diabetes in modifying food behaviour could be introduced through risky food avoidance programs & campaigns (Lupton 2015). **Promotional mix**: Advertising & promotional campaigns using fear arousal or emotional appeals whereby the dangers and risks of consuming sugary foods, fatty foods etc are highlighted (i.e. leading to heart disease, limb amputations, blindness etc) (Lupton 2015).

3.	Food Lifestyle Model (Grunert, Brunsø & Bisp 1993)	Food Related Lifestyle (FRL)	Food Lifestyle involves cognitive behaviour such as habits, thoughts, beliefs & attitudes towards food (Grunert, Brunsø & Bisp 1993) Lifestyle is a cognitive construct involving habits, thoughts, beliefs & attitudes towards food (Grunert, Brunsø & Bisp 1993)	Socio-demographic factors are found to influence FRL & food related lifestyles (Grunert, Brunsø & Bisp 1993)	LDC	Key theoretical perspective: Food lifestyles guide food choices & food decision making & influences LDC (Grunert, Brunsø & Bisp 1993) Examples of marketing mix applications: **Promotional mix**: SM campaigns highlighting the importance of food modification lifestyles could be introduced (e.g. diabetic healthy food campaigns in shopping malls, healthy cooking tips via media outlets, web-based campaigns etc) (Maher et al. 2014). **Place**: Promotion of healthy food stores, diabetic support systems & easy access to diabetic educational food lifestyle programs could be introduced targeting relevant demographic segments (Carins & Rundle-Thiele 2013). Key theoretical perspective: Food lifestyles guide food choices & food decision making & influences LDC (Grunert, Brunsø & Bisp 1993) Examples of marketing mix applications: **Promotional mix**: SM campaigns highlighting the importance of food modification lifestyles could be introduced (e.g. diabetic healthy food campaigns in shopping malls, healthy cooking tips via media outlets, web-based campaigns etc) (Maher et al. 2014). **Place**: Promotion of healthy food stores, diabetic support systems & easy access to diabetic educational food lifestyle programs could be introduced targeting relevant demographic segments (Carins & Rundle-Thiele 2013).

4.	Social Support Theory (Antonovsky 1974; Thoits 1985)	Social Support Group Usage (SSG)	SSG usage is found to influence LDC (Antonovsky 1974) Cognitive constructs such as self-efficacy, risk perception & lifestyle values are found to influence SSG usage (Antonovsky 1974; Bandura 1986; Caplan 1974; Cassel 1976)	Extrinsic factors are found to influence the type & level of SSG usage & health behaviour (Antonovsky 1974; Caplan 1974; Cassel 1976)	LDC	Key theoretical perspective: The type & level of SSG usage is found to influence LDC Examples of marketing mix applications: **Product**: The product in this case is SSG usage & its' potential to solve diabetic management problems. SM strategies highlighting the benefits of its usage (e.g. its usage for emotional, motivational & efficacious support) can be introduced through a variety of media & public relations channels (Huang et al. 2015). **Promotional mix:** As SSG usage involves multiple support groups such as family, friends, diabetic organisations etc. Advertising & other promotional campaigns encouraging family & friends for example to participate in diabetic awareness campaigns; diabetic educational programs & counselling on how to provide diabetic support could be introduced (George et al. 2015) **Place:** SM initiatives to include special diabetic support centres by diabetic support organisations with affordable & easy access will encourage people with diabetes to utilise diabetic support organisations. Access for diabetic educational & counselling centres in community areas would not only encourage people with diabetes to seek support in these areas but also encourage family & friends to visit these centres (Huang et al. 2015).

~**Diagrams illustrating Theory Integration**. The following diagrams (i.e. Figures 2.5 to 2.10) illustrates theory integration within the context of this study.

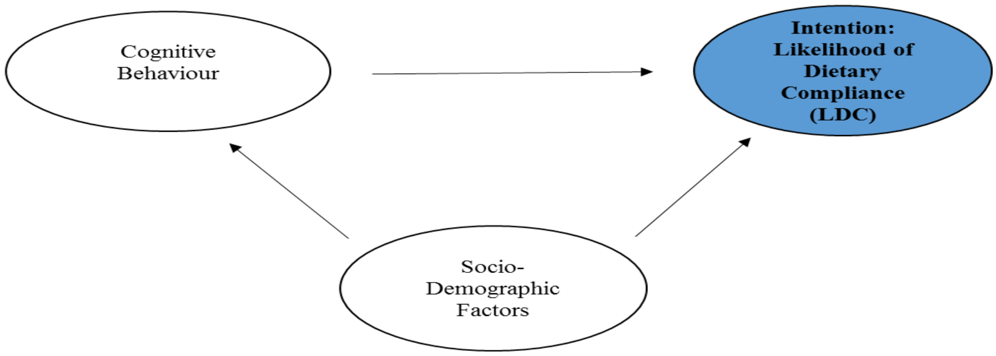


Figure 2.5: Theory Integration: Stage 1: Overarching Psycho – Socio Theory

Figure 2.5, represents the key common explanatory account presented by the overarching psycho-social theory in that cognitive behaviours are found to influence the behavioural intention of the likelihood of dietary compliance (Antonovsky 1974: Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993; Thoits 1985). At the same time these streams of research propose that extrinsic factors such as socio-demographic factors could possibly influence cognitive behaviours and health behaviour such as the likelihood of dietary compliance (Antonovsky 1974: Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993; Thoits 1985).

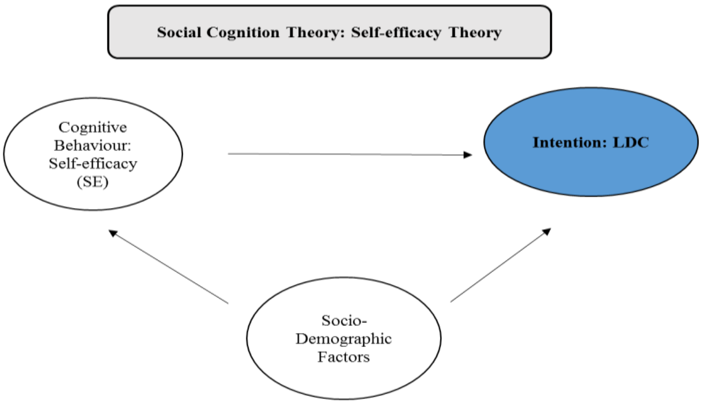


Figure 2.6: Stage 2: Psycho – Socio Theory (i.e. Self-efficacy)

Figure 2.6, represents the explanatory account as proposed by the Self-Efficacy Theory i.e. Bandura (1986) in which the cognitive behaviour of self-efficacy (i.e. the independent variable) influences the behavioural intention of the likelihood of dietary compliance amongst people with diabetes (i.e. dependent variable). Additionally, extrinsic factors (i.e. socio-demographic factors) are also found to influence self-efficacy and the likelihood of dietary compliance (Bandura 1986).

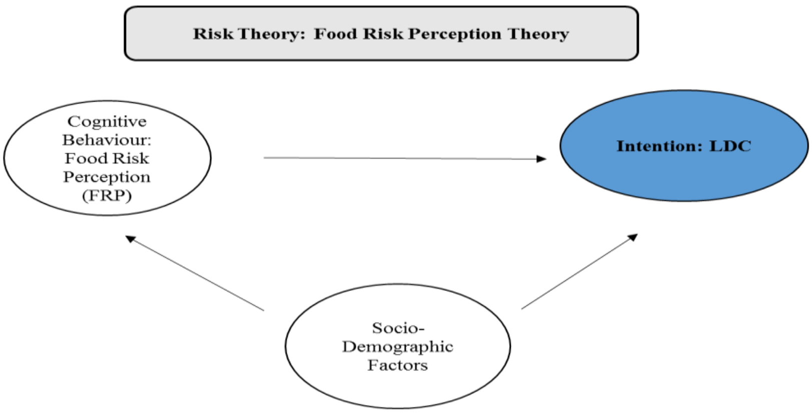


Figure 2.7: Stage 3: Psycho – Socio Theory (i.e. Food Risk Perception)

Figure 2.7, represents the explanatory account proposed by the Food Risk Perception Theory i.e. Frewer et al. (1996) in which the cognitive behaviour of food risk perception (i.e. the independent variable) influences the behavioural intention of the likelihood of dietary compliance (i.e. dependent variable). Whilst extrinsic factors (i.e. socio-demographic factors) are found to influence food risk perception and the likelihood of dietary compliance (Frewer et al. 1996).

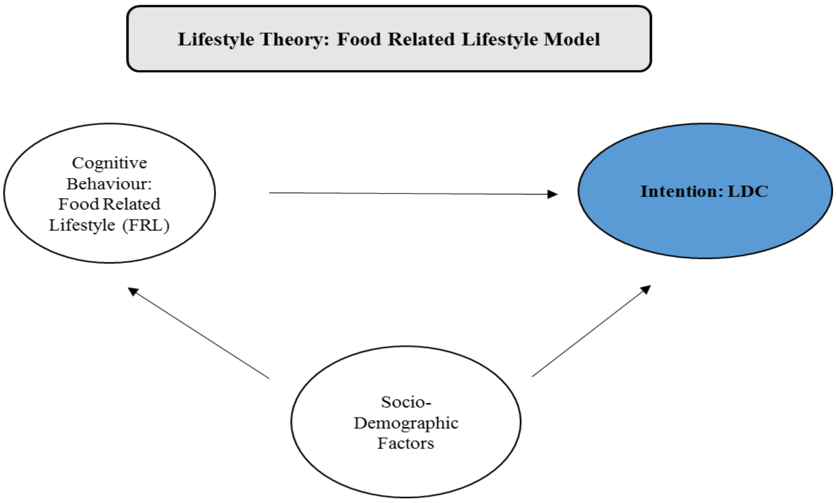


Figure 2.8: Stage 4: Psycho – Socio Theory (i.e. FRL)

Figure 2.8, represents the explanatory account as proposed by the Food Related Lifestyle Model i.e. Grunert, Brunsø & Bisp (1993) in which the cognitive behaviour of food related lifestyle (i.e. the independent variable) influences the behavioural intention of the likelihood of dietary compliance (i.e. dependent variable). At the same time, extrinsic factors (i.e. socio-demographic factors) are found to influence food related lifestyle and the likelihood of dietary compliance (Grunert, Brunsø & Bisp 1993).

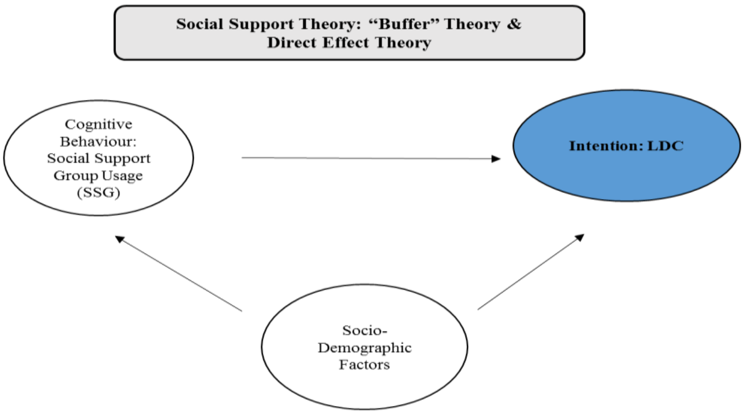


Figure 2.9: Stage 5: Psycho – Socio Theory (i.e. Social Support Group)

Figure 2.9, represents the explanatory account proposed by the Social Support "Buffer" Theory and the Direct Effects Theory (i.e. Antonovsky 1974; Thoits 1985) in which the independent variable of social support group usage influences the behavioural intention of the likelihood of dietary compliance (i.e. dependent variable) (Antonovsky 1974; Thoits 1985). Whilst extrinsic factors (i.e. socio-demographic factors) are also found to influence social support usage and the likelihood of dietary compliance (Antonovsky 1974; Thoits 1985).

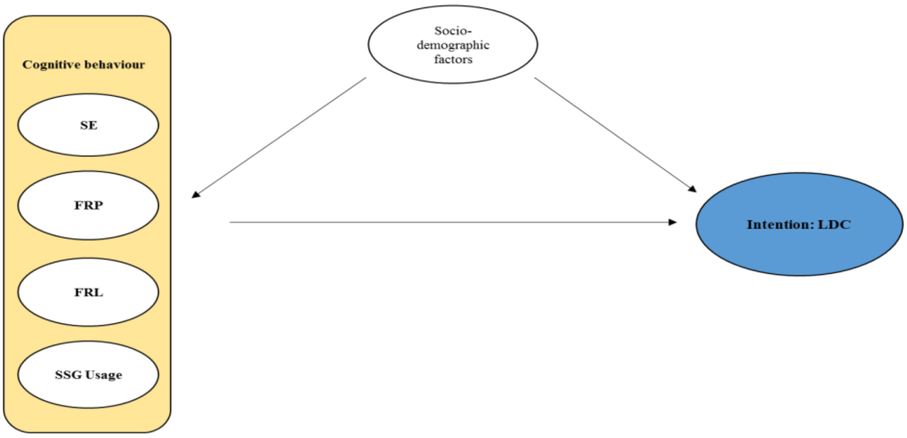


Figure 2.10: Stage 6: Psycho -Social Theories can be used to describe the following relationships:

**Note: Acronyms for this diagram*
Self-efficacy (SE); Food Risk Perception (FRP); Food Related Lifestyles (FRL); Social Support Groups Usage (SSG); Likelihood of Dietary Compliance (LDC)

Figure 2.10, illustrates the common explanatory account as a result of theory integration derived from the overarching Psycho-Social Theories of Self-Efficacy Theory i.e. Bandura (1986); Food Risk Theory i.e. Frewer et al. (1996); Food Related Lifestyle Theory i.e. Grunert, Brunsø & Bisp (1993) and Social Support Theory i.e. Antonovsky (1974); Thoits (1985). In this case, each cognitive construct (i.e. self-efficacy, food risk perception, food related lifestyle and social support groups usage) are independent variables presented by each theory found to influence the behavioural intention of the dependent variable of the likelihood of dietary compliance (Antonovsky 1974: Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993; Thoits 1985) Additionally, each theory shares a common explanatory account in that wider social contexts such as extrinsic socio-demographic factors are found to influence cognitive behaviours and the likelihood of dietary compliance (Antonovsky 1974: Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993; Thoits 1985).

Given that theories and models serve as important frameworks for the design and implementation of research, policy and practice (Lefebvre 2000; Mayer & Sparrowe 2013; Winett 1995), outcomes from theory integration presented thus far is used to build the conceptual framework presented in the next section. Additionally, theory integration developed for this study will likely be a vital blue-print for the development and implementation of future social marketing initiatives such as food modification programs, healthy eating campaigns and food related educational programs targeted at people with diabetes and society at large.

2.8 Preliminary Conceptual Framework

The underpinning concepts discussed thus far indicate the association between constructs in which a preliminary conceptual framework is developed for this study and presented in this chapter (i.e. Diagram 1 pp. 58). The discussion so far leads to the assumption that the likelihood of dietary compliance amongst people with diabetes is influenced by key cognitive factors, namely self-efficacy, food risk perception, food related lifestyles and social support group usage (Antonovsky 1974: Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993; Thoits 1985). Additionally, social support group usage is found to likely mediate between self-efficacy and food risk perception to either positively or negatively affect the likelihood of dietary compliance amongst people with diabetes (Bigliardi & Galati 2013; Falguera et al. 2012; Miller & DiMatteo 2013; Vest et al. 2012).

Key psycho-social theories namely, Social Cognition Theory (Bandura 1986; Bandura & McClelland 1977); Risk Perception Theory (Kahneman, Slovic & Tversky 1982) Lifestyle Theory (Weber 1949; Kelly 1955; Adler 1927) and Social Support Theory (Antonovsky 1974; Thoits 1985) forms the basis for this study in understanding individual cognitive processes related to health and dietary behaviours. Other sub-psycho-social theories namely, Self-Efficacy Theory (Bandura 1986); Food Risk Perception Theory (Frewer et al. 1996) and Food Related Lifestyle Models (Grunert, Brunsø & Bisp 1993) provides extensive insights on behaviours related to food consumption, food habits and food decision making processes relevant for this study. Whilst the "Buffering" Social Support Theory (Antonovsky 1974) and the Direct Effects Theory (Thoits 1985) provides the basis for understanding the link between social support and its likely positive effects on health outcomes.

As suggested by experts (e.g. Lefebvre 2000; Mayer & Sparrowe 2013; Winett 1995) theories and models serve as important underlying framework for the implementation of sustainable policy development. Hence, the aforementioned theories namely, Self-Efficacy Theory, Food Risk Perception Theory, Food Related Lifestyle Models and Social Support Theory (Antonovsky 1974; Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993; Thoits 1985) were integrated into this study as an important framework for future implementation of intervention programs, health care policies and social marketing campaigns aimed at improving diabetes related health issues and concerns.

Furthermore, an important contribution of this study which at the point of writing has not been found elsewhere is the examination of the constructs of self-efficacy, food risk perception, FRL and social support group usage within a given study to determine their likely influence on the likelihood of dietary compliance amongst people with diabetes. Thus, this study could possibly provide new insights, added knowledge and relevant feedback within this particular context. The outcome of this study is important for policy and practice as it may be crucial in countering poor dietary compliance practices amongst people with diabetes and in turn possibly limit health, economic and social burdens for people with diabetes and society at large (Carins & Rundle-Thiele 2013; George et al. 2016).

Diagram 2.1, below illustrates the preliminary conceptual framework for this study and the relationships between the constructs. There are four key independent variables (IV) namely self-efficacy, food risk perception, FRL and social support group usage and one dependent variable (DV) namely, the Likelihood of Dietary Compliance. Details of the hypotheses development and explanation of each hypotheses is discussed in section 2.9 of this thesis.

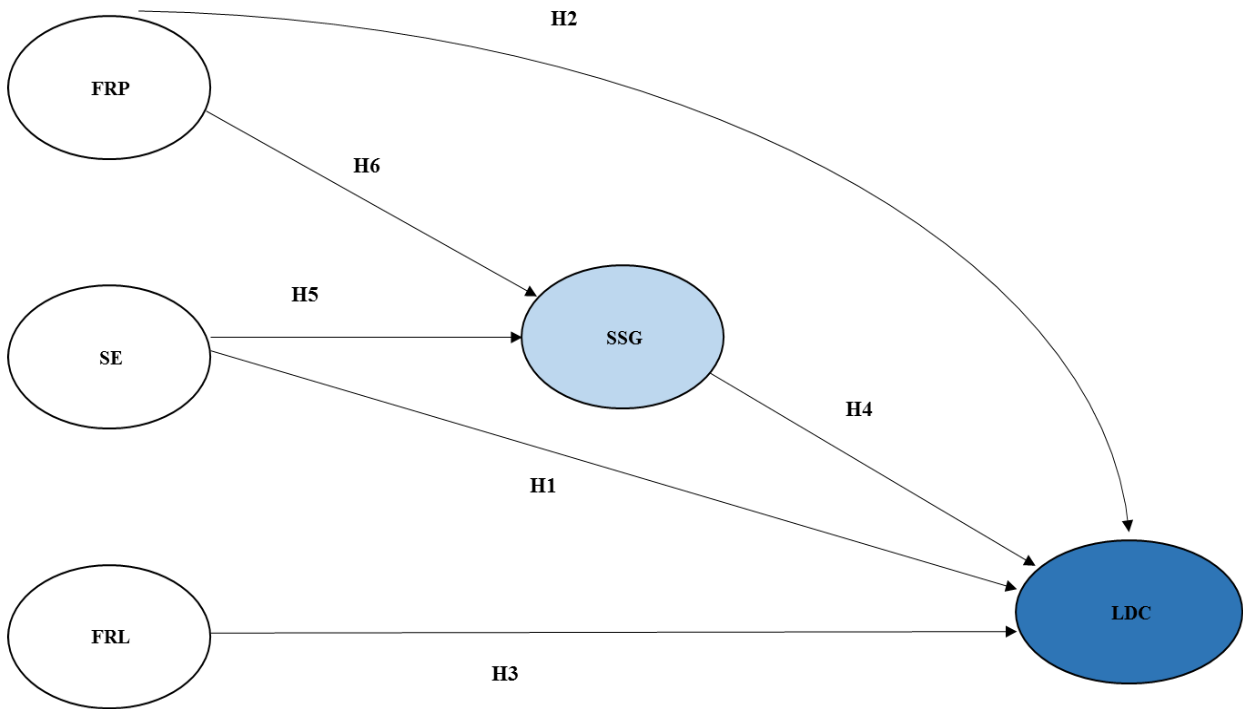


Diagram 2.1: Preliminary Conceptual Framework.

**Note Acronyms for Diagram 1:*

Self-efficacy **(SE)**
Food Risk Perception **(FRP)**
Food Related Lifestyles **(FRL)**
Social Support Groups usage **(SSG)**
Likelihood of Dietary Compliance **(LDC)**

2.9 Hypotheses Development

The underpinning concepts discussed thus far provide for the development of an appropriate hypotheses which is gleaned from the research questions presented in Section 1.5 of this thesis.

Each research question is derived from the main research objective which is:

To investigate the factors influencing the likelihood of dietary compliance amongst people with diabetes.

This study will examine key cognitive constructs (i.e. independent variables) namely self-efficacy, food risk perception, FRL and usage of social support groups and its influence on the dependent variable namely, the likelihood of dietary compliance amongst people with diabetes. Psycho-social theories (i.e. Antonovsky 1974; Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993) posit that cognitive factors influence individual motives, decisions and lifestyle habits on a range of issues including health and well-being. Therefore, examining cognitive factors is important for researchers as it not only likely provides a deeper understanding of individual thought processes but also enables researchers to identify and predict health related behaviour (Antonovsky 1974; Bandura 1986). Additionally, from a marketing perspective cognitive analysis is useful for behavioural segmentation purposes in which the target market is identified on *why* and *how* they purchase and/or consume products rather than identifying *who* the target market are as practiced in traditional market segmentation techniques (Kotler, Bowen & Makens 2003). As a result, behavioural market segmentation is considered an effective tool to unearth the complex nature of human nature as compared to market segmentation analysis which may not be sufficient within this context (Kotler, Bowen & Makens 2003).

Therefore, examining the behavioural constructs (i.e. self-efficacy, food risk perception, FRL and social support group usage) in this study will likely provide a better understanding of individual behaviour and characteristics which may guide dietary habits amongst people with diabetes. As a result, behavioural segmentation data gleaned from this study can be aligned with social marketing strategies and policies for relevant diabetic health promotional messages or campaigns (Andreasen 1995; 2002; Carins & Rundle-Thiele

2013; George et al. 2016; Kotler, Bowen & Makens 2003). Additionally, at the point of writing no known studies have yet been found to combine the aforementioned constructs in a single study to examine their possible influence on the likelihood of dietary compliance amongst people with diabetes. As such it is yet to be determined whether self-efficacy, food risk perception, FRL and social support group usage work to either facilitate or hinder the likelihood of dietary compliance amongst people with diabetes.

Therefore, this study will likely close research gaps and provide further insights on whether the aforementioned behavioral constructs influences the likelihood of dietary compliance amongst people with diabetes. The following section explains the key cognitive constructs of (i.e. independent variables) namely self-efficacy, food risk perception, FRL and social support group usage and its influence on the dependent variable namely, the likelihood of dietary compliance amongst people with diabetes, whereby hypotheses **H1, H2, H3** and **H4** are derived.

2.9.1 Self-Efficacy and its Influence on the Likelihood of Dietary Compliance amongst People with diabetes

This section begins with the aim to examine hypotheses from the specific **research question 1, (RQ 1):**

RQ1: Does self-efficacy influence the likelihood of dietary compliance amongst people with diabetes?

According to Bandura (1997; 2006), self-efficacy involves self- judgement of an individual's capacity to accomplish goals and to influence life events. Self-efficacy theory (Bandura 1986) postulates that individuals with higher levels of self-efficacy are better able to cope and persevere in distressful and/or challenging situations. Perceived self-efficacy influences individual behavioral setting and decision making (Badura 1977). Numerous studies (Cha et al. 2014; Walker et al. 2014; Weaver et al. 2014) have shown a positive relationship between higher levels of self-efficacy and improved diabetic self-management outcomes. On the other hand, studies (e.g. Bhattacharya 2012; Fisher et al. 2014; Hinder & Greenhalgh 2012; Ramirez, Kulinna & Cothran 2012) indicate people with diabetes with low self-efficacy levels are found to have lower coping mechanisms; are easily de-motivated; and are unable to persevere in challenging situations; all of which results in poor self-management outcomes amongst people with diabetes.

However it is still not clear if the self-efficacy construct independent of other factors would significantly improve self-management regimens including dietary compliance amongst people with diabetes (Gao et al. 2013; Kirwan et al. 2013; Song et al. 2014). For example, Gao et al. (2013) in a study on Chinese people with diabetes found that whilst self-efficacy, social support and patient-provider communication (PPC) have direct effects on diabetes self-management behaviours; however, only social support and PPC were correlated with each other. Gao et al. (2013) further explains that this outcome suggests that self-efficacy does not necessarily provide the greatest assistance in self-management practices amongst people with diabetes. Other studies (Hinder & Greenhalgh 2012; Ku & Kegels 2015; Song et al. 2014) indicate that self-efficacy may also be influenced by a number of extrinsic factors such as gender, age, income etc. This suggests that self-efficacy is a complex construct and may be regulated by a variety of factors as proposed by theory (i.e. Bandura 1997). Therefore it is still unclear if the self-efficacy construct works independently to influence health behaviour or whether it may be influenced by other forces to either encourage or hinder lifestyle modification such as dietary compliance.

However, given that self-efficacy is an important factor to positively influence self-management outcomes amongst people with diabetes, researchers (e.g. Fisher et al 2014; Walker et al. 2014; Wu et al. 2013) agree that the self-efficacy construct warrants further attention and examination. Thus, this study aims to examine whether self-efficacy works to either positively or negatively influence the likelihood of dietary compliance amongst people with diabetes. Further to this, examining the self-efficacy construct in this study would potentially provide useful information for social marketers to promote positive self-efficacy efforts amongst people with diabetes (Carins & Rundle-Thiele 2013; George et al. 2016).

As such with the understanding that self-efficacy influences LDC amongst people with diabetes, research objective, **RO1: To examine if self-efficacy influence the likelihood of dietary compliance amongst people with diabetes is transformed to the following hypotheses:**

H1: **Self-efficacy influences the likelihood of dietary compliance amongst people with diabetes.**

2.9.2 Food Risk Perception and its influence on the likelihood of dietary compliance amongst people with diabetes.

This section aims to examine hypotheses from the specific **research question 2, (RQ 2):**

RQ2: Does food risk perception influence the likelihood of dietary compliance amongst people with diabetes?

Risk Theorists (Slovic 1987; Tversky & Kahneman 1974) propose that risk perception involves the ways in which individual forethought influences purposive actions and/or reactions to one's surrounding and circumstances. Proponents of food risk theory (Frewer et al. 1996) suggest that individual food choices and decision making are based on individual judgement of food and its perceived risk to health and well-being. Key to risk perception is that individuals may over or underestimate risk situations, therefore resulting in either higher levels of concern or disregard for the risk situation (Keller et al. 2012; Shreck et al. 2014). Perception of risk has been found to play an important role in positive self-management behaviours amongst people with diabetes (Shreck et al. 2014). For example, feeling vulnerable to a health risk or feeling threatened by health complications may motivate people with diabetes to adopt preventive health behaviours such as diet, exercise and medication adherence amongst others (Frewer et al. 1996; Rijswijk & Frewer 2012; Shreck et al. 2014; Wills et al. 2012).

Food risk perception however is complex and may vary from person to person due to differing circumstances, situations and attitudes of individuals thus making it a challenge for researchers to examine (Bigliardi & Galati 2013; Dwyer et al. 2012; Rijswijk & Frewer 2012). As a result, mixed outcomes have been found in studies (e.g. Keller et al. 2012; Nicolaou et al. 2014; Shreck et al. 2014; Willig et al. 2014) examining the risk perception construct and its relationship with diabetes self-management. For example, Shreck et al. (2014) in their study found no relationships between risk perceptions and glycaemic control but a positive relationship between risk perception and dietary adherence. In their study, Nicolaou et al. (2014) reported that gender differences were found to influence food risk perceptions amongst people with diabetes in which women were found to make careful food choices when preparing or consuming food as compared to men.

This indicates that thus far, risk perception is a multi-faceted construct with diverse outcomes and relationships making it difficult to gather any conclusive evidence with regards to its role in dietary compliance amongst people with diabetes (Bigliardi & Galati 2013; Dwyer et al. 2012; Rijswijk & Frewer 2012; Keller et al. 2012; Vidal, Ares & Gimenez 2013). However, as food perception is associated with either positive or negative implications to health amongst people with diabetes (i.e. Nicolaou et al. 2014; Shreck et al. 2014; Willig et al. 2014), it is important to examine the food risk perception construct to verify its role within the context of this study.

Examining the aforementioned relationship will possibly provide a better understanding of situations, circumstances and factors that most likely influence food risk perception and whether it benefits or hinders dietary compliance amongst people with diabetes. From a policy perspective, social marketing campaigns highlighting the importance of proper food judgement and knowledge on assessing risky food items could be introduced to encourage improved food choices amongst people with diabetes (Ho, Chesla & Chun 2012; Tse et al. 2012).

Hence, with the understanding that food risk perception influences the likelihood of dietary compliance amongst people with diabetes, research objective, **RO2: To examine if food risk perception influences the likelihood of dietary compliance is postulated to the following hypotheses:**

H2: **Food risk perception influences the likelihood of dietary compliance amongst people with diabetes.**

2.9.3 Food Related Lifestyle and its influence on the Likelihood of Dietary Compliance amongst People with diabetes.

This section aims to examine hypotheses from the specific **research question 3, (RQ 3):**

RQ3: Does food related lifestyles influence the likelihood of dietary compliance amongst people with diabetes?

Lifestyle theorists (e.g. Askegaard 1993; Cockerham 2005; Grunert, Brunso & Bisp 1993; Hustad & Pessemier 1971) explain that individual lifestyles involve habits that form to guide daily living. Kesic & Piri-Rajh (2003), describe lifestyle as individual characteristics which are influenced by a range of environmental and psycho-social factors. Therefore, individual choices and decisions are made up of individual cognitive behaviours and its interaction with wider social forces such as economic conditions, culture, educational level etc. (Cockerham 2005; Kesic & Piri-Rajh 2003).

Studies (e.g. Alkerwi et al. 2012; Dumas, Robitaille & Jette 2014; Lamichhane 2012; Igumbor et al. 2012) indicate people with diabetes who are able to adapt to new lifestyle habits such as changing diets, making careful food selection and controlling diets in a social setting show positive results with diabetic health outcomes. On the other hand people with diabetes who make poor lifestyle choices or are unwilling to modify their unhealthy eating habits have been found to negatively impact the overall health and well-being amongst people with diabetes (Alkerwi et al. 2012; Lamichhane 2012; Saba, Cupellaro, & Vassallo 2014).

The complex nature of food related lifestyles have shown mixed results in terms of which lifestyle factors are most likely to influence dietary compliance amongst people with diabetes (Conklin et al. 2014; Dumas, Robitaille & Jette 2014). For example, Conklin et al. (2014); Dyson et al. (2011); Lamichhane (2012); Mathew et al. (2012) report variables such as age, gender and ethnicity play a significant role in lifestyle behaviour. On the other hand (e.g. Choi, Ng & DiNitto 2013; Igumbor et al. 2012; Dumas, Robitaille & Jette 2014) report socio-economic status influences lifestyle habits. Some studies (e.g. Hinder & Greenhalgh 2012; George et al. 2016; Werle, Trendel & Ardito 2013) indicate external cues such as advertising, social engagement and cultural influence may influence food choices amongst people with diabetes.

Therefore, by examining the key dimensions of the FRL constructs (i.e. shopping habits, cooking, social activities, advertising etc) in this study will most likely provide further insights into the food-related lifestyle values that possibly act to either hinder or improve the likelihood of dietary compliance amongst people with diabetes.

Hence, with the understanding that FRL influences the likelihood of dietary compliance amongst people with diabetes, research objective, **RO3: To examine if FRL influence LDC amongst people with diabetes is postulated to the following hypotheses,**

H3: **FRL influences LDC amongst people with diabetes.**

2.9.4 Social Support Groups Usage influences the likelihood of dietary compliance amongst people with diabetes.

This section aims to examine hypotheses from the specific research question **4, (RQ 4):** ***Does Social support groups usage influence the likelihood of dietary compliance amongst people with diabetes?***

Social support theories (i.e. Antonovsky 1974; Thoits 1985) postulate that social support acts as a "buffer" or protector to a variety of life stressors such as depression, anxiety and illness. A number of correlational studies (Conklin et al 2014; Mayberry & Osborn 2012; Vest et al. 2013) have shown a positive and significant relationship between social support usage and dietary compliance amongst people with diabetes. Researchers (i.e. Baek, Tanenbaum & Gonzalez 2014; Strom & Egede 2012; Waki et al. 2015) report that higher levels of social support group usage are associated with improved diabetic therapy, reduced psychological stress and better adaptation of life-style modification behaviour.

However, uncertainties and mixed results with social support group usage and whether it positively or negatively influences dietary compliance amongst people with diabetes have been found (e.g. Nam et al. 2011; Shiotz et al. 2012; Singh, Sinnirella & Bradley 2012). For example, Muchiri, Gericke & Rheeder (2016) in their study on the effect of a nutrition education programme for adult Type 2 people with diabetes on clinical status and dietary behaviours; reported the programme did not significantly improve glycaemic control or other clinical outcomes for the particular cohort.

On the other hand, some evidence (Brown et al. 2013; Neves, Amaro & Fonseca 2013) show that social support may in fact hinder diabetic compliant behaviour. For example, poor family support, peer pressure and poor physician support amongst others hinder dietary modification behaviour amongst people with diabetes (Gallagher et al. 2012; Ramadas et al. 2012). As a result some people with diabetes avoid using social support or have negative perceptions about social support usage (Ahola & Groop 2013; Vest et al. 2013).

Hence, this study will aim to close these research gaps and provide further evidence on whether usage of social support groups either positively or negatively influences the likelihood of dietary compliance amongst people with diabetes. The discussion presented thus far, provides the basis for research objective, **RO4: To examine if social support group usage influences the likelihood of dietary compliance amongst people with diabetes,** is transformed to the following hypotheses:

H4: Social Support Groups Usage influences the likelihood of dietary compliance amongst people with diabetes.

2.9.5 Cognitive Factors and its influence on Social Support Groups Usage.

As proposed by researchers, (e.g. Bhattacharya 2012; Hinder & Greenhalgh 2012), cognitive factors have been found to influence the type and level of social support usage amongst people with diabetes. For example, people with diabetes with low self-efficacy tend to seek additional support from family and friends for emotional, motivational and financial support amongst others (Bhattacharya 2012; Hinder & Greenhalgh 2012). Perceived risk is also found to influence the type and level of social support group usage amongst people with diabetes (Miller & DiMatteo 2013). For example, the perceived threats from food on health likely influences people with diabetes to seek social support groups to manage their food concerns (Miller & DiMatteo 2013; Shreck et al. 2014). The following sections explains the cognitive factors of food risk perception and self-efficacy and its influence on the likelihood of dietary compliance amongst people with diabetes whereby hypotheses **H5 and H6** are derived.

~Self-efficacy influences Social Support usage amongst people with diabetes. According to self-efficacy theory (i.e. Bandura 1986) the self-efficacy construct is an important aspect of human functioning as it determines the ways in which individuals cope and/or manage challenging situations and circumstances. Self-efficacy is thought to involve a number of cognitive based behaviours such as confidence, belief and personal will to accomplish tasks (Fisher et al. 2013). Studies indicate (e.g. Chew, Khoo & Chin 2015; Singh, Sinnirella & Bradley 2012; Mayberry & Osborn 2012; Vest et al. 2013) that people with diabetes with low-self-efficacy generally seek emotional, financial and physical support amongst others from a variety of social support groups to help them cope with their diabetes management regimens.

On the other hand, people with diabetes with high self-efficacy are thought to better cope with their diabetes regimens and may not highly depend on social support groups (Fisher et al. 2014). Furthermore, researchers suggest that a history of successful diabetes self-care regimens builds confidence in self-care abilities amongst people with diabetes thereby limiting their dependence on social support groups (Fisher et al. 2014). Additionally, self-efficacy is a relatively strong indicator of positive diabetic self-management outcomes (Fisher et al.; Walker et al. 2014; Wu et al. 2013). For example, an earlier study by Williams & Bond (2002) found that when the effects for self-efficacy were controlled, social support was not a significant independent predictor of diabetic self-care. This contention is further reinforced by other more recent researchers e.g. Wu et al. (2013) who found self-efficacy positively correlates with self-care behaviour.

However, whether the self-efficacy construct influences social support group usage remains uncertain (Kamimura et al. 2014; Strom & Egede 2012). This is because self-efficacy is a complex construct involving a number of individual factors such as emotional state, confidence levels, perceptions and external socio-demographic factors which in turn influences the type and frequency of social support usage amongst people with diabetes (Choi & DiNitto 2013; Hu et al. 2013; Kamimura et al. 2014; Kim et al. 2014; Vest et al. 2013). Therefore, a growing number of researchers (Fisher et al. 2013; Miller & Di Matteo 2013; Strom & Egede 2012; Walker et al. 2014) suggests that further understanding and examination of self-efficacy and the social support usage relationship should be examined. Incorporating the self-efficacy construct and its likely role on social support group usage in this study may provide further evidence if the self-efficacy construct works to either foster or hinder social support group usage amongst people with diabetes.

Hence, with the understanding that self-efficacy influences social support group usage amongst people with diabetes, **research objective, RO 5: To examine if self-efficacy influences Social Support Groups usage amongst people with diabetes** is postulated to the following hypothesis,

H5: Self efficacy influences Social Support Groups Usage amongst people with diabetes.

- Food Risk Perception and its influence on social support groups usage amongst people with diabetes.

This section aims to examine hypotheses from the specific research question, **6, RQ (6),**

Does food risk perception influence Social Support Groups Usage amongst people with diabetes?

Risk perception plays a role in many theories of health related behaviour (i.e. Brewer et al. 2004; Frewer et al. 1996). Food perception has been linked to perceived susceptibility to health and illness and thus likely influences food judgements and food decision making amongst people with diabetes (Shreck et al. 2014; Wills et al. 2012). Worry, concern and the inability to make good food choices are some of the reasons for people with diabetes to seek additional support in managing their diet (Fisher et al. 2014; Olsen, Perrild & Willaing 2016; Willig et al. 2014). Shreck et al. (2014) in their study on Type 2 people with diabetes, found perceived risk positively relates to dietary, exercise and medication adherence for those who were assigned to an intervention group for diabetes self-care as compared to those who were not given any support.

On the other hand, some studies (i.e. Fukuoka et al. 2014; Schiotz et al. 2012) indicate that people with diabetes may be reluctant to seek additional support in managing their worries or concerns about food risk for a number of reasons. For example, family and friends may in fact trivialise the effects of food risks by continually tempting people with diabetes to eat risky food at home or in social settings (Singh, Sinnirella & Bradley 2012; Weaver et al. 2014). Poor trust in formal social support mechanisms is another hindrance for people with diabetes who may need some advice on their food risk concerns (Brown et al. 2013). For example, physicians who generate conflicting health messages; provide poor consultation service; or those who chide their patient's about poor diet management may hinder people with diabetes from discussing their dietary worry or concerns with formal support systems (Ahola & Groop 2013; Brown et al. 2013; Fukuoka 2014).

Furthermore, food risk perception is a complex construct and apart from cognitive factors there are likely many other external cues such as socio-demographic factors which may influence its impact on social support group usage (e.g. Choi & DiNitto 2013; Hinder & Greenhalgh 2012; Shrivastava, Shrivastava & Ramasamy 2013). Hence, there are still some uncertainties in determining the extent to which food risk perception influences social support group usage amongst people with diabetes (Miller & Di Matteo 2013). Therefore, outcomes from this study will likely add further information and insights into whether food risk perception either encourages or discourages social support group usage amongst people with diabetes. For example, initiatives to educate both formal and informal social systems to be more understanding and empathetic towards the food concerns amongst people with diabetes may alleviate some of the barriers towards social support group usage amongst people with diabetes. Taking into consideration the aforementioned factors, research objective, **RO6: To examine if food risk perception influences social support group usage amongst people with diabetes,** is transformed to the following hypotheses:

H6: Food risk perception influences social support Groups usage amongst people with diabetes.

2.9.6 The mediating role of Social Support Groups Usage.

A number of studies (Song et al. 2012; Strom & Egede 2012; Schiotz et al. 2012; Nicolucci et al. 2013; Tovar et. al 2015) have supported the notion that social support group usage is an important factor in the relationship between individual cognition and positive self-management outcomes amongst people with diabetes. Social support theories (i.e. Antonovsky 1974; Thoits 1985) suggest social support groups serve to mediate improved psychological and physical well-being of individuals. However, there are some uncertainties (e.g. Nam et al. 2011; Strom & Egede 2012) with regards to this contention. For example, some studies (e.g. Brown et al. 2013; Neves, Amaro & Fonseca 2013) indicate that social support groups in fact likely hinder self-management amongst people with diabetes due to poor dietary and emotional support provided by some social support groups. However, other researchers, (e.g. Piette et al. 2014; Song et al. 2012) are of the view that social support group usage is still an important mediator between cognitive behaviours and overall diabetic health and well-being. Hence, this study aims to investigate whether social support group usage mediates the relationship between the cognitive constructs of self-efficacy and food risk perception to either hinder or facilitate the likelihood of dietary compliance amongst people with diabetes.

~The Mediating Role of Social Support Usage between Food Risk Perception and the Likelihood of Dietary Compliance amongst People with diabetes.

This section aims to examine hypotheses from the specific research question, **7, RQ (7),**

Does Social Support Groups Usage mediate between Food Risk Perception and the Likelihood of Dietary Compliance amongst People with Diabetes?

Food risk perception is an important cognizant step taken by individuals in making either good or poor food decisions (Frewer et al. 1996; Rijswijk & Frewer 2012; Shreck et al. 2014; Wills et al. 2012). It is especially important to understand the reasons behind poor food judgements and choices as they are likely to increase health risks amongst people with diabetes (Bigliardi & Galati 2013; Dwyer et al. 2012; Rijswijk & Frewer 2012). Social support group usage has been found to mediate food risk perception and dietary compliance amongst people with diabetes in a number of studies (Piette et al. 2014; Schiotz et al. 2011;

Vest et al. 2013). For example, Kim et al. (2015) in their study on Korean-American people with diabetes, report that social support mediated the effect of a number of diabetic self-care regimens such as medication adherence, exercise and diet. Similarly, Strom & Egede (2012) in their review of social support usage found that social support groups such as family played a significant role as a mediator to a number of diabetes regimens including dietary compliance.

However, there are still some uncertainties on whether social support usage mediates the relationship between food perception to improve dietary compliance amongst people with diabetes due to a variety of factors (Miller & Di Matteo 2013; Song et al. 2012; Strom & Egede 2012). For example, Strom & Egede (pp.9, 2012) report that *"it is difficult to infer causality concerning social support and its impact on diabetes management. Because of gaps and inconsistencies in the literature and differences in sample populations, more research is needed regarding the influence of social support on various diabetes-related outcomes"* This suggest that there is likely a lack of information in relation to the mediating role of social support group usage on food related behaviours such as food risk perception amongst people with diabetes (Miller & Di Matteo 2013; Song et al. 2012; Strom & Egede 2012). Therefore, further empirical evidence from this study will likely address these research gaps and inconsistencies within this context.

Thus, with the understanding that, social support group usage mediates the relationship between food risk perception and the likelihood of dietary compliance amongst people with diabetes, **research objective, RO 7: To examine if Social Support Groups Usage mediates the relationship between Food Risk Perception and the Likelihood of Dietary Compliance amongst people with diabetes** is transformed to the following hypothesis,

H7: Social support groups usage mediates the relationship between food risk perception and the likelihood of dietary compliance amongst people with diabetes.

~The Mediating Role of Social Support Groups Usage between self-efficacy and the likelihood of dietary compliance.

This section aims to examine hypotheses from the specific research question, **8, RQ (8),**

Does Social Support Groups Usage mediate between Self-Efficacy and the Likelihood of Dietary Compliance amongst People with Diabetes?

As discussed, Self-efficacy theory (Bandura 1977) proposes that self-efficacy is crucial in supporting and regulating human functioning. Additionally, individual mastery of goal achievement strongly determine positive behavioural change outcomes (Bandura 1977). Studies (e.g. Hunt 2015; Ku & Kegels 2015; Simmons et al. 2015) also indicate that social support group usage has been found to improve self-efficacy amongst people with diabetes

However, a concerning factor highlighted by researchers (Chew, Khoo & Chin; Singh, Sinnirella & Bradley 2012; Mayberry & Osborn 2012; Vest et al. 2013) is that many people with diabetes are unable to reach diabetic management goals due to poor self-efficacy levels. Researchers (Hunt 2015; Ku & Kegels 2015; Simmons et al. 2015; Walker et al. 2015) suggest that social support usage could be an important tool to encourage improved self-efficacy efforts and therefore improve diabetic self-management regimens. A number of studies (Chew Khoo & Chin 2012; Song et al. 2012; Vest et al. 2013) indicate that social support group usage acts to mediate the relationship between self-efficacy and improved diabetic self-management practices. For example, Tovar et al. (2015) report that social support (i.e. friends and family) was found to mediate the relationship between depression and self-management regimens. Additionally, the same study by Tovar (2015), found that formal support (i.e. health practitioners) to be highly significant as a mediator to diabetes health outcomes as compared to support from a spouse and/or partner.

However, there are some uncertainties on whether social support group usage acts to mediate the relationship between self-efficacy and dietary compliance amongst people with diabetes. For example, family or friends who criticize, discourage or chide people with diabetes on their self-efficacy goals may in fact hinder self-efficacy efforts amongst people with diabetes (Miller & DiMatteo 2013; Vest et al. 2012). Similarly other studies (e.g.

Kirwan, Vandelanotte, Fenning & Duncan 2013) show no clear indication that social support groups mediate the relationship between self-efficacy and diabetes health outcomes. Therefore, further empirical evidence is needed to examine the contention that social support group usage mediates the relationship between self-efficacy and the likelihood of dietary compliance amongst people with diabetes. Taking into consideration the aforementioned discussion, and with the understanding that, social support usage mediates the relationship between self-efficacy and the likelihood of dietary compliance amongst people with diabetes, **research objective, RO8: To examine if Social support groups usage mediates the relationship between Food Risk Perception and the Likelihood of Dietary Compliance amongst people with diabetes** is postulated to the following hypothesis,

H8: Social Support Groups Usage mediates the relationship between self-efficacy and the likelihood of dietary compliance amongst people with diabetes.

2.10 Conclusion

This chapter has presented key themes, theoretical perspectives and literature to establish a preliminary conceptual framework for this study. Key psycho-social theories (i.e. Antonovsky 1974; Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993; Thoits 1985) provide a fundamental understanding of the role human cognition plays in guiding food related behaviour amongst people with diabetes. The key constructs namely self-efficacy, food risk perception, FRL and usage of social support groups have shown how these constructs likely influence the likelihood of dietary compliance amongst people with diabetes (Cha et al. 2014; Dumas, Robitaille & Jette 2014; Shreck et al. 2014; Vest et al. 2013). However, evidence (Boyland & Whalen 2015; Gao et al. 2013; Muchiri, Gericke & Rheeder 2016: Nicolaou et al. 2014) suggests that there is still no clear indication as yet if the aforementioned constructs either positively or negatively influences the likelihood of dietary compliance amongst people with diabetes. The uncertainties uncovered so far, provides the impetus for this researcher to gather further evidence to likely close research gaps and add to literature through this study. Additionally, this study is unique in that at the point of writing there are no known studies examining the aforementioned constructs in one study to determine its influence on the likelihood of dietary compliance amongst people with diabetes. Therefore, this study would likely provide new insights, added knowledge and feedback related to dietary behaviour amongst people with diabetes.

Furthermore, another important contribution of this study is the integration of theory which has been prescribed by many experts (i.e. Mayer & Sparrowe 2013; Winett 1995). Researchers (e.g. Luca & Suggs 2013; Mayer & Sparrowe 2013 Rothman et al. 2009) explains that theory integration as an important step towards building a framework for practice such as in developing sound health promotion and disease prevention initiatives. Likewise integrating theory into practice within this study, would likely provide avenues for the future development and implementation of sound policy and practice for health promotion and disease prevention initiatives amongst people with diabetes. Additionally, theory integration in this study would most likely provide practical solutions for relevant diabetes agencies, health care practitioners and government bodies to improve diabetes care and management and minimize health risks amongst people with diabetes.

Taken together, the literature review has thus far established the key variables to be examined for this study as presented in Diagram 2.1. The preliminary conceptual framework developed for this study, will be used as a means to examine the hypotheses generated thus far and will be tested through relevant methodological techniques. Explanation of the research design are discussed in the following Chapter 3.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter discusses the methodology undertaken to address the main research objective for this study, i.e. *to investigate the factors influencing the likelihood of dietary compliance amongst people with diabetes*. The research problems and issues discussed in Chapter 2 of this thesis has provided a basis for the development of a preliminary conceptual framework for this study (i.e. Chapter 2; Diagram 2.1). Additionally, the relevant hypotheses postulated thus far will be examined and tested using relevant methodological techniques. A detailed description of the research methodology for this study in conjunction with relevant justifications for its use and adoption is presented in this chapter. An overview of the hypotheses is presented in Table 3.1 below:

Table 3.1: Summary of Hypotheses for the study:

H1	Self-efficacy influences the likelihood of dietary compliance amongst people with diabetes.
H2	Food risk perception influences the likelihood of dietary compliance amongst people with diabetes.
H3	Food related lifestyles influences the likelihood of dietary compliance amongst people with diabetes.
H4	Social Support Groups Usage influences the likelihood of dietary compliance amongst people with diabetes.
H5	Self-efficacy influences social support usage amongst people with diabetes
H6	Food risk perception influences social support usage amongst people with diabetes
H7	Social Support Groups Usage mediates the relationship between food risk perception and the likelihood of dietary compliance amongst people with diabetes.
H8	Social Support Groups Usage mediates the relationship between self-efficacy and the likelihood of dietary compliance amongst people with diabetes.

Source: Table developed for this study

Figure 3.1, shows the content of this chapter.

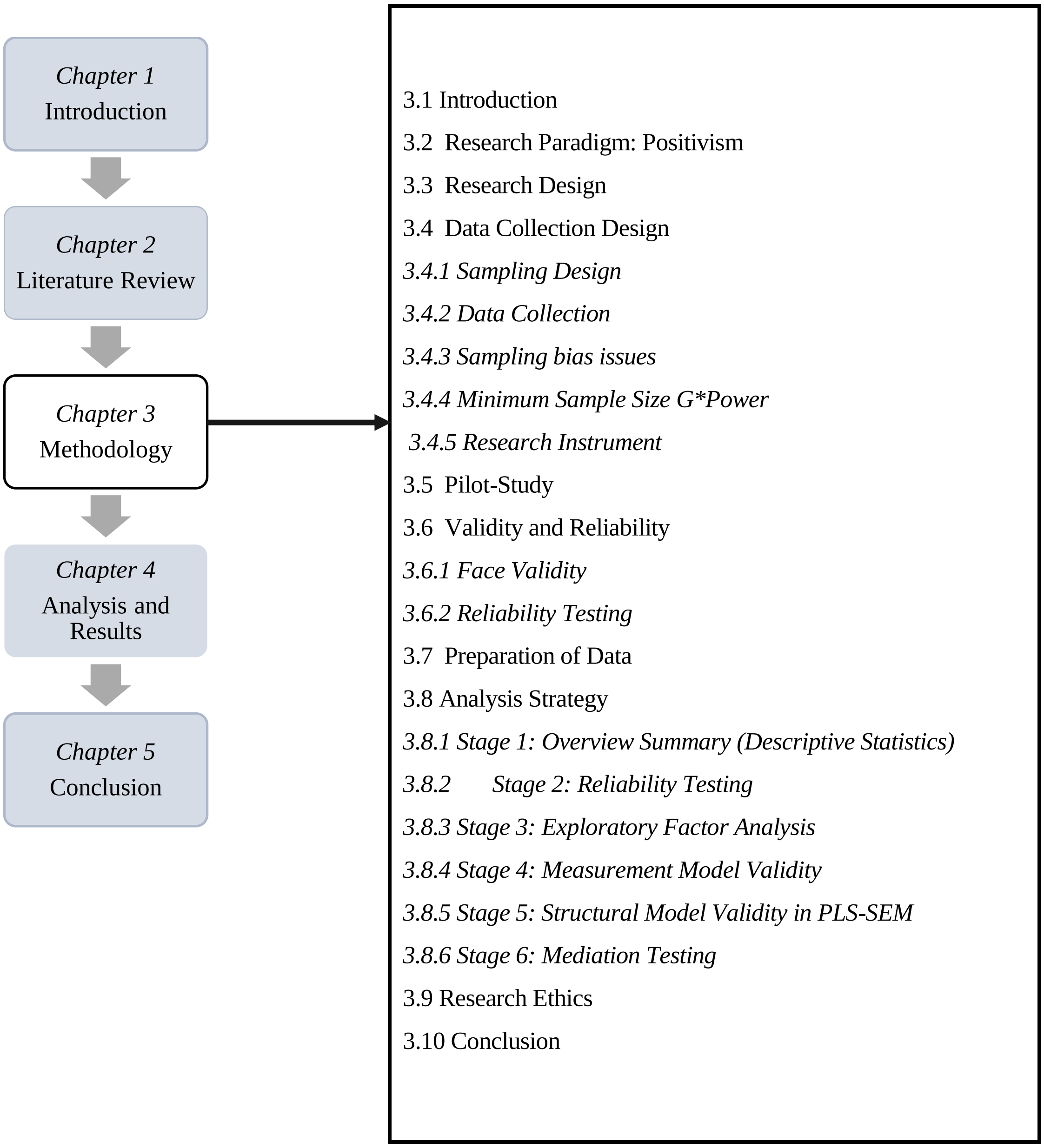


Figure 3.1: Outline of Chapter 3

3.2 Research Paradigm: Positivism

There are generally four major types of research paradigms namely, positivism, critical theory, constructivism and realism (Denzin & Lincoln 1998; Guba 1990; Guba & Lincoln 1994). According to Guba & Lincoln (1994) the basic beliefs which defines a particular research paradigm consists of the ontological question, the epistemological question and the methodological question. The ontological viewpoint holds that a reality is external to social actors [i.e. objectivism] or whether reality is a social construct built from perceptions of actions from social actors [i.e. constructivism] (Bryman & Bell 2015). The viewpoint held which guides the research strategy for this study takes on an objectivist orientation. This means that the research rests on the assumption that social reality is viewed as an external, objective reality (Guba & Lincoln 1994). Therefore, taking on this world view, this study entails a deductive approach to the relationship between theory and research [i.e. theory testing] (Bryman & Bell 2015). Hence, a practical approach which is based on a natural science model (i.e. positivism) that generally emphasises quantification in the data collection and data analysis processes is undertaken for this study (Guba & Lincoln 1994).

