Thesis

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INFLUENCE OF MODERATORS AND MEDIATORS ON RELATIONSHIP BETWEEN PSYCHOSOCIAL FACTORS, DIETARY AND PHYSICAL ACTIVITY BEHAVIOURS OF TYPE II DIABETICS IN KISII LEVEL-V HOSPITAL, KENYA

2010

INFLUENCE OF MODERATORS AND MEDIATORS ON RELATIONSHIP BETWEEN PSYCHOSOCIAL FACTORS, DIETARY AND PHYSICAL ACTIVITY BEHAVIOURS OF TYPE II DIABETICS IN KISII LEVEL-V HOSPITAL, KENYA

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A THESIS SUBMITTED IN FULFILLMENT OF THE REQUIREMENTS OF DOCTOR OF PHILOSOPHY DEGREE IN COMMUNITY NUTRITION AND DEVELOPMENT OF MASENO UNIVERSITY, SCHOOL OF PUBLIC HEALTH AND COMMUNITY DEVELOPMENT

DECLARATION

I declare that this Thesis is my original work and has not been presented in any other University. Therefore, no part of this Thesis may be reproduced without prior written permission of the author and/or Maseno University.

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ACKNOWLEDGEMENTS

My first gratitude goes to the three supervisors, **Prof. Mary K. Walingo, Prof. Grace M. Mbagaya and Prof. Lucas O.A. Othuon**, who played a key supervisory role in this work. The three also acted as my mentors during the supervisory process. They always encouraged me to work hard and finish this process. I would also like to thank **African Population and Heath Research Centre (APHRC) through African, Doctoral Dissertation Research Fund (ADDRF)** who made this process a success by financing the entire research process. This fund increased the speed of data collection, analysis and writing. A part from financing this work, ADDRF organized for a workshop which shed light certain aspects of useful research methods. I appreciate their efforts so much. I also want to thank **Council for the Development of Social Science Research in Africa (CODESRIA) for Small Grant for Thesis Writing**. Finally, I would like to thank the entire members of staff in the School of Public Health and Community who assisted me any one way or another, specifically those who had time to listen to my presentation of progress reports. I also offer my acknowledgement to National Council of Science and Technology, New Nyanza Provincial Hospital Ethical Team and Maseno University School of Graduate Studies for facilitating the research process. Not forgetting my eight research assistants who were very much handy during data collection process and their work was commendable. This category include; Noel, Richard, Ruth, Lucy, Stella, Francis, Gordon, Risper, Rosebella, Justus. Last but not least is my wife, Nasline Akinyi Omondi, who without her support and patience this work could have not been accomplished. Other than providing a good working environment and helping me to correct some grammatical errors and consistently set for me deadlines for completing key sections of this project.

DEDICATION

This piece of work is dedicated to my father **Mzee John Okeyo Nundu** and mother **Alice Oduong' Okeyo**, my wife **Nasline Akinyi Omondi**, my son, David Rodgers Ochieng' Omondi and to my daughter, Davina Rihanna Akinyi who was born when I was just finishing my last Chapter.

ABSTRACT

Despite efforts to promote healthy diet or adequate physical activity among Type II diabetics in most clinics in Kenya the incidence, progression and severity still persit, possibly because of non-patient input approaches used. Motivation theories have been developed for health educators attending to Type II diabetics to aid in promotion of healthy dietary and physical activity practices, however, this approach has not been welcome in most diabetic clinics in Kenya. There was a crucial need to emperically develop a *mental health tailored communicaion model* that could be used to promote healthy dietary and physical activity among Type II diabetics. The main purpose of this study was to establish the influence of moderators and mediators on relationship between psychosocial factors, dietary and physical activity behaviours of Type II diabetics in Kisii level-V hospital in Kenya. This was broadly achieved by testing the predictive power of the Theory of Planned Behaviour (TPB) and newly developed versions within dietary practice and physical activity domains. The study was conducted in Kisii Level-V hospital chosen on the basis that it had more advanced and well organized diabetic programmes with comparatively high number of regular Type II diabetics compared to other hospitals in Nyanza Province. Sequential Mixed Methods Design (SMMD) involving qualitative study (*phase 1*), questionnaire development (*phase 2*) and quantitative study (*phase 3*) was adopted since it is recommended for grounded theory investigations. Data was collected between the month of June and November, 2009 during which all the three phases of the study design were covered. Using a Cross-Model approach two different cohorts of patients participated in the study comprising of 237 for the dietary survey and 230 patients for physical activity survey. Each cohort had a population frame of 400 Type II diabetic patients. Focus Group Discussion guides and structured questionnaires were used to collect data on selected variables. Questionnaires were statistically