The epistemological position taken for this study is positivism. The positivist approach is based on the assumption that there is an objective reality (i.e. “phenomenalism”) of which a testable hypothesis can be generated (Bryman & Bell 2015). Thus, the positivist approach is well suited to quantitative research methods and most statistical analysis intending to test and/or explain relationships between constructs (Saunders, Lewis & Thornhill 2009). Whilst a qualitative approach is useful as a tool for data collection through for example, observations and face to face interviews, it has the disadvantage in that construct validity is often a concern (Bryman & Bell 2015; Saunders, Lewis & Thornhill 2009). This means that in a qualitative approach the constructs of interests are not necessarily directly observable, which may lead to biasness and its reliability questionable (Graziano 2013).

As the constructs of interest in this study are predominantly behavioural constructs (i.e. self-efficacy, food risk perception, FRL and social support group usage) and relatively intangible in nature, the researcher has used a quantitative approach which may limit issues concerning construct validity and reliability. As such validity testing measures such as content validity and face validity were some of the measures used in this study to limit validity problems (Sekaran 2011). Detailed description of validity testing is presented in section 3.5 of this thesis. Another important aspect of the quantitative approach is the ability of researchers to replicate a study, which not only confirms the reliability of the study but also creates greater confidence amongst researchers about the study (Sekaran 2011). In this case the possibility of replicating this particular study will likely provide further opportunities to generate new ideas, improve policy measures and other practical solutions for the benefit of people with diabetes and society at large.

Additionally, Saunders, Lewis & Thornhill (2009) suggests that the positivism view links real-life scenarios to theoretical concepts which is then examined through hypotheses testing. Further to this Chia (2002 pp. 8) states that, *"Moreover, all observations are guided by the use of established terminologies, concepts and theories which provide a common basis for unifying the research enterprise."* This statement, highlights the importance of ensuring that the overall research is guided through the alignment of literature, theory and hypothesis testing to ensure research validity and rigour (Chia 2002). The application of the positivist approach in this study was firstly through the generation of the hypotheses from theory (i.e. Section 2.9). Secondly, the researcher compared the empirical findings from observing "the reality" which in this case are the factors concerning dietary compliance amongst people with diabetes. Finally, the empirical findings were generalised to explain the results of this particular enquiry as presented in Chapter 4 of this thesis.

3.3 Research Design

A research design is the plan in which the researcher executes the data collection and analysis phase (Sekaran 2006). Central to this plan is the research problem which is the core statement of a study i.e. *the issue that needs to be addressed* (Baker 1994). According to Baker (1994), a valid research problem, should ideally originate from a combination of experience and knowledge that relates to issues in a society. Once the research problem has been identified, a systematic process of inquiry transpires as illustrated in Figure 3.2.

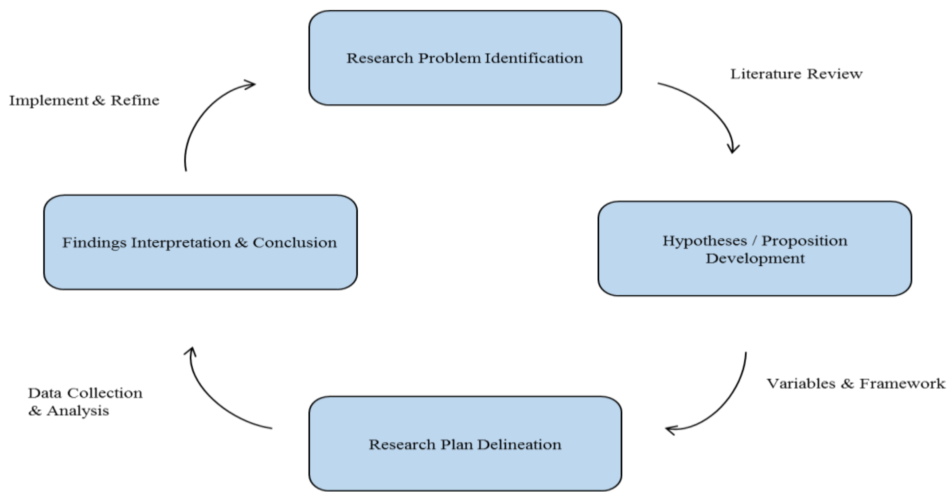


Figure 3.2: The Research Process

Source: Adapted from Sekaran (2006, p. 28).

Figure 3.2, illustrates the overall process of a scientific research which comprises several phases and components (Sekaran 2006). Adapting the research process into this study, the following process has been undertaken by the researcher:

a. Research problem identification: The key research problem identified thus far in this study is that poor dietary compliance is an important factor found to impact the growth and prevalence of diabetes and its related health risks (Basu et al. 2013). As this study is a national study, a quantitative approach using a survey instrument is suited to examine and explain the issues related to a larger population (Aaker, Kumar & Day 2003);

b. Research framework which guides the research: Literature review i.e. Chapter 2 of this thesis has revealed a number of research gaps within the context of this study (i.e. Section 2.9). This shows that there are likely many areas pertaining to dietary behaviour amongst people with diabetes that remain relatively unknown. Additionally, the challenges associated with understanding the complex nature of food compliance amongst diabetic has generated diverse and conflicting research outcomes thus far (Holands 2016; Vandelanotte 2016). Therefore, the research framework of this study includes the use of validated constructs which provides a sound framework to guide this research. Additionally, other measures such as a pilot study and expert interviews were incorporated into the study to ensure that each construct to be examined is reliable.

c. Research plan which is feasible for the research: The research plan included the careful consideration of the study population, sampling procedures, data collection methods and the data analysis procedures, bearing in mind the specific time frame and resource allocations for this study.

The research methodology employed for this study involves a quantitative approach. A quantitative approach involves theory testing, employing inquiry techniques such as surveys, and collecting data using instruments that produce statistical data (Malhotra 2004). Furthermore, the quantitative approach allows for empirical hypothesis testing whereby the nature of relationships is tested based on the construction of a conceptual framework. Creswell (2003) explains that the quantitative approach develops knowledge through a number of methods such as follows:-

Cause and effect thinking;

- The use of measurements and observations;
- Variables and hypotheses testing;
- Examination of theory, and;
- The collection of statistical data using pre-determined data.

Since this study involves hypotheses testing, in which it proposes to establish the relationship between a number of variables (i.e. self-efficacy, food risk perception, food related lifestyle and social support group usage) and the dependent variable of the likelihood of dietary compliance, the quantitative analysis is suited to this study (Sekaran 2003). Additionally, the quantitative approach using surveys within diabetic studies have been well documented in literature, for example SEM (Walker et al. 2014); hierarchical regression (Wardian & Sun 2014); descriptive analysis (Kim et al. 2014); ANCOVA (Muchiri, Gericke, & Rheeder 2016); PLS-SEM (Iranagh, Rahman & Motalebi 2016; Rho et al. 2015).

Saunders et al. (2011), presents the research design as akin to the layers of an onion with each layer contributing towards the overall research design. Figure 3.3 presents the research design which is employed for this study.

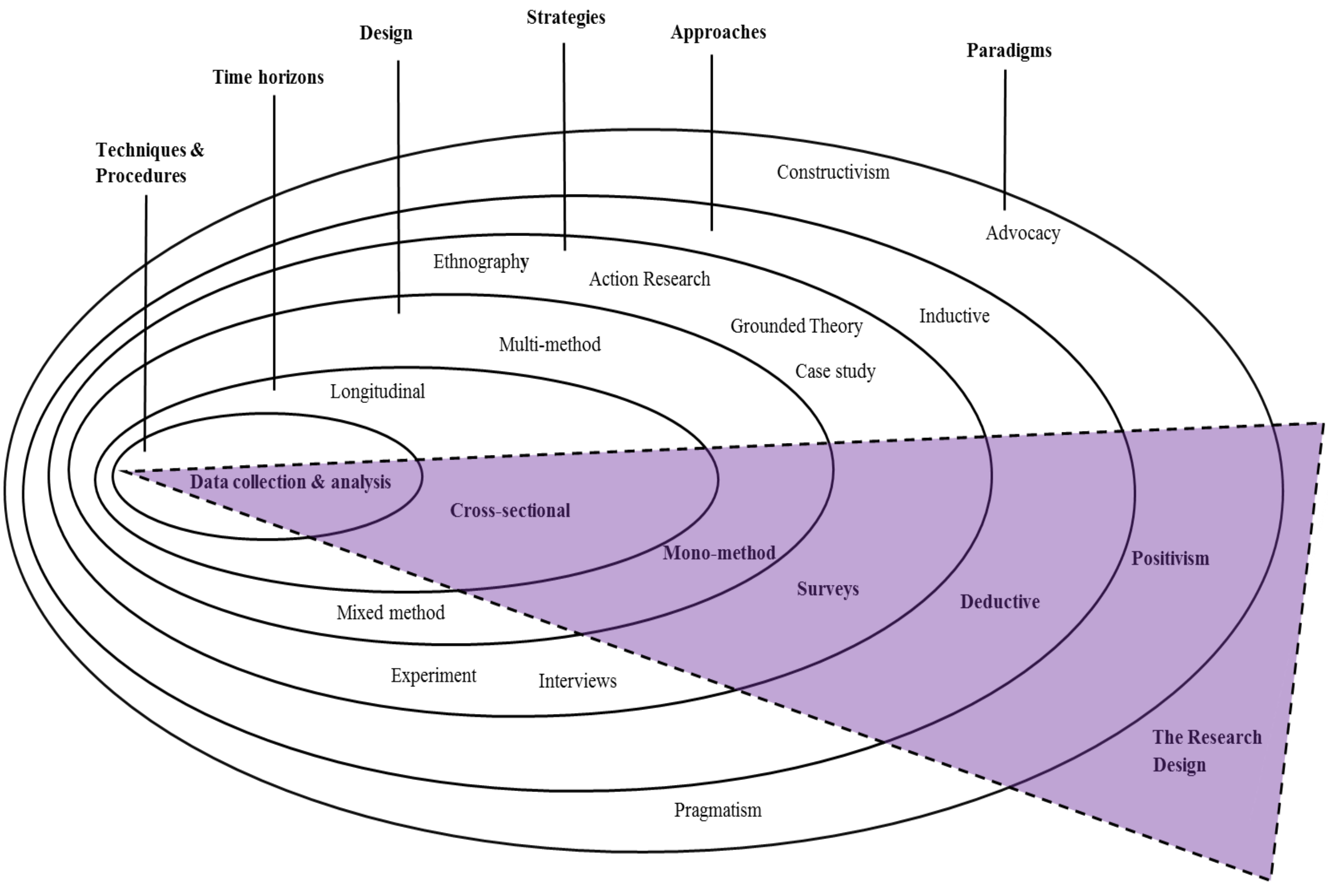


Figure 3.3: The research 'onion' layers.
Source: Adapted from Saunders et al. (2011, p. 138).

Based on the "research onion" concept as proposed by Saunders et al. (2011), the research design for this study is highlighted in the coloured section of Figure 3.3. In this case, the research design takes on a positivist approach, whereby a testable hypotheses is examined. A mono-research approach is used in this study which has been a well-established method (e.g. Carey 2013; Denzin and Lincoln, 1994; Howe 1998) to analyse causal relationships between variables. Numerous researchers (Carey 2013; Howe 1998; Sandelowski 2014; Spector 2006) have stated that the mono-method is a justifiable research approach due to the rigorous techniques and protocols which are employed (i.e. reliability and validity testing etc.) during the analysis process. Therefore, the mono-research method has been considered an equally reliable research approach to other approaches such as the mixed-method approach (Carey 2013; Sandelowski 2014; Spector

2006). Furthermore, researchers (i.e. Onwuegbuzie and Leech, 2005; Spector 2006) support the view that any research approach undertaken must most importantly reflect the research questions being asked which ultimately determines the outcome of the enquiry. In this case the key research question for this study i.e. *what are the factors which influence dietary compliance amongst people with diabetes?,* is investigated through rigorous theory and hypothesis testing to reflect the enquiry presented. These measures are further explained in Sections 3.1 and 4.1 of this chapter.

The main research strategy employed in this study is the use of an anonymous on-line and traditional printed survey method. The data was collected from a cross-section of the population in numeric format and analysed using quantitative procedures. Cross sectional studies have been considered as a suitable method for most survey methodology (Gray 2014). Relevant statistical tools such as Statistical Package for the Social Sciences (SPSS) version 22 was used for the analysis of numerical data. To ensure data is suitable for hypothesis testing, **descriptive statistics, reliability tests and factor analysis** was conducted using SPSS software. Diagram 3.1, presents the sequence of activities in the research plan which will be undertaken for this study. Details of the data collection design and the overall data analysis procedure is explained from Section 3.4 onwards.

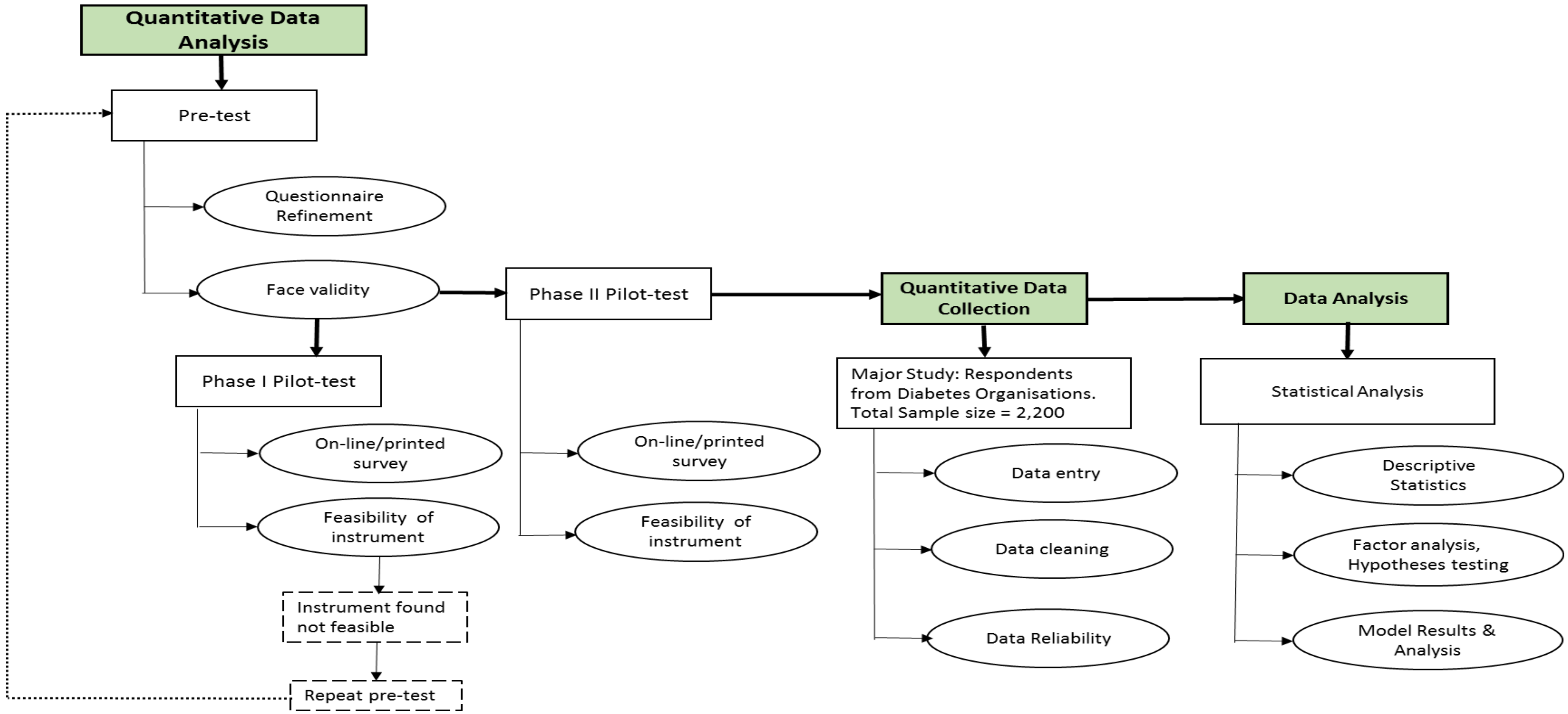


Diagram 3.1: Research Plan Flow-Chart for the study.

Source: Diagram Developed for this study

3.4 Data Collection Design

This section introduces the data collection design for this study which includes the sampling design, the research instrument, the questionnaire design and the pilot-test.

3.4.1 Sampling Design

The proposed sampling design for this study is a probability or random sampling design. Many empirical studies require a random or representative sample to be drawn from a population (Aaker, Kumar & Day 2003; Malhotra 2004). The sampling design must consider whether the sample is representative of the population and whether the sampling method is appropriate (Aaker, Kumar & Day 2003). Additionally, probability sampling allows researchers to conduct tests of significance that permits inferences about the selected sample (Bryman & Bell 2015). However, if a sample is not representative of the population, it is described as biased (Aaker, Kumar & Day 2003; Malhotra 2004; Veal 2005). Generally, sample sizes are much larger in quantitative studies than those used in qualitative research, thus statistical methods to ensure that samples are representative can be used in a quantitative sampling design (Carey, 1993). This section details the sample selection, sample size and sampling method determinants for this study.

At the point of data collection, there were approximately 1.7 million Australians who have been diagnosed with diabetes (Diabetes Australia 2016). For the purpose of this study, random sampling was employed in which the samples included people with diabetes who were registered with diabetic support organisations within Australia, namely, Diabetes Australia and AH Diabetes Toowoomba, Queensland. Each of the aforementioned diabetes organisation provided for a relatively good representation of the population. At the point of writing this thesis, approximately 1,800 people with diabetes were members of Diabetes Australia and 400 members were registered with AH Diabetes. The breakdown of the sample representative is presented in table 3.2 below.

Table 3.2: Breakdown of the sample representative.

No.	Name	Type	Sample
1.	Diabetes Australia	National (Australia)	1,800
2.	AH Diabetes	Local (Toowoomba)	400
	TOTAL		**2,200**

Source: Table developed for this study

The choice of the aforementioned diabetes organisations was based on an initial request by the researcher through e-mail and phone-calls to a number of diabetes support organisations in Australia to participate in this study. Eventually, the diabetic support organisations listed in table 3.2 agreed to promote this study and invite members of their respective organisations to participate in this research.

~Justification for the inclusion of the local sample population. The aim of the initial sampling design plan for this study was to obtain the sampling representative from a national sample size, which would likely provide a larger sample. For this reason, the researcher contacted the National Diabetes Service Scheme (NDSS), Australia. At the point of contact (May 2015) NDSS had recorded approximately 1 million registrants with the organisation. This would provide a relatively good representation of the population. Unfortunately, in June 2016, the researcher was informed by the NDSS representative that the agency was going through a major organisational transition and therefore was unable to commit to this research project. (Refer to Appendix A – NDSS Transition). Additionally, NDSS informed the researcher that they were unable to confirm how long the transitional process would take. Due to the critical time constraints for this study, the researcher had to then source for local agencies in order to work within this time-frame.

In July 2016, a local agency AH Diabetes Toowoomba agreed to promote and deploy the survey for this study. At the point of contact, there were approximately 400 members registered with AH. The Toowoomba region is not immune to diabetes as there has been a 12 % growth in diabetes in the region from 6,217 people diagnosed with diabetes in 2013 to 6,944 people diagnosed with diabetes in 2015 (The Queensland Times 2015).

Therefore, data collection and analysis of the Toowoomba area would likely be important to further understand issues surrounding its growth and prevalence in this region.

At the same time, due to the relatively small sample size (N = 400) with AH Diabetes, the researcher decided to contact other agencies both locally and nationally to increase the sample representation. In November of 2016, Diabetes Australia which is a national diabetes organisation with about 1,800 members agreed to promote and deploy the survey for this study. Table 3.3 shows the time-line of activities concerning the sample design issues faced during the sampling design phase of this study.

Table 3.3: Time-line of sampling design issues

No.	Activity	May 2015-June 2016	June 2016-July 2016	July 2016-Aug 2016	Aug 2016 – Sep. 2016	Oct 2016-Nov 2016	Nov 2016-June 2017
1.	NDSS agreed to promote & deploy the survey						
2.	NDSS unable to commit to the project.						
3.	Began sourcing for local agencies						
4.	AH Diabetes Toowoomba confirmed their involvement in the project. Sourced for other agencies to boost sample size.						
5.	Diabetes Australia confirmed their involvement in the project.						

~Implications to the study. The inclusion of the local diabetes organisation i.e. AH Toowoomba would likely have some implications to the overall data output of this study. Firstly, the inclusion of both the local and national sample in this study has increased the sample size for this study. Secondly, there may be future opportunities to examine the impact of diabetes in smaller regions like Toowoomba amongst others, as these areas are also not immune to diabetes and may also require necessary support. Overall, these implications would likely be beneficial towards the continued efforts to further understand the behaviour, characteristics and factors which may influence dietary compliance amongst people with diabetes.

3.4.2 Data Collection

In each case, the aforementioned organisations placed an on-line advertisement on their respective web-pages inviting registered members to participate in the on-line survey. Additionally, a printed version of the survey was deployed at the request of AH Diabetes, Toowoomba to cater for some older respondents who may not be internet savvy or who may not have access to internet services. The printed version (n=100) was personally distributed by the staff at AH Diabetes to potential respondents who visited the support organisation. The inclusion and exclusion criteria for this study are as follows:-

Table 3.4: Inclusion and Exclusion criteria of the study

Inclusion Criteria	Exclusion Criteria
- Those diagnosed with Diabetes (Type 2 & Type 2) - Adults above the age 18 - English speaking; - Australian citizens/residents	- Non-people with diabetes - Minors & those below the age of 18 - Non-English speaking - Non-Australian citizens/residents - *Gestational diabetes[1]

3.4.3 Sampling bias issues

Generally, sampling bias i.e. error is a type of bias which can occur from errors in choosing a sample which could distort data (Leedy & Ormrod 2005). Sampling error can be categorised as random sample error and systematic error i.e. bias (Leedy & Ormrod 2005). Random sample error occurs when there is a difference between the results of a sample and the results of a survey conducted using the same procedures (Pallant 2013). Systematic errors or non-sampling error occurs as a result of problems in the research design or problems with execution of the research design and are generally categorised as respondent error and administrative error (Leedy & Ormrod 2005). In this case the bias occurs when the research results deviates from the true value of the population parameter (Leedy & Ormrod 2005). Errors can also occur when respondents do not cooperate or do not provide truthful answers and is generally categorised as non-response error and response bias (Pallant 2013). Details of minimising sampling errors are explained in section 3.6 of this chapter.

[1] The gestational diabetes category is excluded from this study as this is considered a temporary condition (Diabetes Australia 2016). This study aims to explore dietary compliance among longer term diabetes conditions (Type 1 & 2)

3.4.4 Minimum Sample Size G*Power

The power of a statistical test can be defined as the probability of rejecting the null hypothesis with the assumption that the null hypotheses is in fact false (Faul & Erdfelder 1992). Therefore, significance tests lacking statistical power are of little use as they cannot reliably discriminate between the null hypothesis (H_0) and the alternative hypothesis (H_1) of interest (Faul & Erdfelder 1992). The G*Power tool is a flexible and convenient tool generally used for a range of statistical tests such as t-tests, F-tests, z-tests and exact tests or binomial reference distributions amongst others, which can be directly computed into the system (Faul & Erdfelder 1992). According to Faul & Erdfelder (1992), the G*Power program has not only been useful in the social and behavioural sciences but also equally useful in a number of other disciplines who use statistical tests such as natural sciences and medical research amongst others.

A priori analyses can be conducted to provide a better method of controlling statistical power before the actual study is implemented (Faul & Erdfelder 1992). For this study, G*Power Statistical Power Analysis tool, version 3.1.9.2 was used to determine the minimum sample size. To establish the minimum sample size for this study a priori power analysis for a linear multiple regression with four predictors i.e. Self-efficacy (SE), Food Risk Perception (FRP), Food Related Lifestyle (FRL) and Social Support Group (SSG) usage was conducted on its influence on the dependent variable of the likelihood of dietary compliance (LDC) amongst people with diabetes.

Table 3.5, provides a summary of Cohen's (1977; 1988) effect size conventions:-

Table 3.5: Cohen's Effect Size Conventions

Measures	Index	Small	Medium	Large
t-Test on Means	d	0.20	0.50	0.80
t-Test on Correlations	r	0.10	0.30	0.50
F-Test (ANOVA)	f	0.10	0.25	0.40
F-Test (MLR)	F2	0.02	0.15	0.35
Chi-Square Test	W	0.10	0.30	0.50

Source Adapted from Cohen 1988

In this case, G*Power was used to determine the minimum sample size for this study using a medium effect size of (f^2 = 0.15) that revealed a statistical power of 0.95 and a minimum sample size of 129. For this study, the statistical power of 0.95 is more than adequate power (i.e. power * .80) as prescribed by experts (i.e. Cohen 1988). A minimum sample is needed for the specified significance criterion and hypothesized effect size to achieve the desired power (Cohen 1992).The medium effect size of 0.15 was considered for this study based on Cohen's (1977; 1988) effect size conventions. Figure 3.4 shows the G*Power test conducted to determine the minimum sample size for this study.

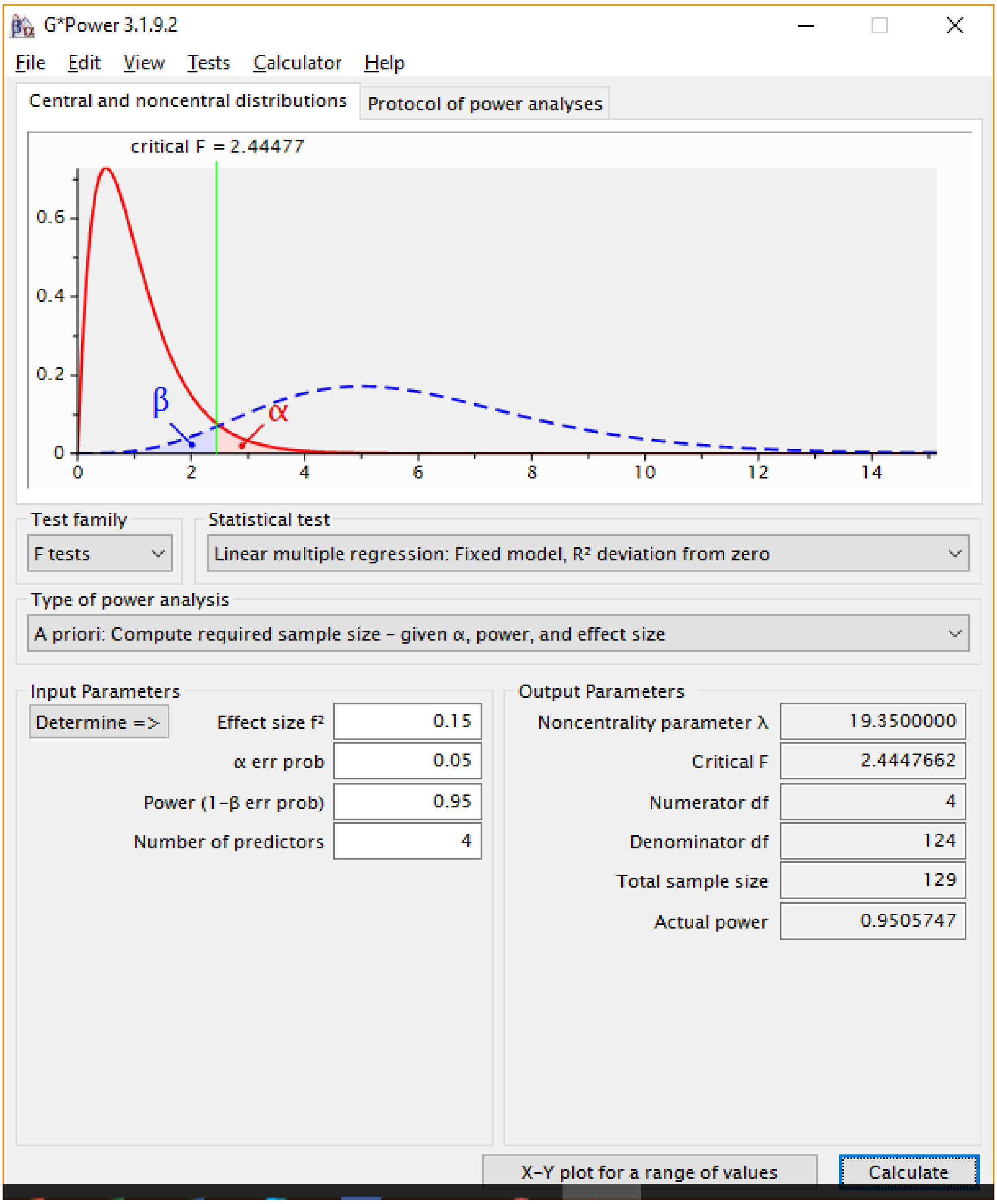


Figure 3.4: G*Power test for minimum sample size.

Therefore, the minimum sample size of 129 revealed by the G*Power test would likely achieve the main objective of this study and should allow the usage of other statistical tests such as testing between groups and mediation based analysis. The planned sample size for this study is 200. A post hoc G*Power test was conducted once the major sample size was established for this study and is presented in Chapter 4 of this thesis.

3.4.5 Research Instrument

For the purpose of this study specific scales from existing instruments for each of the key variables and constructs were used and adapted to generate items to be measured. Table 3.5, provides a summary of each of the instruments and scales used in generating items to be measured for key independent variables (IV) namely Self-efficacy, Risk Perception, Food Related Lifestyles and Social Support Group usage and the dependent variable (DV) of the likelihood of dietary compliance.

¬***Questionnaire Design.*** The questionnaire consisted of four parts which included the following sections:

Section A: **Diabetic Profile**

This section gathered information on the general diabetic background of each respondent with the following questions:

- What is the respondent's diabetes category? (i.e. Type 1, Type 2, or other)
- Length of diagnoses in years. (i.e. ranging from less than one year to more than 10 years & an "unsure" option)
- Type of medication (i.e. oral, insulin, medication by injection and other)
- What is the average blood glucose level of the respondent within the last 6 months (i.e. ranging from a "good range" of at 7 or below, "normal range" of more than 7 to 8, and "not ideal range" of above 8)

- The sub-section of Section A: (i.e. Question 5) is a 5-point Likert scale question on eating behaviour to gather further information on the dependent variable (DV) of the likelihood of dietary compliance amongst the respondents. Each questions asks the respondents to agree or disagree with statements about the type of food and beverages that they normally consume. The Eating Behaviour Patterns Questionnaire Scale (EBPQ Scale) Schlundt, Hargreaves & Buchowski, (2003) was adapted into this section. Additionally, expert interviews with a physician, a nurse practitioner, a pharmacist and diabetes educator was conducted for the item generation for this section. The Likert scale is anchored accordingly, with **1-being Strongly Disagree and 5-being Strongly Agree.**

Section B & C: Questions on the independent variables of Self-efficacy, Food risk Perception, FRL & Social Support Group Usage.

- Using a 5-point Likert scale, and represented accordingly, with **1-being, Strongly Disagree and 5-being Strongly Agree.** this section asks respondents about the independent variables as follows:-

- **Section B (i): Self-Efficacy**

➢ This section examined how strongly the respondents agree or disagree with their levels of self-efficacy pertaining to their confidence in managing a range of diabetes related goals such as healthy eating, blood glucose control, exercise regimes, following recommended diets and whether they feel insecure in managing their diet. The items for this section are adapted from:

➢ Diabetes Self-Management Questionnaire (Schmitt et al. 2013), the Self-Efficacy Scale (Sherer et al. 1982) and Diabetes Self-Efficacy Scale (Stanford Patient Education Research Centre 2016). The outcomes from this section may be useful in the future development of positive self-efficacy and motivational programs to improve dietary goals amongst people with diabetes.

- **Section B (ii) Food Risk Perception**

➢ This section examined the respondent's perceptions on food risk by asking respondents to agree or disagree on whether they believe the consumption of certain foods such as sugar, sweeteners and fat would damage their health either immediately or in the long-run. Respondents were also asked if they agreed or disagreed on whether it is easy to tell if foods containing sugar would be a risk to their health. Additionally, a question asking whether respondents agree or disagree on whether they worry about the potential risk to their health if they consumed sweetened foods was included. The Perceived Food Risk Scale (Fife-Schaw & Rowe 1996) was adapted into this section. The information from this section may provide opportunities to develop improved food knowledge and health protective behaviour amongst people with diabetes.

- **Section B (iii): Food Related Lifestyles.**

- In this section, respondents were asked to agree or disagree on a range of items related to their daily food related lifestyles habits. The questions in this section were adapted from the FRL model script to suit the context of this study (Grunert, Brunsø & Bisp 1993). Statements of agreement or disagreement were generated according to food lifestyle factors such as whether respondents eat when they feel the slightest bit hungry and whether they liked or disliked changing their food habits. Questions on whether respondents agree or disagree if external factors such as friends, going out for meals, and advertising cues influence their food habits was included.

- A shopping script question was asked on whether respondents agree or disagree whether they impulse buy for food. Other questions on whether respondents agree or disagree if personal eating habits, food sensory appeal and ethnic food influences their diet was included. Overall, the questions in this section investigated the cognitive and external factors which likely influence food behaviour as suggested by Grunert, Brunsø & Bisp (1993). Outcomes from this section could be used in the promotion of food modification campaigns to encourage better dietary and lifestyle management practices amongst people with diabetes.

- **Section C: Social Support Groups Usage (Independent/Mediating Variable)**

➢ This section gathered information on the independent variable (i.e. also considered a mediating variable) of social support group usage. This section gathered information on the type of social support the respondents use to help them manage their diabetes. A 5-point Likert scale, and anchored accordingly, with **1-being Strongly Disagree and 5-being Strongly Agree** was included in this section. Items from this section were adapted from the Medical Outcomes Study (MOS) Social Support Survey Scale (Sherbourne & Stewart 1991) and the Diabetes Distress Scale (Polonsky et al. 2005)

➢ Respondents were asked if they agree or disagree with whether they can contact other people with diabetes to share their concerns about diabetes management. Other questions on whether they agree or disagree if they could talk to family and friends (i.e. informal support) about managing their diabetes was asked. Questions on whether they agree or disagree if they find formal support such as being able to talk to their doctor about diabetes management or whether diabetes support organisations and diabetes educators provided them with useful information on diabetes management was included.

➢ A question on whether they agree or disagree if they could find information on the internet about managing diabetes was also included. Finally, a question on whether they agree or disagree that they had no one to talk to about managing their diabetes was asked. This section provided information on the type and level of informal and formal social support groups used by the respondents. Information from this section would possibly be useful for future planning and development of improved formal and informal support networks to cater to the various needs amongst people with diabetes.

Table 3.6: Summary of main variables to be examined and the relevant scales adapted

Survey Section	Examples of Variables	Type of Variable	Measures & Standardised Scales	Source of Scales
A	Dietary Compliance	Dependent Variable	**(Items 1-12)** adapted from: The Eating Behaviour Patterns Questionnaire Scale (EBPQ Scale)	Schlundt, Hargreaves & Buchowski, (2003)
B (i)	Self-efficacy	Independent Variable	**Items 13-16** adapted from: Stanford Patient Education Research Centre: Diabetes Self-Efficacy Scale. **Items 17-18** adapted from**:** Diabetes Self-Management Questionnaire (DSMQ) **Item 19** adapted from**:** The Self-Efficacy Scale	(Items 17-18): Schmitt et al. (2013) (Item 19): Sherer et al. (1982) (Items 13-16): Stanford Patient Education Research Centre: Available from: http://patienteducation.stanford.edu/research/sediabetes.html
B (ii)	Food Risk Perception	Independent Variable	**Items 20-24** adapted from: Perceived Food Risk Scale (PFRI Scale)	Fife-Schaw & Rowe (1996)
B (iii)	Food Related Lifestyle	Independent Variable	**Items 25-35** adapted from: Food Related Lifestyle Model (FRL**).**	Grunert, Brunsø & Bisp (1993)
C	Social Support Group	Independent Variable	**Items 36-42** adapted from: MOS Social Support Survey Scale **Item 43** adapted from: Diabetes Distress Scale:	(Items 36-42): Sherbourne & Stewart (1991). (Item 43): Polonsky et al. (2005)

Source: Table developed for this study

Table 3.7: Survey Instrument Breakdown

Survey Section	Constructs	Original Items:	Adapted:	Adapted/Retained/Removed/Added	Measures & Standardised Scales	Source of Scales
A	Likelihood of Dietary Compliance **(DV)**	**Factor 5: Haphazard planning** I have at least three to four servings of vegetables per day. **Factor 1: Low-fat eating** I reduce fat in recipes by substituting ingredients and cutting portions. I carefully watch the portion sizes of my foods.	**Factor : Likelihood of dietary compliance** I eat 2 or more serves (e.g.. 2 ½ cups) of cooked vegetables every day. I eat 3 or more serves (e.g. 5 cups) of salad vegetables every day. I eat a serve (e.g. 1 cup) of high-fibre fruits every day (e.g. banana, oranges, apples & kiwi) I like to eat lean meats (e.g. skinless chicken, red meats or pork with the fat trimmed off). I consume low-fat dairy products (e.g. low-fat milk and cheese). I carefully read food packaging labels to choose lower sugar options.	**Items 1, 2 & 3:** Adapted/added from Expert interviews to quantify portion sizes & food categories. **Items 4-5:** Adapted/added from expert interviews to specify food items. **Item 6:** Adapted/from expert interviews.	The Eating Behaviour Patterns Questionnaire Scale **(EBPQ Scale):** **6 factor model:** **Factor 1: Low fat eating** (14 items). **Factor 2: Emotional eating** (10 items) **Factor 3: Snacking on sweets** (6 items**).** **Factor 4: Cultural/lifestyle behaviours** (7 items) **Factor 5: Haphazard planning** (9 items) **Factor 6: Meal skipping** (5 items) EBPQ scale: Items are based on a 5-point scale (1=Strongly disagree – 5= Strongly agree)	Schlundt, Hargreaves & Buchowski, (2003)

		Factor 3: Snacking on sweets. Sometimes I eat desserts more than once a day. I eat cookies, candy bars, or ice-cream in place of dinner. I snack two to three times every day.	I eat sugary desserts more than once a day. I like to eat sugary snacks in place of main meals more than once a week. I eat processed canned foods more than once a week. I eat processed snack foods more than once a week. I consume more than one sugary soft drink a day. I consume an alcoholic beverage more than five days a week.	**Item 7:** Adapted. **Item 8:** Adapted/from expert interview to include time frame (i.e. once a week). **Items: 9-12:** Adapted/ from expert interviews to specify food type i.e. process foods, processed snacks, sugary soft drinks & alcohol beverages		
B (i)	Self-efficacy (IV)	**Factor: How confident do you feel….?** How confident do you feel that you can eat your meals every 4 to 5 hours every day, including breakfast?	**Factor: Self-efficacy** I am confident in following a healthy eating plan on a daily basis. I am confident in my ability to limit eating processed foods containing high amounts of sugar, salt and fat. I feel confident in maintaining healthy eating goals. I am confident in keeping my blood sugar in good control. I strictly follow the dietary recommendations given by my doctor or diabetes specialist.	**Items 13-16:** Adapted/added: eating plan, eating processed foods…., maintaining healthy eating goals generated from expert interviews & supervisory consultation. **Item 16**: Adapted/from expert interviews	**Items 13-16:** Stanford Patient Education Research Centre: **Diabetes Self-Efficacy Scale.** 8 items Scale: "How confident do you feel that you can…?" Eat meals every 4 to 5 hours…..; Follow your diet when……; Choose the appropriate foods…….; You can exercise…….; You can do something to prevent your blood sugar……;	Stanford Patient Education Research Centre: Available from: http://patienteducation.stanford.edu/research/sediabetes.html

		How confident do you feel that you know what to do when your blood sugar levels goes higher than it should be? **Factor : Self-care activities** Item 9: I strictly follow the dietary recommendations given by my doctor or diabetes specialist. Item 8: I do regular physical activity to achieve optimal blood sugar levels. **Factor: General self-efficacy** Item 14: I feel insecure about my ability to do things	I do regular physical activity to help me achieve optimal blood sugar levels. I feel insecure about my ability in managing healthy eating goals.	**Item 17**: Retained **Item 18:** Adapted **Item 19**: Adapted: from expert interviews	You know what to do when you blood sugar…….; You can judge when the changes in your illness……; Control your diabetes……; **Diabetes Self-Efficacy Scale: a 10-point scale: 1 = Not at all confident to 10= Totally confident** **Items 17-18:** Diabetes Self-Management Questionnaire **(DSMQ)** **DSMQ Scale 16 item:**: 4-point Likert scale 0 = Does not apply to me to 3= Applies to me very much No neutral **Item 19:** The Self-Efficacy Scale: Original scale items: General Self-efficacy: 17 items; Social self-efficacy: 6 items. Total: 23 items. Rated on 14-point Likert scale: 1=strongly disagree to 14= strongly agree.	Schmitt et al. (2013) Sherer et al. (1982)
		Factor: Set A: DELAY EFFECT (DELAYEFF) Item 7: Would any damage to your health from the following things be immediately apparent or at a later date?	**Factor: Food Risk Perception** I believe if I consume high amounts of sugar, damage to my health would be immediately apparent.	**Item 20**: Adapted/from supervisory consultation & expert interviews,	**Items 20-24** adapted from: Perceived Food Risk Scale **(PFRI Scale)** Original scale based on two sub-sets (A & B) of 10 items each with a list of potential food risk items (11 items each subsets) e.g. set A:	

B (ii)	Food Risk Perception	**Factor Set B**: **EASY to TELL (EASYTEL)** Item 5: How easy is it for you to tell if foods like those listed below contain a risk to your health **Factor Set A: SERIOUSLY HARM (SERIOUS)** Item 9: How seriously do you think that he following things may harm your health? **Factor Set B: WORRY** Item 2: How worried are you about potential risks associated with the following things? **Factor: Set A: DELAY EFFECT (DELAYEFF)** Item 7: Would any damage to your health from the following things be immediately apparent or at a later date?	It is easy for me to tell if foods containing sugar and sweeteners are a risk to my health. I believe that the consumption of foods containing sugar, fats and sweeteners could seriously harm my health. I am worried about the potential risks to my health associated with the consumption of sweetened food products. I believe if I consume high amounts of sugar, damage to my health would be apparent in the long run.	**Item 21: Adapted** –food items (sugar & sweeteners) added from food list Set B of the original questionnaire. **Item 22: Adapted** –food items (sugar & sweeteners) added from food list Set A & B of the original questionnaire. **Item 23: Adapted**. Item 24: **Adapted.** Item 7 from the instrument is split to item 20 (immediate) and item 24 (long run) based on supervisory consultation.	Foods containing saturated fats, caffeine, preservatives etc. Set B: Foods containing cholesterol, sugar and sweeteners etc. Respondents would relate each factor with the given food subsets to answer in a 5-point Likert scale E.g. **DELAYEFF** 1= Damage immediately apparent to 5= Damage apparent after a long time **EASYTELL** 1= Never to 5 = You can always tell **SERIOUS** 1= not seriously at all, to 5 = extremely serious **WORRY** 1= not likely at all to 5= extremely worried	Fife-Schaw & Rowe (1996)

B(iii)	Food Related Lifestyle	**FRL Domain**: **Usage Situations** **Factor Name: Snacks versus meals** Item 2: I eat whenever I feel the slightest bit hungry **FRL Domain**: **Higher order product attributes** **Factor Name: Novelty** Item 7: I like to try new foods that I have never tasted before. **FRL Domain**: **Desired consequences** **Factor Name: Self-fulfilment in food** Item 2: Eating is to me a matter of touching, smelling, tasting and seeing, all the senses are involved. It is a very exciting sensation. **FRL Domain**: **Meal preparation script** **Factor Name: Convenience** Item 9: I use a lot of mixes, for instance baking mixes and powder soups**.** **FRL Domain**: **Desired consequences** **Factor Name: Social-relationships** Item 6: I find that dining with friends is an important part of my social life. **FRL Domain**: **Meal preparation script** **Factor Name: Looking after new ways** Item 6: Recipes and articles on food from other culinary traditions makes me experiment in the kitchen. **FRL Domain**: **Desired consequences**	**Factor: FRL** I eat whenever I get the slightest bit hungry. My friends encourage me to buy new foods which may not be good for my diabetes. I enjoy the taste, smell and texture of food. I regularly use pre-mixed food products for its convenience. I regularly go out for meals. Some of my favourite ethnic foods may not be good for my diabetes. I dislike changing my eating habits. It is hard to cook diabetic friendly meals that the whole family can enjoy. I like to impulse buy when shopping for food.	Item 25: Adapted Item 26: Adapted: include social influence of friends-based on supervisory consultation. Item 27: Adapted Item 28: Adapted Item 29: Adapted Item 30: Adapted Item 31: Adapted Item 32: Adapted	**Items 25-35** adapted from: Food Related Lifestyle Model **(FRL)** FRL measures 21 lifestyle dimensions from 5 domains, each with its own sub-scales:- **ways of shopping** (six subscales or dimensions: importance of product information, attitude towards advertising, joy of shopping, specialty shops, price criterion, shopping list), **cooking /meal preparation methods** (six subscales: involvement in cooking, looking after new ways, convenience, whole family, spontaneity, woman's task), **quality aspects/ higher order attributes** (four subscales: health, price/quality relation, novelty, organic products) **consumption situation** (two subscales: snacks versus meals, social event) **purchasing motives/desired consequences** (three subscales: self-fulfilment in food, security, social relationships).	Grunert, Brunsø & Bisp (1993)

		Factor Name: Security Item 4: I dislike anything that might change my eating habits **FRL Domain**: **Meal preparation script** **Factor Name: Involvement with cooking** Item 2: At home we usually eat quickly prepared meals rather than more carefully prepared dishes. **FRL Domain**: **Shopping script** **Factor Name: Shopping list** Item 16: Before I do a large food shopping, I make a list of everything I need. **FRL Domain**: **Shopping script** **Factor Name: Attitude towards advertising** Item 6: I am influenced by what people say about a food product	Advertisements promoting sugary foods makes me want to purchase sugary items. I find it hard to resist the attractive packaging of sugary food items in stores.	Item 33: Adapted Item 34: Adapted Item 35: Added after supervisory consultation	Original Items measured through a 5-point Agreement scale 1= Strongly Disagree to 5= Strongly Agree	

C	Social Support Group	**Factor Name: Support Available** **Emotional** Item 3: Someone you can count on to listen to you when you need to talk **Factor Name: Support Available** **Emotiona**l: Item 9: Someone to confide in or talk to about yourself or your problem **Informational**: Item 8: Someone to give you information to understand a situation	**Factor: Social Support Group Usage** I can contact other people who have diabetes to share my concerns about diabetes management. I can talk to my family about issues related to my diabetes. I can talk to my close friends about issues related to my diabetes. I can find information on the internet about issues concerning my diabetes. I can talk to my doctor about managing my diabetes. I find diabetes support organisations such as Diabetes Australia, NDSS etc useful in providing me with information on managing my diabetes. I find diabetes educators useful in providing me with information on managing my diabetes.	Item 36: Adapted **Items 37, 38, & 40**: Adapted from item 9 of the original scale. **Items 39, 41 & 42**: Adapted from item 8 of the original scale.	**Items 36-42** adapted from: **Medical Outcomes Study (MOS) Social Support Survey Scale** Original scale: 19 item survey of functional social support which is divided into dimensions of support, each with its own subset- **Emotional** (3 sub-sets: positive affect, empathetic understanding, encouragement of feelings) **Informationa**l (4 subsets: offering advice, information, guidance or feedback) **Tangible** (2 subsets-material or behavioural aid) **Affectionate** (2 sub-sets: expression of love & affection) **Positive social interaction** (1 sub-set: availability of other people to have fun with)	Sherbourne & Stewart (1991).

		Factor: Diabetes distress Item 4: Feeling that there is no one in my life with whom I can talk really openly about my feelings about diabetes.	I feel there is no one in my life with whom I can talk to about managing my diabetes.	Item: 43 Adapted	**Items 43** adapted from: Diabetes Distress Scale (DDS) Polonsky et al. 2005) DDS 28 item scale using a 6-point Likert scale: 1= No problem to 6= Serious problem	Polonsky et al. (2005)

3.5 Pilot-Study

The pilot-study is considered a useful step in the research process and is generally a trial-run or a feasibility study of the main study (Van Teijlingen & Hundley, 2001). In most cases, the researcher will be able to determine the type of research questions to be asked, the applicability of the survey and the overall value of the survey instrument through the pilot study (Van Teijlingen & Hundley, 2001). Additionally, the pilot study can ensure the correct phrasing of questions, sequence and general layout of the questionnaire as well as face validity of the instrument (Bryman & Bell 2015). As such the researcher conducted a pilot study to check the feasibility of this study.

The pilot study was conducted following the general procedure for anonymous on-line survey research technique which has the advantage of shorter duration and lower cost of survey delivery and data entry (Fan & Yan 2010). During this phase of the study, (i.e. Phase I) the researcher discovered some problems which could hinder the applicability of the survey instrument into the main study. Therefore, a second pilot study (i.e. Phase II) was conducted to ensure the feasibility and applicability of the survey. Phase II of the pilot study was to confirm the reliability and stability of the instrument before the final distribution of the major survey. Details of the pilot study are presented in the next sub-section:-

-Pilot-study: Phase I. Prior to conducting the pilot study the researcher conducted a pre-test of the instrument with five individuals comprising both Type I and Type II people with diabetes and a researcher who is a food scientist to gather feedback on the overall, structure, flow and completion time of the survey. Pre-tests are useful to identify any issues as mentioned to rectify and/or iron out any problems before conducting the pilot study (Bryman & Bell 2015). After the pre-test the researcher corrected some minor issues such as grammar, spelling and sentence construction. The researcher then proceeded with the pilot study.

The pilot study consisted of an on-line anonymous survey which was sent out to full-time staff from the University of Southern Queensland (USQ), from November 2015 to February 2016. Since it was not possible to identify which individuals amongst the staff were diagnosed with diabetes, a general e-mail was sent out to all USQ staff (N = 1,400) by the department administrator inviting staff who have been diagnosed with diabetes to participate in the pilot study. The online survey was developed on the University of Southern Queensland (USQ) Custom Survey System platform that was administered by the Strategic Business Management and Improvement (SBMI) unit. A total of 36 staff completed the on-line survey. The overall outcome from the initial pilot study revealed some minor issues with sentence construction and flow of the questions. Whilst the researcher was able to conduct some basic descriptive statistics from this pilot data, unfortunately, the researcher found a problem with the statistical validity of this survey.

In this case the researcher was able to analyse the relationship between the independent variables (i.e. Self-efficacy, Food-risk perception, FRL & Social Support Group usage). However, the researcher was unable to analyse the relationship between the independent constructs (IV) and the dependent variable (DV) i.e. the likelihood of dietary compliance. The main reason behind this problem is due to inter-item inconsistency between the IV and the DV. In this case the particular question to determine the likelihood of dietary compliance (i.e. the DV) is set as an ordinal scale with those answering "Glycaemic level of more than 8.0" labelled for analysis as "non-dietary compliant." This question was to identify dietary compliance amongst respondents based on literature and expert opinion. This means that those with higher levels of glycaemic levels (i.e. more than 8%) within the last 3 to 6 months are generally considered in poor control of their blood glucose levels and likely not dietary compliant. The example below shows the original question that was asked in Phase I, to determine the likelihood of dietary compliance amongst people with diabetes:-

Question 4.

What was your average glycaemic level (HbA1c) percentage (%) within the last 6 months?

Please check only **ONE** response below:

- Glycaemic level **at 7.0 or below**
- Glycaemic level between **7.1 to 8.0**
- Glycaemic level of **more than 8.0**
- Not sure

Whilst the dependent variable question was set as an ordinal scale, the independent constructs were all based on a 5-point Likert scale, and represented accordingly, with **1-being, Strongly Disagree and 5-being Strongly Agree.** Due to the inconsistent measurement scales used between the IV (i.e. Likert scale) and DV (i.e. ordinal scale), the researcher was unable to conduct relevant statistical tests to determine the relationship between the IV and DV. As a result the inter-item consistency was questionable and considered not reliable. Additionally, important reliability tests such as determining the Cronbach's Alpha value (i.e. between 0.70 and 0.9) as per Meyers, Gamst and Guarino (2013) suggestion cannot be determined. Therefore, with this situation, the researcher was unable to proceed with further reliability tests. Due to the impracticality of the situation a second pilot study (Phase II) was conducted and at the same time the results of pilot study (Phase I) was discarded.

-Pilot study (Phase II). The problems arising out of Phase I of the pilot study, prompted the researcher to conduct the second pilot-study (i.e. Phase II). Many experts (Polit & Beck 2010; van Teijlingen & Hundley 2002) have highlighted the value of a pilot study as an important step to discover problems, inconsistencies and flaws with a particular survey instrument. At the same time another benefit of a pilot study is that a research instrument can be modified and adapted accordingly (van Teijlingen & Hundley 2002). Therefore, Phase II of the pilot study did not only iron out the problems uncovered in the initial pilot study but provided another level of reassessment and validation of the intended research instrument, thereby likely enhancing the quality and reliability of the instrument (Polit & Beck 2010).

The first step in rectifying the survey instrument was to modify the DV question by adding a 5-point Likert scale, to determine the likelihood of dietary compliance amongst people with diabetes. The scale was represented accordingly, with **1-being, Strongly Disagree and 5-being Strongly Agree.** By doing so, this not only allowed for improved inter-item consistency between the IV and DV, but also allowed for improved statistical reliability tests. For this particular question item generation was based on existing scales which is presented in section 3.3.4 of this chapter. Expert interviews (i.e. physician, nurse practitioner, pharmacists and diabetic educators) were also conducted to specify the recommended food categories for the dietary compliance item pool.

To test this version of the survey instrument the researcher contacted a local diabetes support organisation (i.e. The Toowoomba & Darling Downs Diabetic Group Inc.) who agreed to allow the researcher to distribute both the on-line and printed version of this pilot-survey to the registered members (N=150) of this organisation. The printed version of the survey was distributed at a diabetes expo held on September 10th 2016 from 9am to 4pm, in Toowoomba which was hosted by the aforementioned diabetes support group and in which the registered members were invited to. The researcher personally distributed the surveys to potential respondents at the expo who fit the inclusion criteria of this study. In total 51 responses (N = 17 online and N = 34 printed) were obtained from this exercise. To ensure parity between the on-line and printed survey steps were taken to ensure both instruments are consistent. Firstly, both survey instruments are identical in terms of questions, sequence, layout, instructions and flow. Minor differences with the instructions i.e. please “click” (on-line) and please “tick” (printed) your response…. , could not be avoided due to the nature of the instrument channels used. In addition, both measures were tested through face validity (i.e. Section 3.6.1) to ensure consistency.

Modification of the survey to include the Likert scale instrument to test the DV, facilitated further statistical tests to measure reliability. For example, reliability tests for Phase II of the pilot study revealed Cronbach’s Alpha values within the acceptable range of between 0.70 and 0.9 for all items tested (Pallant 2013). Further explanation are provided in Section 3.5 of this chapter. After confirmation of the instrument through a final check, the instrument was ready to be deployed for the major study.

Finally, the researcher also noted that in both phases of the pilot study response rates were relatively low. On-line survey methods likely offers some advantages (i.e. lower cost, shorter time and easier administration) compared to other methods such as mail or telephone survey (Allen & Seamen 2013). Unfortunately lower response rates is also evidenced with online surveys (Fan & Yan 2010; Kaplowitz, Hadlock & Levine 2004; Manfreda et al. 2008). However, due to the growing popularity of the internet and its ease of use today, on-line surveys are still considered a better option to mail or telephone surveys (Allen & Seamen 2013). Additionally scholars (Allen & Seamen 2013; Dykema et al. 2013) have suggested that using incentives (i.e. monetary, gifts etc.) are likely to increase on-line survey response rates.

Another method to increase on-line survey responses would be to use promotional strategies such as advertising the survey prior to its actual placement on a website (Dykema et al. 2013). Other scholars such as Duffett et al (2012); Sahlqvist et al (2011) suggest that reminder packs or alerts can also increase survey response rates. By doing so researchers (e.g. Dykema et al. 2013; McPeake et al. 2014) suggest that the early promotion of the survey would act as an advance reminder to potential respondents who would likely notice the actual survey and thus are more likely to respond to it.

Due to budget constraints the researcher was unable to include any incentives for this study and so opted to promote the final survey by placing an invitation to take part on the website of the diabetes organisations (i.e. Diabetes Australia: *www.diabetesaustralia.com.au* and AH Toowoomba: *http://ahdiabetes.com.au/*) prior to conducting the actual on-line survey. Additionally, AH Toowoomba agreed to also promote the survey by placing some printed flyers in their office and also verbally to members who visited their office. In this case both organisations had agreed to promote the final survey on their websites with no cost to the researcher. The researcher had created on-line and printed flyers for this purpose (Please refer to Appendix B: Flyers). Additionally, the researcher was also on-air (April 26th 2017, 9.05am) with ABC Southern Queensland Toowoomba, a local media broadcasting show. The researcher was able to discuss the general aspects of the study and promote the survey on the programme. Given that the researcher did not aggressively promote the pilot study prior to conducting it, the researcher was confident these measures would improve response rates of the final survey.

This experience, shows that the pilot study was essential for the overall value of this study. As Blaxter et. al. (1996, pp. 122) explains, *"You may think that you know well enough what you are doing, but the value of the pilot research cannot be overestimated. Things never work quite the way you envisage, even if you have done them many times before, and they have a nasty habit of turning out very differently than you expected."*

Overall, the researcher found that the analysis of the pilot study was a relatively good trial run before conducting the full-scale study. Furthermore, by rectifying these issues the researcher was quite confident that this particular instrument would most likely contribute to the feasibility and success of this study in determining the factors that influence dietary compliance amongst people with diabetes. Sample (N=51) from phase II pilot was included in the final sample for analysis subject to the identical survey instrument used with the final survey instrument and reliability tests (Cronbach's Alpha between 0.70 and 0.9) of the pilot study (Phase II) which is acceptable. The final version of the questionnaire can be referred to in (Appendix D: Final Survey Questionnaire).

3.6 Validity and Reliability

The validity and reliability of the survey instrument was conducted to ensure the accuracy and consistency of the survey instrument (Mayers, Gamst & Guarino 2013; Sekaran 2000). There are a number of reliability and validity estimates each with its specific purpose and function (Pallant 2013). In this case researchers should asses the research situation and determine the type of reliability and validity estimates best suited for a particular study (Sekaran 2000). Figure 3.5 provides an overview of the various forms of reliability and validity estimates as proposed by Sekaran (2000). The following section will provide details of the validity and reliability estimates taken on for this research.

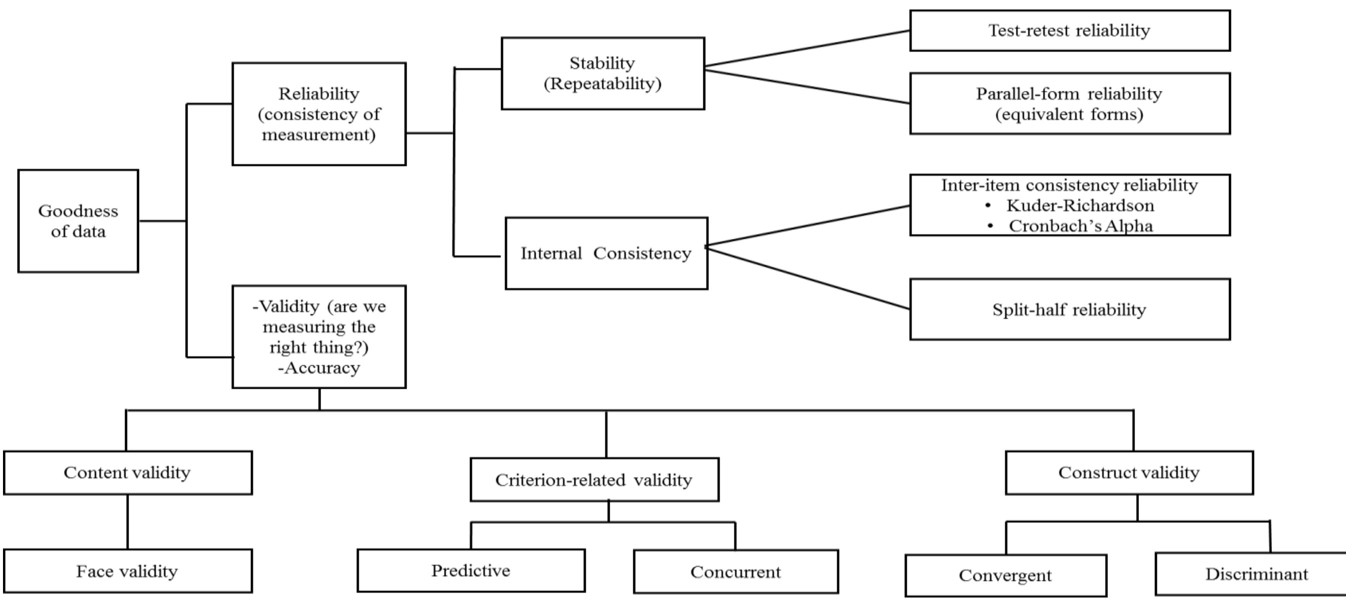


Figure 3.5: Forms of Reliability and Validity Estimates

Source: Adapted from Sekaran (2000, p. 205).

According to Sekaran (2000) validity testing can be described as statistical, construct, external and internal and is described as follows:-

- **Statistical**: The accuracy of the *p*-value on which a statistical decision is based upon;

- **Construct**: The ways in which the underlying theory(s) supporting the study provide(s) the most suited explanation for the outcomes observed;

- **External:** The extent to which the study is generalised to other people, places or situations;

- **Internal**: The extent to which the researcher is confident that the observed changes in the dependent variable were as a result of the effects of the independent variable and not to the effects of other extraneous variables.

The next section will provide details of the validity and reliability estimates taken on for this research.

3.6.1 Face Validity

For this study before the pilot-study was conducted, face validity was carried out by pre-testing the survey instrument. Furthermore, the face validity was conducted to ensure that the survey instrument does not suffer from either deliberate or unintentional response bias (Zikmund 2003). Specifically for Phase II of the pilot study a total of 10 individuals were asked to perform the face validity check as in this case the questionnaire was re-developed from the previous Phase I version. Expert interviews were conducted with a physician, two pharmacists, a nurse practitioner, two diabetes educators, food researcher and a nutritionist. Additionally, three individuals who are diagnosed with diabetes (i.e. Type 1 and Type 2) were also involved in the face validity exercise. Table 3.8 shows the overall summary of each expert category ensuring face validity for phase II pilot. The individuals involved in this exercise are non-participants of the main study. All individuals were asked to read through the survey instrument to check for clarity, flow of the questions and content validity and to estimate the survey completion time.

Table 3.8. Expert Interview Categories

No.	Expert category	Age	Gender-Male (M) Female (F)
1	**Physician – General practitioner**	33	M
2	**Pharmacist**	45	M
3	**Pharmacist**	40	F
4	**Functional food researcher**	41	M
5	**Diabetes Educator/Nurse Practitioner**	55	F
6	**Diabetes Educator/Dietitian**	35	F
7	**Nutritionist**	40	F
8	**Diabetes individual (a) [Type 2]**	65	F
9	**Diabetes individual (b) [Type 1]**	25	M
10	**Diabetes individual (c) [Type 2]**	50	F

Furthermore, the experts (i.e. physician, pharmacist, nurse, diabetes educator and nutritionist) provided feedback specifically on the item-generation for the dependent variable, namely the likelihood of dietary compliance. The experts provided suggestions for the type of food categories and portion sizes which could be considered in the survey. For example, based on the expert interview feedback, medical terms such as “glycaemic” (i.e. Section A: Question 4) was modified to simpler terms such as “blood sugar levels.” The experts felt that the term “blood sugar levels” would be easier for the respondents to understand and comprehend as compared to medical jargon such as “glycaemic” for example. They also commented on the overall feasibility of this study in terms of whether the questions and its structure were clear and met the objectives of this study.

3.6.2 Reliability Testing

Reliability analysis validates that the items used have a consistent result and at the same time identifies stable and usable constructs for a particular model (Pallant 2013). The main concept in reliability testing is that the set of items being measured should be stable and that an instrument with a relatively small error will likely produce reliable data (Osborne & Waters 2002). Therefore, to achieve a relatively good quality research the instrument needs to be stable to yield high reliability results (Pallant 2013). The Cronbach’s Alpha test is a common method for assessing measurement instrument reliability (Nunally 1978).

According to the Cronbach’s reliability test, items with an alpha value of **0.7 or greater** are considered reliable and consistent (Mayers, Gamst & Guarino 2013; Nunnally 1978). Therefore, items which do not meet the proposed threshold are likely deleted from the instrument in order to produce a higher alpha value (Mayers, Gamst & Guarino 2013). This research followed Nunnally’s (1978) convention in which a reliability value above 0.7 is satisfactory. In this case, Cronbach alpha was used to study the consistent reliability of the respondents survey answers to the items in the measure from the factor extractions (Cronbach 1946). The following table 3.9, provides a summary (i.e. Pallant 2013, pp.101) of the reliability description for each alpha value as follows:-

Table 3.9: Summary of Cronbach’s Value & Reliability Description

Cronbach’s Alpha Values	Reliability Description
0.9 and above	Excellent
0.8-0.89	Good
0.7-0.79	Acceptable
0.6-0.69	Questionable
0.5-0.59	Poor

Source: Adapted from Pallant (2013, p. 101).

In this study, reliability measures using Cronbach's Alpha test were calculated using the data set from the pilot study (Phase II) and is further described in section 3.7.2 of this thesis. The same test was conducted on the data set from the major research and further explained in the data analysis chapter, i.e. Chapter 4 of this thesis.

3.7 Preparation of Data

The preparation of data for this study was conducted before any meaningful analysis was done. Data preparation included data screening/cleaning, coding and recoding. Firstly, data screening was conducted to check for errors that might occur during the data collection process. The screening process will be done by the researcher after receiving the completed on-line anonymous self-administered survey and the printed version from respondents. The purpose of data screening is to increase accuracy of the data by identifying rare responses in the questionnaire (Bryman & Bell 2015; Pallant 2013). Observed scoring errors could include errors such as true score, random error (i.e. caused by the order of items in the instrument or respondent fatigue) and systematic error such as method variance (e.g. variance attributed to the measurement method rather than the variable of interest (Bagozzi, Yi & Phillips 1991; Churchill 1979; Heeler & Ray 1972). The researcher will use SPSS version 22 for the data collected and will include observed scores which will then comprise latent variables.

***-Data screening/cleaning*.** Data screening guidelines (i.e. Pallant 2013, pp. 42-47) were used in that firstly scores are checked for each variable to observe if they are all within range. Secondly, if errors occur during the data entry stage, the value is replaced and corrected. During data entry a dot (.) is assigned to indicate unanswered questions as missing values. In this case, the missing values are replaced with the mean value for quantitative variables and median values for ordinal variables (Pallant 2013).

-Data coding. Data coding refers to the process of identifying and classifying each response with a code (usually a number) to each question (Pallant 2013). In doing so, the researcher specified codes, names and numerical values for possible responses of each questions. Recoding is generally referred to as a process of changing codes i.e. reverse coding to facilitate analysis (Graziano 2013). In this case, because some items in the instrument comprised both positive and negative statements of agreement (i.e. *1-being, Strongly Disagree and 5-being Strongly Agree)* the codes on the negative statements are reversed to the same direction and order as the positive statements. If there are limited number of responses in some categories of the instrument then the number of categories will be collapsed using a Chi Square test (Bryman & Bell 2015; Graziano 2013). Other attributes such as types of data (e.g. scale, ordinal or category) were also specified to guide the data recording process. The open-ended responses i.e. *"others please give details"* were coded as free text or string type in SPSS 22.

3.8 Analysis Strategy

The analysis strategy developed for this study is based on a quantitative approach in which the hypotheses is tested based on the research questions and objective postulated thus far. Statistical software such as SPSS version 22 is used for the analysis of numerical data. To ensure that the data from this study is suitable for hypotheses testing, descriptive statistics, reliability tests, factor analysis and SEM will be carried out. Hypotheses testing will be done on hypotheses H_1 - H_6. Multiple linear regression analysis will be conducted to test the significance of H_1, H_2, H_3 and H_4. Mediation testing is done to test H_7 and H_8. Details of the analysis strategy for this study is explained in the next section which is divided into 7 stages (i.e. sections 3.7.1 – 3.7.7). The summary of the overall analysis strategy for this study is presented in Figure 3.5 below:

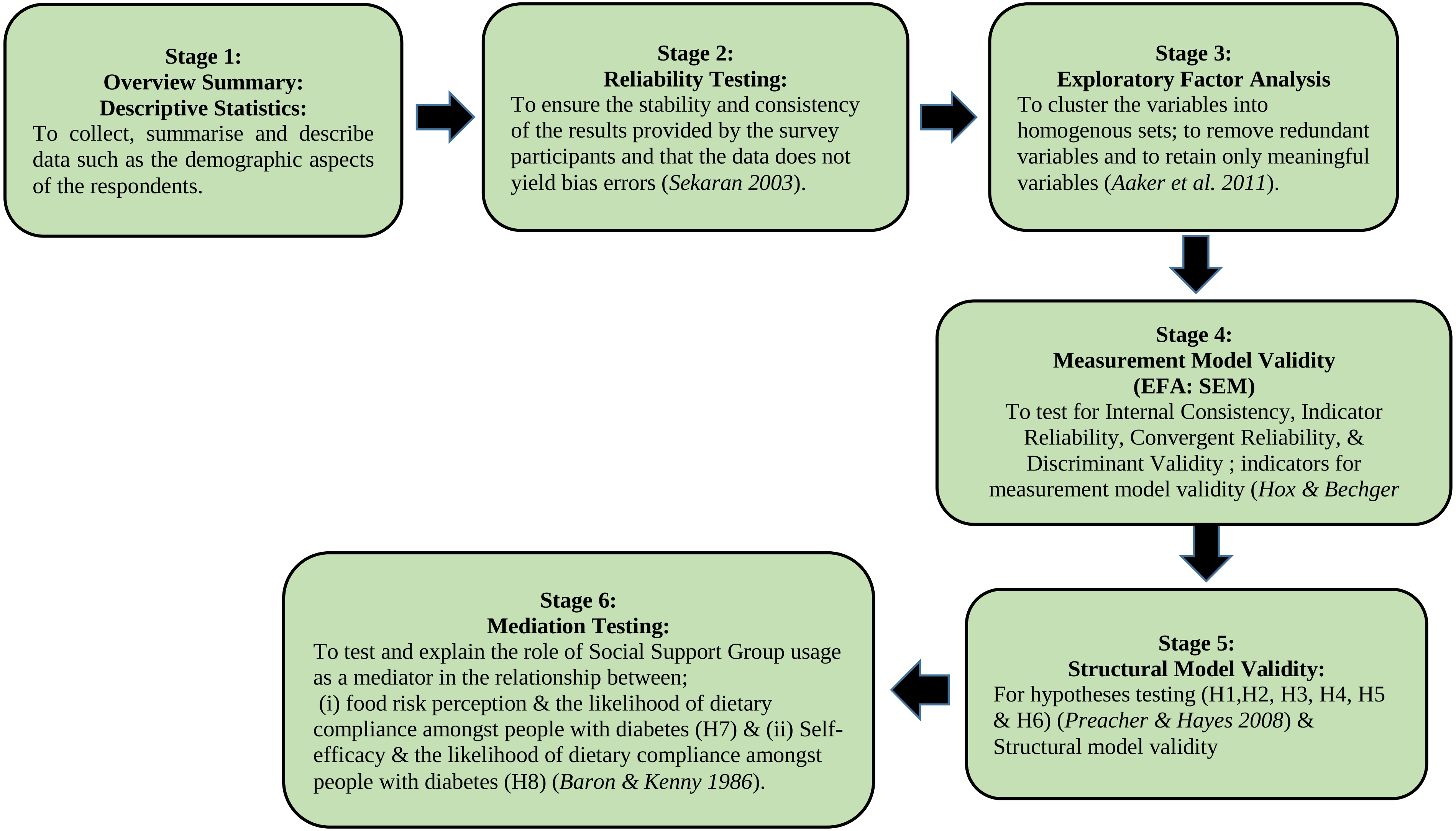


Figure 3.5: Analysis Stages

3.8.1 Stage 1: Overview Summary (Descriptive Statistics)

The purpose of descriptive statistical analysis is to summarise the information in a sample and to assess the normality of the distributions of the data across all variables (Pallant 2013). Descriptive statistics in this study was used to:

1. Summarise demographic characteristics of the respondents and;
2. Describe scores of a single variable or item (also termed as univariate analysis).

The descriptive statistics was reported using frequency distribution (i.e. for categorical or nominal data) and measures of central tendency (i.e. for scale or interval data). A general summary of the demographic variables and the dietary compliant behaviour of the population was tabulated to enable the researcher to study the characteristics of the sample. The data was subjected to a frequency check i.e. **descriptive statistics summary** in the form of frequencies and percentages to provide a better understanding of the general distribution of the data set (Bryman & Bell 2015, pp. 368-381). To ensure the data is not skewed outliers are removed from the data set using relevant steps (Field 2009, pp. 153-156). To view the data graphically appropriate tables and charts are produced to ensure easy interpretation of the results and its patterns (Coakes & Ong, 2011 p. 57). Skewness and kurtosis values of within ±2 (showing asymmetry) was used to assess the **normality** of univariate distribution of each item construct (George & Mallery 2010).

3.8.2 Stage 2: Reliability Testing

Reliability tests are done to ensure the stability and consistency of the results from the respondents of the survey and that the results do not yield bias errors (Sekaran 2003). Additionally, reliability tests ensures that the questionnaire, tests, observations or measurement procedures will produce the same results on repeated trials (Nunnally & Bernstein 1994). Therefore, to achieve a relatively good quality research for this study the instrument needs to be stable to yield high reliability results (Pallant 2013). Cronbach's Alpha test was used on the pilot data set (N= 51) which yielded an alpha value of more than 0.7 for all items (Nunally 1978). Table 3.10, shows the Cronbach's Alpha results for all items in pilot study (Phase II). Therefore, with an alpha value of more than 0.7, the items for this instrument are considered reliable and consistent (Mayers, Gamst & Guarino 2013).

Table 3.10: Cronbach's Alpha Reliability Test-Pilot Study (Phase II)

No.	Constructs	Item no. sequence	Cronbach's alpha from original scales	Cronbach's alpha for Pilot Study (Phase II)
1.	Likelihood of Dietary Compliance (DV)	**1-12**	EBPQ Scale: $\alpha > 0.7$ for all items	**0.825**
2.	Self-efficacy	**13-19**	DSMQ Scale $\alpha = 0.84$ Diabetes Self-efficacy Scale $\alpha = 0.82$ The Self-Efficacy Scale > 0.7 for all items	**0.903**
3.	Food Risk Perception	**20-24**	Not available	**0.851**
4.	FRL[2]	**25-35**	α = between 0.5-0.8	**0.758**
5.	Social Support Group usage	**36-43**	MOS Social Support Scale $\alpha > 0.91$ DDS Scale $\alpha = 0.87$	**0.714**

Source: Table developed for this study

[2] Some lower range Cronbach's Alpha (0.4-0.6) were reported in the original scale (Grunert, Brunsø & Bisp 1993) with some items (e.g. taste, meal preparation and social events). Further testing of the scale (i.e. Brunsø & Grunert 1995; Grunert et al. 1997; Brunsø, Scholderer & Grunert 2004) revealed improved alpha values of above 0.5. Brunsø & Grunert (1995); Pérez-Cueto et.al. (2010), explain that the lower reliabilities (i.e. < 0.7) on some of the items are due to the cross-cultural nature of the instrument and therefore cross-cultural variation may impact reliability outcomes of these items.

3.8.3 Stage 3: Exploratory Factor Analysis

Exploratory Factor Analysis is employed to determine whether indicator groups converge together to form distinct clusters i.e. factors (Bryman & Bell 2015). Additionally, factor analysis will determine which factors will be retained and whether they are statistically important in an analysis (Field 2009). Factor analysis can be defined as *"the dimensionality of the original space and to give an interpretation to the new space, spanned by a reduced number of new dimensions which are supposed to underlie the old ones"* (Rietveld & Van Hout 1993, pp. 254), or to *"explain the variance in the observed variables in terms of underlying latent factors"* (Habing 2003, pp. 2). Hence, factor analysis provides not only the possibility of gaining a better view of the data, but also the likelihood of using the data output in subsequent analyses (Field 2009; Rietveld & Van Hout 1993).

The **Kaiser-Meyer-Olkin (KMO)** measure for the overall data set is employed in this stage where a value of **≥ 0.50** is considered a minimum limit for sampling adequacy (Nunnally & Bernstein 1994). The **Bartlett's test of sphericity** (with the significant value of < .05) is conducted to test whether group variances are the same and that the dependent variables are not correlated (van Teijlingen & Hundley 2002). To determine how many components will be retained in this data set the eigenvalue of, ≥ 1 will be used and reflected in a scree plot, whereby the point in the scree plot is shown to be levelling off (Henson & Roberts 2006; Linacre 2002).

A **varimax** (orthogonal) rotation employed as the current research assumes that the original constructs are uncorrelated, as most of the items have been adapted from various reliable sources. Varimax rotation methods hence simplifies factors and make results more reliable and easier to interpret. Varimax also is employed to ensure similarity between pattern matrix and structure matrix. The final produced rotated component matrix output will show how the principal components load within factors and hence should simplify the interpretation of factors (Field 2009). Thus, for this data set an item that is weakly correlated with other items will be removed one at a time and the exploratory factor analysis procedure will be repeated until a 'simple structure' is achieved. According to Hair et al. (1995), the items with the highest loadings are generally more strongly associated with a factor and should be examined for the meaning of the factor.

The **Cronbach's alpha**, α test will also be conducted for each sets of the components to check for the items reliability i.e. following Nunnally and Bernstein (1994) suggestion for the Cronbach's alpha; α value above 0.70 to be considered as satisfactory. Based on Cronbach and Meehl (1955), correlation coefficient values of 0.30 is minimal, 0.40 is important, and 0.50 is practically significant, therefore, the items with correlation coefficient, $r \geq 0.30$ are worth retaining. The final scree plot for the main data set of this study, showing the remaining items loading is reported in Chapter 4 of this thesis.

3.8.3.1 Common Method Variance Bias

The common method variance (CMV) bias is one of the main sources of measurement error, particularly "variance that is attributable to the measurement method rather than to the constructs the measures represent" (Podsakoff et al. 2003, pp. 879), therefore it is important to assess it. According to Podsakoff et al. (2003), a number of potential sources contributes to CMV, such as:-

- Sources due to having a common rater (e.g. social desirability, leniency);
- Item characteristic effects (e.g. item ambiguity);
- Item context effects (e.g. priming effects, grouping of items) and;
- Measurement context effects (e.g. simultaneous measurement of predictor and criterion variables).

Regardless, of the sources for CMV, systematic error variance can have serious implications on empirical results and thus has the potential to threaten the validity of conclusions and mislead the outcomes in a given study (Bagozzi & Yi, 1991; Nunnally, 1978). The **Harman's single-factor test** is used to determine the level of bias for this study and to observe if a single factor would account for the majority of the variance extracted i.e. more than 50% (Podsakoff & Organ 1986). Chapter 4 of this thesis will present the results of the single-factor test for this study and its implication on the overall data set.

3.8.4 Stage 4: Measurement Model Validity

3.8.4.1 Justification for SMARTPLS Structural Equation Modeling

There are a number of software programs (i.e. AMOS, LISREL and EQS) which provide statistical analysis of raw data and have been used extensively by researchers (Hox and Bechger 1998). However, lately there has been an interest and preference of the use of SMART PLS (Partial Least Squares) methodology of analysis (Chin 2010). Hair Ringle & Sarstedt (2011, pp. 139) describes PLS as, "*PLS-SEM is a causal modeling approach aimed at maximizing the explained variance of the dependent latent constructs. This is contrary to CB-SEM's objective of reproducing the theoretical covariance matrix, without focusing on explained variance."* One of the advantages of SMART PLS over AMOS (Analysis of Moments Structure) is that PLS can explicitly recognise measurement errors whilst in AMOS errors need to be represented (Chin 2010). Additionally PLS can not only model relationships between latent variables but it is also able to manage multiple dependent constructs within a single model (Chin 2010; Hair Ringle & Sarstedt 2011).

Other advantages in using PLS for testing SEM over the alternative of AMOS and its Covariance Based Structural Equation Modeling (CB-SEM), are summarised as follows:-

- PLS is considered flexible in that it almost has no limiting assumptions regarding the model specifications and data (Hair Ringle & Sarstedt 2011);
- PLS has a comparatively high statistical power which makes it particularly adequate for SEM applications which aim at prediction or theory building (Hair Ringle & Sarstedt 2011);
- PLS is useful when there are large numbers of latent and indicator variables in the model (Chin 1988);
- PLS is able to handle both formative and reflective i.e. indicator variables (Bollen 2011);
- Generally, PLS is considered to have less demanding conditions for sample size, independence and normality (Henseler et al. 2009);

- PLS is most suited when the goal of the research is mostly prediction rather than parameter estimation (Chin 1988).

PLS-SEM has also been increasingly applied in marketing and other business disciplines (Ringle, Sarstedt & Straub 2012) as well as in a number of health and diabetes related studies (e.g. Iranagh, Rahman & Motalebi 2016; Rho et al. 2015; Orji & Mandryk 2014; Orji, Vassileva & Mandryk 2013).

Therefore, PLS-SEM will be used in this study to verify theory and its application within the context of this study. Additionally, PLS-SEM will be used to determine the model fitness and hypotheses testing i.e. to determine the relationship between the four variables of Self-efficacy, Food risk perception, FRL and Social Support Group usage on the dependent variable of the likelihood of dietary compliance amongst people with diabetes. Finally, this study is based on a **reflective measurement model**, whereby exclusion of one or more of the variables from the domain will not drastically alter the model (Ringle, Sarstedt & Straub 2012). In the case of this study, the removal or alteration of the indicators from the constructs i.e. self-efficacy, food risk perception, FRL and/or social support group usage will not meaningfully alter the validity of the construct. All constructs in this study are reflective measurements in nature and assumes that causality flows from the construct to the indicators (Hulland 1999). Additionally, the indicators for this study should be highly correlated, whereby the indicators are conceptually represented within the domain of interest and adequate for empirical prediction (Bollen & Lennox 1991; Hulland 1999).

Ringle, Sarstedt & Straub (2012, pp. viii - x) in their review of PLS-SEM studies, state *"Whereas the evaluation of formative measurement models gives rise to concern, our review reveals that PLS-SEM studies in MIS Quarterly usually build on satisfactory evaluations that ensure the reliability and validity of the reflective measurement model construct scores."* Furthermore, according to Ringle, Sarstedt & Straub (2012, pp. viii - x), *"Considering that the parameter estimates depend on the specific set-up of the analyzed model, it is more appropriate to evaluate these measures via PLS-SEM statistics."* Therefore, the reliability and validity of the reflective model in this study will be checked using the PLS-SEM statistics to ensure the consistency of the measurement model.

Once the data is finally ready it will be put into a Structural Equation Model (SEM) procedure and then imported into the SMART PLS software for analysis. SEM will be used to analyse the structural relationship between measured variables and latent constructs and its validity (Hair, Black, Babin & Anderson 2010). SEM is considered a combination of factor analysis and regression i.e. path analysis (Hox and Bechger 1998). Additionally SEM can test various theoretical models that hypothesis in what ways sets of variables define constructs and how these constructs are related to each other (Bagozzi & Youjae 2011; Hox and Bechger 1998). As this study aims to test hypotheses generated from theory SEM is best suited for this purpose. This section will present key measurement model validity for this study such as **Internal Consistency, Indicator Reliability, Convergent Reliability and Discriminant Validity.**

¬ ***Internal Consistency.*** Two methods are used to check internal consistency: - i.e. (1) **Cronbach's alpha** and (2) **Composite Reliability** which is presented as follows:

The Cronbach's alpha test for internal reliability is calculated using SPSS 22 with an acceptable value of 0.70 or higher (Nunnally 1978) is calculated with the given formula **(1)**:- Cronbach's alpha-used for multipoint-scaled items)

(1) **Cronbach's alpha**: $\alpha = \left(\frac{N}{N-1}\right) * \left(1 - \frac{\sum_{i=1}^{N} \sigma_i^2}{\sigma_t^2}\right)$ **(1)**

N = number of indicators assigned to a factor

σ_i^2= variance of indicator *i*

σ_t^2= variance of the sum of all assigned indicators' scores

j = flow index across all reflective measurement model

Composite Reliability

To check Composite Reliability (CR), p, Dhillon-Goldstein Rho is used and is shown with the given formula **(2)**:-

(2) Composite reliability (ρ) = $\frac{\left(\sum_i \lambda_{ij}\right)^2}{\left(\sum_i \lambda_{ij}\right)^2 + \sum_i var(\varepsilon_{ij})}$ **(2)**

λ_i= loadings of indicator *i* of a latent variable

ε_i= measurement error of indicator *i*

j= flow index across all reflective measurement model

The Composite Reliability (CR) value of 0.70 or higher, where values are between 0 and 1, indicates adequate internal consistency or convergence (Gefen, Straub & Boudreau 2000).

¬ **Indicator Reliability.** For this analysis, the **reflective indicator loadings**, within the PLS model that are **less than 0.5** shows the item is a good measurement of the latent construct (Hulland 1999, pp. 198). The indicator reliability will show the proportion of indicator variance that is described by the latent variables which are between 0 and 1 (Hulland 1999).

¬ **Convergent Reliability.** In order to achieve convergent reliability, the **Average Variance Extracted (AVE)** is calculated. The **Average Variance Extracted (AVE) value of 0.50 or higher** (values between 0 and 1), suggests adequate convergent validity (Bagozzi & Yi 1988; Fornell & Larcker 1981). Formula **(3)** calculates the AVE as follows:-

$$\textbf{Average Variance Extracted (AVE)} = \frac{\sum_i \lambda_i^2}{\sum_i \lambda_i^2 + \sum_i var(\varepsilon_i)} \qquad \textbf{(3)}$$

λ_i^2 = square loadings of the indicator *i* of a latent variable

$var\ (\varepsilon_i)$ = squared measurement error of indicator *i*

¬ **Discriminant Validity.** Discriminant validity is assessed to ensure that there is no existence of multicollinearity amongst latent variables (Fornell & Larcker 1981). Discriminant validity of each latent variable is checked using the Fornell & Larcker (1981) criterion and the **Cross Loading Criterion** (Chin 1988a) to make sure that each latent variable are subjectively independent of other indicators. In this case, the AVE of a latent variable should be higher than the squared correlation between the latent variable and all other variables (Chin 2010b; Fornell & Larcker 1981).

- **Heterotrait-Monotrait (HTMT)**

Henseler, Ringle & Sarstedt (2015), have proposed the **Heterotrait-Monotrait ratio of correlation (HTMT)** to assess discriminant validity as an alternative to Fornell-Larcker's (1981), discriminant validity criterion. The HTMT assessment came about mainly due to some disagreement on the usage of Fornell-Larcker's (1981) discriminant validity approach (Ramayah et al. 2017). A Monte Carlo simulation study conducted by Henseler, Ringle & Sarstedt (2015) to compare the HTMT approach to Fornell-Larcker's criterion and the assessment of (partial) cross-loadings shows that the latter criterion are not reliable in detecting the lack of discriminant validity in common research situations. Therefore, it has been suggested, i.e. Henseler, Ringle & Sarstedt (2015) that the HTMT approach is a more effective approach to identify a lack of discriminant validity as HTML is likely to have higher sensitivity rates as compared to other criterion (i.e. Fornell-Larcker and the assessment of (partial) cross-loadings).

As a **criterion**, the HTMT value needs to be **greater than $\text{HTMT}_{.85}$**, **value of 0.85** (Kline 2011), or **$\text{HTMT}_{.90}$, value of 0.90** (Gold et al. 2001). As a **statistical test**, Henseler, Ringle & Sarstedt (2015), propose the null hypotheses (H_0: HTMT<1) versus (H_1: HTMT $\geq$ 1), **$\text{HTMT}_{95\%}$ Confidence Interval** containing the value one (1) (i.e. H_0 holds) shows lack of discriminant validity.

Table 3.11, presents the summary of Indices for Measurement Model Validity using PLS-SEM discussed thus far as per Ramayah et al. 2017, pp. 63

Table 3.11: Summary of Indices for Measurement Model Validity using PLS-SEM

No.	Assessment	Name of Index	Guideline
1.	Internal Consistency	Composite Reliability (CR)	CR > 0.90 (Not desirable) CR > 0.7-0.9 (Satisfactory) CR < 0.6 (for exploratory study)
2.	Indicator Reliability/Factor Loadings	Indicator Loadings	Loading > 0.708 or higher is recommended, however, loadings > 0.7, 0.6, 0.5 or 0.4 is adequate, if other loadings have high scores of loadings to complement AVE & CR.
3.	Convergent Validity	Average Variance Extracted (AVE)	AVE > 0.50
4.	Discriminant Validity	Cross loading Fornell & Larcker's Criterion HTMT Criterion	Loadings of each indicator are highest for their designated constructs. The square root of AVE of the construct should be larger than the correlation between the construct and other constructs in the model. HTMT .85 (Kline 2011) [Stringent Criterion]; HTMT .90 (Gold et al. 2001) [Conservative Criterion]; HTMT inference using bootstrapping technique (Henseler et al. 2015): Does 90% bootstrap confidence interval of HTMT include the value of -1 < HTMT < 1 [Liberal Criterion].

Source: Adapted from (Ramayah et al. 2017, pp. 63).

3.8.5 Stage 5: Structural Model Validity in PLS-SEM

Generally, there are two different types of SEM analysis i.e. **Covariance based SEM (CB-SEM) and Partial Least Squares based SEM (PLS-SEM)** (Hair et al. 2014). Both methods offer different purposes to test the model validity. Section **3.7.4.1** of this theses has presented the justification for using the **PLS-SEM** analysis for this study. Therefore, **PLS-SEM** is used to test hypotheses **H1, H2, H3, H4, H5 and H6** as follows:

Hypotheses Testing

H1: Self-efficacy influences the likelihood of dietary compliance amongst people with diabetes.

H2: Food risk perception influences the likelihood of dietary compliance amongst people with diabetes.

H3: Food related lifestyles influences the likelihood of dietary compliance amongst people with diabetes.

H4: Social Support Group usage influences the likelihood of dietary compliance amongst people with diabetes.

H5: Self-efficacy influences social support usage amongst people with diabetes

H6: Food risk perception influences social support usage amongst people with diabetes

Confirmatory Factor Analysis is used to develop the model and to test that the model fits into theory as prescribed in the theoretical framework for this study (i.e. Chapter 2-Figure 2). Researchers are advised to be systematic and apply sound judgment during exploratory factor analysis to limit subjectivity (Henson & Roberts 2006). Therefore, factor analysis is conducted following standard guidelines as recommended by Williams, Brown and Onsman (2010). In this case, each hypotheses represents a specific relationship and is specified in the structural model (Hair et al. 2010).

To test the predictability of the latent indicator variables on the latent predicted variable, measures such as **R-Square, Effect size (i.e. Cohen's *f^2*) and Predictor Relevance (Q^2)** is used. **The Goodness of Fit Index (GoF)** is used to test how well the data predicted by the model corresponds to the data that is collected for this study (Field 2009; Tenenhaus et al. 2005).

3.8.5.1 Assessing Lateral Collinearity Issues in Structural Model:

The issue of vertical collinearity has been dealt with through the assessment of Discriminant Validity. However, lateral collinearity is may still lie within the model in which two variables that are hypothesized to be causally related measure the same construct resulting in misleading findings by masking a strong causal effect (Kock & Lynn 2012).

Each set of predictors need to be assessed separately for each subset of the structural model. As a rule thumb, Variance Inflation Factor (VIF) values of higher than 5 (Hair, Ringle and Sarstedt, 2011) will indicate potential lateral collinearity problems. Based on the current model, the following collinearity was assessed:

1. between Food Risk Perception (FRP) and Self –Efficacy (SE)
2. between Social Support Group Usage (SSG), Self-Efficacy (SE) and Food Related Lifestyle (FRL)

3.8.5.2 Hypotheses Testing:

Bootstrapping analysis is conducted to cross-validate the stability of the estimation results (Byrne 2013) and to test the hypothesised direct relationships represented by statistical testing of the hypotheses. Thus, the existing data set will be resampled to allow the interpretation of the results based on the distribution ofthe data rather than Baron & Kenny's (1986) normal distribution (Efron & Tibshirani 1993). Shrout & Bolger (2002) explains that bootstrapping is likely more reliable than Baron and Kenny in smaller samples, which is well suited for this study and the analysis in SMART PLS. The sample will be treated as mirrors to the population allowing for inferences to be made about the population parameters (Byrne 2013). To minimise random sampling errors, it is recommended (i.e. Chin 1998) that resampling of the population should be conducted many times and should be larger than the original sample size. A large bootstrap sub-sample of 5000, taken from the original sample with replacement is more than sufficient to determine bootstrap standard errors and *t*-values for significance testing of the structural path (Chin 2013; Ramayah et al. 2017). To assess the structural model Hair et al. (2014) suggested to assess the R^2, beta and the corresponding t-values through a bootstrapping procedure with a resample of 5,000. They also suggested that predictive relevance (q^2) and effect sizes (f^2) be reported as well.

Once the data has been cleaned, the final (n= 169) in this study will be bootstrapped and similar results in each bootstrapping samples will be observed to ensure stability is achieved. From the bootstrapping of 5000 samples to ensure precision following Hair et al. (2017) suggestion, any given hypothesis of $H_i\ ;\ _i$ = 1, 2, 3 and 4 is supported based on the t-value calculated after bootstrapping has been performed at a given level of alpha, in this case 5%. If the calculated t-value shows at 5% level of significance (for a 2-tailed test) a value of above 1.96, then the hypothesis is supported else not supported (Peng and Lai, 2012).

Through bootstrapping, PLS estimates the path model for each bootstrap sample. Whilst, PLS path modelling is useful in estimating complex models, however, rigorous assessments using **coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2) and Goodness of Fit index** is also required to provide evidence supporting the research model (Akter, D'Ambra & Ray 2011). The next sub-sections will describe some of the rigorous assessments needed to support the research model for this study.

3.8.5.3 R-Square

R-Square (R^2) or the coefficient of determination is generally used to analyse how differences in one variable can be explained by a difference in a second variable and is expressed as a percentage (Chin 1998). The path coefficient range greater than 0.1 is deemed acceptable (Lohmoller 1989). The formula **(4)** below is used to calculate the R^2:-

$$SS_{yy} = \sum (y - \bar{y})^2 = \sum y^2 - \frac{(\sum y)^2}{n}$$

$$SS_{yy} = explained\ variation + unexplained\ variation$$

$$SS_{yy} = SSR + SSE$$

$$1 = \frac{SSR}{SS_{yy}} + \frac{SSE}{SS_{yy}}$$

$$r^2 = \frac{SSR}{SS_{yy}} = 1 - \frac{SSE}{SS_{yy}} = 1 - \frac{SSE}{\sum y^2 - \frac{(\sum y)^2}{n}} \qquad \textbf{(4)}$$

** 0<r^2<1; SSR =Sums of squares regression; SSE = Sums of squares error*

3.8.5.4 Effect Size (f^2)

The effect size of the predictor latent variables on the endogenous variables will be tested using Cohen's f^2 (Cohen 1988). Cohen (1988) proposes that f^2 effect sizes of **large, medium and small** will have values of **0.35, 0.15 and 0.02** respectively. Formula **(5)** is used to calculate the effect size:-

$$\text{Effect Size: } f^2 = \frac{R^2_{incl} - R^2_{excl}}{1 - R^2_{incl}} \qquad \textbf{(5)}$$

3.8.5.5 Predictive Relevance (Q^2)

Predictive relevance **(Q^2)** is critical to assess the predictive validity of a complex model through the blindfolding procedure (Fornell & Cha 1994; Chin 1998a). It refers to *"a synthesis of cross validation and function fitting with the perspective that the prediction of observables is of much greater relevance than the estimation of what are often artificial construct – parameters"* (Chin 2010, p. 679). Blindfolding is a resampling technique that systematically deletes and predicts every data point of the indicators in the reflective measurement model of the endogenous construct (Ramayah et al. 2017). Every 7^{th} data point in the endogenous construct indicator is omitted to estimate the parameters with the remaining data points (Chin 1998b; Henseler et al. 2009 & Tenenhaus et al 2005).

The Stone-Geisser criterion (i.e. Stone (1974); Geiser (1975), assesses the model's ability to predict the endogenous latent variables for a given block of indicators (of omitted data) by combining function fitting and cross-validation and will then predict the omitted data based on the calculated parameters (Geiser 1975). Two different types of prediction techniques, can estimate Q^2, which is **Cross Validated Communality** and **Cross Validated Redundancy** (Chin 2010). Formula **(6)**, shows the estimation technique for calculating the missing values of the manifest data as follows:-

$$Pred\left(Y_{ji}\right) = \sum \beta_{\grave{j}} Y_{\grave{j}i} \qquad Pred\left(X_{jhi}\right) = \sum \hat{\pi}_{jh} Y_{\grave{j}i} \qquad \textbf{(6)}$$

Chin (2010), suggests the Q^2 can be estimated using an omission distance of 5-10 under existing PLS software packages and that the rule of thumb shows that a cross validated redundancy $Q^2 > 0.5$ is regarded as a predictive model. The final assessment of effect size (q^2) is calculated for each exogenous variable by deleting corresponding exogenous constructs (constraint model to obtain Q^2 excluded) in the model and comparing with the full model (Q^2 included) in the model using the formula (**7**).

$$q^2 = \frac{Q^2 included - Q^2 excluded}{1 - Q^2 included} \qquad \textbf{(7)}$$

Small, medium and large predictive relevance of latent variables is represented by q^2 values of **0.02, 0.15 and 0.35** respectively (Hanseler et al. 2009).

3.8.5.6 Goodness of Fit (GoF)

The Goodness of Fit Index **(GoF)** is defined as the geometric mean of the average communality and average R2 for all endogenous constructs (Tenenhaus et al. 2005). **GoF** is crucial to assess the global validity of a PLS based complex model (Tenenhaus et al. 2005). Chin et al. (2010, p. 680) asserts that, *"The intent is to account for the PLS model performance at both the measurement and the structural model with a focus on overall prediction performance of the model."*

The **GoF index** can be applied for both reflective and formative latent variables in a complex case as it provides a measure of overall fit which would be suited to the reflective model inherent in this study (Chin 2010). However, whilst a global GoF for PLS-SEM has been proposed, i.e. Tenenhaus et al. (2004), Henseler & Sarstedt (2012) propose that this measure is not suitable for identifying misspecified models. Furthermore, it has been found that the GoF measure proposed by Tenenhaus et al. (2004), does not necessarily represent a fit measure and therefore should not be considered as such (Henseler & Sarstedt 2012). However, for a PLS multi-group analysis (i.e. PLS-MGA), in which researchers compare the PLS-SEM results of varying groups of data for the same path model, the GoF may be useful (Henseler & Sarstedt 2012).

Researchers, (e.g. Ramayah et al. 2017) have suggested using caution when using certain fit model criteria as they may not be suitable for PLS-SEM. For example, whilst fit measures already exist i.e. Lohmöller (1989), these measures are suited to provide a comparison to LISREL outcomes rather than to represent PLS-SEM indexes (Lohmöller (1989); Ramayah et al. 2017). Whilst the concept of GoF is considered in its early stages within the context of PLS-SEM and may not be a compulsory application, researchers i.e. Ramayah et al. (2017) suggest using GoF in the following situations when:-

i. Researchers would like to test a model i.e. reject or support a model;
ii. Researchers would like to compare competing models;
iii. Reviewers and/or editors request for fit measures;

¬ ***Standardised Root Mean Square Residual (SRMR).*** In general there are five GoF criteria which is found in the SMART PLS 3.2.4 software program which include Standardised Root Mean Square Residual (SRMR), Exact Model Fit Tests, Normed Fit Index (NFI) or Bentler and Bonett Index, Chi Square and Degrees of Freedom and RMS_theta (Ramayah et al. 2017). The **SRMR test** will be used to test the fit of the model in this study. Whilst the root mean square (RMSR) is used to measure the absolute value of the covariance residuals, the SRMR fit test is used to transform the sample covariance matrix and the predicted covariance matrix into correlation matrices (Ramayah et al. 2017). Ramayah et al. pp. 105, defines SRMR as, *"the difference between observed correlation and the model implied correlation matrix."* This allows researchers to examine the average discrepancies between observed and expected correlations as an absolute measure of the model fit criterion (Ramayah et. al. 2017). A value of **less than 0.10 or 0.08** are considered a good fit with the SRMR (Byrne 1998; Ramayah 2017). Conversely, PLS can detect a wide range of measurement model misspecifications when a composite factor model is assumed and the test of exact fit and/or the SRMR is used for model validation purposes (Henseler et al. 2014).

3.8.6 Stage 6: Mediation Testing

This analysis stage will test and explain the role of Social Support Group usage as a mediator in the relationship between:-

Food risk perception and the likelihood of dietary compliance amongst people with diabetes (i.e. **H7**);

Self-efficacy and the likelihood of dietary compliance amongst people with diabetes (i.e. **H8**)

According to Holmbeck (1997, pp. 599), *"A mediating variable is one which specifies how (or the mechanism by which) a given effect occurs between an independent variable (IV) and a dependent variable (DV)."* Alternatively, mediation effect can be explained to be a third variable or construct which intervenes between two other related constructs (Baron & Kenny 1986). Generally, multiple linear regression analysis can be conducted to test whether a variable is found to mediate the relationship between two variables (Baron & Kenny 1986). In this case, when controlling for the mediator, the relationship between the two variables is reduced to non-significance (Baron & Kenny 1986). However, Baron & Kenny (1986) have proposed some steps which should be undertaken by researchers to determine the level of mediation (i.e. full, partial or none). Figure 3.6 below shows the mediation effect testing process as proposed by Baron & Kenny (1986):-

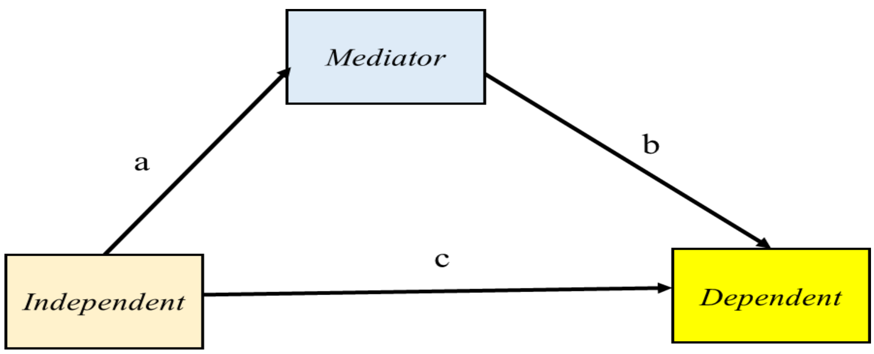


Figure 3.7: Mediation Testing Process

Figure 3.7 illustrates that there are several steps for mediator testing. Firstly, Baron & Kenny (1986) suggests that the researcher should determine if the independent variable significantly effects the dependent variable (i.e. path c); Secondly, if the mediating variable effects the dependent variable (i.e. path b). Thirdly, controlling for paths (a) and (b), test whether the relationship between the independent and the dependent variable is significant (Baron & Kenny 1986). If this relationship is not significant (i.e. path c's value is close to zero) then this indicates that the mediator has a strong presence (Baron & Kenny 1986). The following shows the illustration of how SMART PLS assesses the Indirect Effect of a mediation relationship within a model following Baron and Kenny (1986).