tested for reliability and construct validity using Cronbach Alpha and Exploratory Factor Analysis. Qualitative data was analyzed using constant comparative approach for grounded theory method while Structural Equation Modelling in Analysis of Moments Structures (AMOS) was used to analyze quantitative data. Preliminary findings revealed that over 90 percent of the items in the two questionnaires used were reliable and valid. Main findings revealed that the Theory of Planned Behaviour holds among the Type II diabetics and within dietary and physical activity behaviours based on the fit indices chosen for the analysis. Qualitative results generated three new versions of the theory: *planned behaviour knowledge theory*; *planned behaviour health belief theory* and *planned behaviour maintenance and control theory*, which fitted the data acceptably within dietary and physical activity behaviours among the Type II diabetics based on the common fit indices used during quantitative analysis. However, the *planned behaviour knowledge theory* failed fit the data acceptably within physical activity behaviour. These new generations of planned behaviour theories were comparatively superior to the traditional Theory of Planned Behaviour. In the pre-intention phase knowledge was found to be a mediator and perceived susceptibility; perceived severity; perceived benefits and cues to action were moderators that predicted intention within the TPB model applied to dietary and physical activity behaviour. In the post-intention phase action control, action plan and maintenance self efficacy were mediators between intention and dietary or physical activity behaviour. The original theory and new generation were then used to develop a *mental health tailored communication model* which includes a network of patients' related factors and is proposed for adoption for diabetic patients' education by health professionals to promote healthy dietary practice and physical activity among Type II diabetics within diabetic clinic in Kisii Level-V hospital and other clinics in Kenya.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

DEFINITION OF OPERATIONAL CONCEPTS AND TERMS

Action Control: In this study action control is the magnitude an individual associates with constant self monitoring of appropriate behaviour, careful watching of behaviour recommendations, keeping behaviour intentions in mind, trying hard to engage in appropriate behaviour activities and in accordance with the guidelines weighed by the level of agreement or disagreement that those factors are true.

Action Plan: In this study action plan is the level of magnitude an individual associates with when to engage in appropriate behaviour, where to engage in appropriate behaviour, how to select appropriate behaviour and where to engage in appropriate behaviour weighed by the level of agreement or disagreement that these factors are true.

Attitude: In this study attitude referred to all the beliefs about the outcome of dietary and physical activity behaviour weighed by the value of the outcome.

Cues to Action: In this study cues to action is the magnitude an individual associates with the presence of materials and processes that promotes positive healthy diet and adequate physical activity weighed by the level of agreement or disagreement that such materials and processes exist.

Cross Model Approach: In this study Cross Model Approach was a method of testing the model within dietary behaviour domain using one cohort of Type II diabetic patients and testing the a similar model in physical activity behaviour domain using a different cohort of Type II diabetic

patients. A cohort referred to all the Type II diabetic patients who attended the clinic within the same period of a month and would attend again after completing three months cycle.

Dietary categories: *Class 1 foods/diet class-1;* in this study class 1 foods means high fat diet (i.e. foods rich in fat). *Class 2 foods/diet class-2;* in this study, class 2 foods means high sugar diet (i.e. foods rich in sugar). *Class 3 foods/diet class-3;* in this study, class 3 foods means recommended diet (i.e. fruits, vegetables and non-refined foods)

Dietary practice/Behaviour: In this study dietary behaviour refers to the pattern of eating based on various food categories. In this study it referred to frequency of consumption high fat diet, high sugar diet and recommended diet.

Endogenous variable: in this study endogenous variables referred to all the variables (both observed and unobserved/latent) in the models with predictor arrows pointing at them.

Exogenous Variable: In this study exogenous variables referred to all the variables in the models from which predictor arrows originate.

Health educator: In this study health educator is any health professional attending to Type II diabetic patients on regularly basis.

Maintenance Self-Efficacy: In this study maintenance self efficacy is the magnitude an individual associates with the confidence to stay on engaging healthy dietary practice and

physical activity even when positive outcome is not forth coming, or when they are in the company of friends and relatives or when time is a limiting factor.

Mediator: In this study a moderator is a variable underlying the relationship between independent and dependent variable. Mediators include knowledge, action plan, action control and maintenance self-efficacy.

Moderator: In this study a moderator is a second independent variable, believed to have a significant contingent effect on relationship between independent and dependent. In this study moderators include perceived susceptibility, perceived severity, perceived benefits and cues to action.

Partial Mediator*:* In this study a partial mediator is a variable which mediates the relationship between independent and dependent variable but at the same time acts as a moderator.

Perceived Behavioural Control*:* In this study perceived behavioural control are beliefs that an individual has that certain factors may facilitate or impede ad hearing to healthy dietary practice and physical activity weighed by the perceived control power he/she has on these factors.

Perceived Barriers: In this study perceived barriers are individual's opinions of the tangible and psychological costs of following healthy diet and engaging in adequate physical activity.

Perceived Benefits: In this study perceived benefit is the magnitude an individual associates with the positive outcome of following healthy diet and physical activity weighed by the level of agreement or disagreement that the benefit exists.

Perceived Severity: In this study perceived severity is the magnitude of severity an individual associates with the negative outcome of dietary behaviour or physical activity behaviour weighed by the level of agreement or disagreement that the severity exists.

Perceived Susceptibility: In this study perceived susceptibility is the magnitude of risk an individual associates with the negative outcomes of dietary behaviour or physical activity behaviour weighed by the level of agreement or disagreement that the risk exists.

Physical Activity Behaviour: This is the pattern and level of participation in any manual and sporting activity that leads to some degree of energy expenditure. In this study it referred to the frequency of doing moderate to heavy activity for at least 30 minutes per for five or more days a week or walking/light activity for 1 hour per day for five/more days a week and leading sedentary lifestyle.

Physical Activity Categories: *Class 1 activities;* Sitting down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week. *Class 2 activities:* At least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others for five or more days in a week. *Class 3 activities:* At least 1

hour of physical activities such as washing, normal walking, cooking, sweeping, watering flowers.

Psychosocial Factors: In this study psychosocial factors referred to attitude, subjective norm, perceive behavioural control and intention as applied within the Theory of Planned Behaviour.

Regular Clinical Attendants: In these study regular clinical attendants refers to all Type II diabetic patients enrolled to attend clinics every three months.

Subjective Norm: In this study subjective norm is the belief an individual has that key people in his/her life may influence them to follow specific diet or engage in specific physical activity, weighed by the level of compliance to the influence.

Type II diabetes: Type II diabetes formally non-insulin-dependent diabetes (NIDDM) or adult-onset diabetes is a metabolic disorder that is characterized by high blood glucose in the context of insulin resistance of relative insulin deficiency.

Kisii Level-V Hospital*:* This is a provincial level hospital and second in the National hospital ranking categories in Kenya.

1.0 CHAPTER ONE: INTRODUCTION

This chapter introduces the study by first giving the background and statement of the problem to explain why it was important to conduct the study. It specifies the objectives, hypothesis and justification of the study. Finally, the theoretical framework that guided the conduct of the study is explained.

1.1 Background of the Study

The growing trend of Type II diabetes is a concern worldwide (Canadian Diabetes Association Clinical Practice Guidelines Expert Committee, 2003). About 3 million Kenyans are suffering from Type II diabetes mellitus with the leading cases in Nairobi, Nyeri, Meru, Kisii, Coast and Kisumu in that order (Kimani & Okwemba, 2007). At Kisii Hospital, an increasing incidence of outpatients enrolled in the diabetic clinic on weekly basis has been reported (Ministry of Health, 2007). This incidence is composed of patients who have had their blood sugar tested. Many Kenyans are still unaware of their status (Ministry of Health, 2006) and the incidence may be higher than what is currently known. Introducing proper management strategies that include key lifestyle related factors such as physical activity and dietary practices have promising results in reducing the incidence of Type II diabetes and also in preventing progression into severity level (World Health Organisation: WHO 2003a), hence the need to promote adequate physical activity and dietary practices among those already living with the condition and the general public.

Diabetic individuals worldwide are routinely advised to adopt a healthful eating behaviour, which requires modifications in food habits, beliefs and meal patterns on a lifelong basis (Harris *et al.*, 2001). Diet is a lifestyle behaviour that has been reported as a management domain with

very little compliance (Glasgow *et al*, 1997; Nelson *et al.*, 2002; Peyrot *et al.*, 2005; Panagiotakos *et al.*, 2005; Thanopoulou *et al.*, 2004; Shimakawa *et al.*, 1993) among diabetic patients. In addition, some evidence indicates that diabetic patients are less successful in maintaining long term weight loss than people without diabetes (Guare *et al*., 1995), a parameter that predisposes them to poorer metabolic control especially when they lack adequate physical activity.

It could be that their efforts are not in the appropriate directions or that they receive confusing and contradictory advice from a variety of sources for example, health professionals, media and social contacts. In this case, nutrition and health related education programmes for the diabetic patients need to be standardized across several if not all clinics. More importantly, health professionals need to identify patients' related factors influencing dietary adherence and be informed that the act of eating not only includes nutrient and food intake, but also eating behaviour determined by the patient's own initiative. However, it has been established that self-declared diabetic patients try to modify their dietary habits (Gauthier–Chele *et al*., 2004) but lack proper knowledge to do so.

Physical activity also plays a key role in the management of Type II diabetes (Canadian Diabetes Association Guidelines Expert Committee, 2003; Krishna *et al*., 2004; Richter & Galbo, 1986). However, there seems to be a growing evidence that majority of adults living with Type II diabetes are not active enough to achieve health benefit (Plotnikoff *et al.*, 2000; Plotnikoff, 2006), and the reasons for this are not exhaustively explained. In the case of diet, perceptions

regarding physical activity behaviour among the Type II diabetic patients should to be theoretically (Plotnikoff, 2006).

Due to the combined effects of physical activity and healthy dietary practices for those with Type II diabetes, research was urgently needed in Kenya to investigate effective physical activity and dietary promotion strategies within nutrition education and health promotion disciplines. Currently most diabetic clinics in Kenya use fact-based approaches to promote physical activity and healthy diet among the Type II diabetes patients (Kenyatta National Hospital, 2005) and again physical activity promotion is not quite strong. These approaches do not consider the patients' mental perspective and also impose messages to the patients without considering their perceptions and beliefs. Patients' decisions are important healthy dietary and physical activity promotions which are key behaviour domains in the successful management of the Type II diabetes. Factors related to their decision making process need to be understood carefully by the health providers to ensure for a more focused intervention. As Anderson and Funnell (2000) pointed out, unlike the treatment of acute illness, the most important choices affecting the health and well-being of people with diabetes are made by themselves and not by their physician or any other health professional. Every day they need to make a series of choices with regards to eating and physical activity that are very important in regulating their blood glucose levels and overall health. An understanding of their eating and physical activity behaviour with a focus on mental related factors would help to improve on the effectiveness of dietary practice and physical activity focused interventions in the management of the Type II diabetes. The day to day practice of dietician dealing with these patients should emphasize on mental related factors when promoting healthy diet and adequate physical activity.