Effect of Independent on Dependant:

- Direct Effect: c
- Indirect Effect: a*b = c'
- Total Effect: c + c'

Other measures such as estimating a series of regression to test for mediation can be conducted as proposed by Judd & Kenny (1981) and is summarised as follows:-

i. Regressing the mediator on the independent variable;
ii. Regressing the dependent variable on the independent variable and;
iii. Regressing the dependent variable on the independent variable on the independent variable and on the mediator.

According to Preacher & Hayes (2008), when a variable is found to be a mediator, it is important to conduct further analyses to determine the nature of the mediated effect (i.e. the indirect effect). Bootstrapping technique is conducted to determine the significance of the indirect effect and the corresponding standard deviation is obtained for t-test calculations on the indirect effect (Preacher & Hayes 2004).

3.9 Research Ethics

This study followed the USQ ethical guideline for human research which is in accordance with the Australian Code for the Responsible Conduct of Research and the National Statement on Ethical Conduct in Human Research 2007. The study commenced after ethical approval was granted by the USQ Human Research Ethics Committee with the approval number **H15REA151** for the period of three years from18 August 2015 until 18 August 2018. This study was conducted with three primary areas of ethical concern for a research which considered the relationship between science and society, professional issues and treatment of the research participants (Johnson & Christensen 2012).

Therefore, issues such as dealing with the potential risks to participants, provisions for benefits to the participants, informed consent protocols and assurances for data confidentiality were acted upon based on the relevant code of ethics requirements. Participants are required to read through the Participant Information Sheet (Refer to Appendix C: Survey Cover Page), at the beginning of the survey page, before attempting the survey. The Participant Information Sheet provides information on confidentiality, data storage, risks and benefits if any associated with this study. Participants are also informed that as this is an anonymous survey, clicking on the 'Submit' button (on-line) or return of the completed paper questionnaire is accepted as an indication of their consent to participate in this project.

The researcher's information is also provided if the participants would like to contact the researcher if they require any questions answered or to request further information about this research project. Additionally, the participants have any concerns or complaints about the ethical conduct of the research project they can contact the University of Southern Queensland Ethics Coordinator (e-mail and telephone contact is provided on the Information Sheet).

3.10 Conclusion

This chapter has provided justification for a quantitative approach for this study and in doing so the key paradigm and philosophical approach (i.e. positivist) was presented. The proposed research design and the implementation of the main study was also discussed. The overall survey design process was explained including the formulation of the questions and the adaptation of the relevant scales for this study. An explanation of how the pre-existing scales were used to measure the constructs was also provided in this chapter.

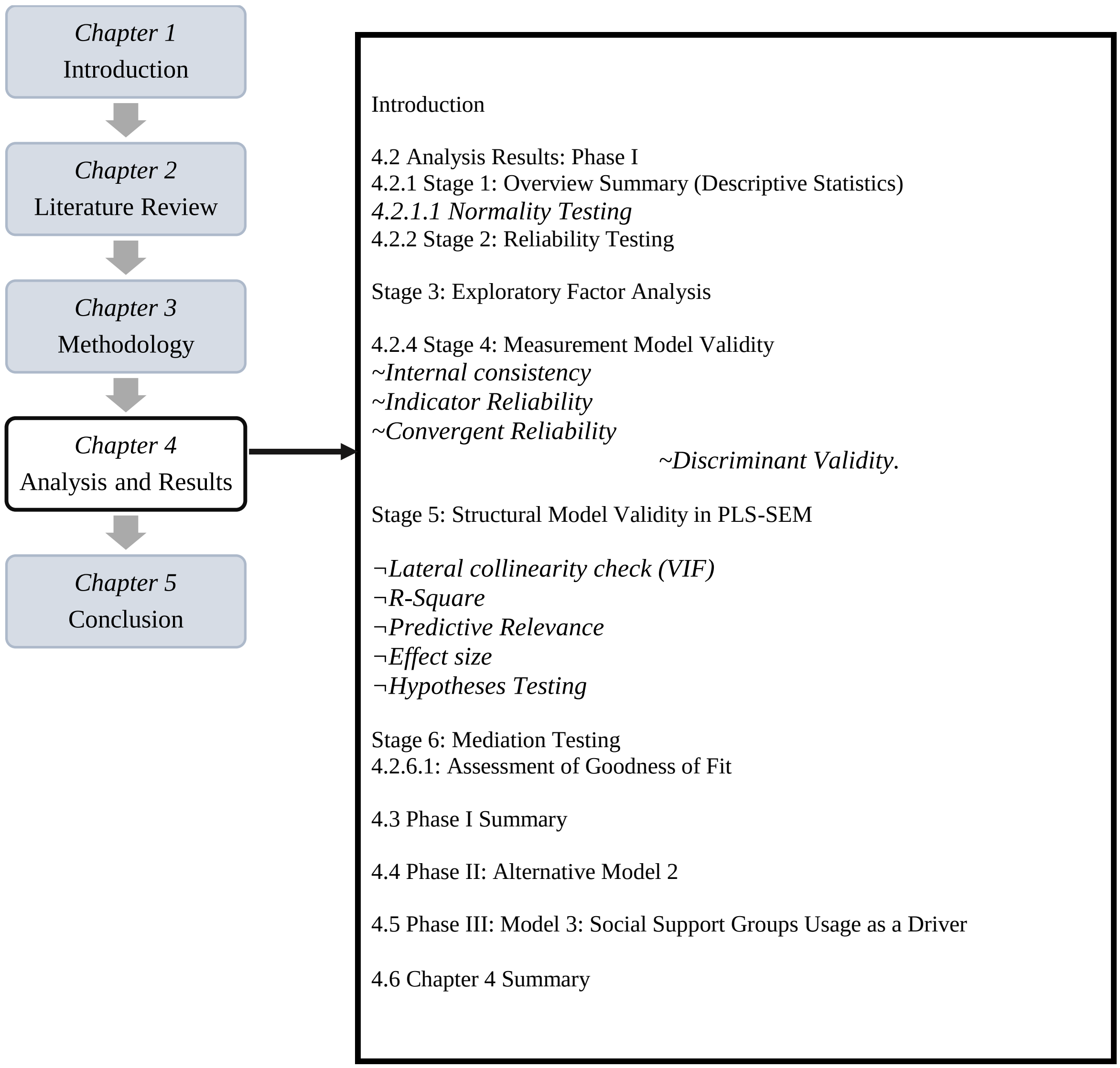
The analysis and its justification was also explained in this chapter. A discussion on the reliability and validity checking needed for analysis was explained at length. Additionally, a detailed description of the analysis strategy (Section 3.7) undertaken for this study was included by explaining how each stage of the analysis is broken down and conducted to link it with the hypotheses for this study. Finally, an overview of the ethical consideration was presented to highlight the key steps taken by the researcher to ensure that concerns related to ethical matters such as confidentiality, privacy and risks amongst others is duly carried out in accordance with relevant guidelines and protocols. Chapter 4 of this thesis will discuss the analysis and the results of the study.

CHAPTER 4: ANALYSIS AND RESULTS

4.1 Introduction

This chapter presents the statistical analysis and results of this study based on the analysis strategy discussed in chapter 3. This chapter begins with the overview summary of the descriptive statistics from the sample collected for this study. This is followed by the reliability analysis of the items used in the instrument to ensure that the data does not yield bias errors. The next section presents the exploratory factor analysis which shows items that have been removed and retained. Next, the measurement and structural model analysis generated from SMART PLS calculations are presented, following with the reliability and validity measures. Finally, the results of the mediation testing is shown on the role social support usage acts to mediate the relationships between food risk perception and the likelihood of dietary compliance amongst people with diabetes and self-efficacy and the likelihood of dietary compliance amongst people with diabetes. The structure of this chapter is presented in diagram 4.1:

Diagram 4.1: Chapter structure



4.2 Analysis Results: PHASE I

4.2.1 Stage 1: Overview Summary (Descriptive Statistics)

A total of 169 responses were obtained from the on-line and printed questionnaire from the total sample size of 2,200 as presented in section 3.4.1. From the data collected, n=169 usable responses was achieved and was considered meaningful for analysis. The final data for analysis are considered complete, accurate and free from missing values and outliers. The respondents comprised individuals who have been diagnosed with diabetes between the ages of 18 to 65 years old and over. Majority of the respondents i.e. about 31.4% are 61years old and above. There was also a fairly good response from those within the above 30's to 50's age range (around 58%). About 11% consisted of those within the 18 to 30 age range. The lower percentage within the younger age range in this sample may be due to the possibility that potential respondents in this category are registered with other diabetes organisations in Australia such as Juvenile Diabetes Research Foundation (JRDF) Australia whose members also comprise those within the 18 to 30 age range and so were not part of this study. Additionally, comparing data with national standards i.e. the National Diabetes Service Scheme Australia (NDSS), registrants in their database within the 18-30 age range also recorded lower percentages as compared with other age ranges. For example, as of March 31 2017, NDSS reports that out of more than a million NDSS registrants in Australia only close to 4% (around 46.000) are below the 20 to 29 years age range, whilst around 70% or more than 860,000 registrants are above 30 years old (NDSS 2017). Appendix E- Snapshot of all Types of Diabetes, shows the overall age breakdown of the NDSS national registrants.

In terms of gender distribution, most of the respondents were female (62.7%) as compared to males (37.3%). The Australian Bureau of Statistics (2015) report more males (5.7%) are diagnosed with diabetes as compared to females (4.6%) in Australia. However, studies (Chlebowy, Hood & LaJoie 2013; Mathew et al. 2012) indicate that men's attitude towards diabetes management differ from women in that men may not feel the need to seek additional support in managing their diabetes or participate in diabetes related support activities. Hence this may impact the lower percentages of men participating in this study or to register with diabetes support organisations. This may be an area of behavioural segmentation (Andreasen 2002; Dietrich et.al 2015; Kotler & Zaltman 1971) which social marketers could consider i.e. targeted campaigns at males with diabetes on a variety of diabetes related campaigns. The household composition of the respondents shows that (more than 50%) are married/de-facto with or without children. Approximately less than 30% of the sample comprised singles who are either living alone, with family members or without family members. Whilst the target of the sample population are Australian citizens and/or permanent residents, the ethnicity with which the respondents most likely identified with are Australian (81.7%), followed by African (6%), Asian (11.8), European (3%), Indigenous (6%) and Others (2.3%). The annual income characteristics show that around 32% either had no income or were earning less than AUD$15,000. About 52% of the sample earned around AUD$35,000 or more per annum. The highest education level of the respondents show that more than 70% had a certificate or higher level of qualification, whilst 42% had a high school qualification. Majority of the respondents reside in Queensland (74%), whilst 26% of the respondents were from other states in Australia.

Information from the diabetes profile of the respondents revealed that majority of the respondents are categorised as Type 2 people with diabetes (around 70%), whilst (31.4%) are categorised as Type 1 people with diabetes. The national diabetes organisation (NDSS) also report lower numbers of Type 1 people with diabetes who are registered with them as compared to Type 2 diabetic registrants with: Type 1 [118,142 registrants (10%)] and Type 2 [1,076,970 registrants (86%)] of the more than 1 million registrants. Smaller percentages with the Type 1 sample size recorded in the current study and with NDSS could imply that Type 1 people with diabetes may be registered with other diabetes organisations such as JRDF Australia who are specifically providing support for Type 1 people with diabetes in Australia. Therefore, a portion of Type 1 people with diabetes may not be represented in this study. This study did not include the gestational diabetes category (1.2%) into the final sample for analysis as per the explanation provided in Section 3.4.3, Chapter 3.

Majority of the respondents (45%) have been diagnosed with diabetes for more than 10 years. The average blood glucose level or HbA1c% within the last 6 months show that around 30.2% had more than 8.0% HbA1c% (blood glucose levels), which are considered not ideal or in this case may not be dietary compliant. Whilst the majority (more than 50%) have acceptable blood glucose levels of between 7% and 8%, on the other hand some (4.1%) are unsure of their blood glucose levels.

Table 4.1 shows the frequency and percentage breakdown of each demographic variable used in this study. The SPSS output for the detail of each frequency breakdown is shown in, Appendix F: Demographic Frequency Distribution.

Table 4.1: Descriptive distribution of the sample

No.	Demographic Characteristics	Frequency	Percentage (%)
1.	**Age category:**		
	18-20	5	3.0
	21-30	13	7.7
	31-40	23	13.6
	41-50	32	18.9
	51-60	43	25.4
	≥ 61 years and over	53	31.4
2.	**Gender:**		
	Male	63	37.3
	Female	106	62.7
3.	**Household Composition:**		
	Single-living alone	15	8.9
	Single- living with family members	18	10.7
	Single- living in a shared household with non-family members	14	8.3
	Married/De-facto with no children	66	39.1
	Married/De-facto-living with partner & chid/children under the age of 15	24	14.2
	Married/De-facto-living with partner & child/children over the age of 15	19	11.2
	Single parent- living with child/children under the age of 15	2	1.2
	Single parent- living with child/children over the age of 15	4	2.4
	Other	7	4.0
4.	**Ethnicity:**		
	Australian	138	81.7
	African	1	0.6
	Asian	20	11.8
	European	5	3.0
	Indigenous	1	0.6
	Other	4	2.3

5.	**Annual Income ($ AUD):**		
	No income	36	21.3
	≤ 15,000	18	10.6
	15,001-24,999	27	16.0
	25,000-34,999	16	9.5
	35,000-44,999	18	10.7
	45,000- 54,999	10	5.9
	55,000-99,999	17	10.1
	100,000-150,000	7	4.1
	≥ 150,000	5	3.0
	I do not wish to answer this question	13	7.6
	Other	2	1.2
6.	**Education (Highest level):**		
	High School	42	24.9
	Certificate	23	13.0
	Diploma	30	17.7
	Bachelor Degree	44	26.0
	Postgrad Certificate/Diploma	6	3.6
	Masters	18	10.7
	Doctorate	5	3.0
	Other	1	0.6
7.	**State:**		
	NSW	16	9.5
	QLD	125	74.0
	VIC	13	7.7
	SA	2	1.1
	WA	10	5.9
	Other	3	1.8
8.	**Diabetes Category:**		
	Type 1	53	31.4
	Type 2	113	66.9
	Other	3	1.2
9.	**Length of diagnosis:**		
	≤ 1 year	16	9.5
	Between 1-5 years	46	27.2
	Between 6-10 years	31	18.3
	≥ 10 years	76	45
10.	**Blood Glucose level (HbA1c %):**		
	At 7.0 or below	48	28.4
	Between 7.1 to 8.0	63	37.3
	More than 8.0	51	30.2
	Not sure	7	4.1

Source: Developed for this study

4.2.1.1 Normality Testing.

Assumptions of normality was assessed on the indicator variables of the latent constructs. The assumptions assesses the skewness and kurtosis of each indicator variable against George & Mallery's (2010) cut-off values of ±2. A skewed distribution can either be positively skewed in which the frequent scores are clustered at the lower end [i.e. the tail points towards the higher or positive scores) or negatively skewed in which the frequent scores are clustered at the higher end (i.e. the tail points towards the lower or negative scores] (Field 2009). At the same time distributions can also vary in their kurtosis, in which the scores cluster at ends of the distribution (i.e. tails) and the extent or level of kurtosis (i.e. how pointy the distribution is) (Hair et al. 2003). A positive kurtosis has many scores in its tail (*leptokurtic*), whilst a negative kurtosis has a thinner distribution in its tail (*platykurtic*) (Field 2009). An ideal situation is for the data to be normally distributed (i.e. not too skewed and not too many or too few scores) (Field 2009).

In a normal distribution the value of the skewness and kurtosis should be closer to zero (Field 2009). Skewness and kurtosis values in the range of ±2 is also acceptable and were therefore applied in this study (Brown, 2008; George & Mallery 2010). The normality test in this case shows all skewness and kurtosis values to be within the acceptable range of ±2, i.e. George & Mallery 2010, the item indicators were then imported into SMART PLS for the purpose of modelling. The SPSS output for the normality test is shown in, Appendix G: Normality Test.

4.2.2 Stage 2: Reliability Testing

Reliability of each construct is checked based on the pilot sample (Phase II) of n = 51 (Nunnally & Bernstein 1994). Cronbach's Alpha is used based on the average correlation of items in a test if the items are standardised. Results in Table 4.2 indicates that the initial Cronbach Alpha for Reliability Testing of the Pilot study-Phase II are all above the acceptable range of 0.7 (Nunnally, 1978).

Table 4.2 Pilot II: Reliability Test Results

No.	Constructs/Reference	Cronbach's alpha from original scales	Cronbach's alpha for Pilot Study (Phase II) tested
1.	Likelihood of Dietary Compliance (DV): Schlundt, Hargreaves & Buchowski, (2003)	α > 0.7	0.825
2.	Self-efficacy: Schmitt et al. (2013); Sherer et al. (1982); Stanford Patient Education Research Centre (2009)	DSMQ Scale α = 0.84 Diabetes Self-efficacy Scale α = 0.82 The Self-Efficacy Scale α > 0.7	0.903
3.	Food Risk Perception: Fife-Schaw & Rowe (1996)	Not available	0.851
4.	FRL: Grunert, Brunsø & Bisp (1993)	α = between 0.5-0.8	0.758
5.	Social Support Group usage: Sherbourne & Stewart (1991);): Polonsky et al. (2005)	MOS Social Support Scale α > 0.91 DDS Scale α = 0.87	0.714

Source: Developed for this research

4.2.3 Stage 3: Exploratory Factor Analysis

Exploratory Factor Analysis is conducted on the final data set of ($n = 169$)**.** Varimax (orthogonal) rotation was conducted indicative of the assumption that the factors are uncorrelated with one another. **The Kaiser-Meyer-Olkin (KMO) measure and the Bartlett's test of sphericity** is used in this stage. The KMO (i.e. sampling adequacy = 0.859) and Bartlett's test ($p<0.01$) is significant and shows that appropriate number of factors have been extracted (Leech, Barret & Morgan; Pallant 2013). The KMO and Bartlett's test is shown in Appendix H: KMO and Bartlett's Test.

The common method variance (CMV) bias using **Harman's single-factor test** was conducted to determine the level of biasness in variance proportion of distribution of the items (Ramayah et. al. 2011). A principle component factor analysis was conducted to ascertain if common method variance was inherent within the sample using SPSS version 23. In this case the test revealed that the un-rotated single latent factor in the factor analysis accounts for only 30.054% and is less than the prescribed 50% cut-off point (Podsakoff and Organ 1986). This test is presented in Appendix I: Harman Single Factor Test).

4.2.4 Stage 4: Measurement Model Validity

The present study's measurement model is assessed through measures of **Internal Consistency, Indicator Reliability, Convergent Reliability, and Discriminant Validity**. Initial assessment of the indicator items is shown in Table 4.3, where reflective indicator items with loadings within the PLS model that are less than 0.5 are removed (Hulland, 1999, p. 198). Next, Table 4.4 shows the full measurement model and Figure 4.1 presents the results after meeting the necessary criteria for this stage of the analysis.

Table 4.3: Measurement Model: Indicator Items (Loadings < 0.5)

Construct	No of items remain (out of)	Items Removed
Self-efficacy (SE)	6 (7)	SE7
Food Risk Perception (FRP)	5 (5)	-
Food related Lifestyle (FRL)	9 (11)	FRL3, 6
Social Support Groups usage (SSG)	7 (8)	SSG 4
Likelihood of Dietary Compliance	5 (12)	LDC 3, 7, 8, 9,10, 11, 12

**Note: LDC 11, LDC 10, LDC 8, LDC 7, LDC 9 –Removed to stabilize the Average Variance Extracted to be above 0.5*

¬ ***Internal Consistency.*** Cronbach's alpha and Composite Reliability i.e**.** Dhillon-Goldstein Rho was used at this stage. Cronbach's alpha tested for this study shows internal consistency for most items to be above the value of 0.7 as suggested by Nunnally (1978). Composite reliability (CR) conducted for this study indicates Internal Consistency to be above 0.7 and is therefore adequate or shows adequate convergence (Gefen, Straub & Boudreau 2000). Initial assessment of the indicator items in Table 4.3 shows that reflective indicator items with loadings within the PLS model that are less than 0.5 are removed to achieve satisfactory indicator reliability (Hulland, 1999, p. 198).

However, particularly, for the Likelihood of Dietary Compliance construct it was noted that a relatively large number of items had to be removed to stabilise the AVE (i.e. 7 out of 12 items). Whilst the removal of items may be acceptable statistically, theoretically this procedure may not be entirely justifiable as it may lead to an empirically skewed discussion rather than a theoretical discussion, thus limiting the potential theoretical contributions from the model.

A re-assessment of the Likelihood of Dietary compliance items in the scale was conducted and it was noted that the items within this scale are positively and negatively worded items. Therefore, it was decided that the single dependent variable would be split into two constructs with a negative and positive path each. The initial model was still run to test its outcome, at the same time a second analysis (Phase II, Section 4.4) was run to test the alternative model. This enabled further examination and comparisons to be made with each model.

¬***Indicator Reliability.*** The reflective indicator loadings, within the PLS model that are less than 0.5 indicates a good measurement of the latent construct (Hulland 1999, p. 198). Reflective indicators with loadings within the PLS model that are less than 0.5 are removed (Hulland, 1999, p. 198). For this study all item loadings are above 0.4 which shows indicator reliability (Hulland, 1999, p. 198).

¬***Convergent Reliability*.** The Average Variance Extracted (AVE) is calculated to achieve Convergent Reliability. The AVE is comparable to the proportion of variance explained in factor analysis, with values ranging from 0 and 1. The Average Variance Extracted (AVE) value of 0.50 or higher (values between 0 and 1), suggests adequate convergent validity (Bagozzi & Yi 1988; Fornell & Larcker 1981). The Average Variance Extracted (AVE) in this case shows a value above 0.5, thereby indicating Convergent Reliability (Bagozzi and Yi (1988); Fornell and Larcker (1981).

Table 4.4: Full Measurement Model

Constructs	Items	Loadings[a]	AVE[b]	CR[c]	Cronbach's alpha[d]
Self-Efficacy (SE)	SE1_13	0.893	0.677	0.925	0.902
	SE2_14	0.858			
	SE3_15	0.928			
	SE4_16	0.794			
	SE5_17	0.786			
	SE6_18	0.646			
Food Risk Perception (FRP)	FRP1_20	0.717	0.651	0.903	0.864
	FRP2_21	0.738			
	FRP3_22	0.876			
	FRP4_23	0.816			
	FRP5_24	0.873			
Food Related Lifestyles (FRL)	FRL1_25	0.738	0.518	0.905	0.881
	FRL2_26	0.707			
	FRL4_28	0.713			
	FRL5_29	0.639			
	FRL7_31	0.642			
	FRL8_32	0.549			
	FRL9_33	0.740			
	FRL10_34	0.855			
	FRL11_35	0.844			
Social Support Groups Usage (SSG)	SSG1_36	0.635	0.517	0.881	0.840
	SSG2_37	0.824			
	SSG3_38	0.845			
	SSG5_40	0.607			
	SSG6_41	0.623			
	SSG7_42	0.662			
	SSG8_43	0.793			
Likelihood of Dietary Compliance (LDC)	LDC1_5.1	0.779	0.554	0.861	0.800
	LDC2_5.2	0.737			
	LDC4_5.4	0.655			
	LDC5_5.5	0.753			
	LDC6_5.6	0.790			

All Item Loadings > 0.4 indicates Indicator Reliability (Hulland, 1999, p. 198)
All Average Variance Extracted (AVE) > 0.5 indicates Convergent Reliability (Bagozzi and Yi (1988); Fornell and Larcker (1981))
All Composite reliability (CR) > 0.7 indicates Internal Consistency (Gefen, et al, 2000)
All Cronbach's alpha > 0.7 indicates Indicator Reliability (Nunnally, 1978)

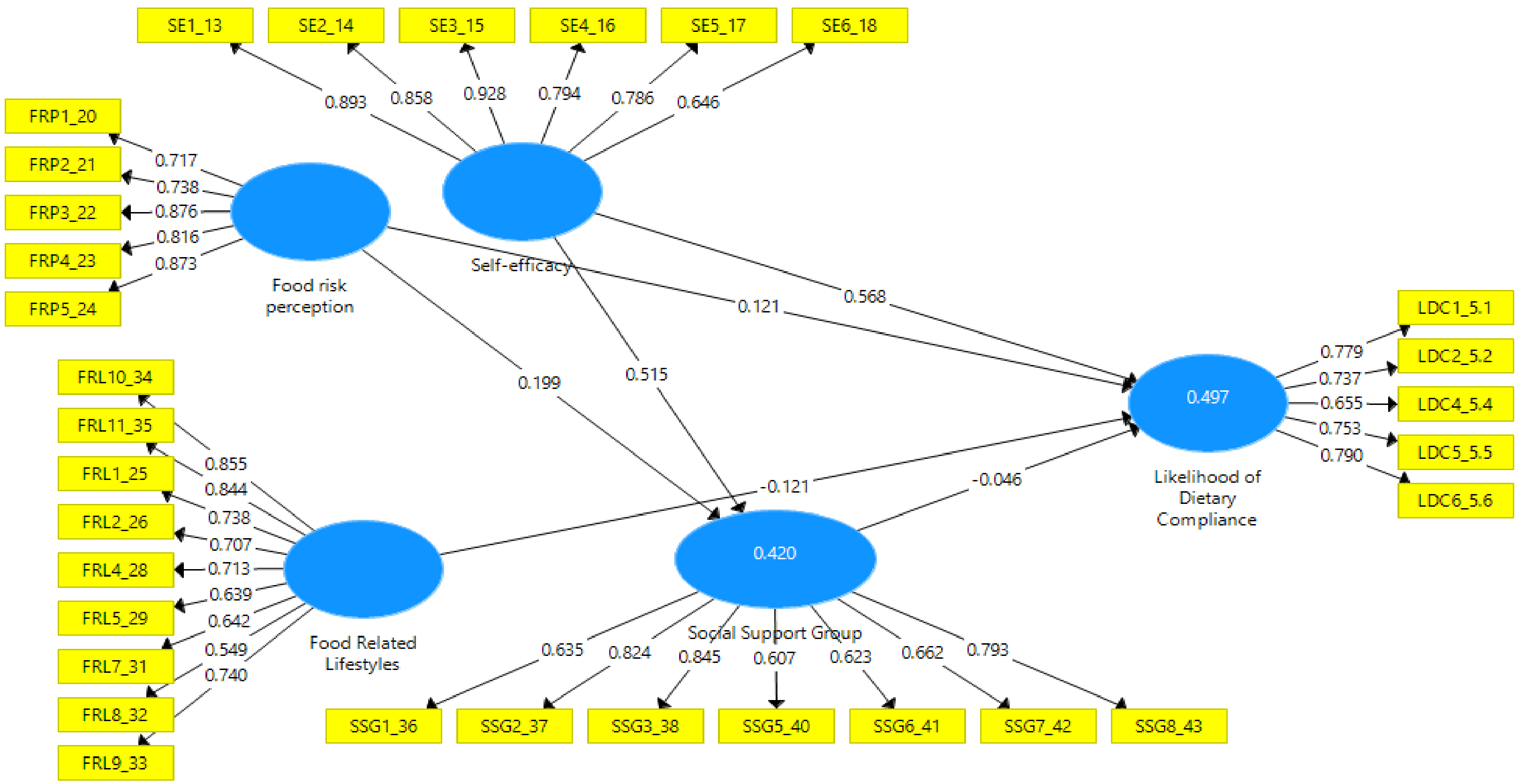


Figure 4.1: Measurement Model

~Discriminant Validity. Discriminant Validity in this study is assessed through Vertical Collinearity Testing and Multicollinearity Testing. Vertical Collinearity is achieved whereby all corresponding indicator items within a specified latent construct appears to be the highest loading vertically and across all other latent constructs (Fornell & Larcker 1981). This can be seen by examining the bolded values of loadings in using the **Cross Loading Criterion** - Appendix J: Cross Loading Criterion. Fornell & Larcker (1981) assessment ensures there is no multicollinearity amongst latent variables (Chin 1988a). This assessment makes sure that each latent variable are subjectively independent of other indicators (Chin 2010; Chin 1998b; Fornell and Larcker 1981).

The AVE of a latent variable in this case should be higher than the squared correlation between the latent variables and all other variables (Fornell & Larcker 1981). The results of the assessment for this study is shown in Table 4.5: Discriminant Validity using the Fornell and Larcker (1981) criterion, whereby values of the diagonals must be higher than the off-diagonal values in that particular row or column. The results imply that the respondents are able to understand and discriminate between the different variables as the diagonal correlations are higher than the off diagonals.

As discussed in section 3.7.4.5.1 due to the criticisms of the Fornell & Larcker's Discriminant Validity assessment, i.e. Henseler, Ringle & Sarstedt (2015), an alternative approach which is the heterotrait-monotrait (HTMT) ratio of correlations is applied for this study. The HTMT assessment in this case found all the values passed both the $HTMT_{.85}$, (Kline, 2011), and the $HTMT_{.90}$, (Gold et al. 2001) criteria. The $HTMT_{95\%\ \text{Confidence Interval}}$ also showed that the confidence interval did not show a value of 1 in the 95% Confidence Interval of any of the constructs, which indicates discriminant validity has been achieved. Table 4.6 presents the results of the Heterotrait-Monotrait analysis to assess Discriminant Validity.

Table 4.5: Discriminant Validity Using the Fornell and Larcker (1981) criterion

	SE	FRP	FRL	SSG	LDC
Self-efficacy (SE)	**0.823**				
Food risk perception (FRP)	0.563	**0.807**			
Food Related Lifestyles (FRL)	0.697	0.471	**0.720**		
Social Support Groups (SSG)	0.627	0.489	0.480	**0.719**	
Likelihood of Dietary Compliance (LDC)	0.692	0.475	0.552	0.427	**0.745**

**Note: Diagonals (bolded) represent the square root of the AVE while off diagonals represent the correlations*

Table 4.6: Heterotrait-Monotrait (HTMT) Assessment for Discriminant Validity

	SE	FRP	FRL	SSG	LDC
Self-efficacy (SE)					
Food risk perception (FRP)	0.635 95%CI (0.447, 0.761)				
Food Related Lifestyles (FRL)	0.769 95%CI (0.691, 0.832)	0.539 95%CI (0.404, 0.665)			
Social Support Groups Usage (SSG)	0.718 95%CI (0.626, 0.794)	0.57 95%CI (0.429, 0.691)	0.554 95%CI (0.409, 0.675)		
Likelihood of Dietary Compliance (LDC)	0.788 95%CI (0.680, 0.866)	0.576 95%CI (0.423, 0.697)	0.632 95%CI (0.477, 0.753)	0.524 95%CI (0.335, 0.671)	

**Note: All values are significantly different from 1 indicating achievement of Discriminant Validity*

4.2.5 Stage 5: Structural Model Validity in PLS-SEM

For this stage, a 5-step Structural Model assessment approach is used to assess the structural model (Hair et al. 2017). Firstly, Table 4.7 shows the lateral collinearity check in which the **Variance Inflation Factor** figures for all the exogenous variables on a particular endogenous construct does not exceed a value of 5 (Casel et al. 1999) indicating no serious case of multicollinearity amongst the latent variables used for predictive modelling. Following on the R^2, beta and the corresponding t-values through a bootstrapping procedure with a resample of 5,000 is carried out. The predictive relevance (q^2) and effect sizes (f^2) are also reported as per Hair et al. (2017) suggestion.

Table 4.7: Variance Inflation Factor between Exogenous and Endogenous Constructs to check for Lateral Collinearity

	Social Support Groups	Likelihood of Dietary Compliance
Self-efficacy (SE)	1.463	2.655
Food risk perception (FRP)	1.463	1.554
Food Related Lifestyles (FRL)		1.984
Social Support Groups (SSG)		1.729

**Note: VIF figures for all the exogenous variables on a particular endogenous construct is not more than 5 (Casel et al., 1999*

Bootstrapping analysis of the direct effects of all the hypothesized relationships is conducted whereby a bootstrapping of 5000 samples is carried out (Hair et al. 2017). The given hypotheses of Hi; i =1, 2, 3, 4, 5 and 6 is supported based on the t-value calculated after the bootstrapping analysis has been performed at a given level of alpha, in this case 5%. If the calculated t-value shows at 5% level of significance (for a 2-tailed test) a value of above 1.96, then the hypothesis is supported or else it is not supported (Peng and Lai, 2012). Figure 4.2 shows the structural model after bootstrapping. Based on the results in Table 4.10 and Figure 4.2, the following hypotheses in this study is supported and shows significant relationships:-

- **H1** *(Self-Efficacy -> Likelihood of Dietary Compliance; β=0.568; p<0.01),*
- **H5** (*Self-Efficacy -> Social Support Groups Usage; β=0.515; p<0.01) and*
- **H6** *(Food Risk Perception -> Social Support Groups Usage; β=0.199; p<0.01)*

Table 4.8: Effect Size (f^2) Calculation *

Predictor Variable	**Endogenous Variable**	**R^2 Included**	**R^2 Excluded**	**f^2**
Self-efficacy	Likelihood of Dietary Compliance	0.497	0.376	0.241
Food Risk Perception	Likelihood of Dietary Compliance	0.497	0.490	0.013
Food Related Lifestyles	Likelihood of Dietary Compliance	0.497	0.489	0.016
Social Support Groups	Likelihood of Dietary Compliance	0.497	0.504	-0.014
Self-efficacy	Social Support Groups	0.420	0.240	0.310
Food Risk Perception	Social Support Groups	0.420	0.394	0.045

* *Based on Formula 5 used in section 3.7.5.4*

Referring to Table 4.8 above, the R^2 values for Likelihood of Dietary Compliance (LDC) and Social Support Groups Usage (SSG) were recorded as 0.497 and 0.420 respectively which exceeds the 0.26 substantial value for predictive modelling as suggested by Cohen (1988). This indicates a substantial model where the predictors contribute to the variance explanation of the respective dependent variables. These values are used to calculate the corresponding effect sizes from the R^2 excluded (effect of removal of the predictor latent variable from the model). The results show that Self-Efficacy (SE) *(f^2=0.241)* has a medium effect size on Likelihood of Dietary Compliance (LDC), whilst both Self-Efficacy (SE) *(f^2=0.310)* and Food Risk Perception (FRP) *(f^2=0.045)* has a medium effect size on Social Support Groups Usage (SSG)

Table 4.9: Predictive Relevance (q^2) Calculation*

Predictor Variable	Endogenous Variable	Q^2 Included	Q^2 Excluded	q^2
Self-efficacy	LDC	0.245	0.183	0.082
Food Risk Perception	LDC	0.245	0.242	0.004
Food Related Lifestyles	LDC	0.245	0.244	0.001
Social Support Groups	LDC	0.245	0.250	-0.007
Self-efficacy	SSG	0.198	0.115	0.103
Food Risk Perception	SSG	0.198	0.186	0.015

* *Based on Formula 7 used in section 3.7.5.5*

Next, blindfolding procedure was used to analyse and assess the predictive relevance of the model whereby every 7th data point in the endogenous construct's indicators was removed to estimate the parameters with the remaining data points (Henseler 2009). Similarly, referring to the corresponding Q^2 included (in Table 4.9) of Likelihood of Dietary Compliance (LDC) and Social Support Groups Usage (SSG) show 0.245 and 0.198 respectively which are then used to calculate the corresponding predictive relevance from the Q^2 excluded (effect of removal of the predictor latent variable from the model). The predictive relevance of the predictor variables which is shown in Table 4.8, suggests that the model has sufficient predictive relevance of q^2 values: 0.35 (large), 0.15 (medium), and 0.02 (small) as suggested by Henseler (2009). The results show that Self-Efficacy (SE) has a small predictive relevance on Likelihood of Dietary Compliance (LDC) *(q^2=0.082)* an on Social Support Groups Usage (SSG) *(q^2=0.103).*

4.2.6 Stage 6: Mediation Testing

This analysis stage tests the indirect effect of hypotheses H7 and H8 on the model and whether the hypotheses are all supported (i.e. whether Social Support Groups Usage is found to mediate the effect between both Self-Efficacy and Food Risk Perception). In this case, when controlling for the mediator, the relationships between the two variables is reduced to non-significance (Baron & Kenny 1986). Bootstrapping of 5000 samples is conducted to determine the significance of the indirect effect and the corresponding standard deviation is obtained for t-test calculations on the indirect effect (Preacher & Hayes 2004). Referring to Table 4.11, the results of this analysis shows that Social Support Groups Usage has no significant mediation effect between both Self-Efficacy (β=-0.009; $p>0.05$) and Food Risk Perception (β=-0.024; $p>0.05$) with the Likelihood of Dietary Compliance.

Table 4.10: Structural Model Hypothesis Testing for Direct Effects

Hypothesis	Relationship	Std Beta	Std Error	t-value	Decision	f^2	q^2	95%CI LL	95%CI UL
H1	Self-efficacy -> Likelihood of Dietary Compliance	0.568	0.082	6.887**	**Supported**	0.241	0.082	0.418	0.69
H2	Food risk perception -> Likelihood of Dietary Compliance	0.121	0.079	1.507	Not Supported	0.014	0.004	-0.008	0.261
H3	Food Related Lifestyles -> Likelihood of Dietary Compliance	-0.121	0.102	1.162	Not Supported	0.016	0.001	-0.306	0.035
H4	Social Support Groups -> Likelihood of Dietary Compliance	-0.046	0.098	0.461	Not Supported	0	0	-0.213	0.112
H5	Self-efficacy -> Social Support Group	0.515	0.072	7.298**	**Supported**	0.310	0.103	0.392	0.619
H6	Food risk perception -> Social Support Group	0.199	0.075	2.756**	**Supported**	0.040	0.015	0.091	0.334

*** p<0.01, *p<0.05*

R^2 (Likelihood of Dietary Compliance = 0.497; Social Support Groups = 0.420); *Effect Size impact indicator are according to Cohen (1988), f^2 values: 0.35 (large), 0.15 (medium), and 0.02 (small)*

Q^2 (Likelihood of Dietary Compliance = 0.245, Social Support Groups = 0.198); *Predictive Relevance of Predictor Exogenous Latent Variables as according to Henseler et al (2009), q^2 values: 0.35 (large), 0.15 (medium), and 0.02 (small)*

Table 4.11: Structural Model Hypothesis Testing for Mediation (Indirect Effects)

Hypothesis	Relationship	Std Beta	Std Error	t-value	Decision	95%CI LL	95%CI UL
H7	Food risk perception -> Likelihood of Dietary Compliance	-0.009	0.021	0.428	Not supported	-0.043	0.026
H8	Self-efficacy -> Likelihood of Dietary Compliance	-0.024	0.053	0.447	Not supported	-0.116	0.058

Mediation variable Social Support Groups Usage
** p<0.01, *p<0.05

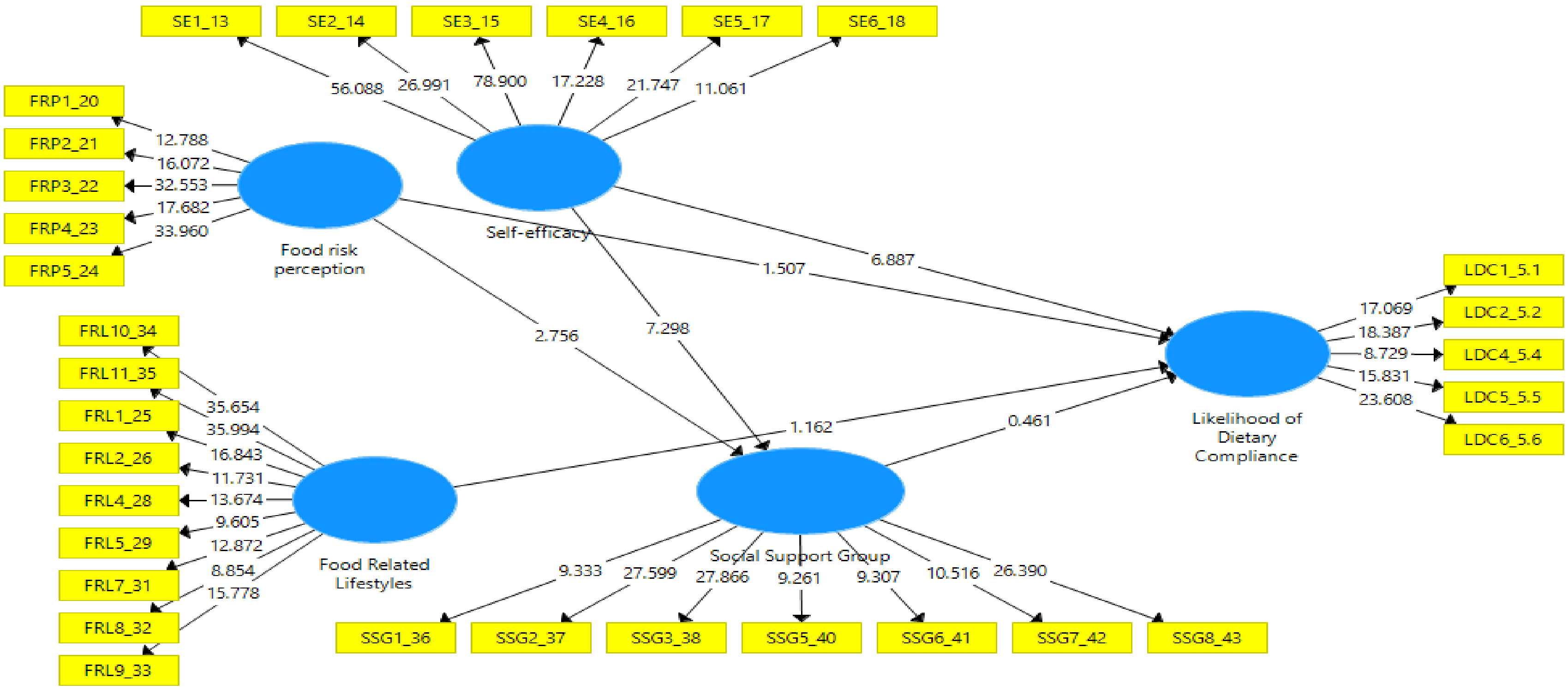


Figure 4.2: Structural Model after Bootstrapping

4.2.6.1 Assessment of Goodness of Fit

The Standardised Root Mean Square Residuals (SRMR) is the Goodness of fit criteria used to assess the fit of the model. The **SRMR** assessment for this model (0.075) indicates that the theoretical application of the model and the data as well as the model for this study is a good fit (Henseler, 2015).

Figure 4.3 shows the final model results of direct and indirect (mediation) relationships for this study. The darkened arrows in the diagram shows that direct effects of H1, H5 and H6 with β=0.568, β=0.515 and β=0.199 respectively shows significant relationships and supports the hypotheses presented. Whilst direct effects on the model i.e. H2, H3 and H4 with β=0.121, β= -0.121 and β= -0.046 is represented in the diagram with broken arrows to show the hypotheses is not supported.

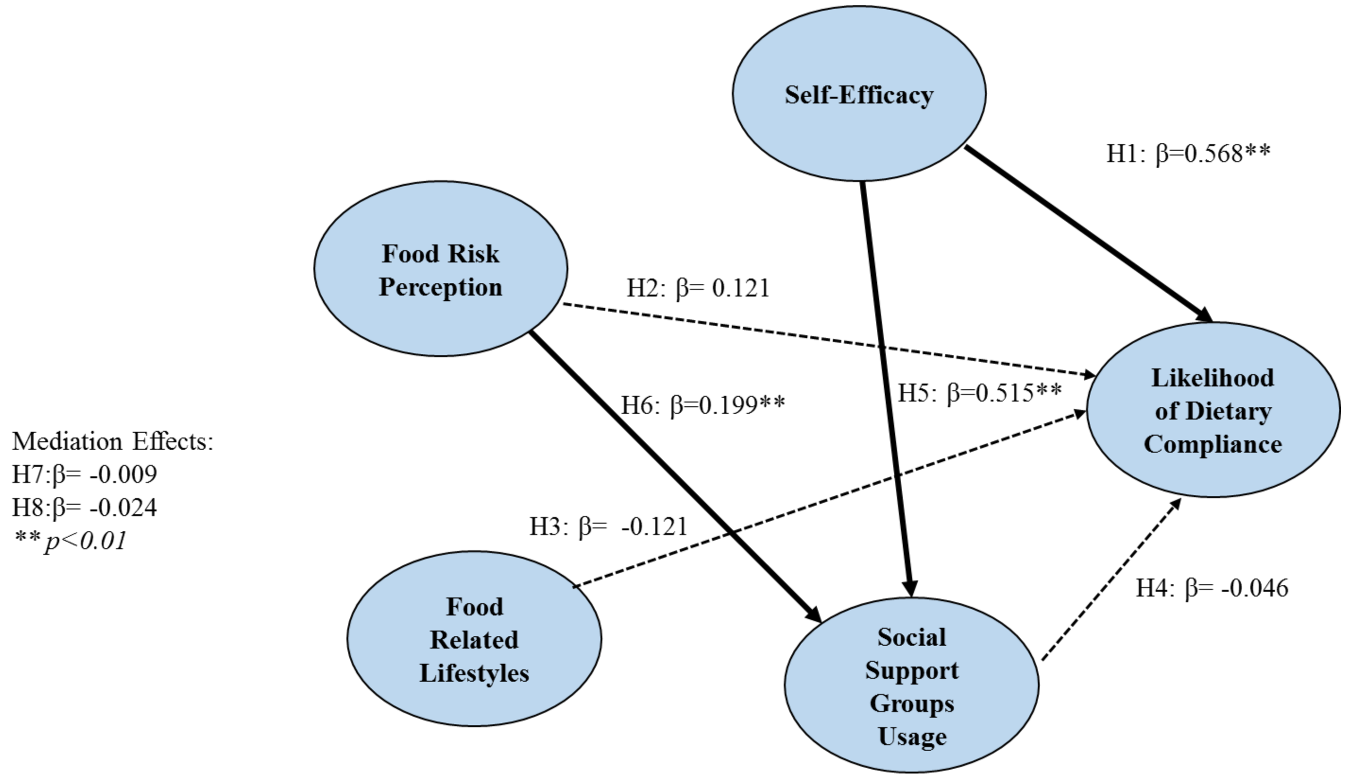


Figure 4.3: Final Model 1 Results

4.3 Phase I Summary

This chapter presented the key findings of the main study and provided details of the analysis stages undertaken for this study. The overall analysis was conducted using quantitative methods to ensure quantifiable and significant results. The outcome from the analysis showed that there were some significant relationships between a number of hypotheses namely, the relationship between self-efficacy and the likelihood of dietary compliance; self-efficacy and social support groups usage; food risk perception and social support groups usage which supports these hypotheses presented in this study. At the same time the analysis revealed that Social Support Groups Usage was found to have no significant mediation effect between both Self-Efficacy and Food Risk Perception with the Likelihood of Dietary Compliance. The analysis process provides the overall model results of this study which shows the final direct and indirect (mediation) relationships as presented in Figure 4.3.

With regards to the final model, the outcomes with H1, H5 and H6 seems to support theory as discussed in Chapter 2 as follows:-

H1: Self-efficacy influences the likelihood of dietary compliance amongst people with diabetes;

H5: Self-efficacy influences Social Support Groups usage amongst people with diabetes and;

H6: Food Risk Perception influences Social Support Groups usage amongst people with diabetes

However, the remaining hypotheses outcomes from this analysis show that the following hypotheses is not supported and is in contrast to theory as proposed in Chapter 2, i.e. as follows:-

H2: Food Risk Perception influences the Likelihood of Dietary Compliance amongst people with diabetes;

H3: Food Related Lifestyles influences the Likelihood of Dietary Compliance amongst people with diabetes;

H4: Social Support Groups usage influences the Likelihood of Dietary Compliance amongst people with diabetes

No mediation effect was found between both Self-Efficacy and Food Risk Perception with the Likelihood of Dietary Compliance (i.e. H7 and H8).

The non-significant results specifically, with the aforementioned hypotheses suggests that there may be some other underlying reasons for these outcomes which does not support the hypotheses presented thus far. Therefore, further investigation was conducted to examine the reasons behind the non-supported hypotheses (i.e. direct effect: H2, H3 and H4 and indirect effect: H7 and H8). As such this chapter will continue with Phase II, in which further analysis was carried out to examine the key reasons for the aforementioned hypotheses outcomes. A detailed explanation of this section and the following Phase II will be discussed in Chapter 5 of this thesis.

PHASE II: Alternative Model 2

4.4 Introduction

Phase I of the analysis indicates that some hypotheses are not supported as presented in Figure 4.3, thereby contrasting theory and literature. Therefore, an alternative model is tested and proposed as Model 2. The following sections will discuss the development of the alternative model 2, and its subsequent analysis outcomes. Detailed explanation of the outcomes from this analysis and its implications to theory and practice will be presented in chapter 5 of this thesis.

4.4.1 PHASE II: Measrurement Model Validity.

This analysis is conducted to test the measurement model validity of the second construct i.e. the Likelihood of Dietary Compliance (Negative) as explained in section 4.2.4 of this chapter. In this case, the second analysis includes the new constuct of the Likelihood of Dietary Compliance (Negative). Table 4.12 presents the full measurement model of the Likelihood of Dietary Compliance (Negative). Figure 4.4 shows the Measurement Model for the alternative Model 2 with the additional Likelihood of Deitary Compliance (Negative) construct.

Table 4.12: Measurement Model of Likelihood of Dietary Compliance (Negative)

Constructs	Items	Loadings[a]	AVE[b]	CR[c]	Cronbach's alpha[d]
Likelihood of Dietary Compliance (Negative)	LDC10_5.10	0.793	0.696	0.932	0.914
	LDC11_5.11	0.838			
	LDC12_5.12	0.712			
	LDC7_5.7	0.859			
	LDC8_5.8	0.909			
	LDC9_5.9	0.880			

All Item Loadings > 0.4 indicates Indicator Reliability (Hulland, 1999, p. 198)
All Average Variance Extracted (AVE) > 0.5 as indicates Convergent Reliability (Bagozzi and Yi (1988); Fornell and Larcker (1981))
All Composite reliability (CR) > 0.7 indicates Internal Consistency (Gefen, Straub & Boudreau 2000)
All Cronbach's alpha > 0.7 indicates Indicator Reliability (Nunnally, 1978)

¬***Measurement Model Results***. The new measurement models' assessment of Internal Consistency, Indicator Reliability and Convergent Reliability meets the required criteria as presented in Table 4.12 whereby the new model is adequate for empirical testing (Hulland 1999). Reliability testing shows values are above the acceptable range of 0.7. Overall, the reliability and validity of the new construct is good.

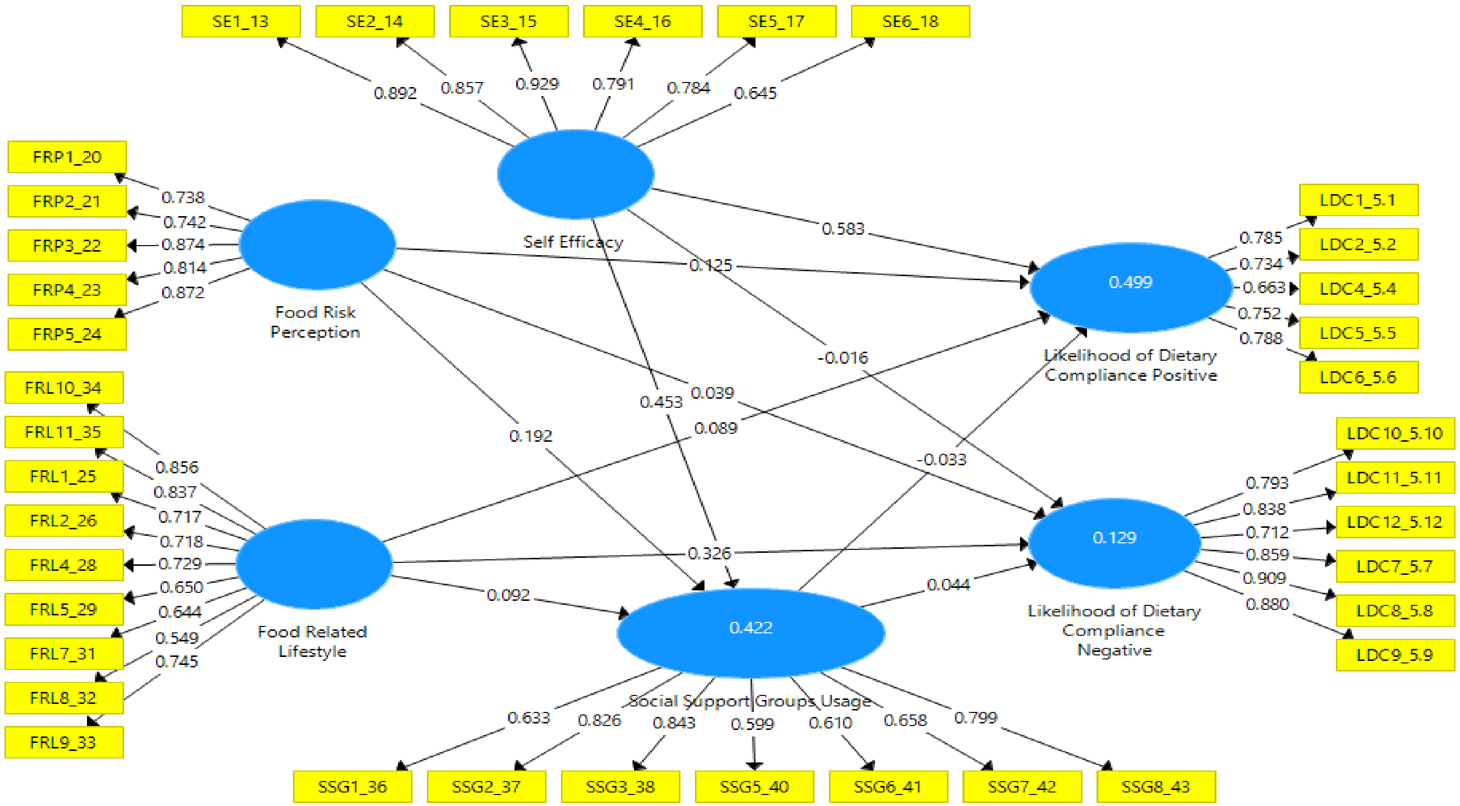


Figure 4.4: Measurement Model for Model 2

¬***Discriminant Validity.*** The results in Table 4.13, shows the discriminant validity (Fornell & Larcker 1981) of constructs with the Likelihood of Dietary Compliance (Negative). Table 4.13, shows the bolded values of loadings (i.e. Cross Loading Criterion) where values of the diagonals must be higher than the off-diagonal values in that particular row or column (Chin 2010).