Probably one of the most innovative approaches is to use theoretical based frameworks with strong emphasis on the patients' decision making process. Based on the critical analysis of five theoretical paradigms (Sella *et al*., 2007) which attempt to explain treatment adherence the Theory of Planned Behaviour (TPB) (Ajzen, 1991) emerged as the only theory which put the patients' decision making process on focus and formed a foundation framework within which patients' perceptions and beliefs regarding dietary and physical activity behaviours, could be measured and empirically tested. This theory explains that behavioural intentions (explicit decisions) are influenced by three factors: attitude, subjective norm and perceived behavioural control and that intention itself influence behaviour. However, the applicability of this theory in dietary and physical activity promotion in Kenya was not well documented and the researcher felt that this theory needed to be tested in populations with Type II diabetes to identify factors that can be manipulated to achieve optimal behaviour change (Anderson & Funnell, 1999). In addition, the scope of this needed to be expanded to include more mental related factors strongly supported by literature in order to come up with an integrated mental tailored communication model that would be adopted for healthy dietary and physical activity promotion.

1.2 Statement of the Problem

More than 3 million Kenyans are suffering from Type II diabetes mellitus with leading cases in Nairobi, Nyeri, Meru, Kisii, Coast and Kisumu in that order (Kimani and Okwemba, 2007). This is a serious threat to our economy since national resources are directed to the management of the condition within our health care systems. Individuals are also directing their meagre resources from food to manage the disease. At Kisii Hospital in Kisii town, records show an increasing incidence of Type II diabetic patients being enrolled in the diabetic clinics every week. Research

has found that the prevalence of these conditions may be due to long-term physical inactivity and unhealthy dietary practices (WHO, 2003a). Effective promotion of adequate physical activity and healthy dietary practices among those already diagnosed with the disease and the general population at risk may be an alternative low-cost solution to the conventional treatment approaches in the management of this disease. Physical activity and dietary promotion interventions among the Type II diabetic patients is evident in most diabetic clinics in Kenya. Despite this, diabetic patients still continue to suffer from the effects of the disease due to mixed perceptions with regard to physical activity and dietary recommendations.

In every clinic, health professionals attending to diabetic clients have unique ways of passing messages. This has brought a lot of confusion to the patients particularly on diet and physical activity therapy. Many clinics lack standardized methodologies in patients' education. Patients' perceptions about practicing healthy diet and engaging in adequate physical activity are often not given serious thoughts by the primary health care providers dealing with diabetes patients. Diabetic programmes emphasizing on healthy dietary and physical activity promotions lack focus mental related patients' factors. The facts-based approach that is currently being adopted has not only ignored many behaviour related factors, but also difficult to standardize across diabetes clinics. Mental related factors such as attitude, social norms, perceived behavioural control, intention, perceived susceptibility, perceived benefits, perceived barriers, cues to action, action control, action plan, maintenance self efficacy as well as knowledge are some of the patients' related factors which are ignored when designing materials to educate diabetic patients due to lack of a well designed patients' education model. These factors have been identified in a number of theoretical models for example Health Belief Model. However, these models are still

limited in scope and have not been developed within environment of application. To accomplish this, there was need to develop a mental health tailored communication model that will include as many of this factors as possible. However, this process should begin from the existing models as a foundation up on which new models can be generated.

This study sought to use the Theory of Planned Behaviour as a foundation upon which new models would be generated within physical activity and dietary practice domains among patients suffering from Type II diabetes. This theory is build up by psychosocial attributes explaining how individuals make decisions or arrives at intention to behave in a certain way and has been proved to be useful in understanding key factors determining physical activity and dietary behaviours among the Type II diabetic patients. It was noted that, this theory may be limited on certain unexplained additional factors both at the pre-intention phase and post-intention phase, hence, the need to expand its scope to include more attributes. Specifically, key individual-related elements in behaviour change including: perceived knowledge, perceived susceptibility, perceived severity, perceived benefit, cues to action, action plans, action control and maintenance self-efficacy were selected to be included as moderators and mediators in the proposed models.

1.3 Objectives

1.3.1 General Objective

The general objective of the study was to establish the influence of moderators and mediators on relationship between psychosocial factors, dietary and physical activity behaviours of Type II diabetics in Kisii level-V hospital in Kenya. This was broadly achieved by testing the predictive power of the Theory of Planned Behaviour (TPB) and newly developed versions within dietary practice and physical activity domains among these patients so as to develop a mental health tailored communication model.

1.3.2 Specific Objectives

The specific objectives of the study were:

1. To determine predictive power of the TPB model applied to dietary and physical activity behaviours treated as mutually exclusive events.
2. To determine influence of perceived knowledge as a pre-intention mediator between attitude, subjective norm, perceived behavioural control and intention within the TPB model applied to dietary and physical activity behaviours treated as mutually exclusive events.
3. To determine moderating influence of perceived susceptibility, perceived severity, perceived benefits and cues to action in predicting intention construct within the TPB model applied to dietary and physical activity behaviours treated as mutually exclusive events.
4. To determine the mediating influence of action plan, action control and maintenance self-efficacy at the post-intention phase within the TPB model applied to dietary and physical activity behaviours treated as mutually exclusive events.

1.4 Research Hypotheses

Eight model based research hypotheses were specified within the framework of set objectives:

1. The TPB model fits the data on dietary behaviour acceptably among Type II diabetic patients.
2. The TPB model with perceived knowledge as mediator between attitude, subjective norm, perceived behavioural control and intention fits the data on dietary behaviour acceptably among Type II diabetic patients.
3. The Theory of Planned Behaviour (TPB) model with perceived susceptibility, perceived severity, perceived benefits and cues to action as moderators of attitude, subjective norm and perceived behavioural control fits the data on dietary behaviour acceptably among Type II diabetic patients.
4. The Theory of Planned Behaviour (TPB) model with action plan, action control and maintenance self–efficacy as mediators between intention and behaviour fits the data on dietary behaviour acceptably among Type II diabetic patients.
5. The TPB model fits the data on physical activity behaviour acceptably among Type II diabetic patients.
6. The TPB model with perceived knowledge as mediator between attitude, subjective norm, perceived behavioural control and intention fits the data on physical activity behaviour acceptably among Type II diabetic patients.
7. The Theory of Planned Behaviour (TPB) model with perceived susceptibility, perceived severity, perceived benefits and cues to action as moderators of attitude, subjective norm and perceived behavioural control fits the data on physical activity behaviour acceptably among Type II diabetic patients.

8. The Theory of Planned Behaviour (TPB) model with action plan, action control and maintenance self–efficacy as mediators between intention and behaviour fits the data on physical activity behaviour acceptably among Type II diabetic patients.

1.5 Justification of the Study

Dietary and physical activity promotions among Type II diabetics now require health communication strategies with strong theoretical backgrounds. Currently, diabetic clinics in Kenya use simple behaviour change communications based on general facts. This process leaves out patients' related mental factors important for their decision making process. Behaviour change communications that incorporate social and cognitive theories have been found to be effective in nutrition and health related behaviour change (Noris *et al.,* 2001) in primary healthcare.

Five theoretical paradigms related to treatment adherence (Lenenthal & Cameron, 1987) have been identified in the field of behavioural health promotion. However, only cognitive paradigm focuses on the mental related factors of patients and include four theories namely; Health Belief Model (Glanz *et al.,* 2002), Social Cognitive Theory (Redding *et al.,* 2000), Protection Motivation Theory (Rogers, 1975) and Theory of Planned Behaviour (Ajzen, 1991). Based on literature, it was evident that among the four theories within this paradigm, the Theory of Planned Behaviour emerged as the only theory which puts the patients' decision making process at the centre with intention being the locus of control. This theory appeared useful in understanding patients' mental related factors especially those related to the decision making process. The researcher therefore argued that testing the predictive power of the Theory of Planned Behaviour and expanding its constructs within dietary and physical activity behaviour

domains could help come up with a *mental health tailored communication model* useful in physical activity and dietary promotion. This was to be achieved when additional factors such as knowledge, perceived susceptibility, perceived severity, perceived benefit, cues to action, action plans, action control and maintenance self–efficacy were included in the original model.

The researcher took into account that two important gaps exist within the theory of planned behaviour. The first gap exists during the pre-intention phase while the second gap exists during the post-intention phase. The initial gap would be closed when factors such as perceived susceptibility, perceived severity, perceived benefit and cues to action (Glanz, *et al.*, 2002) were considered as moderators of attitude, subjective norm and perceived behavioural control within the Theory of Planned Behaviour. This was arrived at based on the critique that variables within the HBM remain unmediated with intention (Stroebe, 2000). In addition, knowledge was also positioned to mediate attitude subjective norm and perceived behavioural control. Fishbein and Ajzen (1995) treated knowledge as a background variable; however, the researcher argued that knowledge should be a key factor within the theory.

Finally, the post intention gap also drew empirical attention in this study. Even though the intention construct is explained by a number of social cognitive theories as a key factor in predicting behaviour (Armitage & Conner, 2000; Abraham & Heeran, 2003; Weistern, 2003; Wallston & Armstrong, 2002), post–intentional processes are not yet well understood and therefore, further research on the latter phase of health behaviour change was necessary (Ades, 2001; Blanchard, *et al.*, 2001; Donker, 2000). It was argued that closing the pre-intention and post-intention gaps in the Theory of Planned Behaviour could make a significant scholarly

contribution in behavioural theory research and finally provide a better all inclusive frameworks for understanding Type II diabetic patients' behaviour.