Table 4.13: Discriminant Validity of Constructs with Likelihood of Dietary Compliance (Negative)

	Food Related Lifestyle	Food Risk Perception	Likelihood of Dietary Compliance Negative	Likelihood of Dietary Compliance Positive	Self-Efficacy	Social Support Groups Usage
Food Related Lifestyle	**0.722**					
Food Risk Perception	0.479	**0.810**				
Likelihood of Dietary Compliance Negative	0.355	0.207	**0.834**			
Likelihood of Dietary Compliance Positive	0.542	0.477	0.226	**0.746**		
Self-Efficacy	0.702	0.559	0.262	0.695	**0.822**	
Social Support Groups Usage	0.502	0.489	0.217	0.437	0.624	**0.717**

Note: Diagonals (bolded) represent the square root of the AVE while off diagonals represent the correlations

4.4.2 Proposed New Direct Effects Hypotheses

The following hypotheses is now proposed for the alternative model 2, in Table 4.14. Hypotheses H1-H6 represents hypotheses for the (Positive) dependent variable and Hypotheses H7-H11 (bolded) the (Negative) dependent variable.

Table 4.14: New Direct Hypothesis

H1	Self-Efficacy -> Likelihood of Dietary Compliance Positive
H2	Food Risk Perception -> Likelihood of Dietary Compliance Positive
H3	Food Related Lifestyle -> Likelihood of Dietary Compliance Positive
H4	Social Support Groups Usage -> Likelihood of Dietary Compliance Positive
H5	Self-Efficacy -> Social Support Groups Usage
H6	Food Risk Perception -> Social Support Groups Usage
H7	**Food Related Lifestyle -> Social Support Groups Usage**
H8	**Self-Efficacy -> Likelihood of Dietary Compliance Negative**
H9	**Food Risk Perception -> Likelihood of Dietary Compliance Negative**
H10	**Food Related Lifestyle -> Likelihood of Dietary Compliance Negative**
H11	**Social Support Groups Usage -> Likelihood of Dietary Compliance Negative**

The addition of hypotheses H7 is to test the direct relationship between Food Related Lifestyles and Social Support Groups Usage into this model and to explore the significance of this particular path. Initially, this particular relationship was not tested in the original model due to limited literature, particularly the Food Related Lifestyle model (Grunert, Brunso & Bisp 1993) in explaining this relationship.

The remaining hypothesis (i.e. H8-H11) will therefore be tested within the "negative" construct of the Likelihood of Dietary Compliance, as per the explanation provided in section (4.2.4), thereby likely providing further empirical evidence within this context. Details of the theoretical implications and its impact on policy are discussed in Chapter 5. Figure 4.5, presents the new structural model after Bootstrapping. Figure 4.6 shows the Final Model 2.

4.4.3 New Mediation Hypotheses

Mediation testing for both hypotheses (i.e. 7 and 8) from the model 1, showed no significant outcomes, contrasting literature (Antonovsky 1974; Thoits 1985). Therefore, mediation testing is introduced in the new model 2, to test the indirect effects H12 to H14 of Social Support Groups Usage on the Positive construct of the Likelihood of Dietary Compliance. Similarly, mediation testing i.e. Hypotheses H15 to H17 tests the same relationships with the Negative construct of the Likelihood of Dietary Compliance. Table 4.15 shows the new mediation hypotheses relationships.

Table 4.15: New Mediation Hypothesis

Hypothesis	Relationship
H12	Self-Efficacy -> Social Support Groups Usage-> Likelihood of Dietary Compliance Positive
H13	Food Risk Perception -> Social Support Groups Usage-> Likelihood of Dietary Compliance Positive
H14	Food Related Lifestyle -> Social Support Groups Usage-> Likelihood of Dietary Compliance Positive
H15	Self-Efficacy -> Social Support Groups Usage-> Likelihood of Dietary Compliance Negative
H16	Food Risk Perception -> Social Support Groups Usage-> Likelihood of Dietary Compliance Negative
H17	Food Related Lifestyle ->Social Support Groups Usage-> Likelihood of Dietary Compliance Negative

Results for the direct effects in Table 4.16 shows the added hypotheses H7 to H11 are all not supported except for H10 (i.e. Food Related Lifestyle -> Likelihood of Dietary Compliance Negative). Mediation testing shown in table 4.17 i.e. H12 to H17 are not supported similarly with the original model (Figure 4.3). Figure 4.5 presents the Structural Model after Bootstrapping. Assessment of Goodness of Fit (SRMR) for this model (0.071) indicates that the theoretical application of the model, data as well as the model for this study is a good fit. Details of this particular outcome is further explained in Chapter 5

Table 4.16: New Structural Model Analysis for Direct Relationships with Likelihood of Dietary Compliance 2

Hypothesis	Relationship	Std Beta	Std Error	t-value	Decision	f^2	q^2	95%CI LL	95%CI UL
H1	Self- Efficacy -> Likelihood of Dietary Compliance Positive	0.583	0.080	7.317**	**Supported**	0.259	0.085	0.447	0.707
H2	Food Risk Perception -> Likelihood of Dietary Compliance Positive	0.125	0.080	1.564	Not Supported	0.016	0.007	0.003	0.263
H3	Food Related Lifestyle -> Likelihood of Dietary Compliance Positive	0.089	0.104	0.860	Not Supported	0.010	-0.004	-0.070	0.274
H4	Social Support Groups Usage -> Likelihood of Dietary Compliance Positive	-0.033	0.099	0.333	Not Supported	-0.014	-0.005	-0.201	0.129
H5	Self -Efficacy -> Social Support Groups Usage	0.453	0.095	4.753**	**Supported**	0.154	0.052	0.277	0.591
H6	Food Risk Perception -> Social Support Groups Usage	0.192	0.078	2.453**	**Supported**	0.040	0.014	0.076	0.331
H7	Food Related Lifestyle -> Social Support Groups Usage	0.092	0.110	0.836	Not Supported	0.007	0.001	-0.078	0.288
H8	Self -Efficacy -> Likelihood of Dietary Compliance Negative	-0.016	0.109	0.146	Not Supported	0.000	-0.001	-0.199	0.160
H9	Food Risk Perception -> Likelihood of Dietary Compliance Negative	0.039	0.088	0.438	Not Supported	0.000	0.000	-0.114	0.177
H10	Food Related Lifestyle -> Likelihood of Dietary Compliance Negative	0.326	0.102	3.183**	**Supported**	0.059	0.033	0.156	0.493
H11	Social Support Groups Usage -> Likelihood of Dietary Compliance Negative	0.044	0.090	0.493	Not Supported	0.001	0.001	-0.088	0.205

** $p<0.01$, * $p<0.05$

R^2 (Likelihood of Dietary Compliance Positive = 0.499; Likelihood of Dietary Compliance Negative = 0.129; Social Support Groups Usage = 0.422); *Effect Size impact indicator are according to Cohen (1988), f^2 values: 0.35 (large), 0.15 (medium), and 0.02 (small)*

Q^2 (Likelihood of Dietary Compliance = 0.250; Likelihood of Dietary Compliance = 0.074; Social Support Groups Usage = 0.196); *Predictive Relevance of Predictor Exogenous Latent Variables as according to Henseler et al (2009), q^2 values: 0.35 (large), 0.15 (medium), and 0.02 (small)*

Table 4.17: New Structural Model Analysis for Indirect Relationships with Likelihood of Dietary Compliance 2

Hypothesis	Relationship	Std Beta	Std Error	t-value	Decision	95%CI LL	95%CI UL
H12	Self- Efficacy -> Social Support Groups Usage-> Likelihood of Dietary Compliance Positive	-0.015	0.048	0.313	Not Supported	-0.098	0.06
H13	Food Risk Perception -> Social Support Groups Usage-> Likelihood of Dietary Compliance Positive	-0.006	0.021	0.295	Not Supported	-0.041	0.029
H14	Food Related Lifestyle -> Social Support Groups Usage-> Likelihood of Dietary Compliance Positive	-0.003	0.017	0.184	Not Supported	-0.031	0.022
H15	Self -Efficacy -> Social Support Groups Usage-> Likelihood of Dietary Compliance Negative	0.020	0.040	0.499	Not Supported	-0.043	0.091
H16	Food Risk Perception -> Social Support Groups Usage-> Likelihood of Dietary Compliance Negative	0.008	0.020	0.425	Not Supported	-0.019	0.046
H17	Food Related Lifestyle ->Social Support Groups Usage-> Likelihood of Dietary Compliance Negative	0.004	0.016	0.250	Not Supported	-0.011	0.039

** $p<0.01$, *$p<0.05$

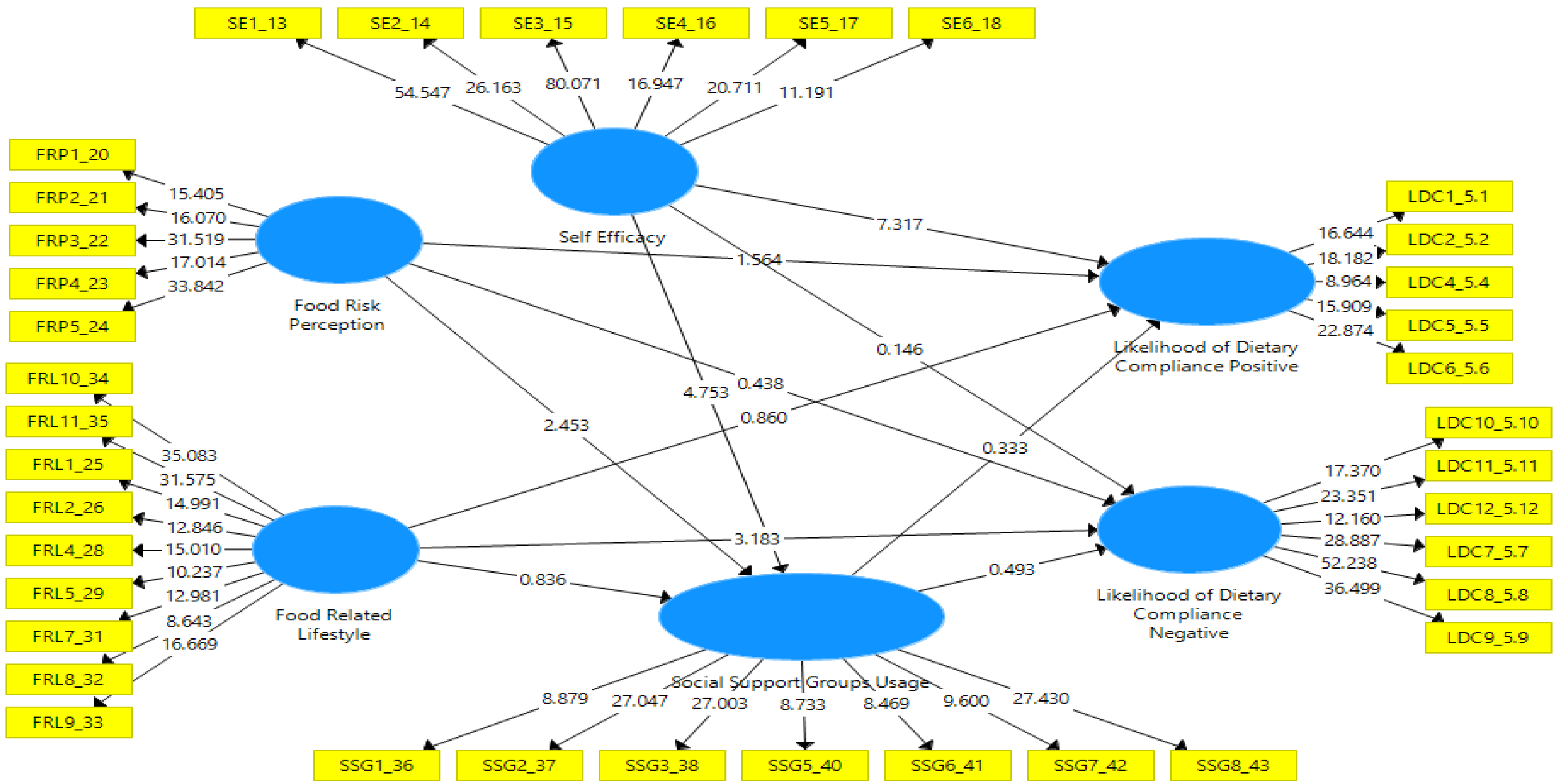


Figure 4.5: Structural Model Bootstrap for Model with Likelihood of Dietary Compliance 2

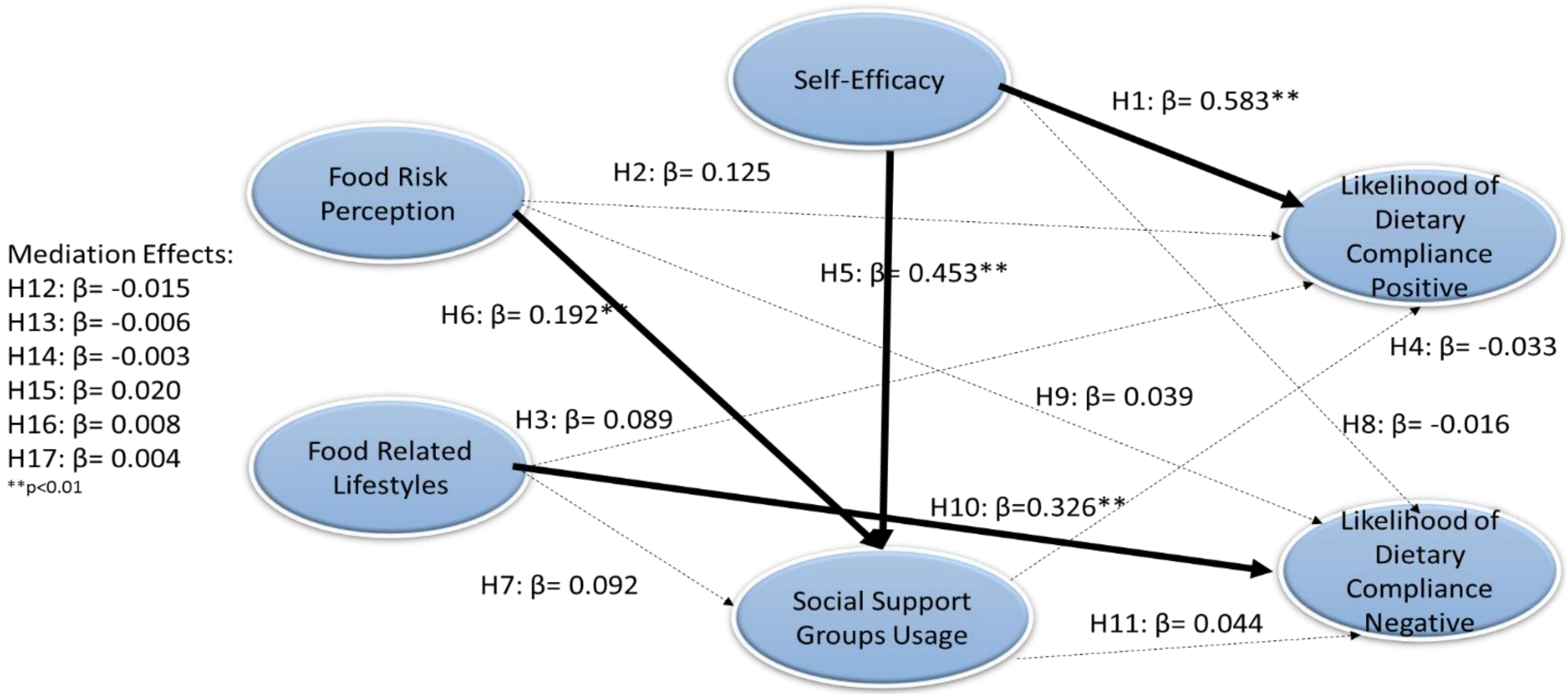


Figure 4.6: Final Alternative Model 2 Results

¬***Phase II Analysis Summary.*** Figure 4.6 shows the final model results for the proposed extension model. The darkened arrows in the diagram shows significant relationships and supports the alternative hypotheses presented, whilst broken arrows show the hypotheses is not supported. The mediation testing as shown in Figure 4.6, shows no mediation effects (i.e. Hypotheses 12 to 17), similarly found in Phase I (Figure 4.3).

The mediation testing results in Models, 1, 2 and 3 are all not supported and shows that usage of social support groups is not a mediator in all three proposed models. These outcomes vastly contradicts literature as proposed in Chapter 2 (Antonovsky (1974; Thoits 1985). Hence, it is proposed that the Social Support Groups Usage construct may alternatively act as a driver in this model and will be tested in Phases III. The theoretical perspective and the justification for this new proposal will be discussed in detail in Chapter 5.

PHASE III: Alternative Model 3: Social Support Groups Usage as a Driver

4.5 Introduction

The full measurement model with Social Support Groups Usage as a driver in this model (Model 3) is shown in Figure 4.7. Table 4.18 shows the new direct hypotheses with Social Support Groups Usage as the driver.

Table 4.18: New Direct Hypothesis with Social Support Groups Usage as Driver

H1	Social Support Groups Usage -> Self Efficacy
H2	Social Support Groups Usage -> Food Risk Perception
H3	Social Support Groups Usage -> Food Related Lifestyle
H4	Social Support Groups Usage -> Likelihood of Dietary Compliance Positive
H5	Social Support Groups Usage -> Likelihood of Dietary Compliance Negative
H6	Self-Efficacy -> Likelihood of Dietary Compliance Positive
H7	Self-Efficacy -> Likelihood of Dietary Compliance Negative
H8	Food Risk Perception -> Likelihood of Dietary Compliance Positive
H9	Food Risk Perception -> Likelihood of Dietary Compliance Negative
H10	Food Related Lifestyle -> Likelihood of Dietary Compliance Positive
H11	Food Related Lifestyle -> Likelihood of Dietary Compliance Negative
H12	Food Risk Perception -> Self Efficacy
H13	Food Risk Perception -> Food Related Lifestyle

Table 4.19: New Indirect Hypothesis with Social Support Groups Usage as Driver

H14	Food Risk Perception -> Lifestyle Dietary Compliance Positive
H15	Food Risk Perception -> Likelihood of Dietary Compliance Negative
H16	Social Support Groups Usage -> Food Related Lifestyle
H17	Social Support Groups Usage -> Self Efficacy
H18	Social Support Groups Usage -> Likelihood of Dietary Compliance Positive
H19	Social Support Groups Usage -> Lifestyle Dietary Compliance Negative

The new structural model analysis for both direct and indirect relationships with the Likelihood of Dietary compliance 2 and Social Support Groups Usage as the driver are shown in Tables 4.20 and 4.21 respectively. The overall analysis summary for Phase III of the analysis is explained in page 217.

The Simultaneous Double Mediation Calculations for indirect paths in PLS modelling (i.e. H18 and H19) were conducted as per Nitzl, Roldan & Cepeda (2016) for complex and/or multiple mediation paths, e.g. when two mediators are connected to each other. The multiple relationships between one or more independent variables, one or more mediator variables and one or more dependent variables is tested in this particular analysis using the following calculations as proposed by Nitzl, Roldan & Cepeda (2016):

$\beta_{h14} = (\beta_{FRP\text{->}FRL}) * (\beta_{FRL\text{->}LDCPos})$
$\beta_{h15} = (\beta_{FRP\text{->}SE}) * (\beta_{SE\text{->}LDCNeg})$
$\beta_{h16} = (\beta_{SSG\text{->}FRP}) * (\beta_{FRP\text{->}FRL})$
$\beta_{h17} = (\beta_{SSG\text{->}FRP}) * (\beta_{FRP\text{->}SE})$

$\beta_{h18} = [(\beta_{SSG\text{->}SE}) * (\beta_{SE\text{->}LDCPos})] + [(\beta_{SSG\text{->}FRP}) *(\beta_{FRP\text{->}LDCPos})] + [(\beta_{SSG\text{->}FRL}) * (\beta_{FRL\text{->}LDCPos})] + [(\beta_{SSG\text{->}FRP}) * (\beta_{FRP\text{->}SE}) *(\beta_{SE\text{->}LDCPos})] + [(\beta_{SSG\text{->}FRP}) * (\beta_{FRP\text{->}FRL}) *(\beta_{FRL\text{->}LDCPos})]$

$\beta_{h19} = [(\beta_{SSG\text{->}SE}) * (\beta_{SE\text{->}LDCNeg})] + [(\beta_{SSG\text{->}FRP}) *(\beta_{FRP\text{->}LDCNeg})] + [(\beta_{SSG\text{->}FRL}) * (\beta_{FRL\text{->}LDCNeg})] + [(\beta_{SSG\text{->}FRP}) * (\beta_{FRP\text{->}SE}) *(\beta_{SE\text{->}LDCNeg})] + [(\beta_{SSG\text{->}FRP}) * (\beta_{FRP\text{->}FRL}) *(\beta_{FRL\text{->}LDCNeg})]$

Table 4.20: New Structural Model Analysis for Direct Relationships with 2 LDC –SSG Driver

Hypothesis	Relationship	Std Beta	Std Error	t-value	Decision	f^2	q^2	95%CI LL	95%CI UL
H1	Social Support Groups Usage -> Self Efficacy	0.460	0.082	5.611**	Supported	0.303	0.142	0.318	0.588
H2	Social Support Groups Usage -> Food Risk Perception	0.487	0.073	6.685**	Supported	-	-	0.372	0.614
H3	Social Support Groups Usage -> Food Related Lifestyle	0.348	0.096	3.638**	Supported	0.134	0.052	0.196	0.508
H4	Social Support Groups Usage -> Likelihood of Dietary Compliance Positive	-0.032	0.102	0.317	**Not Supported**	-0.006	-0.001	-0.206	0.132
H5	Social Support Groups Usage -> Likelihood of Dietary Compliance Negative	0.045	0.089	0.509	**Not Supported**	0.001	0.001	-0.087	0.205
H6	Self-Efficacy -> Likelihood of Dietary Compliance Positive	0.586	0.081	7.238**	Supported	0.262	0.088	0.446	0.712
H7	Self-Efficacy -> Likelihood of Dietary Compliance Negative	-0.014	0.110	0.129	**Not Supported**	0.000	-0.001	-0.201	0.163
H8	Food Risk Perception -> Likelihood of Dietary Compliance Positive	0.124	0.078	1.577	**Not Supported**	0.016	0.008	-0.004	0.256
H9	Food Risk Perception -> Likelihood of Dietary Compliance Negative	0.036	0.089	0.402	**Not Supported**	0.129	0.000	-0.119	0.175
H10	Food Related Lifestyle -> Likelihood of Dietary Compliance Positive	0.087	0.105	0.831	**Not Supported**	0.008	-0.003	-0.076	0.272
H11	Food Related Lifestyle -> Likelihood of Dietary Compliance Negative	0.325	0.102	3.202**	Supported	0.078	0.034	0.163	0.493
H12	Food Risk Perception -> Self Efficacy	0.336	0.096	3.506**	Supported	0.160	0.075	0.178	0.495
H13	Food Risk Perception -> Food Relate Lifestyle	0.314	0.092	3.425**	Supported	0.059	0.040	0.161	0.460

** $p<0.01$, *$p<0.05$

^H2 = Food Risk Perception – Do not have Effect Size and Predictive Relevance as it only has one exogenous variable construct (Social Support Groups Usage)

R^2 (Self Efficacy = 0.475; Food Risk Perception = 0.238; Food Related Lifestyle = 0.326; Likelihood of Dietary Compliance Positive = 0.499; Likelihood of Dietary Compliance Negative = 0.129); *Effect Size impact indicator are according to Cohen (1988), f^2 values: 0.35 (large), 0.15 (medium), and 0.02 (small)*

Q^2 (Self Efficacy = 0.297; Food Risk Perception = 0.145; Food Related Lifestyle = 0.154; Likelihood of Dietary Compliance Positive = 0.251; Likelihood of Dietary Compliance Negative = 0.074) *Predictive Relevance of Predictor Exogenous Latent Variables as according to Henseler et al (2009), q^2 values: 0.35 (large), 0.15 (medium), and 0.02 (small)*

Table 4.21: New Structural Model Analysis for Indirect Relationships with 2 LDC with SSG as Driver

Hypothesis	Indirect Relationships	Std Beta	Std Error	t-value	Decsion	95%CI LL	95%CI UL
H14	Food Risk Perception -> Likelihood of Dietary Compliance Positive	0.224	0.067	3.339**	Supported	0.119	0.340
H15	Food Risk Perception -> Lifestyle Dietary Compliance Negative	0.097	0.048	2.005**	Supported	0.025	0.184
H16	Social Support Groups Usage -> Self Efficacy	0.164	0.062	2.641**	Supported	0.077	0.281
H17	Social Support Groups Usage -> Food Related Lifestyle	0.153	0.054	2.835**	Supported	0.074	0.250
H18	Social Support Groups Usage -> Likelihood of Dietary Compliance Positive	0.469	0.061	7.679**	Supported	0.380	0.582
H19	Social Support Groups Usage -> Lifestyle Dietary Compliance Negative	0.171	0.061	2.810**	Supported	0.074	0.273

** p<0.01, *p<0.05

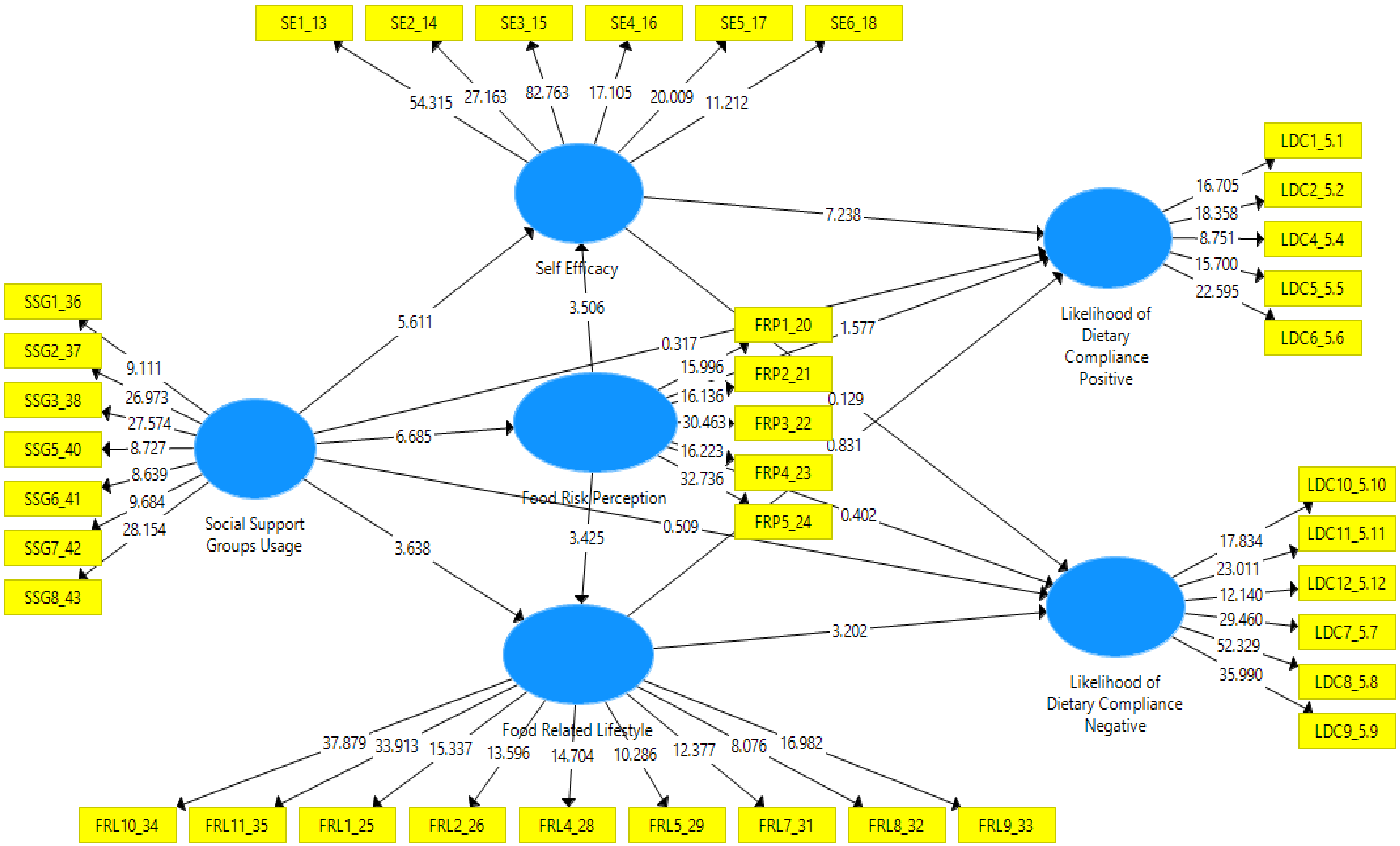


Figure 4.7: Structural Model Bootstrap for Model with 2 LDC and SSG as Driver

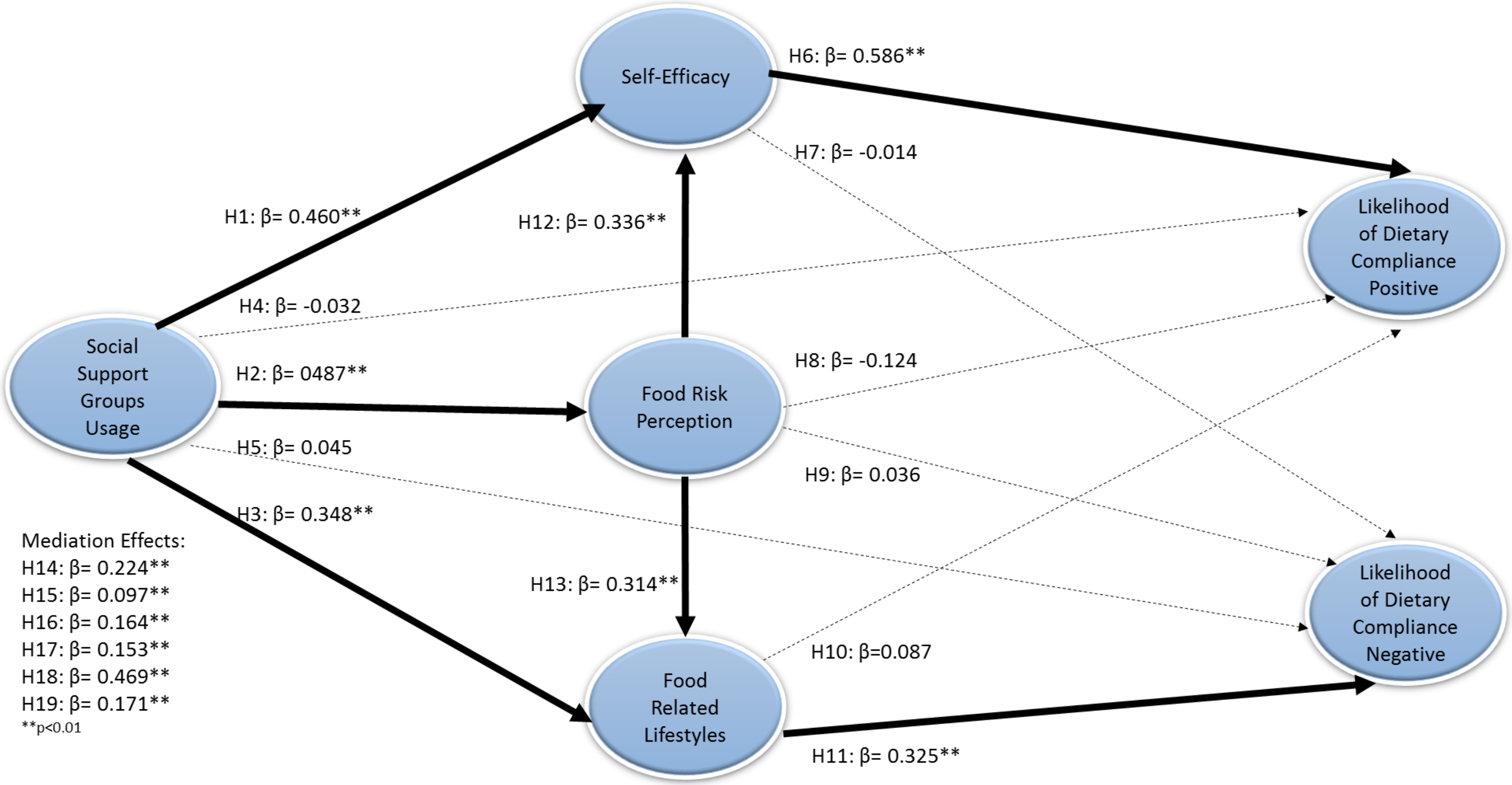


Figure 4.8: Alternative Model 3 with Social Support Groups Usage as Driver

¬***Phase III Summary.*** Refering to Table 4.20, this model shows improvements in terms of its $R^{2,}$ Predictive Relevance and Effect sizes compared with the earlier model (Table 4.10), all of which provides sufficient evidence in supporting this model (Akter, D'Ambra & Ray 2011). Effect size and Predictive Relevance for Hypotheses 2 (Social Support Groups Usage -> Food Risk Perception) is not shown as it has only one exogenous construct (i.e. Social Support Groups Usage). Assessment of Goodness of Fit (SRMR) for this model (0.073) indicates a good fit.

This outcome shows that Self-Efficacy has a strong direct and indirect effect to Likelihood of Dietary Compliance (Positive) but not on the Likelihood of Dietary Compliance (Negative). The Food Related Lifestyle construct shows strong direct and mediation effect to the Likelihood of Dietary Compliance (Negative) but not on the Likelihood of Dietary Compliance (Positive). Strong direct and mediation effect from Food Risk Perception is found on both Food Related Lifestyles and Self-Efficacy. Food Risk Perception does not show strong direct or indirect effect on both the Likelihood of Dietary Compliance (Positive) and (Negative). A strong simultaneous mediation path for Social Support Groups Usage is found on both the Likelihood of Dietary Compliance (Positive) and (Negative). A detailed discussion of the implication of Phase III on theory and practice will be presented in Chapter 5.

4.6 Summary

The overall analysis in this study i.e: Phase I, II and III has shown self-efficacy to have a strong relationship with both the likelihood of dietary compliance and social support groups usage which supports extant theory (Bandura 1977). Due to the removal of a number of items for the dietary compliance construct (Section 4.2.4) Model 2 was introduced in Phase II. An additional causal relationship between the food related lifestyle construct and social support usage was included in Phase II as per the explanation given in (section) and revealed no significant relationship in this case. In Phase I and II, Social Support Groups Usage is not a mediator between the cognitive behavioural constructs proposed in this study and the likelihood of dietary compliance. These findings contrasts a number of literature (Antonovsky 1974; Thoits 1985;Tovar et al. 2015) and hence Phase III was conducted to further examine the social support groups usage construct as a driver in the new model (Figure 4.8).

The outcome from Phase IIIanalysis indicates that social support groups usage is strongly associated with self-efficacy, food risk perception and food related lifestyles. At the same time it is not strongly associated with the likelihood of dietary compliance (positive) and (negative). The simultaneous mediation testing in Phase III shows that the cognitive constructs presented in this study mediates the relationship between social support usage and dietary compliance. Details of the implications of this analysis towards theory, practice and policy is discussed in detail in Chapter 5.

The following Table 4.22 provides a summary of the study through three phases of analysis i.e. Phases I, II and III including the overall key findings from each phase

Table 4.22: Summary of the overall research findings from the study:

Study Phases	Models	Remarks	Key Findings
PHASE I	Model 1- Diagram pp. 212	This thesis examines the model in one study (Phase I), beginning with testing the preliminary conceptual framework. Weak relationships were found in both the direct and indirect effects in Model 1, hence a second analysis (Phase II) was conducted.	• Self-efficacy is a significant factor which influences both the likelihood of dietary compliance and the usage of social support groups amongst people living with diabetes. • Social Support Groups Usage does not mediate the relationship between Food Risk Perception and Self-Efficacy and the Likelihood of Dietary Compliance amongst people with diabetes. *Note: Refer to Chapter 4, pp. 163-184 for Phase I results
PHASE II	Alternative Module 2- Diagram pp. 217	The analysis was done by splitting the dependent variable into two variables based on the positive and negative worded items from the instrument. Weak relationships were also in Alternative Model 2 particularly with the mediation effect testing. Hence, Phase III, Alternative Model 3, was introduced and tested.	• Self-efficacy is a significant factor which influences both the likelihood of dietary compliance and the usage of social support groups amongst people living with diabetes. • Social Support Groups Usage does not mediate the relationship between Food Risk Perception and Self-Efficacy and the Likelihood of Dietary Compliance amongst people with diabetes. *Note: Refer to Chapter 4, pp. 186-191 for Phase II results
PHASE III		The social support groups construct was tested as a	• Self-efficacy is a significant factor which

	Alternative Module 3- Diagram, pp. 222	driver in Alternative Model 3usage may instead be a key driver to influence cognitive behaviours and dietary compliance amongst people with diabetes. In this case, Phase 3 of the analysis shows that social support usage is a significant factor to drive cognitive behaviours towards dietary compliance amongst people with diabetes. Phase 3, also shows overall good results with most of the indirect and direct relationships in Alternative Model 3.	influences the likelihood of dietary compliance; • Social Support Groups Usage is a significant driver of individual cognition and the likelihood if dietary compliance amongst those with diabetes; • The cognitive factors of self-efficacy, food risk perception and food related lifestyles shows improved mediation effect between the usage of social support groups and the likelihood of dietary compliance in Alternative Model 3. *Note: Refer to Chapter 4, pp. 197-204 for Phase III results

CHAPTER 5: CONCLUSION

5.1 Introduction

This chapter further discusses the findings from Chapter 4 of this thesis and will then explain the contributions of this study towards theory, policy and practice as well as future research opportunities. Finally research limitations which impacted this study will also be discussed. The main aim of this study is:

To investigate the factors which influence the likelihood of dietary compliance amongst people with diabetes.

Extant theory (Antonovsky 1974; Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993; Thoits 1985) provides the understanding that cognitive factors such as Self-Efficacy, Food Risk Perception, Food Related Lifestyles and Social Support Group Usage are considered a major driving force to influence individual health behaviour. To date, there remain many uncertainties about the role played by these factors in determining dietary compliance amongst people with diabetes (Falguera et al. 2012; Hollands, Marteau & Fletcher 2016; Rijswijk & Frewer 2012; Hollands, Marteau & Fletcher 2016; Vandelanotte et al. 2016). This study is original in that it combines and empirically investigates the constructs from a series of previous research into one study. The contribution of this study is not only in its empirical nature, but also in the incorporation of a range of constructs that have been examined in various combinations or alone in previous research.

Another contribution of this study is through the integration of theory and practice (Mayer & Sparrowe 2013) to which this study has undertaken and discussed in detail (Chapter 2). Applying theory within a social marketing framework has been shown to improve social marketing campaigns with positive health and behavioral modification outcomes (Lefebvre 2000; Luca & Suggs 2013; Winett 1995). Hence, this study will provide frameworks for the design and evaluation of sustainable diabetes health intervention and dietary modification programs. Additionally, through comparisons with extant literature, as well as model and hypotheses testing, this study has generated areas of agreement, contrasting results and alternative models in the final analysis of this study. The contrasting findings from this research resulted in extending the analysis into three parts (Phase I, II and III) as presented in Chapter 4. All of which highlights the potential contribution of this study for future research opportunities, further development of the model and practical applications for the health system. Figure 5.1 presents the overall content of this chapter.

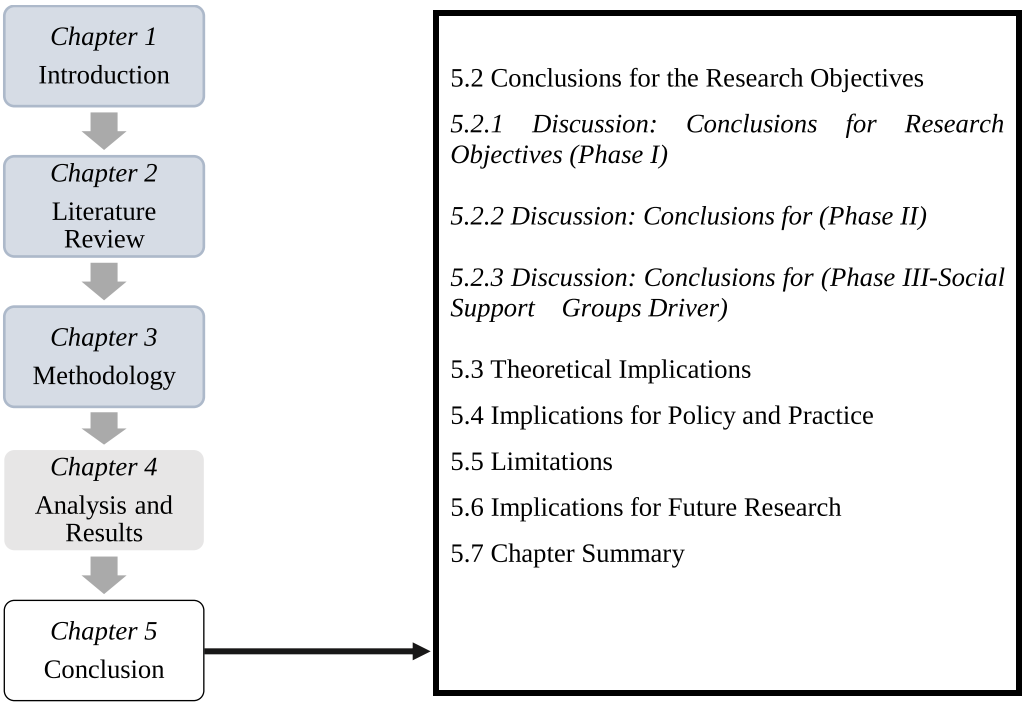


Figure 5.1: Chapter Content

Next a brief overview of each preceding chapter of this thesis is presented which provides a re-cap of the overall thesis discussion presented thus far.

Chapter 1: Outlined the key focus of this study along with the research questions and objectives. Justifications of the study were based on theoretical, practical and societal issues. A mono-method quantitative research design was proposed using an anonymous on-line survey and printed survey. The outline of the study was presented as well as key definitions. The scope of the study was delimited to people diagnosed with diabetes living in Australia.

Chapter 2: Literature relating to key psycho-social theories related to health and food behaviour were reviewed. The key factors and concepts related to dietary compliance and food related behavior were explored with key gaps identified. The theoretical framework was then developed and a conceptual model presented.

Chapter 3: The justification for the research paradigm and the epistemological position of positivism was explained. Next the data collection design was presented followed by the selection and adaptation of scales. Following which details of the Analysis Strategy (in 6 Stages) to be conducted in the study was presented.

Chapter 4: The results of the main study is reported in this chapter. Overview of the descriptive statistics was presented and described. Reliability testing was reported followed by Exploratory Factor Analysis. Next, relevant Measurement Model Validity results were presented. Following which a 5-step Structural Model (in Smart PLS-SEM) assessment was conducted and reported. Finally, mediation testing was performed and presented. The initial model provided in Chapter 2 had to be modified due to the findings from PhaseI of the study. Further analysis (PhaseII and III) was conducted and reported together with the modified Alternative Models 2 and 3.

Chapter 5: This current chapter, ties the research together by drawing conclusions for the research objectives and research hypotheses from comparisons with literature. Next implications for theory are explained, followed by implications for policy and practice. Research limitations are then discussed with implications for future research are explained.

5.2 Conclusions for the Research Objectives

Table 5.1**,** provides a re-cap of the main objectives of this study and the hypotheses testing outcomes from the analysis of the main Model 1, phase I (Figure 4.3) presented in Chapter 4.

Table 5.1: List of Research Objectives and Hypotheses outcomes (Model 1)

No.	Key Research Objectives (RO)	Hypotheses Supported (✓)	Hypotheses not Supported (X)
RO1	To examine if Self-Efficacy influences the Likelihood of Dietary Compliance amongst people with diabetes.	✓	
RO2	To examine if Food Risk Perception influences the Likelihood of Dietary Compliance amongst people with diabetes.		**X**
RO3	To examine if Food Related Lifestyles influences the Likelihood of Dietary Compliance amongst people with diabetes.		**X**
RO4	To examine if Social Support Groups Usage influences the Likelihood of Dietary Compliance amongst people with diabetes.		**X**
RO5	To examine if Self-Efficacy influences Social Support Groups Usage amongst people with diabetes.	✓	
RO6	To examine if Food Risk Perception influences Social Support Groups Usage amongst people with diabetes.	✓	
RO7	To examine if Social Support Groups usage mediates the relationship between Food Risk Perception and the Likelihood of Dietary Compliance amongst people with diabetes.		**X**
RO8	To examine if Social Support Groups usage mediates the relationship between Self-Efficacy and the Likelihood of Dietary Compliance amongst people with diabetes.		**X**

Source: developed for this study

The research objectives presented in Table 5.2 have been developed through extant literature to which key hypotheses is postulated as presented in Chapter 1 and tested i.e. Chapter 4. However, analysis of the original model (i.e. Chapter 2, Diagram 1, pp. 59) has shown a number of contrasting results as presented in Chapter 4. Therefore, further analysis was conducted to investigate these contrasting outcomes to which an alternative model was developed (Chapter 4, Figure 4.6) together with a new set of hypotheses (Chapter 5, Table

5.3). These findings and its implications to this study and future considerations are presented in the following sections.

5.2.1 Discussion: Conclusions for Research Objectives (Phase I)

The discussion will begin with the conclusions generated from Phase I (Chapter 4) and will present the outcomes for the research objectives. This section begins with the discussion on conclusions for the supported hypotheses, followed by the discussion of the non-supported hypotheses generated from Phase I.

¬***Conclusions for Research Objective 1, 5 and 6.*** Phase I reveals that hypotheses 1, 5 and 6 are supported, with the following research objectives;

RO1*: To examine if Self-Efficacy influences the Likelihood of Dietary Compliance amongst people with diabetes;*

RO5: *To examine if Self-Efficacy influences Social Support Groups Usage amongst people with diabetes;*

RO6: *To examine if Food Risk Perception influences Social Support Groups Usage amongst people with diabetes;*

Results from RO 1 and 5 shows that Self-Efficacy is a significant factor impacting both dietary modification practices and social support usage for people with diabetes. This reaffirms the notion that individuals with higher levels of self-efficacy are likely to persevere in challenging situations and hence be able to achieve positive health goals (Bandura 1986). Similarly, studies (Cha et. al 2014; Walker et al. 2014) indicate better self-efficacious behaviour have been found to influence positive health goals including dietary modification among people with diabetes. Therefore, this outcome provides further empirical evidence that self-efficacy is an important construct to influence positive dietary modification outcomes for people with diabetes. This outcome provides evidence for social marketers to implement programs which encourage positive self-efficacy behaviour so that dietary modification practices can be achieved by people with diabetes.

Results (RO 5 and 6) also show that self-efficacy and risk perception drives social support usage. This is supported in theory (Bandura 1986; Frewer et al. 1996) which suggests that individuals with low self-efficacy or who are unsure how to react in uncertain situations tend to seek or use social support groups to help them better cope with their illness. Hence, social marketing strategies which encourage the use of social support mechanisms can be used as a tool to improve individual self-efficacious or risk aversion behaviour amongst people with diabetes.

¬Conclusions for Research Objective 2, 3 and 4

RO2: *To examine if Food Risk Perception influences the Likelihood of Dietary Compliance amongst people with diabetes;*

RO3: *To examine if Food Related Lifestyles influences the Likelihood of Dietary Compliance amongst people with diabetes;*

RO4: *To examine if Social Support Groups Usage influences the Likelihood of Dietary Compliance amongst people with diabetes;*

Interestingly, no significant relationships were found in Phase I for RO 2, 3 and 4, although extant literature (Frewer et al. 1996 Shreck et al. 2014; Wills et al. 2012) has suggested that these factors significantly impact food behaviour. A number of studies (Shreck et al. 2014) have also shown positive outcomes between these constructs and improved dietary behaviour for people with diabetes. Hence, these results seem to oppose current literature findings. However, individual cognition may be impacted through multiple forces and therefore may exhibit varying degrees of behaviour with regards to food choice (Keller et al. 2012; Nicolaou et al. 2014). These findings support the call for practitioners and behavioral social marketers to further understand the factors which may promote or impede diabetes related health management and perhaps provide a multi-pronged behavioural modification approach when implementing relevant diabetes related initiatives (Andreasen 1995; 2002; Carins & Rundle-Thiele 2013; Lefebvre 2000)

¬Conclusions for Research Objective 7 and 8 (Mediation)

RO7: *To examine if Social Support Groups usage mediates the relationship between Food Risk Perception and the Likelihood of Dietary Compliance amongst people with diabetes;*

RO8: *To examine if Social support group usage mediates the relationship between Self-Efficacy and the Likelihood of Dietary Compliance amongst people with diabetes;*

Testing the indirect effect i.e. Social Support Group Usage as a mediator to both Food Risk Perception and Self-Efficacy was not significant. The lack of mediating effect of Social Support Group use was confounding given the degree of support for this relationship in literature (Antonovsky 1974; Kim et al. 2015; Tovar et al. 2015). However, the findings that in some instances family support, peer pressure and/or poor quality physician support have been found to discourage social support usage among those with diabetes (Nam et al. 2011; Schiøtz 2012) may partially explain this result. Given that social support group usage has been found to improve a number of diabetes related health outcomes (Baek, Tanenbaum & Gonzalez 2014; Ku & Kegels 2015; Piette et al. 2014), it is therefore important to understand its bearing on this model. As such, the Social Support Group Usage construct was re-examined to investigate if it played an alternative role in the model i.e. Phase III (Chapter 4, Figure 4.8).

The next section will present findings from Phase II of the study, which was conducted due to the removal of a number of items from the dependent variable in order to stabilise the AVE (Chapter 4, Section 4.2.4, pp. 9). However, whilst this procedure may be acceptable statistically, removing items from a construct may limit the full theoretical understanding of the causal relationships in the overall model. Figure 5.2 provides a re-cap of Model 1.

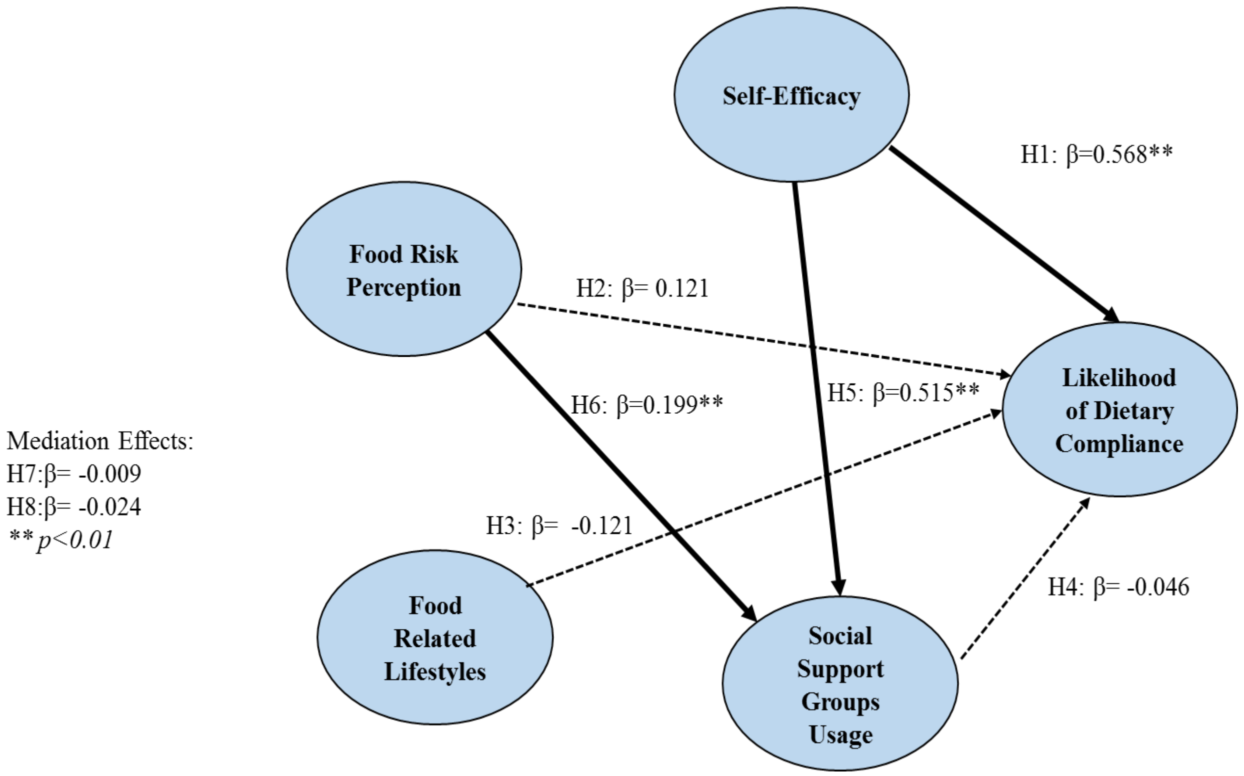


Figure 5.2: Phase I: Model 1

5.2.2 Discussion: Conclusions for (Phase II)

This section will discuss the findings from Phase II, in which an alternative Model 2 is proposed as explained in chapter 4 (Section 4.2.4, pp. 9). The findings from Phase II is based on the dependent variable of the Likelihood of Dietary Compliance with two paths i.e. Positive and Negative. Table 5.3, provides a re-cap of Phase II results discussed in Chapter 4.