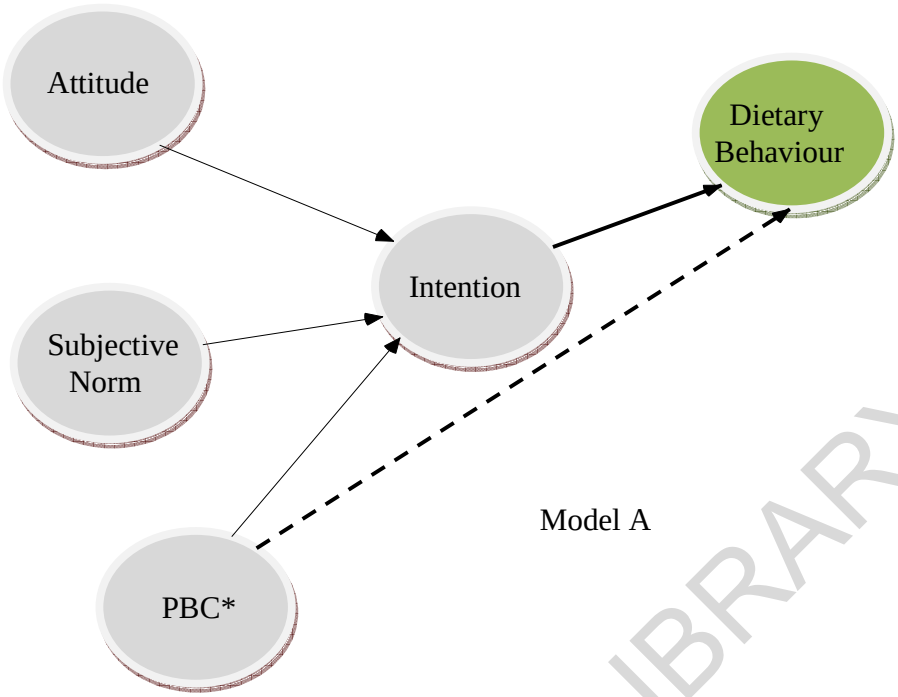
The result of this study can now be applied within primary health care delivery systems in most diabetic clinics in Kenya. Health professionals attending to diabetic patients are key target users of the output of this study. The generated *mental health tailored communication model* can be used as an intervention tool for promoting healthy eating and physical activity behaviours across most if not all clinics in Kenya.

1.6 Theoretical Framework

The Theory of Planned Behaviour (Ajzen, 1991) formed the basis for developing measurable concepts and variables within physical activity and dietary practice domains. According to this theory health related behaviour can be predicted by the intention construct. Intention is influenced by attitude, subjective norm and perceived behavioural control towards the behaviour. Attitudes are considered as beliefs about the outcome of the health related behaviour weighed by the value of the outcome. Subjective norm is the belief an individual has that key people in his or her life may influence them to behave in a certain way, weighed by the level of compliance to such influence. Perceived behavioural control is the belief an individual has that certain factors may facilitate or impede behaviour action weighed by the perceived control power he or she has on these factors. Figure 1.1 illustrates two models separated by a broken line. Model A, illustrates that dietary behaviour may be predicted by intention and intention is further predicted by attitude, subjective norm and perceived behavioural control. Model B illustrates that physical activity behaviour may be predicted by intention and intention is further predicted by attitude,

subjective norm and perceived behavioural control. Both models are developed from the original theory of planned behaviour.

The focal point for this TPB model is the intention construct. Even though the intention construct is a good predicator of behaviour, attitude, subjective norm and perceived behavioural control do not account for 100 percent of the variations in intention across some studies (Astrøm & Okullo, 2004). In addition, Blanchard *et al.,* (2002) found the intention construct to be a weaker predictor of exercise behaviour. A number of factors were excluded in the original model yet may be important mediators between intention and behaviour. This leaves gap for investigations so as to include additional factors that moderate attitude, subjective norm and perceived behavioural control within the TPB model. Therefore, with the TPB model as the theory on focus structural models were specified and tested for goodness of fit for the data obtained on physical activity and dietary practice among the Type II diabetic patients. These models were developed in line with the objectives and hypotheses.



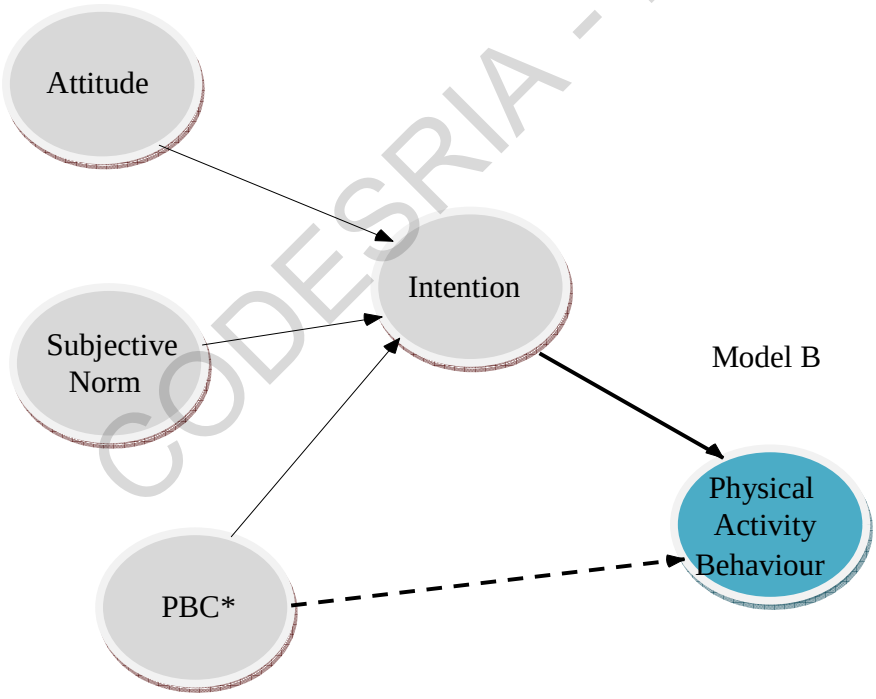


Figure1.1 Theory of Planned Behaviour

(Adapted from Ajzen, 1991)

* Perceived Behavioural Control

Psychosocial attributes, particularly the intention construct may have a substantial contribution towards decision–making process among Type II diabetic patients within physical activity and dietary practice domains. The decision making process rely on the intention construct from a social cognitive perspective. Intention construct is explained by a number of social cognitive theories as a key factor in predicting behaviour (Armitage & Conner, 2000; Wallston & Armstrong, 2002; Weistern, 2003). However, the concern is how best factors related to intention can be beefed up and be included in one framework that may be used in behaviour change. The Theory of Planned Behaviour focuses on the intention as a locus of control (Ajzen, 1991) and seems to be a powerful model that can allow investigation of additional variables related to intention. This theory has so far drawn attention of most health researchers and is currently being used to study health related behaviour (Blue, 2007).