Table 5.2 Summary of Phase II Results (Model 2)

No.	Phase II (with Likelihood of Dietary Compliance – Positive & Negative	Hypotheses Supported (✓)	Hypotheses not Supported (X)
H1	Self –Efficacy -> Likelihood of Dietary Compliance Positive	✓	
H2	Food Risk Perception -> Likelihood of Dietary Compliance Positive		**X**
H3	Food Related Lifestyle -> Likelihood of Dietary Compliance Positive		**X**
H4	Social Support Groups Usage -> Likelihood of Dietary Compliance Positive		**X**
H5	Self- Efficacy -> Social Support Groups Usage	✓	
H6	Food Risk Perception -> Social Support Groups Usage	✓	
H7	**Food Related Lifestyle -> Social Support Groups Usage		**X**
H8	Self -Efficacy -> Likelihood of Dietary Compliance **Negative**		**X**
H9	Food Risk Perception -> Likelihood of Dietary Compliance **Negative**		**X**
H10	Food Related Lifestyle -> Likelihood of Dietary Compliance **Negative**	✓	
H11	Social Support Groups Usage -> Likelihood of Dietary Compliance **Negative**		**X**
	Mediation Phase II		
H12	Self- Efficacy -> Social Support Groups Usage-> Likelihood of Dietary Compliance Positive		**X**
H13			**X**

	Food Risk Perception -> Social Support Groups Usage-> Likelihood of Dietary Compliance Positive		
H14	***Food Related Lifestyle -> Social Support Groups Usage-> Likelihood of Dietary Compliance Positive		**X**
H15	Self-Efficacy -> Social Support Groups Usage-> Likelihood of Dietary Compliance **Negative**		**X**
H16	Food Risk Perception -> Social Support Groups Usage-> Likelihood of Dietary Compliance **Negative**		**X**
H17	Food Related Lifestyle ->Social Support Groups Usage-> Likelihood of Dietary Compliance **Negative**		**X**

*Note: **H7 additional hypotheses.*
Source: Developed for this stud

In Phase II of the study there was a significant association between Food Related Lifestyles and the Likelihood of Dietary Compliance (Negative), but no relationship with the Likelihood of Dietary Compliance (Positive) i.e. hypotheses 10 and 3 respectively. The outcomes with hypotheses 10, could suggest that lifestyle influences such as advertising, the need to impulse buy or food temptations may influence poor food choices amongst those with diabetes (Boyland & Whalen 2015; Carins & Rundle-Theile 2013; Dillen, Papies & Hofmann 2013). As this may be a barrier to positive dietary modification amongst people with diabetes, social marketing mechanisms to boost the confidence or encourage the consumption of healthier food choices may improve dietary modification practices.

Initially, the Food Related Lifestyle and the Social Support Groups Usage direct relationship (H7), was not included in Phase I of this study. This is because at the point of writing this thesis there was no known literature using the Food Related Lifestyle model to explain this particular relationship. However, recent studies (George et al. 2016; Sussman et al. 2015) indicate there is a significant relationship between lifestyle choices and usage of social support mechanisms. For example those who are unable to cook healthy meals or juggle managing a family and their illness may seek additional support from family or friends to help them better manage their diabetes (Conklin et al. 2014; Fisher et al. 2014; Hinder & Greenhalgh 2012). Hence H7 was introduced in the new model 2 to examine its significance in this context.

At the same time, the results indicated no significant relationship between Food Related Lifestyles and Social Support Groups Usage. Those with diabetes may use family support for example, to help them manage their food lifestyle, however, poor family support or peer pressure may impact the decision by them not to seek social support mechanisms (Henry et al. 2013; Seiffge-Krenke et al. 2013). This could explain the non-significant outcome with this particular relationship. Therefore, equally important for diabetes management is for those with diabetes to receive positive experiences with social support mechanisms which would likely encourage their use of it. This means that social marketing health programs should also include initiatives to educate social support mechanisms (family, peers, health practitioners) on how to provide positive and motivating support for those living with diabetes.

The relationship between Food Risk Perception and the Likelihood of Dietary Compliance (Positive) and (Negative), i.e. H2 and H9 were respectively are both not supported. Literature (Knox 2000) suggests that risk perception is a “fuzzy” concept, complex, unpredictable and situationally based. This could explain the non-significant relationship in both cases. Additionally, whilst theory (Brewer 2004; Fife-Schaw & Rowe 1996; Frewer et al. 1996) describes risk perception to be both cognitively and environmentally driven, there is still limited understanding of its workings within the specific context of diabetes food risk behaviour (Shreck et al. 2014; Knox 2000; Weber, Blais & Betz 2000). Regardless of this particular outcome, scholars (Knox 2000; Weber, Blais & Betz 2000) advice that proper understanding and knowledge on how to manage food risks is important for health protection and positive health management outcomes for people with diabetes. Hence, as part of dietary modification initiatives, strategies to educate those with diabetes on the importance of understanding and managing food choice, particularly avoiding or minimizing the consumption of sugary, fatty or processed foods can be introduced.

Phase II reveals that Self-Efficacy continues to have a significant direct relationship with the Likelihood of Dietary Compliance (Negative) i.e. H8, whilst no significant results were found with the Positive dependent variable path (H2). This result aligns with theory and other studies (Bandura 1986; Tovar et al. 2015) and confirms that high levels of self-efficacy promotes positive health behaviour. Therefore, in this case the self-efficacy construct is shown to promote positive dietary behaviour and therefore should be an integral part of dietary behaviour modification initiatives.

The mediation analysis in Model 2, (i.e. H12 to H17) were all not supported. The same outcome was found in Phase I of the study. These results are rather confounding as both theory (Antonovsky 1974) and numerous studies (Antonovsky 1974; Kim et al. 2015; Tovar et al. 2015) have shown the significant role Social Support Group Usage plays as a mediator between individual cognition and positive health outcomes. However, the mechanisms in which Social Support Group Usage operate is dynamic, challenging and difficult to define (Heinrich, Schaper, & de Vries 2015; Strom & Egede 2012). Studies also suggest that the usage of social support systems is dependent on a wide range of factors which could either promote or hinder its usage (Nam et. al. 2011; Schiøtz et al. 2012).

For example, Williams & Bond (2002) suggest that long-term diabetes diagnosis and a history of successful diabetes self-care may build greater self-confidence among people with diabetes to self-manage and therefore may not require additional support. Hence, whilst in this case its role as a mediator may not be significant it may instead be playing another role within this model. Therefore, Phase III (Chapter 4) was introduced to further examine this construct. Figure 5.3, provides a re-cap of Model 2

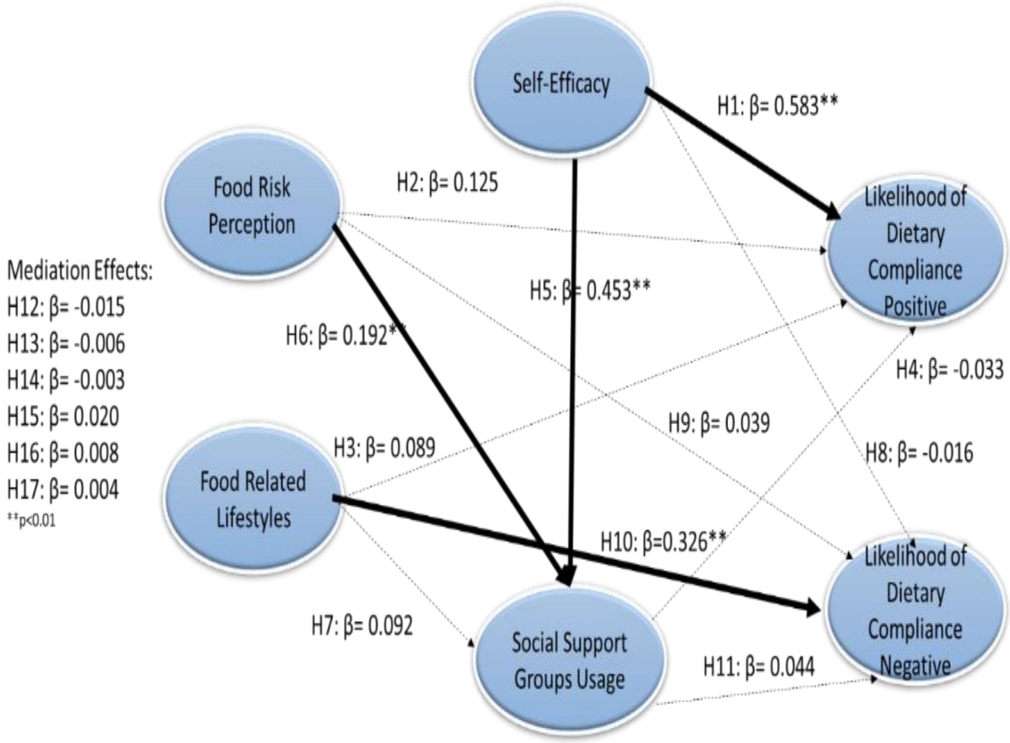


Figure 5.3: Phase II: Alternative Model 2

5.2.3 Discussion: Conclusions for (Phase III-Social Support Groups Driver)

Earlier analysis (Phases I and II, chapter 4) revealed that social support usage was not a mediating factor as proposed in the original Model 1. A re-examination of the model indicated that social support usage may alternatively be a driver in health behaviour modification practices for those with diabetes (Baek, Tanenbaum & Gonzalez 2014; Ku & Kegels 2015; Piette et al. 2014). Therefore, Model 3, was introduced to include the usage of Social Support Groups construct as a driver in the model. Table 5.4, provides a re-cap of the analysis results generated from Phase III in chapter 4.

Table 5.3: Summary of Phase III Results (Model 3)-Social Support Groups Usage Driver

No.	Phase III (with Social Support Groups Usage as Driver)	Hypotheses Supported (✓)	Hypotheses not Supported (X)
H1	Social Support Groups Usage -> Self Efficacy	✓	
H2	Social Support Groups Usage -> Food Risk Perception	✓	
H3	Social Support Groups Usage -> Food Related Lifestyle	✓	
H4	Social Support Groups Usage -> Likelihood of Dietary Compliance Positive		**X**
H5	Social Support Groups Usage -> Likelihood of Dietary Compliance **Negative**		**X**
H6	Self-Efficacy -> Likelihood of Dietary Compliance Positive	✓	
H7	Self -Efficacy -> Likelihood of Dietary Compliance **Negative**		**X**
H8	Food Risk Perception -> Likelihood of Dietary Compliance Positive		**X**
H9	Food Risk Perception -> Likelihood of Dietary Compliance **Negative**		**X**
H10	Food Related Lifestyle -> Likelihood of Dietary Compliance Positive		**X**
H11	Food Related Lifestyle -> Likelihood of Dietary Compliance **Negative**	✓	
H12	Food Risk Perception -> Self Efficacy	✓	
H13	Food Risk Perception -> Food Relate Lifestyle	✓	
	Mediation Phase III		
H14	Food Risk Perception -> Likelihood of Dietary Compliance Positive	✓	
H15	Food Risk Perception -> Likelihood of Dietary Compliance Negative	✓	
H16	Social Support Groups Usage -> Self-Efficacy	✓	
H17	Social Support Groups Usage-> Food Related Lifestyles	✓	
H18	Social Support Groups Usage-> Likelihood of Dietary Compliance Positive	✓	
H19	Social Support Groups Usage-> Likelihood of Dietary Compliance **Negative**	✓	

The overall, results from this analysis indicates a number of positive relationships and seem to fit the alternative model 3 well. Firstly, as a driver Social Support Group Usage is strongly associated with Self-Efficacy (H1), Food Risk Perception (H2) and Food Related Lifestyles (H3). This supports literature (Gao et al. 2015; Piette et al. 2014) which suggests that usage of support mechanisms such as family or friends may positively influence a number of individual characteristics such as self-efficacy, food risk related behavour and daily food lifestyle behaviours.

This analysis also shows that again Self-Efficacy has a strong direct effect on the Likelihood of Dietary Compliance (Positive) i.e. H6 and no significant relationship with the Likelihood of Dietary Compliance (Negative) i.e. H 7, thereby validating its strong influence on diabetes related health behaviour (Cha et al. 2014; Walker et al. 2014; Weaver et al. 2014). This suggests that people with diabetes who are confident in making good food choices are more likely to accomplish positive dietary modification goals as opposed to those with lower self-efficacy levels (Fisher et al. 2014). Therefore, this again re-affirms that social marketing campaigns promoting positive self-efficacy initiatives should be included in diabetes therapy and health behaviour modification programs.

This analysis reveals mixed results with the Food Related Lifestyle construct for its direct effects (H10, H11). The strong relationship between Food Related Lifestyles with the Likelihood of Dietary Compliance (Negative) and its weak relationship with the Likelihood of Dietary Compliance (Positive), shows that daily habits (e.g. cooking, shopping) and external cues such as advertising, unhealthy food promotions etc., may hinder positive dietary behaviour for those with diabetes (Kelly et al. 2015; Pechmann & Catlin 2016). Meanwhile, Food Risk Perception and its relationship with both the Likelihood of Dietary Compliance (Positive i.e. H8) and (Negative i.e. H9) is not significant, although it has been found to impact food behaviour amongst people with diabetes in a number of studies (Frewer et al. 1996 Shreck et al. 2014; Wills et al. 2012).

The findings for the Food Risk Perception construct shows similar outcomes with Phase II, in that its relationship with both the Likelihood of Dietary Compliance (Positive i.e. H8) and (Negative i.e. H9) is not significant. Interestingly, this particular construct shows significant direct relationships with both self-efficacy (H12) and food related lifestyles (H13). This shows that whilst risk perception behavior may have a direct role in promoting diabetes self-efficacy and lifestyle behaviour practices, it may not have a direct impact on food related behaviour. However its significant relationship with both self-efficacy and food related lifestyles indicates that it may have a bearing on the cognitive aspects of health behaviour.

The direct relationship between Social Support Groups Usage for both the negative and positive Likelihood of Dietary compliance in this model is not significant. This shows that whilst the usage of social support may directly impact cognition for people with diabetes, it may not necessarily have a direct bearing on dietary compliance and behaviour. This is again contrasting to literature (Miller et al. 2014) which show positive dietary behaviour amongst people with diabetes who rely on social support. This result indicates that the relationship between social support usage and dietary compliance is still ambiguous and requires further understanding. Hence, this study could be a platform for future research to investigate this particular relationship.

The results from the mediation analysis show that individual cognition mediates the relationship between social support usage and dietary compliance. This is shown with the strong simultaneous mediation path for Social Support Group Usage found on both the Likelihood of Dietary Compliance (Positive) and (Negative). The mediation results show that cognitive behaviours such (i.e. self-efficacy, risk perception and lifestyle behaviours) explain the influence of social support usage on dietary compliance amongst people with diabetes. Therefore, from a policy perspective diabetes support agencies should consider these mediating constructs in the promotion of health initiatives to improve diabetes support mechanisms.

Overall, the indirect results in Phase III confirm that Social Support Group usage is not a mediator as suggested by theory and literature (Antonovsky 1974 Song et al. 2012; Strom & Egede 2012; Schiotz et al. 2012; Tovar et al. 2015) but instead is a key driver of individual cognitive behaviour. Additionally, this model re-affirms extant literature (Callaghan & Morrisey 1993; Song et al. 2014; Strom & Egede 2012) in proposing that dietary modification requires a multi-pronged approach which not only considers the biological aspects of illness management but should also include targeting cognitively driven factors such as individual motivation, attitudes and perceptions towards health management. Figure 5.4, shows the re-cap of Model 3.

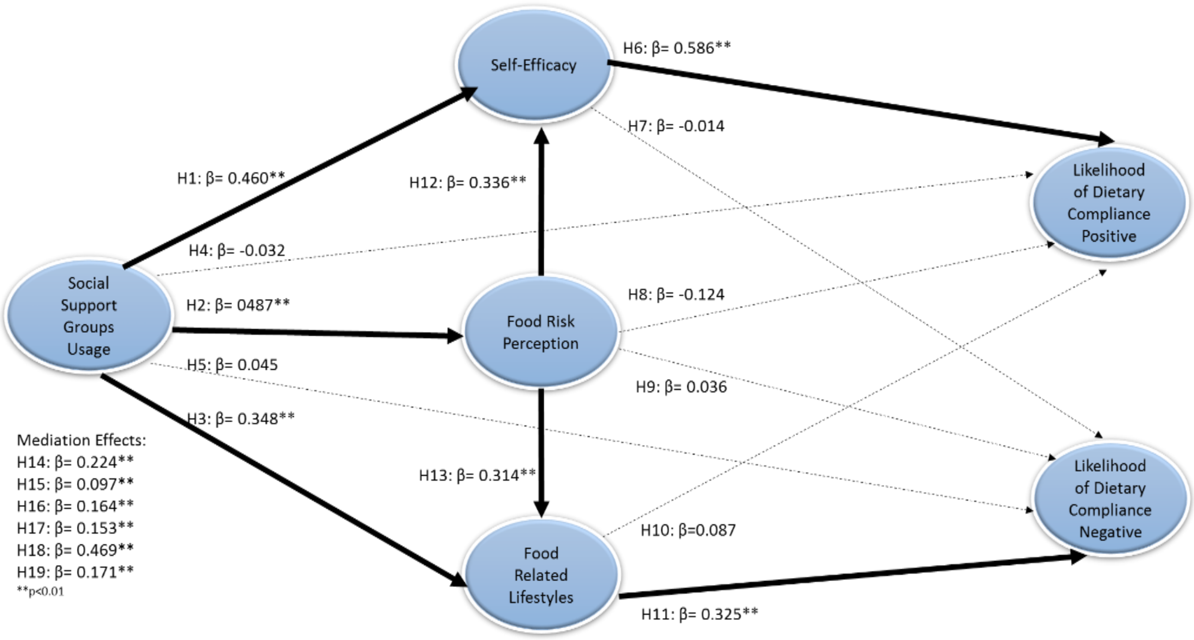


Figure 5.4: Phase III: Model 3

5.3 Theoretical Implications

This study applied key psycho-social theories (Antonovsky 1974; Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993; Thoits 1985) to provide theoretical understanding relevant for this study Overall, these theories provided a strong framework in developing a conceptual model for this study. Additionally, each of these theories provide substantial evidence of the role human cognition plays in guiding health related behaviour. Therefore, key behavioural characteristics such as self-efficacy, perceptions of risk, food related lifestyle behaviour and the usage of social support systems have been incorporated within the model of this study to investigate their influence on dietary compliance amongst people with diabetes. The main theoretical contribution from this study is the development of an empirically tested and validated model for the achievement of better dietary modification behaviour and practices amongst people diagnosed with diabetes. Theory integration in this study (Mayer & Sparrowe 2013) allowed for a wider understanding and application of this particular enquiry thereby contributing to both theory and practice.

¬***Implication 1***. The initial findings from all three phases of this study shows that self-efficacy has a significant bearing on both dietary compliance and social support usage amongst those with diabetes. This is well supported by theory (Bandura 1986), in that higher levels of self-efficacy increases one's ability to accomplish a variety of health related goals. This outcome builds on previous studies (Fisher et al 2014; Walker et al. 2014; Wu et al. 2013) which proposes that self-efficacy is a key cognitive behaviour to drive positive diabetes health outcomes. Overall, this finding is important as it re-affirms the need for health support systems to introduce self-efficacy enhancing programs amongst those with diabetes.

Individuals who sought social support demonstrated higher self-efficacy scores and generally improved their overall health behaviour (Wu et al. 2013). At the same time those with lower levels of self-efficacy tend to rely on social support groups such as family or friends to boost their confidence and morale in achieving positive diabetes health goals (Robertson et al. 2013). Hence, social marketing health programs should consider encouraging self-efficacy efforts to improve both social support usage and to improve dietary modification practices amongst those with diabetes.

Implication 2. Whilst self-efficacy seems to be a strong factor to influence positive dietary compliance in this study, no significant outcomes were found between the food risk perception construct and dietary compliance. Similarly the examination of food related lifestyles reveals that this construct shows mixed outcomes to either significantly influence dietary compliance (negative) or no significant outcomes with dietary compliance (positive). This seems to support literature (Keller et al. 2012; Knox 2000; Shreck et al. 2014) which indicates that cognitive factors such as these may behave inconsistently as it is also impacted by other wider socio-demographic factors. Similarly, theorists (Bandura 1986; Cockerham; 2005; Ryan, Kuhl & Deci 1977; Weber, Blais & Betz 2002) suggests that health behaviour is not only guided by individualistic factors such as attitudes, motives or perception but is also influenced by wider extrinsic forces. Therefore, in this case there are varying degrees of outcomes between the constructs presented in the model and its relationship with dietary compliance. Insignificant outcomes in this case, shows that behavioural constructs such as food risk perception and food related lifestyles requires further attention and hence this study provides the basis to further explore these constructs to determine its role in diabetes related dietary behaviour.

Implication 3. Whilst psycho-social theory (Antonovsky 1974; Bandura 1986) may provide a framework to understand health behaviour they may not necessarily explain them specifically within the domain of diabetes. Researchers (Asghari-Jafarabadi & Salekzamani 2015; Dinca-Panaitescu et al. 2011; Evert et al. 2014) have pointed out that health behaviour amongst people with diabetes is further compounded with the existence and burden of their illness which makes them exhibit health behaviours that are unique to their condition and therefore, not likely comparable to the health behaviours of people who are not living with diabetes. Hence, future researchers intending to adapt current theory into models should consider this factor. Therefore, this study has attempted to build a model through aligning current psycho-social theory with evidenced based research and adaptation of scales in the research instrument within a diabetes health domain. In doing so this study will provide a benchmark for future researchers to align theoretical models and possibly build new models within the domain of diabetes health behaviour.

Furthermore, the application of psycho-social theories to explore health behaviour in this study, will likely provide opportunities in the future to compare health behaviours between those living with diabetes and those not living with it, thereby adding to theory and likely reshaping current health models, considering these differences. Better understanding of the different health needs between these groups will allow for a more streamlined behavioural segmentation approach (Dietrich et.al. 2015) in which social marketing messages and/or initiatives can be designed to meet the unique health needs of people with diabetes rather than a generalised health modification approach.

Implication 4. The insignificant outcome between the direct relationship of social support usage and the Likelihood of Dietary compliance in all research findings in this study (Phases I, II and III) and as a mediator in both Phase I and II is rather confounding. These results are surprising given that social support usage has been touted as a crucial factor in promoting positive health outcomes for those with diabetes (Conklin et al 2014; Mayberry & Osborn 2012; Vest et al. 2013). Proponents of Social Support Theory (Antonovsky 1974; Thoits 1985) considers social support usage as a "buffer" between the strains and burdens of living with illness and illness therapy. Additionally, regular usage of social support mechanisms has been found to improve overall health and well-being outcomes of those with diabetes (Rosland et al. 2014; Williams et al. 2002). The Direct Effects Theory (Thoits 1985) explains that social support provides an overall beneficial effect of support irrespective of life-stressors. Numerous studies (Fisher et al. 2015; Kim et al. 2014; Miller et al. 2014) have also shown that social support usage is a mediator between emotional distress and positive health outcomes. Considering these factors, the social support usage construct was included in this model.

Whilst, theory (Antonovsky 1974; Thoits 1985) proposes that the social support construct is considered an important buffer or mediator to illness, however its role in health studies has also been filled with mixed outcomes (Nam et al. 2011; Shiotz et al. 2012; Singh, Sinnirella & Bradley 2012) and therefore its role in improving health outcomes have been questionable. Additionally, studies (Gallagher et al. 2012; Ramadas et al. 2012) have found that social support usage could in fact be detrimental to the health of individuals. For example, people with diabetes may feel ostracized, or threatened by the over "policing" or judging by family and friends over their dietary choices and practices (Ahola & Groop 2013; Seiffge-Krenke et al. 2013). These experiences causes some people to develop negative perceptions about social support usage and so may choose to avoid its usage completely (Ahola & Groop 2013; Vest et al. 2013) and thus could explain its weak role in this study. Other studies (Bohem et al. 1997; Song et al 2014) have shown that over dependence on support mechanisms such as family or friends are not ideal in the long-run as it may limit the ability of those with diabetes to independently manage their illness.

Implication 5. Finally, the usage of social support mechanisms is complex and is determined by a combination of psycho-social and socio-demographic factors (Nam et al. 2011; Shiotz et al. 2012) which could either promote or hinder its usage. Hence, the decision to take this study a step further was undertaken (Phase III) to re-examine this particular construct. In the re-constructed model (Figure 5.4), phase III, Social Support Groups Usage was considered as a potential factor to drive individual cognition (self-efficacy, food risk perception, food related lifestyles) as proposed by literature. The significant findings in this analysis shows that social support usage is a crucial factor to influence these cognitive constructs. Apart from physical therapy, it is equally important for those with diabetes to receive emotional and psychological care (Singh, Sinnirella & Bradley 2012; Weaver et al. 2014), which is confirmed with this significant result in the present study. This outcome is crucial for the development of social marketing programs which encourages both formal and informal support mechanisms to take an active role in providing positive emotional and physical support to their family, friends or patients diagnosed with diabetes.

However, Phase III also reveals that usage of social support is not significantly associated with dietary compliance amongst people with diabetes. Therefore, this outcome provides the impetus to further examine the negative implications of social support usage on dietary behaviour for those living with diabetes. In doing so, relevant strategies can be introduced to mitigate the negative perceptions of social support usage and also to promote its usage thereby filling this particular gap in diabetes dietary compliance outcomes. At the same time strategies to educate both formal (e.g. physicians, nurses) and informal (e.g. family, friends) on ways to provide positive and motivating environments when providing support to people with diabetes should also be considered in health modification programs. Table 5.5 provides a summary of the key theoretical contributions from this study. Figure 5.4 shows the overall model extensions and modifications introduced in this study.

5.3.1 Summary of Theoretical Implications.

Overall, the findings from this study has contributed to theory in a number of ways. Firstly, by introducing new models into this study further understanding between the causal links between the constructs will add knowledge to a number of fields such as health, psycho-social and social marketing amongst others. Added knowledge in these fields will enable wider application of this understanding for the purpose of building policy and practice in a number of health areas. Additionally, linking theoretical perspectives from both psycho-social and social marketing disciplines in this study will likely create a knowledge driven model which can be used to reinforce and improve health care initiatives for people with diabetes.

Next, this study explored the relationship of the key behavioural constructs of self-efficacy, risk perception, food related lifestyles and social support usage to dietary decision making in a predictive model not previously tested at the point of writing this thesis. In doing so, the combined application of these theories in one study specifically within the domain of diabetes will likely bring together a stronger foundation of understanding of dietary behaviour amongst people with diabetes. Hence, a more comprehensive model of care and therapy can be applied in diabetes health care specifically with the inclusion of the behavioural aspects of diabetes health management.

Finally both theory integration and the extension of theories in diabetes health discipline will likely provide an important framework for future researchers to further explore and expand on this current study in other health areas. Additionally, theory integration will also provide important foundations for the development of sustainable and value driven health campaigns for people with diabetes. Table 5.5 provides a summary of the theoretical contributions from the present study.

Table 5.4: Summary of Theoretical Contributions

No.	Contributing Factors	Remarks	Contribution to Theory
1.	New models were introduced:- Phase II: Extension Model 2 Phase III: Extension Model 3	The original model (Figure 5.1) was modified due to the research findings i.e. (Chapter 4) with the following reasons:- A number of items had to be removed from the original dependent variable scale (the Likelihood of Dietary Compliance to stabilise the AVE (see Chapter 4, Section 4.2.4, pp.9). Whilst the removal of items may be acceptable statistically, theoretically this procedure may not be entirely justifiable as it would lead to an empirically skewed discussion rather than a theoretical discussion, thus limiting the potential theoretical contributions. Hence, Extension Model 2 with two dependent variable were introduced Figure 5.2 Extension Model 3 was introduced after mediation testing of the Social Support Groups Usage construct showed insignificant results contrasting extant theory and literature.	(Extension Model 2) will expand theoretical understanding of the causal links between cognitively driven behaviours and dietary behaviour within two distinct "dietary compliance paths". This will provide added knowledge on the distinct patterns of food behaviour which drives either compliant or non-compliant food behaviour. Whilst current theory may provide extensive understanding about food and health behaviour, this study will contribute towards this understanding from the specific domain of diabetes related health and behaviour. Additionally, this study will also add to the current knowledge within the field of social marketing, so that practical social marketing strategies can be introduced in health behaviour modification initiatives. Extension Model 3, provided further understanding of the role social support usage plays in diabetes related food behaviour. Whilst theory (Antonovsky 1974; Thoits 1985) may propose this construct as a mediator in health management or behaviour, this model has shown that in this case it is playing an alternative role as a significant driver to self-efficacy, food risk perception and food related lifestyles. This outcome provides further understanding that social support usage can be an important element in shaping positive behaviours towards dietary management and self-care for those with diabetes.

2.	Inclusion of key psycho-social constructs of Self-Efficacy, Food Risk Perception, Food Related Lifestyles and Social Support Groups Usage in one study.	At the point of writing this thesis no known studies have combined these constructs from the proposed theory as discussed in chapter 2 into one model to examine its influence on diabetes dietary behaviour.	The combination of these theoretical perspectives is valuable towards the overall understanding of diabetes food related behaviour as each theoretical perspective provides a better understanding of human cognition and its application to health management and lifestyle behaviour. This study through aligning these theoretical perspectives into the domain of diabetes health behaviour will provide additional knowledge on the factors which may promote or impede dietary behaviour amongst people with diabetes. This knowledge would likely benefit areas of study such as psychology, health care and social marketing amongst others.
3.	Theory Integration	The aforementioned theories were aligned for the benefit of its practical application (Mayer & Sparrowe 2013).	Theory integration in this study will likely provide valuable and sustainable social marketing campaigns, initiatives and programs for the benefit of the health and well-being of people with diabetes, specifically in the area of dietary management and modification for people with diabetes. Chapter 2, Section xx provides a detail summary of Theory Integration in Social Marketing.
4.	Theory adaptation and Extension	Key psycho-social theories (Antonovsky 1974; Bandura 1986; Frewer et al. 1996; Grunert, Brunsø & Bisp 1993; Thoits 1985) were used to guide this study.	These key theories were adapted into the specific domain of diabetes health behaviour through model building, aligning current psycho-social theory with evidenced based research and adaptation of scales in the research instrument suited for people with diabetes. These measures will likely provide future researchers or theorists with a blue-print for further research enquiry and/or expand on the findings from this study for further understanding and expansion of knowledge in the area of health behaviour amongst people with diabetes.

Source: developed for this study

5.4 Implications for Policy and Practice

In addition to the theoretical contribution presented in the previous section, this study has a number of implications for policy and practice. These include implications for social marketing and the health sector.

5.4.1 Implications for Social Marketing.

Social marketing is the adaptation of commercial marketing principles for the betterment of society (Andreasen 1995; 2002; Carins & Rundle-Thiele 2013; Lefebvre 2000). It has been widely recognised as a behavioural change tool for a range of social issues and problems (Andreasen 2002; Harvey 1999; Manoff 1975). Numerous social marketing initiatives have been introduced in Australia to generate awareness and educate the public about diabetes and its related health risks such as AusDiab, Life! Prevention program and AUDRISK amongst others (Dunbar et al. 2014). Unfortunately, some initiatives have not necessarily been successful mainly because they lack sustainability or are not effective enough (Guariguata et al. 2014; Rashwani et al. 2014). This coupled with the fact that modifying health behaviour is a difficult task to accomplish for those with diabetes as it is often impacted by individual capacity, will and attitudes towards health modification (Llauradó et al. 2015; Nurkkala et al. 2015; Pechmann & Catlin 2016). Hence, a comprehensive understanding of individual cognitive motives, perceptions and capacity to change behaviour will help improve health modification initiatives (Cockerham 2005; Fisher et al. 2014; Parkinson et al. 2016; Ryan & Deci 2000).

A major barrier to successful social marketing initiatives has been the limited use and application of theory and formative research into social marketing health initiatives (Lefebvre 2000; Luca & Suggs 2013; Novelli 1997). Social marketing initiatives generally involve applying marketing principles, to identify and target their segment base (Andreasen 1995; 2002; Carins & Rundle-Thiele 2013; Lefebvre 2000). A crucial aspect of understanding a target segment is formative research which commercial marketers undertake through focus groups, product testing and data collection amongst others (Kubacki, Rundle-Theile & Buyucek 2015; Kubacki & Rundle-Thiele 2016; Lefebvre & Flora 1988). Unfortunately, for social marketers, conducting formative research such as these are not common practice due to time and budget constraints or the lack of experience (Luca & Suggs 2013; Novelli 1977).

However, recently the application of behavioural theory and the use of research in social marketing has been gaining momentum (Luca & Suggs 2013). This study can therefore contribute towards this knowledge gap by informing social marketers about the behavioural and cognitive characteristics found to promote or hinder positive dietary behaviour amongst those with diabetes. In doing so, social marketers can develop promotional mix health campaigns that distinguish the specific needs and characteristics (e.g. low self-efficacy, inadequate social support etc.) of people with diabetes with the aim of meeting these specific needs (Andreason 2002; Dietrich et.al. 2015).

Whilst it is a challenge to fully comprehend human cognition towards health behaviour, researchers (French & Blair-Stevens 2006; Lefebvre & Flora 1988; Luca & Suggs 2013) recommend the integration of research into practice for a more effective and sustainable health modification program. Hence, this study could provide a framework for social marketers to consider when designing or implementing diabetes related health campaigns and messages. Overall, social marketing health modification initiatives needs to be both sustainable and value enhancing to the target audience (Luca & Suggs 2013; Parkinson et al. 2016). Therefore, information from this study such as demographic profiles, behavioural characteristics and factors related to food behaviour can be used to enhance social marketing health campaigns for diabetes related initiatives. Table 5.6, summarises the potential application of social marketing initiatives for diabetes dietary modification programs based on the findings of this study.

Table 5.5: Implications of the study for Social Marketing Initiatives

No.	Key Cognitive Constructs	Study Findings	Social Marketing Initiatives
1.	Self-Efficacy	Self-Efficacy is found to positively influence both dietary compliance and social support usage.	Campaigns which reinforces positive self-efficacy behaviour would motivate and encourage dietary goals amongst those with diabetes. Initiatives to support and encourage those with low self-efficacy through counselling, education and motivational themes would encourage positive attitudes towards dietary modification efforts. Efforts to encourage those with low self-efficacy to seek or use social support mechanisms through campaigns highlighting the benefits of its usage would likely enhance self-efficacy towards dietary compliance *References: Lee & Kotler (2015); Lefebvre (2013)*
2.	Food Risk Perception	Positive associations with social support usage. Mixed outcome with its relationship with dietary compliance with both significant and non-significant association with dietary compliance. Strong association with both self-efficacy and food related lifestyles.	Initiatives reinforcing the importance of avoiding risky foods and its negative impact on health will likely promote better food choices. Campaigns highlighting the negative effects of sugary, fatty foods to encourage better food judgments may improve food risk perception behaviour. Since, there is a strong association between risk perception with both self-efficacy and food related lifestyles, hence, social marketing campaigns targeting the positive aspects of food risk (i.e. ability to discern good versus bad food choices) may improve both self-efficacy and food lifestyle choices. *References: Lupton (2015); Maher (2014)*
3.	Food Related Lifestyles	Strong association with dietary compliance (negative); not significant with dietary compliance (positive). No relationship with social support usage.	A major barrier to healthy living for people with diabetes is negative external influences such as advertising temptations, peer pressures etc., hence, educational campaigns and counselling initiatives such as these may limit poor dietary lifestyle choices :- Healthy cooking campaigns-diabetes friendly/convenient cooking recipes etc., to promote healthy lifestyles may encourage dietary modification practices. Health awareness campaigns at shopping malls, media outlets or web-based campaigns etc., may have a wider reach to promote healthy living choices for those with diabetes. Based on the findings of this study, campaigns encouraging the use of family or formal support (nutritionist, physician) to improve dietary practices may be needed. *References: Cugelman, Thelwall, & Dawes (2011); Huesch et al. (2016)*

4.	Social Support Groups Usage	Social support usage is a key driver positively impacting cognitive factors of self-efficacy, food risk perception and food related lifestyles. Social support usage is not significantly related to dietary compliance and neither is it a mediator between cognitive behaviour and dietary compliance.	A multi-pronged approach is needed to encourage social support usage as it encompasses a variety of mechanisms offering multiple support to multiple needs of people with diabetes:- Firstly to encourage its use social marketing initiatives to change negative perceptions of it may improve its usage. Secondly, initiatives to educate social support mechanisms such as family, friends or formal support such as physicians, therapists etc., is needed to mitigate poor quality support or poor support experiences. Hence, initiatives targeting both the people with diabetes who may use social support and the providers of social support require education, counselling and information on how best to utilise and/or deliver social support to enhance and improve dietary modification efforts by people with diabetes. *References: Dietrich et al. (2015); Penny & Kirk (2015)*

Source: Developed for this study

5.4.2 Implication for the Australian Health System.

¬ ***Overview of the health sector.*** The Australian health sector is a complex network of public and private sector health service providers which includes a number of stakeholders working to provide a range of healthcare services to the community (AIHW 2014). The World Health Organisation (2013) describes the health system as all the activities whose main aim is to promote, restore and/or maintain health. The health system may vary between countries and therefore may differ in how it is funded, organised, delivered and used by recipients (AIHW 2014). In Australia the health system is multi-faceted and provides a multitude of services across many levels such as public health, preventative services, primary health care hospital-based treatment, rehabilitation and palliative care amongst others (Willis 2016).

Generally, the public health sector in Australia is funded by the state territory and the government and managed by the state and territory governments (AIHW 2014). Other services provided by the Australian government and state territory include population health programs, community health services, health and medical services and health infrastructure amongst others. At the same time there are new or emerging models of care in the pipeline which include walk in clinics, e-health services, tele-health services and self-monitoring health technologies (AIHW 2014; Willis 2016). Additionally, the government also provides Medicare which is a universal public health insurance scheme offering free or subsidised treatment to the community (Willis 2016 pp. 27-31).

However, one of the greatest challenges for the Australian health system is to coordinate, manage and disperse health care services within limited resources, which may impact a number of factors such as the quality of care, access to healthcare and healthcare support services (Willis 2016). Unfortunately a fragmented or poorly managed health sector can negatively impact the health and well-being of those requiring health care including people with diabetes (Penny & Kirk 2012; Wong et al 2014). The following section will provide an overview of the impact of the health sector on diabetes care and management and how this present study could fill the healthcare gaps in Australia.

¬***Diabetes Health Care***. The Australian health sector is equally impacted by the costs and burdens of diabetes. The overall total health expenditure estimates in Australia between the years 2014 to 2015 was $161.6 billion, out of which approximately $14.6 billion is spent annually on diabetes health care (AIHW 2016; Diabetes Australia 2016). Unfortunately, there seems to be little respite from the exponential growth and burdens of this disease. An estimated 2.0 to 2.9 million Australian adults will be diagnosed with diabetes by 2025, which in turn will incur even greater financial strain on the health system (Lee et al. 2013). Whilst initiatives have been taken to reduce the impact of diabetes to date it is still a major health problem in Australia (Diabetes Australia 2016; Dunbar et al. 2014; Lee et al. 2013).

The Australian National Diabetes Strategy (2015), a government based initiative has outlined a number of strategies to inform relevant agencies on how existing limited health care resources can be better managed and coordinated for targeted efforts of diabetes management and care across all levels of government. Key to this is overcoming the many barriers to diabetes by involving a multi-sectorial response led by government agencies to be implemented at the community level (Australian National Diabetes Strategy 2015; Diabetes Australia 2016). In doing so, this strategy aims to provide a framework for collaborative efforts by governments and a wide range of individuals and groups including people with diabetes, health care professionals, non-government organisations and researchers amongst others to improve diabetes care, minimise its burdens and health risks (Australian National Diabetes Strategy 2015).

The involvement of researchers in initiatives such as this is an important step to improve diabetes care and management. Such collaborations will not only maximise the use of resources but will also generate a wider understanding of the factors which are barriers to diabetes therapy and management, hence providing better services and resources for people with diabetes and the community (Australian National Diabetes Strategy 2015; Diabetes Australia 2016). As such findings from the present study could contribute towards these initiatives. The next section will provide practical solutions to address how this present study can help reduce the service gaps in the health sector as well as strategies to improve dietary management amongst people with diabetes.

5.4.2.1. Strategies in Closing Current Health Care Gaps.

¬***Health Promotion by Social Cognition***. A crucial aspect of diabetes care and management is the ability of people with diabetes to self-manage their disease effectively (Deeb et al. 2015; Patra et al. 2014). However, this study has shown the various barriers and challenges associated with diabetes self-management including dietary compliance (Bhattacharya 2012; Hinder & Greenhalgh 2012; Taylor et al. 2014). Whilst dietary management can be improved through a number of strategies such as diet and exercise (Diabetes Australia 2016), it is often a challenge to carry out diet and lifestyle modification practices amongst those with diabetes (Schiøtz e al. 2012; Strom & Egede 2012). The health sector may have provided a range of diabetes support mechanisms including health campaigns, free consultations and other such initiatives (Dunbar et al. 2014), however, the rapid progression of diabetes and obesity (Diabetes Australia 2016) in Australia shows that there seems to be little improvement in mitigating these health problems. Studies show that individual willpower, attitudes, perceptions and a range of other cognitive behaviour are key to individual health behaviour modification (Piette et al. 2014; Schiøtz et al. 2012; Tovar et al. 2015). Therefore, health policies should also include strategies which involve improving aspects of individual cognition such as self-efficacy, food risk perception and attitudes towards food behaviour. Whilst it is a challenge to comprehend the workings of human thought and decision making due to its intangible nature (Bandura 1977), researchers could close these knowledge gaps through their empirical findings, analysis and reporting which can then be used to inform relevant health agencies to provide the necessary health care and support for people with diabetes.

In view of this, this study has shown the importance of self-efficacy as a crucial cognitive behaviour in guiding and influencing positive dietary compliance amongst people with diabetes. Hence, the health sector specifically physicians, counsellors, nurse practitioners, nutritionist and diabetes educators amongst others could include health promotion by social cognitive means (Bandura 2004). Health promotion by cognitive means (Bandura 2004) involves promoting positive health behaviour through facilitating improved motivation, self-belief and self-worth amongst those with lower motivation or self-efficacy to do so. At the same time the health sector could provide training and education to the various health sector support systems on behavioural health care approaches such as this so that a more meaningful and motivating environment can be created during their consultations with people with diabetes.

¬***Social Support in the Health System.*** Experts (Bandura 2004) suggest that people dealing with health behaviour modification also seek affirmation from others on their self-care practices and goals. This means individuals require positive encouragement, reassurance and positive feedback in their health management and often look to their family, friends or physicians for motivation and encouragement (Schiøtz et al. 2012). In the health sector, formal diabetes support systems such as physicians, nutritionists, nurse practitioners and diabetes educators amongst others provide a range of diabetes related therapy for people with diabetes (Archer 2014; Wong et al. 2014). Unfortunately, in some cases these support systems may not necessarily provide proper care during consultation (Archer 2014). For example practitioners may create an environment of shame or guilt placed on people with diabetes which may hinder positive health goals amongst them (Archer 2014; Schiøtz et al. 2012). On the other hand, positive experiences with formal support systems have been shown to have a positive effect on a range of diabetes therapeutic outcomes (Archer 2014; Wong et al. 2014).

A recent report on obesity intervention, Penny & Kirk (2015), explains that “fat shaming” and “fat blame” or placing the burden of weight loss entirely on the shoulders of obese patients or clients creates unnecessary fear and anxiety by those receiving formal therapy. Penny & Kirk (2015) further explain that intervention programmes such as the Health at Every Size (HAES) initiative which encourages body acceptance, healthy eating and living a meaningful life saw improvements in self-efficacy, diet and general well-being. In most cases lack of training, experience and knowledge in providing diabetes support can lead to poor quality support, thus negatively impacting diabetes therapy outcomes (Archer 2014; Penny & Kirk 2012; Wong et al 2014).

Additionally, researchers (Archer 2014; Dietrich et.al 2015; Penny & Kirk 2015) have highlighted the importance of gathering wider empirical evidence, working collaboratively and exchanging information as an important step towards improving health behaviour and health care. Therefore, it is crucial for the health system to introduce comprehensive education and training programs within the formal support network to provide a positive consultation environment for their patients and/or clients seeking diabetes therapy. Information from this study could therefore be an important tool for the design and implementation of training and educational programs aimed at formal support systems to improve diabetes consultation experiences for people with diabetes. These measures are important as evidence (Archer 2014; Vivienne et al. 2014) that positive consultation with formal care is strongly associated with improved health outcomes for people with diabetes. Therefore, collaborative efforts between formal health care networks, the healthcare system and researchers should take place so that the exchange of ideas, resources and information related to diabetes health behaviour can be improved through such collaborations.

¬***Emerging health care models***. The Australian health care system is in the process of delivering a range of improved e-health and digital health technologies for a more streamlined and efficient health service for the community (Wise 2016). Currently the Australian health system has introduced telemedicine services and technologies to self-monitor individual health status and progress (Wise 2016). Researchers (Cripps, & Standing 2011 & Standing & Cripps 2015) report that e-health data banks are both necessary and vital for the overall management and coordination of health services. Whilst, such initiatives are important and would contribute towards a progressive health system, there are still areas in e-health which are lagging in Australia (Cripps, & Standing 2011 & Standing & Cripps 2015). Some of these include overall poor coordination of data, poor quality data and lack of reliable health information (Adler-Milstein et al. 2013; Standing & Cripps 2015). Researchers (Adler-Milstein et al. 2013; Cripps, & Standing 2011; Liaw et al. 2014) agree that better data banks with up to date information will create better policy in the long run. Crucial to this is the integration of data from various disciplines in the health field so that healthcare services can be improved and importantly these data should be valid and reliable (Adler-Milstein et al. 2013; Liaw et al. 2014).

Therefore, by integrating data from validated recent research will provide useful data which fits the purpose of each healthcare need including behavioural aspects of healthcare such as this present study. Additionally, the integration of research data with the health system data banks will likely provide a comprehensive and knowledge driven healthcare policy and practice for the benefit of diabetes related therapy (Liaw et al. 2014). For example, data showing gender differences on a range of behavioural factors from this study such as self-efficacy, positive dietary compliance or social support usage can be used to create tele-health counselling services or targeted digital self-care support systems to target the specific gender needs and wants amongst people with diabetes. Whilst current e-health services (AIHW 2016) may provide support in glucose monitoring, medicine adherence etc., this study could enhance the e-health system by providing added information in the form of behavioural characteristics such as individual attitudes, perceptions and behaviours towards dietary behaviour. Numerous studies (Piette et al. 2014; Schiøtz et al. 2012; Tovar et al. 2015) have shown that overall diabetes health therapy should include emotional and behavioural support as part of its diabetes therapy strategies to improve overall health and well-being of people with diabetes.

¬***Changing the food environment.*** Food behaviour is not only guided by intrinsic factors but can be equally influenced by external forces (Grunert, Brunsø & Bisp 1993). Unfortunately, whilst individuals may strive to modify diets and exercise, these attempts may be thwarted by external factors such as advertising, easy access to unhealthy food or access to cheap unhealthy foods (Boyland & Whalen 2015). The temptation to consume unhealthy food by people with diabetes can be further compounded by low self-efficacy, poor willpower or poor food risk judgements amongst them (Song et al. 2015; Tse et al. 2012). Unfortunately, in Australia the healthy food environment is lagging due to affordable and easy access to sugary drinks, sweets and snacks which are high in calories and with poor nutritional value (Reeve & Jones 2016; Veerman et al. 2016). The World Health Organisation (2016) report on global diabetes prevention and control shows that in terms of Australia's national response to diabetes, its operational policies and strategies to reduce overweight and obesity is not fully implemented or not well developed yet. Appendix xx shows the breakdown of the National Response to Diabetes prevention and control in Australia. This shows that more preventative measures such as creating a healthy food environment should be considered to limit health problems such as diabetes and obesity.

Studies (Veerman et al. 2016) have shown that imposing food taxes on unhealthy food items is strongly associated with better diet and weight management. Australia should follow the lead of other countries such as Mexico, France and Hungary in imposing taxes on unhealthy food and beverages (Reeve & Jones 2016; Veerman et al. 2016). The World Health Organization (2013) recommends governments to include economic strategies such as taxes on unhealthy foods and at the same time introduce subsidies on healthy foods. This would improve the affordability of heathy foods and discourage unhealthy food consumption (WHO 2013). Additionally food taxes such as sugar taxes could lead to healthier lives and reduced health costs (Veerman et al. 2016). Evidence (Bíró 2015; Wise 2016) suggests that imposing taxes and subsidies such as this will ultimately improve the overall health and well-being of citizens. For example in Hungary, overall dietary habits improved (especially among the lower income group) after the government introduced a junk food tax (Bíró 2015) and a report (Wise 2016) in the United Kingdom (U.K) suggests that a sugar tax could stop 3.7 million people becoming obese in the U.K within the next few years.

The aforementioned factors and the present research should be used as important feedback for the government and health system to take note off, especially the serious implications of the overconsumption of unhealthy food on health in Australia. Therefore, concerted efforts by the relevant government and health ministries are needed to develop a healthy food environment urgently. Not only will poor dietary environments negatively impact the health of the current Australian diabetes population but it needs to consider the impact of such an environment in the future especially amongst the growing number of younger obese individuals and those considered pre-diabetes (Diabetes Australia 2016; World Health Organisation 2016). Both obesity and pre-diabetes are considered as high risk categories for being diagnosed with diabetes (World Health Organisation 2016). Data from World Health Organisation (2016) shows the prognosis for the prevalence of diabetes in Australia is not looking good with numbers estimated to grow to 1,673,000 by 2030. Therefore, urgent steps are needed to introduce health policies which could mitigate many of the challenges and barriers associated with diabetes and its health risk. Table 5.7 provides a checklist of possible strategies to be developed by the Australian health system utilising information from this study.

Table 5.6: Country and regional data on diabetes

WHO Western Pacific Region

Prevalence of diabetes in the WHO Western Pacific Region

Country	2000	2030
Australia	**941,000**	**1,673,000**
Brunei Darussalam	18,000	49,000
Cambodia	110,000	317,000
China	20,757,000	42,321,000
Cook Islands	700	1,300
Fiji	37,000	72,000
Japan	6,765,000	8,914,000
Kiribati	4,000	7,000
Lao People's Dem. Rep.	46,000	128,000
Malaysia	942,000	2,479,000
Marshall Islands	2,000	4,000
Federated States of Micronesia	5,000	13,000
Mongolia	34,000	81,000
Nauru	2,000	4,000
New Zealand	179,000	307,000
Niue	<100	<100
Palau	1,000	2,000
Papua New Guinea	152,000	392,000
Philippines	2,770,000	7,798,000
Republic of Korea	1,859,000	3,378,000
Samoa	4,000	7,000
Singapore	328,000	695,000

Country	2000	2030
Solomon Islands	13,000	41,000
Tonga	3,000	6,000
Tuvalu	300	800
Vanuatu	6,000	17,000
Viet Nam	792,000	2,343,000
Total	35,771,000	71,050,100

Source: WHO (2016) Country and regional data on diabetes

Table 5.7: Checklist of Possible Strategies by the Australian Health System.

Checklist of Possible Strategies to be developed by the Health System using the Current Study:-
Develop Health Promotion by Social Cognition; Training and education targeted at formal social support systems: specifically on cognitive aspects of health behaviour; Developing relevant e-health and digital diabetes health care systems through utilising and integrating current and reliable research data from this study; Introduce policies and strategies such as the sugar tax to change the Australian food environment.

Source: Developed for this study

5.4.3 Implications for People with Diabetes

Finally, this study and its implications are importantly for the benefit of people living with diabetes. Whilst diabetes is a disease which requires formal therapy and self-care practices to manage it (Diabetes Australia 2016), equally important is the type and level of social support received by people with diabetes. People with diabetes are not only impacted by the physical challenges of the disease (kidney failure, limb amputations etc.,) (American Diabetes Association, 2017) but are also impacted emotionally and psychologically (American Diabetes Association 2015; Snoek, Bremmer & Hermanns 2015). People living with diabetes can face psychological trauma such as depression, loneliness and guilt while managing diabetes (Snoek, Bremmer & Hermanns 2015). Hence, experts (American Diabetes Association 2015; Robertson et al. 2013) recommend that emotional and psychological care should also be considered in diabetes therapy. Human cognition is the key driving force which impacts daily lives including the ways in which individuals manage their disease (Bandura 1986; Ku & Kegels 2015; Robertson et al. 2013). Therefore, if the behavioural aspects of diabetes health therapy is not properly managed or is hindered it can have negative consequences on diabetes therapy outcomes.

Numerous studies (Robertson et al. 2013; Wu et al. 2013) have shown that low self-efficacy, feeling dejected, depression and loneliness have negatively impacted formal therapy outcomes such as medicine adherence, glucose monitoring, diet and exercise amongst those with diabetes. Hollands, Marteau & Fletcher 2016 pp. 392 suggest "……..*interventions that target non-conscious processes and are less reliant on reflective, conscious engagement have significant potential for changing behaviour across populations"* This shows that the inclusion of strategies and policies to understand and serve the behavioural aspects of diabetes care is vital for optimal diabetes therapy.

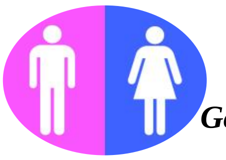
~Social Support. Therefore, based on the aforementioned discussion, people living with diabetes need a combination of support mechanisms to help them manage their diabetes, especially in the area of cognitive behaviour. Hence, the health system should consider strategies to incorporate behavioural based therapy (counselling, emotional support etc.,) in conjunction with formal diabetes therapy. Cost effective and sustainable measures for diabetes care should include a multi-layered approach considering various aspects of support mechanisms such as the health system, social marketers and other support agencies.

This study has shown that informal systems such as family and friends amongst others are also important support mechanisms. Unfortunately, when both formal and informal support systems are unreliable or insufficient in providing support to people with diabetes, this would then hinder positive diabetes self-management health goals (Deeb 2014). Researchers (Aziz et al. 2015; Pronk & Remington 2015) have found that even when diet intervention programs are moderate it can still have a profound impact on the weight loss of individuals, however crucially the program should be conducted with great support for the recipients.

Other successful intervention programs include community based interventions (Kahn & Davidson 2014; Pronk & Remington 2015) in which active participation of the community is encouraged to provide social support to people with diabetes. Hence, programs to educate the community on the risks of diabetes and the importance of community support for people with diabetes should be encouraged in Australia. This will likely foster greater understanding about diabetes in the community and thus may limit the stigma and discrimination surrounding the disease (Pronk & Remington 2015).

One of the key barriers of implementing diabetes support programs in Australia is the lack of funding and resources to do so (Penny & Kirk 2015). Hence the coordinated efforts between the health system, social marketers, the community and researchers are cost effective methods to share knowledge, exchange information and work together to manage and minimise the challenges and barriers associated with diabetes (Kahn & Davidson 2014). This has been mooted by numerous researches (Dietrich et al. 2015; Penny & Kirk 2015) who have pointed out that optimal diabetes therapy requires a multi-pronged approach to effectively manage and control diabetes. Therefore, with the rapid progression of diabetes and its health risks and the inability of many people with diabetes to self-manage it, a comprehensive diabetes behavioural intervention program is needed urgently to help people with diabetes in Australia to change their eating and lifestyle behaviours.

~ ***Social Marketing Segmentation-"One size does not fit all."*** Social marketing experts (Andreasen 2002; Dietrich et.al 2015; Kotler & Zaltman 1971; Kubacki & Rundle-Thiele 2016; Penny & Kirk 2015; Sussman et al. 2015) specifically in the area of health have highlighted the importance of using social marketing segmentation or behavioural segmentation as an effective health modification strategy. Studies (Dietrich et.al 2015; George et al. 2016) also show positive health behaviour modification outcomes in campaigns or messages which use segmentation based strategies. Using this study as a framework there are some possible strategies specifically in terms of behavioural segmentation which could be implemented as part of dietary modification initiatives. The following explanation is based on some of the demographic characteristics from this study as presented in Chapter 4 (Descriptive Statistics pp. 5), which could be applied in future social marketing segmentation dietary modification campaigns or initiatives.



Gender segmentation: Firstly, many studies (Imamura et al. 2015; Mathew et al. 2012; Song et al. 2012) have shown that males and females exhibit different characteristics, habits and attitudes towards diet. Males tend to take on a relaxed attitude towards dieting and consider eating out with friends as an important part of their social life as compared to women (Mathew et al. 2012). Males may not be as emotionally driven (i.e. depression, body image, self-image etc.,) towards food as compared to women (Chlebowy, Hood & LaJoie 2013; Mathew et al. 2012). Literature (Brewer et al. 2004; Chlebowy, Hood & LaJoie 2013; Hackworth et al. 2013) suggest that underestimating health risk (i.e. unhealthy food) could hinder dietary modification behaviour among people with diabetes. Women on the other hand may be overly concerned about their weight, body image and how others perceive them (Albertson et al. 2015), hence may take diet more seriously than men.

However, studies (Chlebowy, Hood & LaJoie 2013; Mathew et al. 2012; Singh, Cinnirella & Bradley 2012) also show women may overeat or diet excessively due to depression, loneliness or poorer dietary control compared to men. Women also tend to seek social support from a wider network of family or friends as compared to men (Singh, Cinnirella & Bradley 2012; Song et al. 2012). Therefore, dietary modification initiatives for males and females should be designed to consider gender differences not only from a demographic perspective but also from an emotional and behavioural aspect. Hence, targeted behavioural segmentation approaches (e.g. in counselling, educational programs, messages) considering these differences can be an effective dietary modification strategy which would meet the specific gender needs of people with diabetes.

Diabetes categories: Similarly, social marketing segmentation strategies should be considered when designing dietary modification campaigns for each diabetes category. Each category has specific biological and psychological needs which require specific attention and support (Schabert et al. 2013; World Health Organisation 2016). Studies (Albright & Gregg 2013; Dunbar et al. 2014) show that health outcomes are improved for people with Type I and Type II diabetes when they are involved with specially tailored programs such as counselling, community support or educational programs for each of their specific health needs. Therefore, targeted initiatives such as these are important for social marketers to consider and for the Australian health system to introduce. This is also further discussed in Section 5.6 (Future Research Direction)

Age differences: Numerous studies (Lamichhane et al. 2012; McGavock, Dart & Wicklow 2015; Llauradó et al. 2015; Rasmussen et al. 2011; van Dooren et al. 2013) have shown vast differences in the behavioural and social characteristics of different age groups amongst people with diabetes. Younger people with diabetes often have to deal with issues such as peer pressure, bullying and embarrassment whilst coping with their diabetes (Lamichhane et al. 2012; Llauradó et al. 2013; McGavock, Dart & Wicklow 2015). Older persons with diabetes may face issues such as depression, feeling lonely or coping with multiple illnesses along with managing their diabetes (American Diabetes Association 2015). Those in the 30's to 50's age range may face issues such as work, marital or financial problems whilst dealing with diabetes (Li et al. 2013; Moulton, Pickup & Ismail 2015; Snoek, Bremmer & Hermanns 2015).

In each case, these problems and issues may negatively impact the overall health and well-being of people with diabetes (Rasmussen et al. 2011; McGavock, Dart & Wicklow 2015; van Dooren et al. 2013). Therefore, implementing specific health initiatives which cater to the diverse socio-economic and psychological needs amongst these age groups would be an important initiative for social marketers and the health system to consider.

i. Youth intervention: With the rise of internet and mobile usage amongst youths today (Hamine et al. 2015) the health system and social marketers could tap into these platforms to enhance diet modification campaigns or other such initiatives. Internet and mobile based platforms such as Facebook, blogs or mobile (m-health) have been found to improve diabetes self-care amongst youths (Grey et al. 2013; Hamine et al. 2015; Zang, He & Sang 2013). Harris, Freeman & Duke (2015) found positive outcomes in blood glucose management when Skype was used as a face to face diabetes intervention tool amongst youths with diabetes. Meanwhile, Ko, Turner-McGrievy & Campbell (2014) found the application of podcasting as an effective diabetes support tool and can be used as a modern alternative health intervention programs in the future. These strategies should be incorporated into diabetes intervention programmes specifically in the area of youth diabetes care in Australia.

Additionally, some studies (Llauradó et al. 2015; McGavock, Dart & Wicklow 2015) have shown positive psychological and physical well-being among youths who participated in peer-led intervention programs. Therefore, the health system should create opportunities for community or internet/mobile based peer-led programmes to encourage youths to share their diabetes related issues with each other. These initiatives are important as they could provide additional support for young people with diabetes who may not feel comfortable talking to adults about their general well-being and/or those who do not have access to social support groups (Llauradó et al. 2015; McGavock, Dart & Wicklow 2015).

ii. Adults/Older diabetes intervention: Similarly, for older people with diabetes, social and or behavioural segmentation initiatives promoting community based diabetes support, diabetes counselling services at aged care facilities and/or telephone based support could limit the various burdens faced by older people living with diabetes (American Diabetes Association 2015). The health system could also promote peer support programs in which community based gatherings could be held at various diabetes support centres for older people with diabetes to gather and share their problems and issues with each other and with diabetes educators. Free mobile health support facilities for older people with diabetes could be implemented for those who lack transport or are immobile.

Additionally, intervention programmes which provide support for working adults with diabetes have shown improved overall health and well-being (Dale, Williams, & Bowyer 2012). These initiatives are important as poor mental or physical well-being at the workplace among people with diabetes could hinder productivity levels, incur greater health costs and other economic burdens for Australia (Diabetes Australia 2016). Therefore initiatives such as promoting positive mental health and/or physical care among working adults with diabetes will likely be beneficial for both individuals and society in general.

Household composition*:* Studies (Jones et al. 2016; Mayberry & Osborne 2012; Singh, Cinnirella & Bradley 2012) have shown that household situations can negatively impact diabetes management. For example, people with diabetes who are single and living alone may face loneliness, depression and lack of support and so may not manage their diet well (American Diabetes Association 2016). Barriers to dietary modification in households with families include poor meal-time management, unhealthy snacking and poor food choices by either parents or children living in the household (Singh, Cinnirella & Bradley 2012; Weaver et al. 2014).

Therefore, initiatives promoting healthy eating habits could be implemented in future diabetes dietary related health campaigns. This could include the health system introducing toll-free diabetes counselling call centres or peer support programs for single people living alone with diabetes. Campaigns promoting healthy home cooking or cooking workshops for families may limit unhealthy food consumption in homes and at the same time involve the whole family in such activities.

**Note: All images sourced for this section from: www.googleimage.com*

5.5 Limitations

This study found sample size, geographical and methodological limitations that may have impacted some aspects of the study which is described in the following sections.

¬***Sample size***. The data was collected from a cross-section of the population and whilst the total number of respondents (*n* =169) was considered adequate for this study (Cohen 1988), a larger sample may have provided further demographic and behavioural information from the data. A larger sample may have also provided further detail and understanding about the causal relationships within the model thus likely enhancing the empirical findings.

¬***Theoretical limitations***. Whilst this study examined a range of cognitively driven factors (i.e. self-efficacy, food risk perception, food related lifestyles and social support groups usage) in the model, there are other factors which were not included in this study. For example, factors such as diabetes distress, socio-economic factors, demographic factors and government policy factors amongst others which have also been found to influence diabetes health behaviour (Baek, Tanenbaum & Gonzalez 2014; Nadia Islam 2013). This may have limited further theoretical contribution and perspectives related to health behaviour. However, these limitations do not render the research or the findings insignificant as this study will likely provide further opportunities to examine its scope in future research undertakings.

¬***Geographical limitations.*** As the study sample was limited to Australia, the empirical findings may be limited within the cultural and contextual setting of this region. Therefore, it is difficult to assume if these findings are universally applicable or relatable to other geographical samples. However, this provides opportunities to extend this study to other geographical locations thereby extending it to other research options such as cross-cultural studies.

5.6 Implications for Future Research

This section will present the potential research direction and future research opportunities stemming from this research. The implication for future research is found within two main areas namely, methodological and research direction.

¬***Future Methodological Direction.*** In this case there are a number of opportunities to further explore the present study using a variety of research methodology. This study applied a deductive approach based on a natural science model (i.e. positivism) and in which data collection and data analysis processes was undertaken (Guba & Lincoln 1994). Whilst, a quantitative approach is considered a justifiable research approach due to the application of rigorous techniques and protocols, it may lack some aspects of understanding in which a qualitative approach provides (Cresswell 2009). Hence, in future this model can be tested using alternative methods such as a qualitative approach or a mixed method approach to further explore the behavioural aspect of food choice among people with diabetes.

Researchers (Kubacki & Rundle-Thiele 2016; Novelli 1997) state that for most social marketing or health behaviour studies the research focus is rather narrow with self-completion surveys or focus groups as the main area of research. Hence, it has been suggested (Kubacki et.al. 2015) that social marketing researchers should widen their research scope using multiple research approaches such as triangulation or longitudinal studies. Therefore, there is opportunity in future to conduct other research methods to gain new insights into this study.

¬***Future Research Direction.*** There are a number of areas in which this study can be further explored, this includes global direction, Comparative studies between diabetes categories, extending to other health areas. This is further explained in the following sections.

1. Global Direction. Firstly, this study is conducted in Australia and therefore there is future opportunity to conduct this study in other global regions. As diabetes is a global pandemic (Diabetes Australia 2016), this would allow for comparative or cross-cultural studies and collaborations to gather a wider set of empirical evidence with the current study. Research collaborations such as this will likely inform global health agencies and health systems on the barriers to healthy living amongst people with diabetes so that extensive health strategies can be introduced to minimise the global threat of diabetes.

2. Comparison between Diabetes Categories. Another area which could be explored further is to examine the differences in dietary compliance between Type I and Type II diabetes categories. Whilst the two categories are different in terms of their medical condition (Chapter 1,), it is still recommended for people with Type I and Type II diabetes to include diet and exercise as part of their diabetes therapy. However, there is evidence (Tse et al. 2012; Kumar & Holt 2015) to suggest that these two groups may behave differently due to their different medical conditions and medical therapy. Therefore, food decisions and behaviours may be different and if so it would be interesting to note these differences and the factors which impact these differences. This would then provide further evidence for social marketers in the area of health to provide targeted and segmented diabetes campaigns (Kubacki, Rundle-Theile & Buyucek 2015; Kubacki & Rundle-Thiele 2016) to effectively target the unique needs of each diabetes category.

3. Other Health Areas. Whilst the focus of this study is on diabetes related eating behaviour, there is potential for this study to be used in other areas of health concern such as obesity or disordered eating. Obesity and disordered eating is a major problem facing many societies (Teik 2015; Mason et al. 2016), therefore, this study could provide a framework to further investigate and contribute towards health issues such as these. At the same time, another use of this study in future would be to further understand health coping behaviour among individuals with multiple health issues such as those with diabetes and celiac disease amongst others (Cohn, Sofia, & Kupfer 2014). For such cases the challenges of juggling multiple illness and managing their diets can be overwhelming and at the same time a challenge for the health system to manage (Cohn, Sofia, & Kupfer 2014).

Finally, this research could potentially be a benchmark to understand health behaviour in other areas of disease such as HIV, drug addiction or other forms of addiction which may require behaviour modification initiatives (Andreasen 2002; Friedman et al. 2016). In this case adaptation of this study into these health areas could also benefit social support mechanisms and social marketers involved with behaviour modification or rehabilitation programs in broader areas of health management and care. Information from this study could also provide a framework in developing counselling and or educational training programs for the relevant counsellors, support networks and agencies to provide better care and services when dealing with those who require their services.

5.7 Chapter Summary

In conclusion this chapter combined findings from the research objectives and the literature to provide conclusions and implications for the research questions. This study has provided three alternative models based on the initial research findings from Phase I, II and III which allows for a more substantial and comprehensive understanding of the factors which influences dietary compliance for people with diabetes. The models presented are valid models for measuring self-efficacy, food risk perception, food related lifestyles and social support groups usage, all of which are key factors found to impact food choices amongst people with diabetes. The present study is also a likely useful framework for the development of social marketing behaviour modification programs targeting people with diabetes. Specifically, this study highlights the importance of considering the cognitive or behavioural aspects of health behaviour which is a crucial part of diabetes management and hence warrants further attention in the area of health behaviour modification.

Additionally, the research findings can provide information which can be adapted by the health system and/or other diabetes support agencies to improve and better manage diabetes related health initiatives. This study also provides a number of implications for future research opportunities, collaborative research undertakings and adaptation of this research into other areas of health and disease management. Importantly, this study will likely provide valuable insights and a framework for the health system and social marketing practitioners to deliver sustainable and value driven health programs and services for the benefit of people with diabetes. All of which is an important step towards limiting the growing burdens and costs of diabetes.

LIST OF REFERENCES

Aaker, D, Kumar, V & Day, G 2003, *Marketing research. 800 p*, John Wiley and Sons, New York, USA.

Abbott, A & Pearson, H 2004, 'Fear of human pandemic grows as bird flu sweeps through Asia', *Nature*, vol. 427, no. 6974, pp. 472-3.

Adler, A 1927, 'Understanding human nature'.

Adler-Milstein, J, Ronchi, E, Cohen, GR, Winn, LAP & Jha, AK 2013, 'Benchmarking health IT among OECD countries: better data for better policy', *Journal of the American Medical Informatics Association,* vol.21, no. 1, pp.111-116.

Ahola, A & Groop, PH 2013, 'Barriers to self-management of diabetes', *Diabetic Medicine*, vol. 30, no. 4, pp. 413-20.

Albright, AL & Gregg, EW 2013, 'Preventing type 2 diabetes in communities across the US: the National Diabetes Prevention Program', *American journal of preventive medicine*, vol. 44, no. 4, pp. S346-S51.

Alkerwi, A, Sauvageot, N, Nau, A, Lair, M-L, Donneau, A-F, Albert, A & Guillaume, M 2012, 'Population compliance with national dietary recommendations and its determinants: findings from the ORISCAV-LUX study', *British Journal of Nutrition*, vol. 108, no. 11, pp. 2083-92.

American Diabetes Association 2013, viewed 10 December 2014, <http://www.diabetes.org/>

American Diabetes Association, 2017, 'Lifestyle management', *Diabetes care,* no. 40, Supplement 1, pp.S33-S43.

Andreasen, AR 1994, 'Social marketing: Its definition and domain', *Journal of public policy & marketing*, pp. 108-14.

Antonovsky, A 1974, *Conceptual and methodological problems in the study of resistance resources and stressful life events. In Stressful Life Events: Their Nature and Effects,*
Dohrenwend, BS & Dohrenwend, BP. Eds, Wiley, New York.

Australian Institute of Health and Welfare 2013, *Prevalence of diabetes*, viewed 14 November 2013, <http://www.aihw.gov.au/diabetes-indicators/prevalence/ >

Australian Institute of Health and Welfare 2016. *Australia's health 2016*. Australia's health series no. 15. Cat. No. AUS 199. Canberra: AIHW.

Australian Institute of Health and Welfare 2016. *Health expenditure Australia 2014–15*. Health and welfare expenditure series no. 57. Cat. No. HWE 67. Canberra: AIHW

Australian Institute of Health and Welfare 2017, *How many Australians have diabetes? Diabetes indicators, Australia: Prevalence of diabetes*, viewed 12 April 2017 http://www.aihw.gov.au/diabetes/indicators/#u1

Ayling, K, Brierley, S, Johnson, B, Heller, S & Eiser, C 2015, 'How standard is standard care? Exploring control group outcomes in behaviour change interventions for young people with type 1 diabetes', *Psychology & health*, vol. 30, no. 1, pp. 85-103.

Aziz, Z, Absetz, P, Oldroyd, J, Pronk, NP & Oldenburg, B 2015, ‘A systematic review of real-world diabetes prevention programs: learnings from the last 15 years,’ *Implementation Science*, vol.10, no. 1, pp.172.

Baek, RN, Tanenbaum, ML & Gonzalez, JS 2014, ‘Diabetes burden and diabetes distress: The buffering effect of social support’, *Annals of Behavioral Medicine*, vol. *48*, no. 2, pp.145-155.

Bagozzi, RP, Yi, Y & Phillips, LW 1991, 'Assessing construct validity in organizational research', *Administrative science quarterly*, pp. 421-58.

Bagozzi, RP & Yi, Y 2012, 'Specification, evaluation, and interpretation of structural equation models', *Journal of the academy of marketing science*, vol. 40, no. 1, pp. 8-34

Baker Heart & Diabetes Institute 2017, *Diabetes and your health*, viewed 18 April 2017 https://www.baker.edu.au/health_fact_sheets/diabetes_your_health/

Baker IDI, 2012, *diabetes: the silent pandemic and its impact on Australia* viewed December 10 2014, <https://static.diabetesaustralia.com.au/s/fileassets/diabetes-australia/e7282521-472b-4313-b18e-be84c3d5d907.pdf>

Bandura, A 1996, ‘Health promotion from the perspective of social cognitive theory’, *Psychology and Health*, vol. 13, pp. 623-649.

Bandura, A 1994, *Self-efficacy*, Wiley Online Library.

Bandura, A 1991, ‘Social cognitive theory of self-regulation’, *Organizational Behaviour and Human Decision Processes*, vol. 50, pp. 248-287.

Bandura, A 1986. The explanatory and predictive scope of self-efficacy theory. *Journal of social and clinical psychology*, *4*(3), pp.359-373.

Bandura, A, Adams, NE & Beyer, J 1977, 'Cognitive processes mediating behavioral change', *Journal of personality and social psychology*, vol. 35, no. 3, p. 125.

Bandura, A, Adams, NE, Hardy, AB & Howells, GN 1980, 'Tests of the generality of self-efficacy theory', *Cognitive therapy and research*, vol. 4, no. 1, pp. 39-66.

Bandura, A & McClelland, DC 1977, 'Social learning theory'.

Baron, RM & Kenny, DA 1986, 'The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations', *Journal of personality and social psychology*, vol. 51, no. 6, p. 1173.

Baruch, Y & Holtom, BC 2008, 'Survey response rate levels and trends in organizational research', *Human relations*, vol. 61, no. 8, pp. 1139-60.

Baruch, Y 1999, 'Response rate in academic studies-A comparative analysis', *Human relations*, vol. 52, no. 4, pp. 421-38.

Basu, S, Yoffe, P, Hills, N & Lustig, RH 2013, 'The relationship of sugar to population-level diabetes prevalence: an econometric analysis of repeated cross-sectional data', *PloS one*, vol. *8*, no. 2, p.e57873.

Bhattacharya, G 2012, 'Self-management of type 2 diabetes among African Americans in the Arkansas Delta: A strengths perspective in social-cultural context', *Journal of Health Care for the Poor and Undeserved*, vol. 23, no. 1, pp. 161-178.

Bilotta, C, Bowling, A, Nicolini, P, Casè, A & Vergani, C 2012, 'Quality of life in older outpatients living alone in the community in Italy', *Health & social care in the community*, vol. 20, no. 1, pp. 32-41.

Bilotta, F & Rosa, G 2012, 'Glycemia management in critical care patients.' *World Journal of Diabetes*, *3*(7), pp.130-4.

Bíró, A 2015, 'Did the junk food tax make the Hungarians eat healthier?' *Food Policy*, vol. 54, pp.107-115.

Blair, J, Czaja, RF & Blair, EA 2013, *Designing Surveys: A Guide to Decisions and Procedures: A Guide to Decisions and Procedures*, Sage Publications.

Blaxter, L, Hughes, C & Tight M 1996, *How to research*, Buckingham: Open University Press.

Bodicoat, DH, Carter, P, Comber, A, Edwardson, C, Gray, LJ, Hill, S, Webb, D, Yates, T, Davies, MJ & Khunti, K 2015, 'Is the number of fast-food outlets in the neighbourhood related to screen-detected type 2 diabetes mellitus and associated risk factors?', *Public health nutrition*, vol.*18*, no. 9, pp.1698-1705.

Boyland, EJ & Whalen, R 2015, 'Food advertising to children and its effects on diet: review of recent prevalence and impact data', *Pediatric diabetes*, vol.*16*, no.5, pp.331-337.

Brewer, NT, Weinstein, ND, Cuite, CL & Herrington Jr, JE 2004, 'Risk perceptions and their relation to risk behavior', *Annals of Behavioral Medicine*, vol. 27, no. 2, pp. 125-30.

Browne, JL, Ventura, A, Mosely, K & Speight, J 2013, ''I call it the blame and shame disease': a qualitative study about perceptions of social stigma surrounding type 2 diabetes', *BMJ open*, vol. 3, no. 11, p. e003384.

Brunsø, K & Grunert, GG 1995, 'Development and testing of a cross-culturally valid instrument: food-related life style', *Advances in Consumer Research*, vol. 22.

Bryman, A & Bell, E 2015, *Business research methods*, Oxford University Press, USA.

Byrne, BM 2013, *Structural equation modeling with Mplus: Basic concepts, applications, and programming*, Routledge.

Callaghan, P & Morrissey, J 1993, 'Social support and health: a review', *Journal of advanced nursing*, vol. 18, no. 2, pp. 203-10.

Caplan, G 1974, *Support Systems and Community Mental Health,* Behavioural Publications, New York.

Carins, JE & Rundle-Thiele, SR 2014, 'Eating for the better: A social marketing review (2000–2012)', *Public health nutrition*, vol. 17, no. 7, pp. 1628-39.

Cembalo, L, Lombardi, A, Pascucci, S, Dentoni, D, Migliore, G, Verneau, F & Schifani, G 2015, '"Rationally Local": Consumer Participation in Alternative Food Chains', *Agribusiness*, vol. 31, no. 3, pp.330-352.

Cha, E, Kim, KH, Lerner, HM, Dawkins, CR, Bello, MK, Umpierrez, G & Dunbar, SB 2014, 'Health literacy, self-efficacy, food label use, and diet in young adults', *American journal of health behavior*, vol. 38, no. 3, p. 331.

Charles, D 2001, 'Why North Americans think what they do about GM food', *Biotechnology and Development Monitor*, vol. 47, pp. 10-2.

Chew, BH, Khoo, EM & Chia, YC 2015, 'Social support and glycemic control in adult patients with type 2 diabetes mellitus', *Asia-Pacific Journal of Public Health*, vol. *27*, no.2, pp. NP166-NP173.

Chia, R 2002, 'The production of management knowledge: philosophical underpinnings of research design', *Essential Skills for Management Research, Sage, London*, pp. 1-18.

Chin, WW 1998a, 'The Partial Least Squares Approach to Structural Equation Modeling', In G.A. Marcoulides (Ed.), *Modern Business Research Methods*, pp. 295-358, Mahwah, NJ: Lawrence Erlbaum Associates.

Chin, WW 1998b, 'Issues and opinions on Structural Equation Modeling', *MIS Quarterly*, vol. 22 no. 1, pp. 7-16.

Chin, WW 2010, 'How to Write up and Report PLS Analyses', In V. Esposito Vinze, WW.

Chin, J. Henseler, and H. Wang (Eds.), Handbook of partial least squares: Concepts, methods and application (pp. 645 - 689). New York: Springer.

Cohen, J. (1988). Statistical power analysis for the behavioural sciences. Mahwah, NJ: Lawrence Erlbaum Associates.

Chlebowy, DO, Hood, S & LaJoie, AS 2013, 'Gender differences in diabetes self-management among African American adults', *Western journal of nursing research*, p. 0193945912473370.

Choi, NG & DiNitto, DM 2013, 'The digital divide among low-income homebound older adults: Internet use patterns, eHealth literacy, and attitudes toward computer/Internet use', *Journal of medical Internet research*, vol. 15, no. 5, p. e93.

Churchill Jr, GA 1979, 'A paradigm for developing better measures of marketing constructs', *Journal of marketing research*, pp. 64-73.

Cobb, S 1976, 'Social support as a moderator of life stress', *Psychosomatic medicine*, vol. 38, no. 5, pp. 300-14.

Cockerham, WC 2005, 'Health lifestyle theory and the convergence of agency and structure', *Journal of health and social behavior*, vol. 46, no. 1, pp. 51-67.

Cohen, J 1988, 'The effect size index: d', *Statistical power analysis for the behavioral sciences*, vol. 2, pp. 284-8.

Cohen, S & Wills, TA 1985, 'Stress, social support, and the buffering hypothesis', *Psychological bulletin*, vol. 98, no. 2, p. 310.

Conklin, AI, Forouhi, NG, Surtees, P, Khaw, KT, Wareham, NJ & Monsivais, P 2014. 'Social relationships and healthful dietary behaviour: evidence from over-50s in the EPIC cohort, UK.' *Social Science & Medicine*, *100*, pp.167-175.

Creswell, JW 2003, *Research design*, Thousand Oaks, CA: Sage.

Critchley, CR, Hardie, EA & Moore, SM 2012, 'Examining the psychological pathways to behavior change in a group-based lifestyle program to prevent type 2 diabetes', *Diabetes care*, vol. 35, no. 4, pp. 699-705.

Cripps, H & Standing, C 2011, 'The implementation of electronic health records: A case study of bush computing the Ngaanyatjarra Lands', *International journal of medical informatics*, vol. 80, no. 12, pp. 841-8.

Dale, J, Williams, S & Bowyer, V 2012, 'What is the effect of peer support on diabetes outcomes in adults? A systematic review', *Diabetic Medicine*, vol. 29, no. 11, pp. 1361-77.

Deeb, A, Abu-Awad, S, Abood, S, El-Abiary, M, Al-Jubeh, J, Yousef, H, AbdelRahman, L, Al Hajeri, A & Mustafa, H 2015, 'Important determinants of diabetes control in insulin pump therapy in patients with type 1 diabetes mellitus', *Diabetes technology & therapeutics*, vol. 17, no. 3, pp. 166-70.

Deci, EL & Ryan, RM 2011, 'Self-determination theory', *Handbook of theories of social psychology*, vol. 1, pp. 416-33.

Dehghan, P, Asghari-Jafarabadi, M & Salekzamani, S 2015, 'Validity, Reliability and Feasibility of the Eating Behavior Pattern Questionnaire (EBPQ) among Iranian Female Students', *Health promotion perspectives*, vol. 5, no. 2, p. 128.

Denzin, N & Lincoln, Y 1998, *[Vol. 1]: The landscape of qualitative research: theories and issues*, Thousand Oaks [etc.]: Sage.

de Souza Lima, AP, Müller, RCS, de Souza Sarkis, JE, Alves, CN, da Silva Bentes, MH, Brabo, E & de Oliveira Santos, E 2000, 'Mercury contamination in fish from Santarém, Pará, Brazil', *Environmental Research*, vol. 83, no. 2, pp. 117-22.

Dietrich, T, Rundle-Thiele, S, Leo, C & Connor, J 2015, 'One size (never) fits all: Segment differences observed following a school-based alcohol social marketing program', *Journal of School Health*, vol. 85, no. 4, pp. 251-9.

Dinca-Panaitescu, S, Dinca-Panaitescu, M, Bryant, T, Daiski, I, Pilkington, B & Raphael, D 2011, 'Diabetes prevalence and income: results of the Canadian Community Health Survey', *Health Policy*, vol. 99, no. 2, pp. 116-23.

Diabetes Australia 2017, *Diabetes in Australia*, viewed 18 April 2017 https://www.diabetesaustralia.com.au/diabetes-in-australia

Diabetes Australia 2016, '*the State of the Nation Report'*, viewed 27 February 2017, <https://static.diabetesaustralia.com.au/s/fileassets/diabetes-australia/0e17949e-4ba7-4c6f-a251-3f020ed2d8e6.pdf>

Duffett, M, Burns, KE, Adhikari, NK, Arnold, DM, Lauzier, F, Kho, ME, Meade, MO, Hayani, O, Koo, K & Choong, K 2012, 'Quality of reporting of surveys in critical care journals: a methodologic review', *Critical care medicine*, vol. 40, no. 2, pp. 441-9.

Dumas, A, Robitaille, J & Jette, SL 2014, 'Lifestyle as a choice of necessity: Young women, health and obesity', *Social Theory & Health*, vol. 12, no. 2, pp. 138-58.

Dunbar, JA, Jayawardena, A, Johnson, G, Roger, K, Timoshanko, A, Versace, VL, Shill, J, Philpot, B, Vartiainen, E & Laatikainen, T 2014, 'Scaling up diabetes prevention in Victoria, Australia: policy development, implementation, and evaluation', *Diabetes care*, vol. 37, no. 4, pp. 934-42.

Dwyer, JT, Fulgoni III, VL, Clemens, RA, Schmidt, DB, Freedman MR 2012, 'Is "processed" a four-letter word? The role of processed foods in achieving dietary guidelines and nutrient recommendations', *American Society for Nutrition, Advances in Nutrition*, vol. 3, pp. 536-548.

Dykema, J, Stevenson, J, Klein, L, Kim, Y & Day, B 2013, 'Effects of e-mailed versus mailed invitations and incentives on response rates, data quality, and costs in a web survey of university faculty', *Social Science Computer Review*, vol. 31, no. 3, pp. 359-70.

Dyson, PA, Kelly T, Deakin T, Duncan A, Frost, G, Harrison Z, Khatri D, Kunka D, Mc Ardle P, Mellor, D, Oliver, L & Worth J 2011, 'Diabetes UK position statements and care recommendations: diabetes UK evidence-based nutrition guidelines for the prevention and management of diabetes', *Diabetic Medicine*, vol. 28, pp. 1282–1288.

Efron, B & Tibshirani, RJ 1994, *An introduction to the bootstrap*, CRC press.

Evert, AB, Boucher, JL, Cypress, M, Dunbar, SA, Franz, MJ, Mayer-Davis, EJ, Neumiller, JJ, Nwankwo, R, Verdi, CL & Urbanski, P 2014, 'Nutrition therapy recommendations for the management of adults with diabetes', *Diabetes care*, vol. 37, no. Supplement 1, pp. S120-S43.

F. Hair Jr, J, Sarstedt, M, Hopkins, L & G. Kuppelwieser, V 2014, 'Partial least squares structural equation modeling (PLS-SEM) An emerging tool in business research', *European Business Review*, vol. 26, no. 2, pp. 106-21.

Falguera V, Aliguer N, Falguera M 2012, ‘An integrated approach to current trends in food consumption: Moving toward functional and organic products?’ *Food Control*, vol. 31, no.26(2), pp.274-81.

Fan, W & Yan, Z 2010, 'Factors affecting response rates of the web survey: A systematic review', *Computers in human behavior*, vol. 26, no. 2, pp. 132-9.

Faul, F & Erdfelder, E 1992, 'GPOWER: A priori, post-hoc, and compromise power analyses for MS-DOS [Computer program]', *Bonn, FRG: Bonn University, Department of Psychology*.

Field, A 2009, *Discovering statistics using SPSS*, Sage publications.

Fife-Schaw, C & Rowe, G 1996, 'Public perceptions of everyday food hazards: A psychometric study', *Risk analysis*, vol. 16, no. 4, pp. 487-500.

Fife-Schaw, C & Rowe, G 2000, ‘Research Note: Extending the application of the psychometric approach for assessing public perceptions of food risk: some methodological considerations’, *Journal of Risk Research*, vol.*3*, no. 2, pp. 167-179.

Fisher, J & Clayton, M 2012, 'Who gives a tweet: assessing patients’ interest in the use of social media for health care', *Worldviews on Evidence-Based Nursing*, vol. 9, no. 2, pp. 100-8.

Fisher, L, Hessler, D, Masharani, U & Strycker, L 2014, ‘Impact of baseline patient characteristics on interventions to reduce diabetes distress: the role of personal conscientiousness and diabetes self-efficacy’, *Diabetic Medicine,* vol. *31*, no. 6, pp.739-746.

Fisher, L, Polonsky, WH, Hessler, DM, Masharani, U, Blumer, I, Peters, AL, Strycker, LA, & Bowyer, V 2015, ‘Understanding the sources of diabetes distress in adults with type 1 diabetes’, *Journal of Diabetes and its Complications*, vol.*29, no.*4, pp.572-577.

Fornell, C & Larcker, DF 1981, 'Structural equation models with unobservable variables and measurement error: Algebra and statistics', *Journal of marketing research*, pp. 382-8.

Free, C, Phillips, G, Galli, L, Watson, L, Felix, L, Edwards, P, Patel, V & Haines, A 2013, 'The effectiveness of mobile-health technology-based health behaviour change or disease management interventions for health care consumers: a systematic review', *PLoS med*, vol. 10, no. 1, p. e1001362.

Frewer, LJ, Howard, C, Hedderley, D & Shepherd, R 1996, ‘What determines trust in information about food-related risks? Underlying psychological constructs’, *Risk analysis*, vol.*16*, no. 4, pp.473-486.

Fukunaga LL, Uehara DL, Tom T 2011, ‘Perceptions of diabetes, barriers to disease management, and service needs: a focus group study of working adults with diabetes in Hawaii’, *Preventing Chronic Disease*, vol. 8, no. 2, A32.

Fukuoka, Y, Lindgren, TG, Bonnet, K & Kamitani, E 2014, ‘Perception and sense of control over eating behaviors among a diverse sample of adults at risk for type 2 diabetes’, *The Diabetes Educator*, pp. 0145721714522717.

Gao J, Wang J, Zheng P, Haardörfer R, Kegler MC, Zhu Y, Fu H 2013, ‘Effects of self-care, self-efficacy, social support on glycemic control in adults with type 2 diabetes’, *BMC family practice.* vol. 24, no. 14(1), pp. 66.

Gefen, D, Straub, D & Boudreau, M-C 2000, 'Structural equation modeling and regression: Guidelines for research practice', *Communications of the association for information systems*, vol. 4, no. 1, p. 7.

George, D & Mallery, M 2010, 'SPSS for Windows Step by Step: A Simple Guide and Reference, Boston: Pearson'.

German, PS 1988, 'Compliance and chronic disease', *Hypertension*, vol. 11, no. 3 Pt 2, p. II56.

George, KS, Roberts, CB, Beasley, S, Fox, M & Rashied-Henry, K 2016, ‘Our Health Is in Our Hands A Social Marketing Campaign to Combat Obesity and Diabetes’, *American Journal of Health Promotion*, vol. 30, no.4, pp.283-286.

Glasgow, RE, Kurz, D, King, D, Dickman, JM, Faber, AJ, Halterman, E, Woolley, T, Toobert, DJ, Strycker, LA & Estabrooks, PA 2012, 'Twelve-month outcomes of an Internet-based diabetes self-management support program', *Patient education and counseling*, vol. 87, no. 1, pp. 81-92.

Gold, A.H., Malhotra, A. and Segars, A. H. (2001). Knowledge management: an organizational capabilities perspective. *Journal of Management Information Systems*, 18(1), 185-214

Goodall, I, Shephard, M & Tate, J 2015, 'Recommended Changes in HbA1c Reporting Units for Australian Laboratories', *Position Statement of the Australasian Association of Clinical Biochemists.—2010.—6 p*.

Graham, JW 2009, 'Missing data analysis: Making it work in the real world', *Annual review of psychology*, vol. 60, pp. 549-76.

Gray, DE 2013, *Doing research in the real world*, Sage.

Graziano, AM & Raulin, ML 1993, *Research methods: A process of inquiry*, HarperCollins College Publishers.

Grier, S & Bryant, CA 2005, 'Social marketing in public health', *Annu. Rev. Public Health*, vol. 26, pp. 319-39.

Grunert, K, Brunsø, K & Bisp, S 1993, 'FRL: Development of a cross-culturally valid instrument for market surveillance'.

Guariguata, L, Whiting, D, Hambleton, I, Beagley, J, Linnenkamp, U & Shaw, J 2014, 'Global estimates of diabetes prevalence for 2013 and projections for 2035', *Diabetes research and clinical practice*, vol. 103, no. 2, pp. 137-49.

Guba, EG 1990, *The paradigm dialog*, Sage Publications.

Guba, EG & Lincoln, YS 1994, 'Competing paradigms in qualitative research', *Handbook of qualitative research*, vol. 2, no. 163-194, p. 105.

Haas, L, Maryniuk, M, Beck, J, Cox, CE, Duker, P, Edwards, L, Fisher, EB, Hanson, L, Kent, D & Kolb, L 2013, 'National standards for diabetes self-management education and support', *Diabetes care*, vol. 36, no. Supplement 1, pp. S100-S8.

Habing, B 2003, 'Exploratory factor analysis', *University of South Carolina-October*, vol. 15, p. 2003.

Hackworth, NJ, Matthews, J, Burke, K, Petrovic, Z, Klein, B, Northam, EA, Kyrios, M, Chiechomski, L & Cameron, FJ 2013, 'Improving mental health of adolescents with type 1 diabetes: protocol for a randomized controlled trial of the nothing ventured nothing gained online adolescent and parenting support intervention', *BMC public health*, vol. 13, no. 1, p. 1.

Hair Jr, JF, Anderson, RE, Tatham, RL & William, C 1995, 'Black (1995), Multivariate data analysis with readings', *New Jersy: Prentice Hall*.

Hair, JF, Ringle, CM & Sarstedt, M 2011, 'PLS-SEM: Indeed a silver bullet', *Journal of Marketing theory and Practice*, vol. 19, no. 2, pp. 139-52.

Harries, AD, Kumar, AM, Satyanarayana, S, Lin, Y, Zachariah, R, Lönnroth, K & Kapur, A 2016, 'Addressing diabetes mellitus as part of the strategy for ending TB', *Transactions of the Royal Society of Tropical Medicine and Hygiene*, vol. 110, no. 3, pp. 173-9.

Hayes, A. F. & Preacher, K. J. (2014). Statistical mediation analysis with a multicategorical independent variable. *British Journal of Mathematical and Statistical Psychology, 67*, 451-470

Heeler, RM & Ray, ML 1972, 'Measure validation in marketing', *Journal of marketing research*, pp. 361-70.

Heinrich, E, Schaper, NC & de Vries, NK 2015, 'Self-management interventions for type 2 diabetes: a systematic review', *European Diabetes Nursing*.

Henry, SL, Rook, KS, Stephens, MAP & Franks, MM 2013, 'Spousal undermining of older diabetic patients' disease management', *Journal of health psychology*, pp.1359105312465913.

Henseler, J, Ringle, CM & Sarstedt, M 2015, 'A new criterion for assessing discriminant validity in variance-based structural equation modeling', *Journal of the academy of marketing science*, vol. 43, no. 1, pp. 115-35.

Henson, RK & Roberts, JK 2006, 'Use of exploratory factor analysis in published research: Common errors and some comment on improved practice', *Educational and Psychological measurement*, vol. 66, no. 3, pp. 393-416.

Hinder, S & Greenhalgh, T 2012,"This does my head in". Ethnographic study of self-management by people with diabetes', *BMC Health Services Research*, vol. 12, no. 83.

Hinton, PR 2016, *Presenting Your Data with Spss*, Routledge.

Ho, EY, Chesla, CA & Chun, KM 2012, 'Health communication with Chinese Americans about type 2 diabetes', *The Diabetes Educator*, vol. 38, no. 1, pp. 67-76.

Hollands, GJ, Marteau, TM & Fletcher, PC 2016, 'Non-conscious processes in changing health-related behaviour: a conceptual analysis and framework.' *Health psychology review*, *10*(4), pp.381-394.

Holsten, JE, Deatrick, JA, Kumanyika, S, Pinto-Martin, J & Compher, CW 2012, 'Children's food choice process in the home environment. A qualitative descriptive study.' *Appetite*, *58*(1), pp.64-73.

Holt, T & Kumar, S 2015, *ABC of Diabetes*, John Wiley & Sons.

Hu, J, Amirehsani, K, Wallace, DC & Letvak, S 2013, 'Perceptions of Barriers in Managing Diabetes Perspectives of Hispanic Immigrant Patients and Family Members', *The Diabetes Educator*, p. 0145721713486200.

Hulland, J 1999, 'Use of partial least squares (PLS) in strategic management research: A review of four recent studies', *Strategic management journal*, pp. 195-204.

Hunt, CW 2015, 'Technology and diabetes self-management: An integrative review', *World journal of diabetes*, vol.6, no.2, pp.225-233.

Hustad, TP & Pessemier, EA 1971, *Industry's use of life style analysis: Segmenting consumer market with activity and attitude measures*, Purdue University.

Igumbor, EU, Sanders, D, Puoane, TR, Tsoleklle, L, Schwarz, C, Purdy C, Swart, R, Durao, S & Hawkes C 2012, '"Big Food," the consumer food environment, health, and the policy response in South Africa', *PLoS Medicine*, vol. 9.

International Diabetes Federation 2017, *Diabetes Facts and Figures*, viewed 18 April 2017 http://www.idf.org/about-diabetes/facts-figures

Iranagh, JA, Rahman, HA & Motalebi, SA 2016, 'Health Belief Model-based intervention to improve nutritional behavior among elderly women', *Nutrition research and practice*, vol. 10, no. 3, pp. 352-8.

Jang, Y & Yoo, H 2012, 'Self-management programs based on the social cognitive theory for Koreans with chronic disease: a systematic review', *Contemporary nurse*, vol. 40, no. 2, pp. 147-59.

Jones, A, Olsen, MZ, Perrild, HJ & Willaing, I 2016, 'The psychological impact of living with diabetes: descriptive findings from the DAWN2 study in Denmark', *Primary care diabetes*, vol.10, no.1, pp.83-86.

Joseph, RP, Royse, KE, Benitez, TJ & Pekmezi, DW 2014, 'Physical activity and quality of life among university students: exploring self-efficacy, self-esteem, and affect as potential mediators', *Quality of life research*, vol. 23, no. 2, pp. 659-67.

Kahneman, D 1982, *The simulation heuristic In D Kahneman, P Slovic, & A. Tversky (Eds), judgment under uncertainty: Heuristics and biases (pp 201-208)*, Cambridge, England: Cambridge University Press.

Kahn, R & Davidson, MB 2014, ‘The reality of type 2 diabetes prevention,’ *Diabetes care*, vol. 37, no. 4, pp.943-949.

Kamimura, A, Christensen, N, Myers, K, Nourian, MM, Ashby, J, Greenwood, JL & Reel, JJ 2014, ‘Health and diabetes self-efficacy: A study of diabetic and non-diabetic free clinic patients and family members’, *Journal of community health*, vol. 39, no. 4, pp.783-791

Kelly, GA 1955, 'A theory of personal constructs', *New York: Norton. Nellie Ismail, Tan Jo-Pei and Rahimah Ibrahim pre-to postnatal period. Journal of Reproductive and Infant Psychology*, vol. 19, no. 2, pp. 83-110.

Kim, G, Shim, R, Ford, KL & Baker, TA 2014, ‘The Relation Between Diabetes Self-Efficacy and Psychological Distress Among Older Adults Do Racial and Ethnic Differences Exist?’, *Journal of aging and health*, pp. 0898264314549662.

Kirwan, M, Vandelanotte, C, Fenning, A, Duncan, MJ 2013, ‘Diabetes self-management smartphone application for adults with type 1 diabetes: randomized controlled trial’, *Journal of medical Internet research*, vol.*15*, no. 11, pp.e235.

Kline, R.B. (2011) Principles and practice of structural equation modeling. New York: Guilford Press.

Kock, N & Lynn, G 2012, 'Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations'.

Kotler, P & Zaltman, G 1971. Social marketing: an approach to planned social change. *The Journal of Marketing*, pp.3-12.

Kovacs BK, Nicolucci, A, Holt, RIG, Willaing, I, Hermanns, N, Kalra, S, Wens, J, Pouwer, F, Skovlund, SE & Peyrot, M 2013, ‘Diabetes Attitudes, Wishes and Needs second study (DAWN2™): Cross- national benchmarking indicators for family members living with people with diabetes’, *Diabetic Medicine*, vol. 30, no.7, pp.778-788.

Kubacki, K, Rundle-Thiele, S, Pang, B & Buyucek, N 2015, 'Minimizing alcohol harm: A systematic social marketing review (2000–2014)', *Journal of Business Research*, vol. 68, no. 10, pp. 2214-22.

Ku, GMV & Kegels, G 2015, ‘Knowledge, attitudes and perceptions of people with type 2 diabetes as related to self-management practices: results of a cross-sectional study conducted in Luzon, Philippines’, *Chronic illness*, vol. 11, no.2, pp.93-107.

Lamichhane, AP, Mayer-Davis, EJ, Puett, R, Bottai, M, Porter, DE & Liese, AD 2012, 'Associations of built food environment with dietary intake among youth with diabetes', *Journal of nutrition education and behavior*, vol. 44, no. 3, pp. 217-24.

Leedy, P & Ormond, J 2005, 'Review of the related literature', *Practical research: Planning and design*, pp. 64-84.

Lee, CMY, Colagiuri, R, Magliano, DJ, Cameron, AJ, Shaw, J, Zimmet, P & Colagiuri, S 2013, 'The cost of diabetes in adults in Australia', *Diabetes research and clinical practice*, vol. 99, no. 3, pp. 385-90.

Lee, SM, Lim, LC & Koh, D 2015, ‘Stigma among workers attending a hospital specialist diabetes clinic’, *Occupational Medicine*, vol.65, no.1, pp.67-71.

Lefebvre, RC 2000, 'Theories and models in social marketing', *Handbook of marketing and society*, pp. 506-18.

Ley, SH, Hamdy, O, Mohan, V, & Hu, FB 2014, ‘Prevention and management of type 2 diabetes: dietary components and nutritional strategies’, *The Lancet*, vol.383, no.9933, pp.1999-2007.

Liaw, ST, Taggart, J, Yu, H, de Lusignan, S, Kuziemsky, C & Hayen, A 2014, ‘Integrating electronic health record information to support integrated care: practical application of ontologies to improve the accuracy of diabetes disease registers’, *Journal of Biomedical Informatics*, vol. 52, pp.364-372.

Lineback, JF & Thompson, KJ 2010, 'Conducting nonresponse bias analysis for business surveys', *Journal of Services Marketing*.

Little, RJ 1988, 'A test of missing completely at random for multivariate data with missing values', *Journal of the American Statistical Association*, vol. 83, no. 404, pp. 1198-202.

Llauradó, E, Aceves-Martins, M, Tarro, L, Papell-Garcia, I, Puiggròs, F, Arola, L, Prades-Tena, J, Montagut, M, Moragas-Fernández, CM, Solà, R & Giralt, M 2015, ‘A youth-led social marketing intervention to encourage healthy lifestyles, the EYTO (European Youth Tackling Obesity) project: a cluster randomised controlled0 trial in Catalonia, Spain’. *BMC public health*, vol. *15*, no.1, pp.607.

Lohmöller, J-B 1989, 'Predictive vs. Structural Modeling: PLS vs. ML', in *Latent Variable Path Modeling with Partial Least Squares*, Springer, pp. 199-226.

Lorig, KR, Ritter, P, Stewart, AL, Sobel, DS, Brown Jr, BW, Bandura, A, Gonzalez, VM, Laurent, DD & Holman, HR 2001, 'Chronic disease self-management program: 2-year health status and health care utilization outcomes', *Medical care*, vol. 39, no. 11, pp. 1217-23.

Loskutova, NY, Tsai, AG, Fisher, EB, LaCruz, DM, Cherrington, AL, Harrington, TM, Turner, TJ & Pace, WD, 2016, ‘Patient navigators connecting patients to community resources to improve diabetes outcomes’, *The Journal of the American Board of Family Medicine*, vol. 29, no.1, pp.78-89.

Luca, NR & Suggs, LS 2013, 'Theory and model use in social marketing health interventions', *Journal of health communication*, vol. 18, no. 1, pp. 20-40.

Lysy, Z, Booth, GL, Shah, BR, Austin, PC, Luo, J & Lipscombe, LL 2013, 'The impact of income on the incidence of diabetes: a population-based study', *Diabetes research and clinical practice*, vol. 99, no. 3, pp. 372-9.

Major, B, Hunger, JM, Bunyan, DP & Miller, CT 2014, ‘The ironic effects of weight stigma.’ *Journal of Experimental Social Psychology*, vol. 51, pp.74-80.

Mak, AH, Lumbers, M, Eves, A & Chang, RC 2012, 'Factors influencing tourist food consumption', *International Journal of Hospitality Management*, vol. 31, no. 3, pp. 928-36.

Malhotra, NK 2008, *Marketing research: An applied orientation, 5/e*, Pearson Education India.

Marwick, C 1998, 'Investigators Present Latest Findings on Hong Kong 'Bird Flu'to the FDA', *JAMA*, vol. 279, no. 9, pp. 643-4.