Despite wide utilization of the Theory of Planned Behaviour in studying health behaviour, there have been cases when the theory fails to fully explain behaviour. For example a study conducted by Blanchard *et al*., (2002) where the Theory of Planned Behaviour(TPB) was put to test during and after Phase 2 cardiac rehabilitation (CR). In this study the patients completed a TPB questionnaire that included attitudes, subjective norms, perceived behavioural control (PBC), intentions, and previous exercise behaviour. Results indicated that attitude, subjective norm, and PBC explained 38 percent (R^2 =0.38) of the variance in exercise intention during Phase 2 CR and 51 percent (R^2 =0.51) of the variance 6 to 10 weeks after Phase 2 CR. Regression analysis also revealed that intention explained 22 percent of the variance in exercise adherence during and 23 percent after Phase 2 CR. In this study intention construct appeared to be a weaker predictor of exercise behaviour after following Ajzen's (1991) methodological steps. This may be an

indication that a number of factors other than intention may intervene during post–intentional phase to influence behaviour on focus as opposed to what the theory postulates. It also demonstrates that post-intentional processes are not yet fully explained and therefore further research on this latter phase of health behaviour change is necessary (Ades, 2001; Donker, 2000). Some authors suggested the need to include the post-intentional mediators such as action control, action plans and maintenance self–efficacy (Falko *et al.,* 2005) into the models with intention construct as a locus of control. On the other hand, some factors may also compete with the intention predictors during the pre-intention phase. In this methodological paradigm, there is need to consider expansion of the TPB model at the pre-intentional (motivational) phase (Heckhansen, 1991). In this motivational phase attitude, subjective norm and perceived behavioural control are key predictors of intention (Ajzan, 1991) but it would be appropriate to consider other moderating factors such as perceived susceptibility, perceived severity, perceived benefits, cues to action (Glanz *et al.,* 2002) and knowledge which the model ignored yet could be important in understanding health behaviour. Probably an attempt to close the pre-and post intention gaps may improve the value of this theoretical framework.

Limited studies have used the Theory of Planned Behaviour in studying health related behaviours particularly in Kenya. Using this theory to understand physical activity and dietary practice among the Type II diabetic patients may be a significant contribution made in health behaviour research and especially in developing countries. A better approach should go beyond the application of the theory as it is, but in modified versions. Factors that need to be put into consideration during expansion of this theoretical model include knowledge, patients perceptions in relation to susceptibility, severity, benefits and cues to action, action control, action plan and

maintenance self-efficacy. All these need to be considered as possible determinants of physical activity and dietary behaviours of Type II diabetics. It is on this argument that the researcher proposed a series of new models with additional concepts to the traditional concepts of the theory of planned behaviour. The first model category (Model 1A) dwelt on mediating role of knowledge at the pre-intention phase of the TPB model applied to dietary behaviour while the second model (Model 1B) focused on knowledge as a mediator during the pre-intention phase of the TPB model applied to physical activity behaviour (Figure 1.2).

As improvement to the TPB model, the proposed models close the gap between psychosocial factors (attitude, subjective norm and perceived behavioural control) and intention. Ajzen (1991) considered knowledge as a foundation upon which attitude, subjective norm and perceived behavioural control are built. However, we proposed that knowledge should mediate these factors with intention in a structural network. Figure 1.2 illustrates two models separated by a broken line. Model 1A, illustrates that dietary behaviour may be predicted by intention and intention is further predicted by knowledge. Dietary knowledge can be predicted by attitude, subjective norm and perceived behavioural control. Model 1b illustrates that physical activity behaviour may be predicted by intention and intention is further predicted by knowledge. Perceived knowledge in relation to physical activity can be predicted attitude, subjective norm and perceived behavioural control. Both models are developed from the original theory of planned behaviour.