Mason, AE, Epel, ES, Kristeller, J, Moran, PJ, Dallman, M, Lustig, RH, Acree, M, Bacchetti, P, Laraia, BA, Hecht, FM. & Daubenmier, J 2016, 'Effects of a mindfulness-based intervention on mindful eating, sweets consumption, and fasting glucose levels in obese adults: data from the SHINE randomized controlled trial'. *Journal of behavioral medicine*, vol. *39*, no. 2, pp.201-213.

Mathew, R, Gucciardi, E, De Melo, M & Barata, P 2012,' Self-management experiences among men and women with type 2 diabetes mellitus: a qualitative analysis.' *BMC Family Practice*, vol. *13*, no.1, pp.122.

Mayberry, LS & Osborn, CY 2012, 'Family support, medication adherence, and glycemic control among adults with type 2 diabetes', *Diabetes care*, vol. 35, no. 6, pp. 1239-45.

Mayer, KJ & Sparrowe, RT 2013, 'Integrating theories in AMJ articles', *Academy of Management Journal*, vol. *56*, no. 4, pp.917-922.

McPeake, J, Bateson, M & O'Neill, A 2014, 'Electronic surveys: how to maximise success', *Nurse researcher*, vol. 21, no. 3, pp. 24-6.

Mehrens, WA 1997, 'The consequences of consequential validity', *Educational Measurement: Issues and Practice*, vol. 16, no. 2, pp. 16-8.

Messick, S 1988, 'MEANING AND VALUES IN TEST VALIDATION: THE SCIENCE AND ETHICS OF ASSESSMENT1', *ETS Research Report Series*, vol. 1988, no. 2, pp. i-28.

Meyers, LS, Gamst, GC & Guarino, A 2013, *Performing data analysis using IBM SPSS*, John Wiley & Sons.

Miller, CK, Kristeller, JL, Headings, A & Nagaraja, H 2014, 'Comparison of a Mindful Eating Intervention to a Diabetes Self-Management Intervention Among Adults With Type 2 Diabetes A Randomized Controlled Trial', *Health Education & Behavior*, vol.41, no.2, pp.145-154.

Mitchell, A 1983, *The VALS typology*, na.

Montaquila, JM & Olson, KM 2012, 'Practical Tools for Nonresponse Bias Studies', *SRMS/AAPOR Webinar*.

Moreno, G, Morales, LS, Isiordia, M de Jaimes, FN, Tseng, CH, Noguera, C & Mangione, CM 2015, 'Latinos with diabetes and food insecurity in an agricultural community', *Medical care*, vol.53, no.5, pp. 423.

Muchiri, JW, Gericke, GJ & Rheeder, P 2016, 'Effect of a nutrition education programme on clinical status and dietary behaviours of adults with type 2 diabetes in a resource-limited setting in South Africa: a randomised controlled trial', *Public health nutrition*, vol. 19, no.1, pp.142-155.

Nam, S, Chesla, C, Stotts, NA, Kroon, L & Janson LK 2011, 'Barriers to diabetes management: patient and provider factors', *Diabetes Research and Clinical Practice*, vol. 93, pp. 1-9.

National Health and Medical Research Council. Australian Dietary Guidelines (2015), viewed 27 February 2017, <https://www.eatforhealth.gov.au/guidelines/australian-dietary-guidelines-1-5>

Nevo, B 1985, 'Face validity revisited', *Journal of Educational Measurement*, vol. 22, no. 4, pp. 287-93.

Nicolaou, M, Vlaar, E, Van Valkengoed, I, Middelkoop, B, Stronks, K & Nierkens, V 2014, 'Development of a diabetes prevention program for Surinamese South Asians in the Netherlands', *Health promotion international*, vol.29, no.4, pp.680-691

Nitzl, C, Nitzl, C, Roldan, JL, Roldan, JL, Cepeda, G & Cepeda, G 2016, 'Mediation analysis in partial least squares path modeling: Helping researchers discuss more sophisticated models', *Industrial management & data systems*, vol. 116, no. 9, pp. 1849-64.

Ng, M, Fleming, T, Robinson, M, Thomson, B, Graetz, N, Margono, C, Mullany, EC, Biryukov, S, Abbafati, C, Abera, SF & Abraham, JP 2014, 'Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: a systematic analysis for the Global Burden of Disease Study 2013.' *Lancet*, vol. *384*, no. 9945, pp.766-781.

Ng, SW, Slining, MM & Popkin, BM 2014, 'Turning point for US diets? Recessionary effects or behavioral shifts in foods purchased and consumed', *The American journal of clinical nutrition*, vol. 99, no. 3, pp. 609-16.

Nurkkala, M, Kaikkonen, K, Vanhala, ML, Karhunen, L, Keränen, AM & Korpelainen, R 2015, 'Lifestyle intervention has a beneficial effect on eating behavior and long-term weight loss in obese adults.' *Eating behaviors*, vol.18, pp. 179-185.

Nunnally, JC & Bernstein, I 1994, 'The assessment of reliability', *Psychometric theory*, vol. 3, no. 1, pp. 248-92.

Olander, EK, Fletcher, H, Williams, S, Atkinson, L, Turner, A & French, DP 2013, 'What are the most effective techniques in changing obese individuals' physical activity self-efficacy and behaviour: a systematic review and meta-analysis', *Int J Behav Nutr Phys Act*, vol. 10, no. 1, pp. 29-.

OLSON, K, BOND, D & WING, RR 2017, 'Behavioral Approaches to the Treatment of Obesity', *Rhode Island medical journal (2013)*, vol. 100, no. 2, p. 21.

Onwuegbuzie, AJ & Leech, NL 2005, 'On becoming a pragmatic researcher: The importance of combining quantitative and qualitative research methodologies', *International journal of social research methodology*, vol. 8, no. 5, pp. 375-87.

organisation, WH 2015, 'Global Health Risks-Mortality and burden of disease attributable to selected major risks', *The Lancet*.

Organization, WH 2016, *Global report on diabetes*, World Health Organization.

Orji, R, Vassileva, J & Mandryk, RL 2013, 'LunchTime: a slow-casual game for long-term dietary behavior change', *Personal and Ubiquitous Computing*, vol. 17, no. 6, pp. 1211-21.

Palladino, DK & Helgeson, VS 2012, 'Friends or foes? A review of peer influence on self-care and glycemic control in adolescents with type 1 diabetes', *Journal of pediatric psychology*, vol. 37, no. 5, pp. 591-603.

Pallant, J 2013, *SPSS survival manual*, McGraw-Hill Education (UK).

Patra, J, Jha, P, Rehm, J & Suraweera, W 2014, 'Tobacco smoking, alcohol drinking, diabetes, low body mass index and the risk of self-reported symptoms of active tuberculosis: individual participant data (IPD) meta-analyses of 72,684 individuals in 14 high tuberculosis burden countries', *PloS one*, vol. 9, no. 5, p. e96433.

Pechmann, C & Catlin, JR 2016, 'The effects of advertising and other marketing communications on health-related consumer behaviors.' *Current Opinion in Psychology*, vol. 10, pp.44-49.

Podsakoff, PM & Organ, DW 1986, 'Self-reports in organizational research: Problems and prospects', *Journal of management*, vol. 12, no. 4, pp. 531-44.

Polit, DF & Beck, CT 2010, 'Generalization in quantitative and qualitative research: Myths and strategies', *International journal of nursing studies*, vol. 47, no. 11, pp. 1451-8.

Polonsky, WH, Fisher, L, Earles, J, Dudl, RJ, Lees, J, Mullan, J & Jackson, RA 2005, 'Assessing psychosocial distress in diabetes', *Diabetes care*, vol. 28, no. 3, pp. 626-31.

Presser, S, Couper, MP, Lessler, JT, Martin, E, Martin, J, Rothgeb, JM & Singer, E 2004, 'Methods for testing and evaluating survey questions', *Public opinion quarterly*, vol. 68, no. 1, pp. 109-30.

Pronk, NP & Remington, PL 2015, 'Combined diet and physical activity promotion programs for prevention of diabetes: Community preventive services task force recommendation statement task force statement on diabetes prevention with diet and physical activity', *Annals of internal medicine*, vol. 163, no. 6, pp.465-468.

RACGP 2013, *General practice management of type 2 diabetes 2014–15*, viewed 10 December 2014, < http://www.racgp.org.au/your-practice/guidelines/diabetes/>

Ramayah T, Cheah J, Chuah F, Ting H & Memon, MA 2016, *Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 3.0. An Updated and Practical Guide to Statistical Analysis Basic Level*. First Edition. Pearson Malaysia

Rasmussen, B, Ward, G, Jenkins, A, King, SJ & Dunning, T 2011, 'Young adults' management of Type 1 diabetes during life transitions.' *Journal of clinical nursing*, vol. 20, no. 13-14, pp.1981-1992.

Reeve, B & Jones, A 2016, 'Time to commit to good food policy', *Medical Journal of Australia Insight*.

Riddell, MA, Renwick, C, Wolfe, R, Colgan, S, Dunbar, J, Hagger, V, Absetz, P & Oldenburg, B 2012, 'Cluster randomized controlled trial of a peer support program for people with diabetes: study protocol for the Australasian peers for progress study', *BMC public health*, vol. 12, no. 1, p. 1.

Rietveld, T & Van Hout, R 1993, 'Statistical techniques for the study of language behaviour', *Berlijn: Mouton de Gruyter*.

Ringle, CM, Sarstedt, M & Straub, D 2012, 'A critical look at the use of PLS-SEM in MIS Quarterly'.

Rintala, T-M, Jaatinen, P, Paavilainen, E & Åstedt-Kurki, P 2013, 'Interrelation between adult persons with diabetes and their family a systematic review of the literature', *Journal of Family Nursing*, vol. 19, no. 1, pp. 3-28.

Robertson, SM, Amspoker, AB, Cully, JA, Ross, EL & Naik, AD 2013, 'Affective symptoms and change in diabetes self-efficacy and glycaemic control', *Diabetic Medicine*, vol. *30*, no.5, pp.e189-e196.

Rosland, AM, Piette, JD, Lyles, CR, Parker, MM, Moffet, HH, Adler, NE, Schillinger, D & Karter, AJ 2014, 'Social support and lifestyle vs. medical diabetes self-management in the Diabetes Study of Northern California (DISTANCE)', *Annals of Behavioral Medicine*, vol.*48*, no.3, pp.438-447.

Russell, SJ, El-Khatib, FH, Sinha, M, Magyar, KL, McKeon, K, Goergen, LG, Balliro, C, Hillard, MA, Nathan, DM & Damiano, ER 2014, 'Outpatient glycemic control with a bionic pancreas in type 1 diabetes', *New England Journal of Medicine*, vol. 371, no. 4, pp. 313-25.

Saba, A, Cupellaro, E & Vassallo, M 2014, 'Which dimensions of food-related lifestyle are likely to be associated with obesity in Italy?', *Public health nutrition*, vol. 17, no. 03, pp. 607-13.

Sandelowski, M 2014, 'Unmixing Mixed-Methods Research', *Research in Nursing & Health*, vol. 37, no. 1, pp. 3-8.

Saunders, MN 2011, *Research methods for business students, 5/e*, Pearson Education India.

Savoca, M & Miller, C 2001, 'Food selection and eating patterns: themes found among people with type 2 diabetes mellitus', *Journal of nutrition education*, vol. 33, no. 4, pp. 224-33.

Sax, LJ, Gilmartin, SK & Bryant, AN 2003, 'Assessing response rates and nonresponse bias in web and paper surveys', *Research in higher education*, vol. 44, no. 4, pp. 409-32.

Schabert, J, Browne, JL, Mosely, K & Speight, J 2013, 'Social stigma in diabetes', *The Patient-Patient-Centered Outcomes Research*, vol. 6, no. 1, pp. 1-10.

Sherbourne, CD & Stewart, AL 1991, 'The MOS social support survey', *Social Science & Medicine*, vol. 32, no. 6, pp. 705-14.

Sherer, M, Maddux, JE, Mercandante, B, Prentice-Dunn, S, Jacobs, B & Rogers, RW 1982, 'The self-efficacy scale: Construction and validation', *Psychological reports*, vol. 51, no. 2, pp. 663-71.

Schiøtz, ML, Bogelund, M, Almdal, Jensen, BB & Willaing, I 2011, 'Article: Education and psychological aspects. Social support and self-management behaviour among patients with type 2 diabetes', *Diabetic Medicine*, vol. 29, pp. 654-661.

Schlundt, DG, Hargreaves, MK & Buchowski, MS 2003, 'The eating behavior patterns questionnaire predicts dietary fat intake in African American women', *Journal of the American Dietetic Association*, vol. 103, no. 3, pp. 338-45.

Schmitt, A, Gahr, A, Hermanns, N, Kulzer, B, Huber, J & Haak, T 2013, 'The Diabetes Self-Management Questionnaire (DSMQ): development and evaluation of an instrument to assess diabetes self-care activities associated with glycaemic control', *Health and quality of life outcomes*, vol. 11, no. 1, p. 138.

Seiffge-Krenke, I, Laursen, B, Dickson, DJ & Hartl, AC 2013, 'Declining metabolic control and decreasing parental support among families with adolescents with diabetes: the risk of restrictiveness', *Journal of pediatric psychology*, pp. jst006.

Sekaran, O 2011, 'Research methods in management', *Translated by Mohammad Saebi and Mahmood Shirazi, Tehran: State Management Training Center*.

Seligman, HK, Jacobs, EA, López, A, Tschann, J & Fernandez, A 2012, 'Food insecurity and glycemic control among low-income patients with type 2 diabetes', *Diabetes care*, vol. 35, no. 2, pp. 233-8.

Seuring, T, Archangelidi, O & Suhrcke, M, 2015, 'The economic costs of type 2 diabetes: a global systematic review', *Pharmacoeconomics*, vol.33, no.8, pp.811-831.

Shen, H, Edwards, H, Courtney, M, McDowell, J & Wu, M 2012, 'Peer-led diabetes self-management programme for community-dwelling older people in China: study protocol for a quasi-experimental design', *Journal of advanced nursing*, vol. 68, no. 12, pp. 2766-77.

Shreck, E, Gonzalez, JS, Cohen, HW & Walker, EA 2014, 'Risk perception and self-management in urban, diverse adults with type 2 diabetes: the improving diabetes outcomes study', *International journal of behavioral medicine*, vol. 21, no. 1, pp. 88-98.

Shrivastava, SR, Shrivastava, PS & Ramasamy, J 2013, 'Role of self-care in management of diabetes mellitus', *Journal of diabetes and metabolic disorders*, vol. 12, no. 1, p. 1.

Simmons, D, Prevost, AT, Bunn, C, Holman, D, Parker, RA, Cohn, S, Donald, S, Paddison, CA, Ward, C, Robins, P & Graffy, J 2015, ‘Impact of community based peer support in type 2 diabetes: a cluster randomised controlled trial of individual and/or group approaches’, *PloS one*, vol.10, no. 3, pp.e0120277.

Singh, H, Cinnirella, M & Bradley, C 2012, 'Support systems for and barriers to diabetes management in South Asians and Whites in the UK: qualitative study of patients’ perspectives', *BMJ open*, vol. 2, no. 6, p. e001459.

Sleiman, D, Al-Badri, MR & Azar, ST 2015, 'Effect of Mediterranean diet in diabetes control and cardiovascular risk modification: a systematic review', *Frontiers in public health*, vol. 3, p. 69.

Slovic, P 1987, 'Perception of risk', *science*, vol. 236, no. 4799, pp. 280-5.

Snoek, FJ, Bremmer, MA & Hermanns, N 2015, ‘Constructs of depression and distress in diabetes: time for an appraisal’, *The Lancet Diabetes & Endocrinology*, vol.3, no.6, pp.450-460.

Sobel, ME 2013, *Lifestyle and social structure: Concepts, definitions, analyses*, Elsevier.

Song, Y, Song, H-J, Han, H-R, Park, S-Y, Nam, S & Kim, MT 2012, 'Unmet needs for social support and effects on diabetes self-care activities in Korean Americans with type 2 diabetes', *The Diabetes Educator*, vol. 38, no. 1, pp. 77-85.

Spector, PE 2006, 'Method variance in organizational research truth or urban legend?', *Organizational research methods*, vol. 9, no. 2, pp. 221-32.

Speight, J, Browne, JL, Holmes-Truscott, E, Hendrieckx, C & Pouwer, F 2012, 'Diabetes MILES--Australia (management and impact for long-term empowerment and success): methods and sample characteristics of a national survey of the psychological aspects of living with type 1 or type 2 diabetes in Australian adults', *BMC public health*, vol. 12, no. 1, p. 1.

Sparks, P & Shepherd, R 1994, 'Public perceptions of the potential hazards associated with food production and food consumption: an empirical study', *Risk analysis*, vol. 14, no. 5, pp. 799-806.

Standing, C & Cripps, H 2015, 'Critical success factors in the implementation of electronic health records: A two-case comparison', *Systems Research and Behavioral Science*, vol. 32, no. 1, pp. 75-85.

Stanford Patient Education Research Center: Diabetes self efficacy scale, 2009,
Available from: http://patienteducation.stanford.edu/research/sediabetes.html

Starr, C 1969, 'Social benefit versus technological risk', *science*, pp. 1232-8.

Strom, JL & Egede, LE 2012, ‘The impact of social support on outcomes in adult patients with type 2 diabetes: a systematic review’, *Current diabetes reports*, vol. 12, no. 6, pp.769-781.

Teik, DOL 2015, 'Enhancing the experience of needs satisfaction through service engagement: A case of commercial fitness centers in Malaysia', *Journal of Global Scholars of Marketing Science*, vol. 25, no. 2, pp. 109-21.

Tenenhaus, M, Vinzi, VE, Chatelin, Y-M & Lauro, C 2005, 'PLS path modeling', *Computational statistics & data analysis*, vol. 48, no. 1, pp. 159-205.

Thoits, PA 1985, ‘Social support and psychological well-being: Theoretical possibilities’, In *Social support: Theory, research and applications*, pp. 51-72. Springer Netherlands.

Thorpe Jr, RJ, Wilson-Frederick, SM, Bowie, JV, Coa, K, Clay, OJ, LaVeist, TA & Whitfield, KE 2013, 'Health behaviors and all-cause mortality in African American men', *American journal of men's health*, vol. 7, no. 4_suppl, pp. 8S-18S.

Toobert, DJ & Glasgow, RE 1994, 'Assessing diabetes self-management: the summary of diabetes self-care activities questionnaire', *Handbook of psychology and diabetes: A guide to psychological measurement in diabetes research and practice*, pp. 351-75.

Tovar, E, Rayens, MK, Gokun, Y & Clark, M 2015, 'Mediators of adherence among adults with comorbid diabetes and depression: The role of self-efficacy and social support', *Journal of health psychology*, vol. 20, no. 11, pp. 1405-15.

Trief, PM, Izquierdo, R, Eimicke, JP, Teresi, JA, Goland, R, Palmas, W, Shea, S & Weinstock, RS 2013, ‘Adherence to diabetes self-care for white, African-American and Hispanic American telemedicine participants: 5 year results from the IDEATel project’, *Ethnicity & health*, vol. 18 no.1, pp.83-96.

Tse, J, Nansel, TR, Haynie, DL, Mehta, SN & Laffel, LM 2012, 'Disordered eating behaviors are associated with poorer diet quality in adolescents with type 1 diabetes', *Journal of the Academy of Nutrition and Dietetics*, vol. 112, no. 11, pp. 1810-4.

Tversky, A & Kahneman, D 1974, 'Judgment under uncertainty: Heuristics and biases', *science*, vol. 185, no. 4157, pp. 1124-31.

Vaccaro, JA, Exebio, JC, Zarini, GG & Huffman, FG 2014, ‘The role of family/friend social support in diabetes self-management for minorities with type 2 diabetes, *World Journal of Nutrition and Health*, vol. 2, no. 1, pp.1-9.

Van Rijswijk, W, Frewer, LJ 2012, ‘Consumer needs and requirements for food and ingredient traceability information.’ *International Journal of Consumer Studies*, vol. *36*, no. 3, pp.282-290.

Van Teijlingen, E & Hundley, V 2001, 'Social research update', *Department of Sociology, University of Surrey*, no. 35.

Van Teijlingen, E & Hundley, V 2002, 'The importance of pilot studies', *Nursing standard*, vol. 16, no. 40, pp. 33-6.

Veerman, JL, Sacks, G, Antonopoulos, N & Martin, J, 2016, ‘The impact of a tax on sugar-sweetened beverages on health and health care costs: a modelling study’, *PloS one,* vol. 11, no. 4, p.e0151460.

Vest, BM, Kahn, LS, Danzo, A, Tumiel-Berhalter, L, Schuster, RC, Karl, R, Taylor, R, Glaser, K, Danakas, A & Fox, CH 2013, 'Diabetes self-management in a low-income population: impacts of social support and relationships with the health care system', *Chronic illness*, p. 1742395313475674.

Vivienne Wu, S-F, Tung, H-H, Liang, S-Y, Lee, M-C & Yu, N-C 2014, 'Differences in the perceptions of self-care, health education barriers and educational needs between diabetes patients and nurses', *Contemporary nurse*, vol. 46, no. 2, pp. 187-96.

von Neumann, J 1944, 'Morgenstern, 0', *Theory of games and economic behavior*, vol. 3.

Waki, K, Aizawa, K, Kato, S, Fujita, H, Lee, H, Kobayashi, H, Ogawa, M, Mouri, K., Kadowaki, T & Ohe, K 2015, ‘DialBetics With a Multimedia Food Recording Tool, FoodLog Smartphone-Based Self-Management for Type 2 Diabetes’, *Journal of diabetes science and technology,* vol. 9, no.3, pp.534-540.

Walker, RJ, Smalls, BL, Hernandez-Tejada, MA, Campbell, JA, Egede, LE 2014, ‘Effect of diabetes self-efficacy on glycemic control, medication adherence, self-care behaviors, and quality of life in a predominantly low-income, minority population’, *Ethnicity & disease*, vol. 24, no.3, pp.349-355.

Wardian, J & Sun, F 2014, ‘Factors associated with diabetes-related distress: implications for diabetes self-management’, *Social work in health care*, vol. 53, no. 4, pp.364-381.

Weaver, RR, Lemonde, M, Payman, N & Goodman, WM 2014, 'Health capabilities and diabetes self-management: the impact of economic, social, and cultural resources', *Social Science & Medicine*, vol. 102, pp. 58-68.

Weber, EU, Blais, AR & Betz, NE 2002, 'A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors', *Journal of behavioral decision making*, vol. 15, no. 4, pp. 263-90.

Weber, M 1978, *Economy and society: An outline of interpretive sociology*, Univ of California Press.

Weber, M 1949, ‘*Max Weber on the methodology of the social sciences*’, Free Press.

World Health Organisation, 2017, Diabetes Programme: Facts and Figures about Diabetes, Country and regional data on diabetes viewed 11 July 2017, <http://www.who.int/diabetes/facts/world_figures/en/index6.html>

Wilkinson, A, Whitehead, L & Ritchie, L 2014, 'Factors influencing the ability to self-manage diabetes for adults living with type 1 or 2 diabetes', *International journal of nursing studies*, vol. 51, no. 1, pp. 111-22.

Williams, B, Brown, T & Onsman, A 2010, *Exploratory factor analysis: A five-step guide for novices Journal of Emergency Primary Health Care (JEPHC)*.

Williams, KE & Bond, MJ 2002, 'The roles of self-efficacy, outcome expectancies and social support in the self-care behaviours of diabetics', *Psychology, Health & Medicine*, vol.7, no. 2, pp.127-141.

Willig, AL, Richardson, BS, Agne, A & Cherrington, A 2014, 'Intuitive eating practices among African-American women living with type 2 diabetes: a qualitative study', *Journal of the Academy of Nutrition and Dietetics*, vol. 114, no. 6, pp.889-896.

Willis, E, Reynolds, L & Keleher H. eds., 2016, 'Understanding the Australian health care system', *Elsevier Health Sciences.*

Winett, RA 1995, 'A framework for health promotion and disease prevention programs', American Psychologist, vol. 50, no. 5, p. 341.

Wise, J 2016, *Sugar tax could stop 3.7 million UK people becoming obese, claims report*, British Medical Journal Publishing Group, 1756-1833.

Wu, C-JJ, Chang, AM, Courtney, M, Shortridge-Baggett, LM & Kostner, K 2011, 'Development and pilot test of a peer-support based Cardiac-Diabetes Self-Management Program: A study protocol', *BMC health services research*, vol. 11, no. 1, p. 74.

Wu, SFV, Huang, YC, Lee, MC, Wang, TJ, Tung, HH & Wu, MP 2013, 'Self-efficacy, self-care behavior, anxiety, and depression in Taiwanese with type 2 diabetes: A cross-sectional survey', *Nursing & health sciences*, vol. 15, no. 2, pp.213-219.

Zhang, Y, He, D & Sang, Y 2013, 'Facebook as a platform for health information and communication: a case study of a diabetes group', *Journal of medical systems*, vol. 37, no. 3, pp. 1-12.

APPENDICES

Appendix A: Communication NDSS Transition

Hi Elizabeth,

Hope you are well. In regards to our conversation yesterday, I am just writing to confirm that currently the NDSS is transition into a new agreement with the Commonwealth Government. This may impact on our capacity to handle requests such as yours.

When you are able to provide us with all of your material, we will hopefully be able to confirm a date at which we will be able to proceed. Currently, we are unable to provide any concrete time-frames.

Please do not hesitate to contact me for any clarification.

Kind regards,

Robert Cox
Senior Operations, Communications and Support Officer, NDSS
Diabetes Australia
T: 02 6232 3816 F: 02 6230 1535
E: rcox@diabetesaustralia.com.au

W: diabetesaustralia.com.au
Level 1, 101 Northbourne Ave
Turner ACT 2612
GPO Box 3156 Canberra ACT 2601

diabetes australia

Appendix B: Flyers for Diabetes Support Organisations

INVITATION TO TAKE PART IN A NATIONAL SURVEY ABOUT FACTORS INFLUENCING DIETARY INTAKE AMONG PEOPLE WITH DIABETES

Following a recommended diet is sometimes a challenge for people with diabetes and as a result can be a major contributor to diabetes related health risks. This on-line survey is about the likely factors that influences your decisions about eating and how you manage your daily recommended diet as a person living with diabetes.

WHAT WILL THE SURVEY ASK ME?

Your participation will involve completion of an anonymous on-line self-completion questionnaire that will take approximately ten (10) minutes of your time.

The questionnaire includes a range of closed-ended questions asking you about some information on your diabetic profile, your daily eating habits, whether you receive any additional support in managing your diabetes and information on what your feelings and perceptions are towards living with and coping with diabetes.

Your participation in this project is entirely voluntary. If you do not wish to take part you are not obliged to.

WHO SHOULD TAKE PART?

You can choose to participate, if you are,

18 years and above.

An Australian citizen/permanent resident.

Have been diagnosed with either Type 1 or Type 2 diabetes.

WHY SHOULD I TAKE PART?

If you choose to participate in this survey, your involvement in this research project would potentially benefit you and the diabetic community with additional and or improved diabetic support services such as diabetes education programs, diabetic resources, counselling initiatives and information necessary in helping you and the diabetic community at large cope with and manage your diabetes effectively.

HOW CAN I TAKE PART?

You can take part by clicking on the link provided on the Diabetes Australia website.

The survey is advertised as:

Factors influencing dietary intake among people with diabetes. Just click on the link to participate.

https://www.diabetesaustralia.com.au/take-part

Researcher Contact
Elizabeth Andrews
DPHD Candidate
School of Management and Enterprise | Faculty of Business, Education, Law and Arts |
Room T450 | University of Southern Queensland | Toowoomba | QLD | 4350 |
Office Phone: +61 7 4687 5756
elizabeth.andrews@usq.edu.au

UNIVERSITY OF SOUTHERN QUEENSLAND

This study is approved by University of Southern Queensland Human Research Ethics Committee Reference **H15REA151**

Appendix C: Survey Cover Page

Title of Project: Factors influencing dietary compliance amongst people with diabetes
HREC Approval Number: H15REA151

Description:
Following a recommended diet is at times a challenge for people living with diabetes. As a result, this can be a major contributor to a variety of diabetic related health risks. The following questionnaire intends to investigate key factors that influences what you eat and how you cope with your diet on a daily basis. The results of the study will provide diabetic educators, social marketers, health practitioners and diabetic support organisations with better understanding of how and to what extent these factors influence your diet. As a result diabetic support groups and educators are able to provide opportunities to better target diabetes education programs, campaigns, counselling initiatives and additional support for diabetics to better manage their diabetes, make better food choices and limit health risks.

Participation:
Your participation involves the completion of an on-line anonymous self-completion questionnaire that will take approximately ten (10) minutes of your time.

The questionnaire includes a range of closed-ended questions asking you about some information on your diabetic profile, how you manage your diabetes, whether you receive any additional support in managing your diabetes and information on what your feelings and perceptions are towards living with and coping with diabetes.

Your participation in this research project is entirely voluntary. If you do not wish to take part you are not obliged to do so. If you decide to take part and later change your mind, you are free to withdraw from the research project at any stage. Please note, that if you wish to withdraw from the research project after you have submitted your responses, the Research Team are unable to remove your data from the research project (unless identifiable information has been collected). If you do wish to withdraw from this research project, please contact the Research Team (contact details at the bottom of this page).

Your decision whether you take part, do not take part, or to take part and then withdraw from the research project, will in no way impact your current or future relationship with the University of Southern Queensland or Diabetes Organisation in Australia with which you are currently registered with.(i.e. Diabetes Australia, NDSS, AH Diabetes etc).

Expected Benefits:
Your involvement in this research project would potentially benefit you and the diabetic community at large in future with additional and or improved diabetic support services such as diabetes education programs, diabetic resources, counselling initiatives and information necessary in helping you and the diabetic community at large cope with and manage diabetes effectively.

Risks:
There are no serious potential risks involved to you if you choose to participate in this questionnaire.

No Incentives:
There are no monetary and or any other form of incentives, gifts and or compensation given to you including any form of reimbursements of expenses or rewards associated with this study if you choose to participate in this survey.

Privacy and Confidentiality:
This anonymous survey does not require you to include any personal information such as your name, address and personal contact in any section of the survey, as such your personal information is non-identifiable and or traceable to the researcher or any other external agencies. All comments and responses will be treated in strictest confidentiality unless required by law.

Any data collected as a part of this research project will be stored securely as per University of Southern Queensland's Research Data Management policy.

Data usage:
The survey results may be made available in published journal articles and or in conference proceedings. The researcher will maintain your privacy, anonymity and confidentiality in each of these cases as per the Privacy and Confidentiality statement above. A brief summary of the study can be made available to you upon request by contacting the researcher through the contact information of the researcher at the bottom of this page.

Consent to Participate:
As this is an anonymous survey, clicking on the 'Submit' button at the conclusion of the questionnaire is accepted as an indication of your consent to participate in this research project.

Contact Information:

Please refer to the Research Team Contact Details if you have any questions to be answered or to request further information about this research project.

Principal Investigator: Ms. Elizabeth Andrews
School of Management & Enterprise
Faculty of BELA
University of Southern Queensland
Toowoomba, Qld 4350
Telephone: +617 4631 5756
Mobile: 0412277485
Email: elizabeth.andrews@usq.edu.au

Supervisor: Associate Professor Dr. Jane Summers
School of Management & Enterprise
Faculty of BELA
University of Southern Queensland
Toowoomba, Qld 4350
Telephone: +61 74631 5756 Email: jane.summers@usq.edu.au

If you have any concerns or complaints about the ethical conduct of the project you may contact the University of Southern Queensland Ethics Coordinator. The Ethics Coordinator is not connected with the research project and can facilitate a resolution to your concern in an unbiased manner.

Ethics Coordinator
Office of Research
University of Southern Queensland
West Street, Toowoomba 4350
Ph: +61 7 4631 2690
Email: ethics@usq.edu.au

Appendix D: Final Survey

Factors influencing dietary compliance among people with diabetes.

Section a: Diabetic Profile

1. What is your diabetes category?

- Type I
- Type II
- Other (please specify)

2. I have been diagnosed with diabetes for approximately:

- Less than 1 year
- Between 1-5 years
- Between 6-10 years
- More than 10 years

3. What diabetes medication(s) have you been prescribed by your physician? (Please check all that apply)

- Oral Medication
- Insulin
- Other diabetic medication by injection
- Other (please give details)

4. What is your overall blood glucose level (HbAc1) percentage (%) within the last 6 months?

- Blood glucose level at 7.0 or below
- Blood glucose level between 7.1 and 8.0
- Blood glucose level of more than 8.0
- Not sure

Section A:

5. Please indicate the types of food and beverages that you normally consume by checking only *ONE* response in each of the following statements below.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. I eat 2 or more serves (e.g. 2 ½ cups) of cooked vegetables every day.	◯	◯	◯	◯	◯
2. I eat 3 or more serves (e.g. 5 cups) of salad vegetables every day.	◯	◯	◯	◯	◯
3. I eat a serve (e.g. 1cup) of high-fibre fruits everyday (e.g. banana, oranges, apples, grapes and kiwi)	◯	◯	◯	◯	◯
4. I like to eat lean meats (e.g. skinless chicken, red meats or pork with the fat trimmed off).	◯	◯	◯	◯	◯
5. I consume low-fat dairy products (e.g. low-fat milk and cheese.)	◯	◯	◯	◯	◯
6. I carefully read food packaging labels to choose lower sugar food options.	◯	◯	◯	◯	◯
7. I eat sugary desserts more than once a day.	◯	◯	◯	◯	◯
8. I like to eat sugary snacks in place of main meals more than once a week.	◯	◯	◯	◯	◯
9. I eat processed canned foods more than once a week.	◯	◯	◯	◯	◯
10. I eat processed snack foods more than once a week.	◯	◯	◯	◯	◯
11. I consume more than one sugary soft drink a day.	◯	◯	◯	◯	◯
12. I consume an alcoholic beverage more than five days in a week.	◯	◯	◯	◯	◯

Section B:

i. Please indicate the ways in which you monitor, plan and carry out diabetic activities in your daily life by checking only *ONE* response in each of the following statements below.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
13. I am confident in following a healthy eating plan on a daily basis.	○	○	○	○	○
14. I feel confident in my ability to limit eating processed foods containing high amounts of sugar, salt and fat.	○	○	○	○	○
15. I feel confident in maintaining healthy eating goals.	○	○	○	○	○
16. I am confident in keeping my blood sugar in good control.	○	○	○	○	○
17. I strictly follow the dietary recommendations given by my doctor or diabetes specialist.	○	○	○	○	○
18. I do regular physical activity to help me achieve optimal blood sugar levels.	○	○	○	○	○
19. I feel insecure about my ability in managing healthy eating goals.	○	○	○	○	○

Section B:

This section aims to gather information about your views on whether you consider certain foods to be potentially harmful and/or damaging to your health.

ii. Please indicate your perceptions of food risk by checking only *ONE* response in each of the following statements below.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
20. I believe if I consume high amounts of sugar, damage to my health would be immediately apparent.	○	○	○	○	○
21. It is easy for me to tell if foods containing sugar and sweeteners are a risk to my health.	○	○	○	○	○
22. I believe that the consumption of foods containing sugar, fats and sweeteners could seriously harm my health.	○	○	○	○	○
23. I am worried about the potential risks to my health associated with the consumption of sweetened food products.	○	○	○	○	○
24. I believe if I consume high amounts of sugar, damage to my health would be apparent in the long run.	○	○	○	○	○

Section B:

This section aims to identify how your daily lifestyle such as shopping, cooking, social activities and daily habits influence what you eat.

iii. Please indicate your daily lifestyle activities by checking only *ONE* response in each of the following statements below.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
25. I eat whenever I get the slightest bit hungry.	○	○	○	○	○
26. My friends encourage me to buy new foods which may not be good for my diabetes.	○	○	○	○	○
27. I enjoy the taste, smell and texture of food.	○	○	○	○	○
28. I regularly use pre-mixed food products for its convenience.	○	○	○	○	○
29. I regularly go out for meals.	○	○	○	○	○
30. Some of my favourite ethnic foods may not be good for my diabetes.	○	○	○	○	○
31. I dislike changing my eating habits.	○	○	○	○	○
32. It is hard to cook diabetic friendly meals that the whole family can enjoy.	○	○	○	○	○
33. I like to impulse buy when shopping for food.	○	○	○	○	○
34. Advertisements promoting sugary foods makes me want to purchase sugary items.	○	○	○	○	○
35. I find it hard to resist the attractive packaging of sugary food items in stores.	○	○	○	○	○

Section C:

This section aims to gather information on how you cope with your diabetes and the types of support you may use to manage your diabetes. For this section please think about the people, organisations and groups, including web based organisations and groups, who may provide you with a variety of help with your diabetes.

Please indicate how you cope with your diabetes and the types of support you may use to manage your diabetes by checking only *ONE* response in each of the following statements below.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
36. I can contact other people who have diabetes to share my concerns about diabetes management.	○	○	○	○	○
37. I can talk to my family about issues related to my diabetes.	○	○	○	○	○
38. I can talk to my close friends about issues related to my diabetes.	○	○	○	○	○
39. I can find information on the internet about managing diabetes.	○	○	○	○	○
40. I can talk to my doctor about managing my diabetes.	○	○	○	○	○
41. I find diabetes support organisations such as Diabetes Australia, NDSS etc useful in providing me with information on managing my diabetes.	○	○	○	○	○
42. I find diabetes educators useful in providing me with information on managing my diabetes.	○	○	○	○	○
43. I feel there is no one in my life with whom I can talk to about managing my diabetes.	○	○	○	○	○

Section D: Demographic Profile

44. What is your age?

- 18-20
- 21-30
- 31-40
- 41-50
- 51-60
- 61 years and over

45. What is your gender?

- Male
- Female
- Other

46. What is your usual household composition?

- Single – living alone
- Single – living with family members
- Single - living in a shared household with non-family members
- Married/De-facto – with no children in household
- Married/De-facto– living with partner and child/children under the age of 15
- Married/De-facto – living with partner and child/children over the age of 15
- Single parent - living with child/children under the age of 15
- Single parent - living with child/children over the age of 15
- Other

Other details

47. What is the ethnicity with which you most identify with?

- Australian
- African
- Asian
- European
- Indigenous
- Other
- Other details

48. What is your annual personal income (AUD) before tax including salary benefits?

- No income
- Less than $15,000
- $15,001-$24,999
- $25,000-$34,999
- $35,000-$44,999
- $45,000-$54,999
- $55,000-$99,999
- $100,000-$150,000
- More than $150,000
- I do not wish to answer this question
- Other

Other details

49. What is your HIGHEST level of qualification?

- High School
- Certificate
- Diploma
- Bachelor Degree
- Postgrad
- Certificate/Diploma
- Masters
- Doctorate
- Other

Other details

50. Which state do you currently reside in?

- NSW
- QLD
- VIC
- SA
- WA
- NT
- Other

Other details

51. Please provide any comments and or feedback about this survey or any related issues concerning diabetic matters.

Appendix E: NDSS-Snapshot of all types of diabetes.

nDSS
national diabetes services scheme

diabetes australia

The National Diabetes Services Scheme (NDSS) is an initiative of the Australian Government administered by Diabetes Australia.

ALL TYPES OF DIABETES

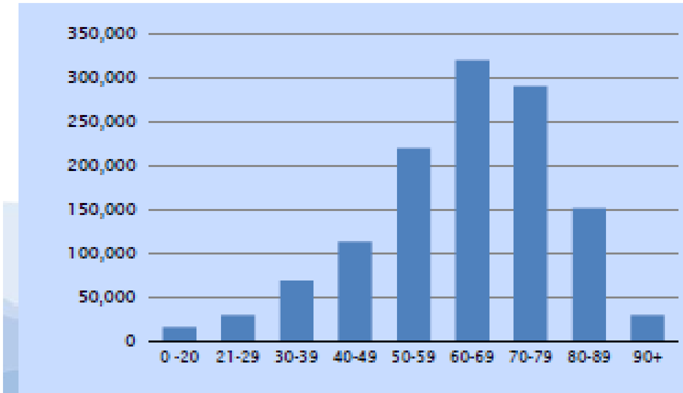
as at 31 March 2017

There were 1,240,151 people with diabetes registered on the NDSS

Diabetes Type	Number	%	Registered in Past Year
Type 1	118,142	10%	3,186
Type 2	1,076,970	86%	67,122
Gestational*	37,424	3%	37,424
Other	7,615	< 1%	976
Total	1,240,151	100%	108,708

* An additional 121,346 women who previously had gestational diabetes are registered on the NDSS. These women are at high risk of developing type 2 diabetes and receive regular reminder letters to have a diabetes check.

All People With Diabetes by Age Group



Over the last 12 months 108,708 people with diabetes were registered

Equivalent to 298 new registrants every day

Of these, 184 new registrants had type 2 diabetes and 9 had type 1 diabetes

8,119 people with diabetes were aged 15 years or under

16,180 people with diabetes were aged 20 years or under

29,776 people with diabetes were aged 21 to 29 years old

68,888 people with diabetes were aged 30 to 39 years old

791,365 people with diabetes were aged 60 years or older

NDSS Infoline 1300 136 588 www.ndss.com.au

Statistical Snapshot at 31 March 2017

Appendix F: Demographic Frequency Distribution

Statistics

		Q44_ Age	Q45_ Gender	Q46_Hs_Comp	Q47_ Ethnic	Q48_ Income	Q49_ Education	Q50_ State	Diab Cat	Diag_ Length	Blood_ glug
N	Valid	169	169	169	169	169	169	169	169	169	169
	Missing	0	0	0	0	0	0	0	0	0	0

Frequency Table

Q44_Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-20	5	3.0	3.0	3.0
	21-30	13	7.7	7.7	10.7
	31-40	23	13.6	13.6	24.3
	41-50	32	18.9	18.9	43.2
	51-60	43	25.4	25.4	68.6
	61>	53	31.4	31.4	100.0
	Total	169	100.0	100.0	

Q45_Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	63	37.3	37.3	37.3
	Female	106	62.7	62.7	100.0
	Total	169	100.0	100.0	

Q46_Hs_Comp

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single-alone	15	8.9	8.9	8.9
	Single-with fam	18	10.7	10.7	19.5
	Single-shared/non-fam	14	8.3	8.3	27.8
	Married/DF-no children	66	39.1	39.1	66.9
	Married/DF-with child_under_15	24	14.2	14.2	81.1
	Married/DF-with child_Over_15	19	11.2	11.2	92.3
	Single parent-child_under 15	2	1.2	1.2	93.5
	Single parent-with child_over 15	4	2.4	2.4	95.9
	Other	7	4.1	4.1	100.0
	Total	169	100.0	100.0	

Q47_Ethnic

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Australian	138	81.7	81.7	81.7
	African	1	.6	.6	82.2
	Asian	20	11.8	11.8	94.1
	European	5	3.0	3.0	97.0
	Indigenous	1	.6	.6	97.6
	Other	4	2.4	2.4	100.0
	Total	169	100.0	100.0	

Q48_Income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No income	36	21.3	21.3	21.3
	<$15,000	18	10.7	10.7	32.0
	$15,001-24,999	27	16.0	16.0	47.9
	$25,000-34,999	16	9.5	9.5	57.4
	$35,000-44,999	18	10.7	10.7	68.0
	$45,000-54,999	10	5.9	5.9	74.0
	$55,000-99,999	17	10.1	10.1	84.0
	$100,000-150,000	7	4.1	4.1	88.2
	>$150,000	5	3.0	3.0	91.1
	I do not wish to answer	13	7.7	7.7	98.8
	Other	2	1.2	1.2	100.0

	Total	169	100.0	100.0	

Q49_Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High School	42	24.9	24.9	24.9
	Cert	23	13.6	13.6	38.5
	Dip	30	17.8	17.8	56.2
	Bachelor Degree	44	26.0	26.0	82.2
	Postgrad Cert/Dip	6	3.6	3.6	85.8
	Masters	18	10.7	10.7	96.4
	Doctorate	5	3.0	3.0	99.4
	Other	1	.6	.6	100.0
	Total	169	100.0	100.0	

Q50_State

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NSW	16	9.5	9.5	9.5
	QLD	125	74.0	74.0	83.4
	VIC	13	7.7	7.7	91.1
	SA	2	1.2	1.2	92.3
	WA	10	5.9	5.9	98.2
	Other	3	1.8	1.8	100.0
	Total	169	100.0	100.0	

DiabCat

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Type 1	53	31.4	31.4	31.4
	Type 2	113	66.9	66.9	98.2
	Other	3	1.8	1.8	100.0
	Total	169	100.0	100.0	

Diag_Length

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 1 yr	16	9.5	9.5	9.5
	1-5	46	27.2	27.2	36.7
	6-10	31	18.3	18.3	55.0
	more than 10	76	45.0	45.0	100.0
	Total	169	100.0	100.0	

Blood_glug

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	at 7	48	28.4	28.4	28.4
	7.1-8.0	63	37.3	37.3	65.7
	more than 8	51	30.2	30.2	95.9
	not sure	7	4.1	4.1	100.0
	Total	169	100.0	100.0	

Appendix G: Normality Test.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Eat_cooked_veg	169	1	5	3.78	1.045	-.772	.187	-.239	.371
Eat_salad	169	1	5	3.38	1.123	-.127	.187	-1.193	.371
Eat_High_fibre	169	1	5	3.69	1.130	-1.012	.187	.276	.371
Eat_Lean_meat	169	1	5	3.81	1.000	-1.130	.187	1.067	.371
Eat_Low_fat	169	1	5	3.49	1.211	-.515	.187	-.828	.371
Read labels	169	1	5	3.73	1.068	-.566	.187	-.577	.371
Eat_sugary desserts	169	1	5	3.34	1.492	-.312	.187	-1.393	.371
Sugary snacks	169	1	5	3.40	1.544	-.413	.187	-1.418	.371
Processed canned foods	169	1	5	3.39	1.341	-.340	.187	-1.117	.371
Processed snacks	169	1	5	3.28	1.397	-.217	.187	-1.330	.371
Sugary soft drinks	169	1	5	3.61	1.641	-.598	.187	-1.379	.371
Alcohol	169	1	5	3.51	1.626	-.527	.187	-1.398	.371
Confident_daily eating plan	169	1	5	3.76	.929	-.488	.187	-.339	.371
Confident_limit_processed foods	169	1	5	3.72	.988	-.654	.187	-.129	.371
Confident_maintaining_healthy eating goals	169	1	5	3.71	.966	-.511	.187	-.321	.371
Confident_keeping blood sugar in control	169	1	5	3.49	1.007	-.207	.187	-.793	.371
Strictly follow dietary recommendations	169	1	5	3.43	.980	-.290	.187	-.138	.371
Regular physical activity	169	1	5	3.31	1.186	-.154	.187	-.969	.371

Feel insecure_healthy eating goals	169	1	5	3.11	1.210	-.064	.187	-1.090	.371
Damage immediately apparent	169	1	5	3.87	1.033	-.917	.187	.225	.371
Easy to tell	169	1	5	3.57	1.068	-.373	.187	-.809	.371
Sugar, fats, sweeteners_seriously harm	169	1	5	4.08	.869	-1.319	.187	1.296	.371
I am worried	169	1	5	3.78	.954	-.880	.187	.562	.371
Damage in the long-run	169	1	5	4.26	.847	-1.656	.187	1.611	.371
Eat slightest bit hungry	169	1	5	3.33	.918	-.333	.187	-.744	.371
Friends encourage	169	1	5	3.82	1.067	-.876	.187	.164	.371
Enjoy taste, smell and texture of food	169	1	4	2.11	.748	.514	.187	.296	.371
Regularly use Pre-mixed food	169	1	5	3.54	1.058	-.378	.187	-.557	.371
Regularly go out for meals	169	1	5	3.58	1.033	-.890	.187	.160	.371
Ethnic foods	169	1	5	3.02	1.136	.014	.187	-.922	.371
Dislike changing eating habits	169	1	5	2.88	1.098	.359	.187	-.566	.371
Hard to cook diabetes friendly meals	169	1	5	3.15	1.200	-.029	.187	-1.090	.371
Impulse buy	169	1	5	3.64	1.109	-.584	.187	-.702	.371
Advertising influence	169	1	5	3.95	1.154	-1.060	.187	.169	.371
Hard to resist attractive packaging of sugary items	169	1	5	3.99	1.134	-1.142	.187	.435	.371
Can contact others	169	1	5	3.52	1.012	-.632	.187	-.187	.371
Talk to family	169	1	5	3.76	1.019	-.909	.187	.292	.371
Talk to close friends	169	1	5	3.63	1.068	-.693	.187	-.153	.371
Information from internet	169	1	5	3.98	.960	-.944	.187	.607	.371
Talk to doctor	169	1	5	4.28	.692	-1.208	.187	1.345	.371

Diabetes support organisations useful	169	1	5	3.91	.892	-.690	.187	.140	.371
Diabetes Educators useful	169	1	5	4.12	.878	-.980	.187	.730	.371
No one I can talk to	169	1	5	4.14	1.023	-1.424	.187	1.726	.371
Valid N (listwise)	169								

Appendix H: KMO and Bartlett's Test.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.859
Bartlett's Test of Sphericity	Approx. Chi-Square	4747.324
	df	903
	Sig.	.000

Appendix I: Harman Single Factor Test

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12.923	30.054	30.054	12.923	30.054	30.054
2	4.046	9.410	39.464			
3	2.729	6.347	45.811			
4	2.114	4.917	50.728			
5	1.967	4.574	55.302			
6	1.671	3.885	59.187			
7	1.339	3.113	62.300			
8	1.150	2.673	64.974			
9	1.101	2.561	67.534			
10	.971	2.258	69.792			
11	.956	2.224	72.016			
12	.879	2.045	74.061			
13	.818	1.903	75.963			
14	.770	1.790	77.754			
15	.748	1.739	79.493			
16	.703	1.636	81.129			
17	.643	1.495	82.624			
18	.600	1.395	84.018			
19	.556	1.294	85.312			
20	.515	1.197	86.509			
21	.479	1.115	87.624			
22	.465	1.082	88.705			
23	.439	1.020	89.726			
24	.397	.924	90.650			
25	.380	.883	91.533			
26	.346	.804	92.337			
27	.338	.787	93.124			
28	.310	.721	93.845			
29	.288	.669	94.514			
30	.282	.655	95.170			
31	.263	.612	95.782			
32	.244	.566	96.348			
33	.217	.506	96.854			
34	.209	.486	97.339			
35	.198	.462	97.801			
36	.168	.391	98.192			
37	.154	.357	98.549			

38	.145	.338	98.887			
39	.130	.303	99.190			
40	.107	.249	99.439			
41	.098	.227	99.666			
42	.083	.192	99.858			
43	.061	.142	100.000			

Extraction Method: Principal Component Analysis.

Appendix J: Cross Loading Criterion

Items	Food Related Lifestyle	Food Risk Perception	Likelihood of Dietary Compliance	Self-Efficacy	Social Support Groups Usage
FRL10_34	**0.855**	-0.434	-0.445	-0.585	-0.408
FRL11_35	**0.844**	-0.417	-0.522	-0.604	-0.354
FRL1_25	**0.738**	-0.297	-0.399	-0.446	-0.251
FRL2_26	**0.707**	-0.466	-0.334	-0.429	-0.372
FRL4_28	**0.713**	-0.352	-0.403	-0.597	-0.418
FRL5_29	**0.639**	-0.277	-0.331	-0.456	-0.402
FRL7_31	**0.642**	-0.281	-0.382	-0.529	-0.352
FRL8_32	**0.549**	-0.097	-0.324	-0.395	-0.228
FRL9_33	**0.74**	-0.381	-0.382	-0.428	-0.33
FRP1_20	-0.391	**0.717**	0.338	0.406	0.308
FRP2_21	-0.392	**0.738**	0.422	0.48	0.34
FRP3_22	-0.38	**0.876**	0.358	0.441	0.482
FRP4_23	-0.348	**0.816**	0.363	0.455	0.416
FRP5_24	-0.394	**0.873**	0.433	0.487	0.408
LDC1_5.1	-0.445	0.396	**0.779**	0.543	0.351
LDC2_5.2	-0.45	0.326	**0.737**	0.484	0.309
LDC4_5.4	-0.219	0.331	**0.655**	0.391	0.286
LDC5_5.5	-0.346	0.395	**0.753**	0.489	0.344
LDC6_5.6	-0.531	0.331	**0.79**	0.627	0.307
SE1_13	-0.598	0.461	0.696	**0.893**	0.532
SE2_14	-0.646	0.541	0.664	**0.858**	0.475
SE3_15	-0.704	0.504	0.662	**0.928**	0.548
SE4_16	-0.49	0.43	0.447	**0.794**	0.519
SE5_17	-0.58	0.496	0.494	**0.786**	0.614
SE6_18	-0.362	0.315	0.382	**0.646**	0.396
SSG1_36	-0.257	0.369	0.26	0.381	**0.635**
SSG2_37	-0.362	0.402	0.319	0.483	**0.824**
SSG3_38	-0.391	0.406	0.318	0.536	**0.845**
SSG5_40	-0.326	0.285	0.284	0.44	**0.607**
SSG6_41	-0.216	0.269	0.262	0.356	**0.623**
SSG7_42	-0.314	0.334	0.305	0.407	**0.662**
SSG8_43	-0.493	0.376	0.386	0.519	**0.793**