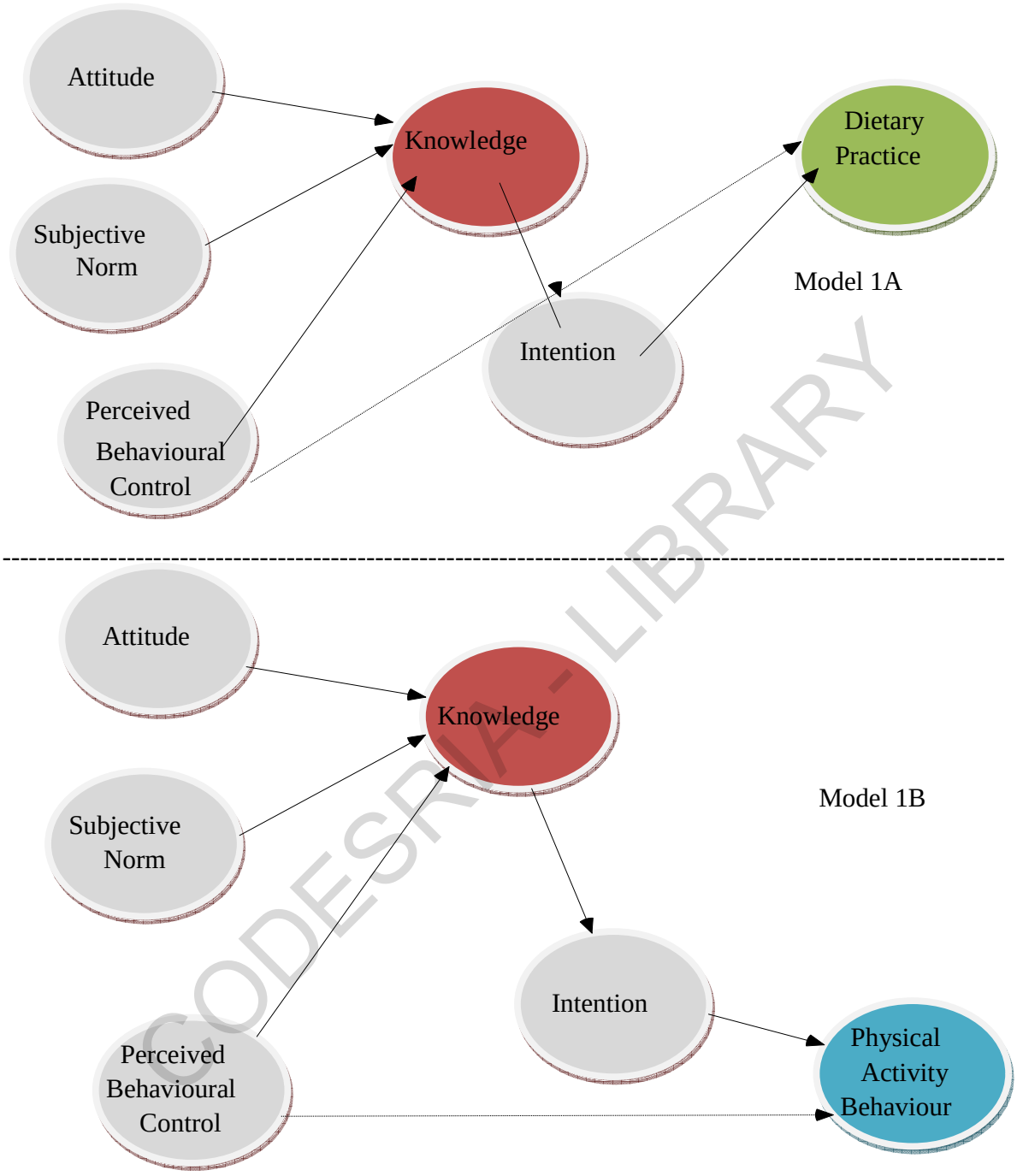


Figure 1.2 TPB Models (A&B) with knowledge as a mediator between psychosocial factors and intention within physical activity and dietary behaviours

(Modified from Ajzen, 1991)

In the second model category (Figure 1.3) we considered the role of perceived susceptibility, perceived severity, perceived benefits and cues to action drawn from health belief model (Glanz *et al*., 2002) as moderators along psychosocial factors (attitude, subjective norm and perceived behavioural control) which are the key predictors of the intention within TPB model applied to dietary behaviour (Model 2A). The second model (Model 2B) also focused on the role of perceived susceptibility, perceived severity, perceived benefits and cues to action as moderators along psychosocial factors (attitude, subjective norm and perceived behavioural control) that are key predictors of the intention within TPB model applied to physical activity behaviour. These model series attempts to improve on the original TPB model by trying to explain that other than attitude, subjective norm and perceived behavioural control other intervening factors such as perceived susceptibility, perceived severity, perceived benefits and cues to action all drawn for health belief model may have some overall effect on the original model. Figure 1.3 illustrates two models separated by a broken line. Model 2A, illustrates dietary behaviour may be predicted by intention and intention is further predicted by perceived susceptibility, severity, benefit and cues to action in addition to attitude, subjective norm and perceived behavioural control. Model 2B illustrates that physical activity behaviour may be predicted by intention and intention is further predicted by perceived susceptibility, severity, benefit and cues to action in addition to attitude, subjective norm and perceived behavioural control. Both models are developed from the original theory of planned behaviour.

The third model series (Figure 1.4) put to test two models with a focus on the post-intention phase of the TPB model. The first model (Model 3A) dwell on the mediating roles of action plan, action control and maintenance self efficacy between intention and dietary behaviour. The

second model (Model 3B) dwell on the mediating roles of action control, action plan and maintenance self efficacy between intention and physical activity behaviour. This series attempt to improve on the original TPB model by closing the gap between intention and behaviour. It attempted to explain that beyond the intention, there were factors that eventually influence behaviour. These factors had their own interaction patterns. Three paths were proposed in this model. In the first path the relationship between intention and behaviour was mediated by action plan. In the second path the relationship between intention and behaviour was mediated by maintenance self efficacy and action control. In the final path, the relationship between intention and behaviour was mediated maintenance self efficacy and action plan. Both action plan and action control were direct predictors of behaviour.

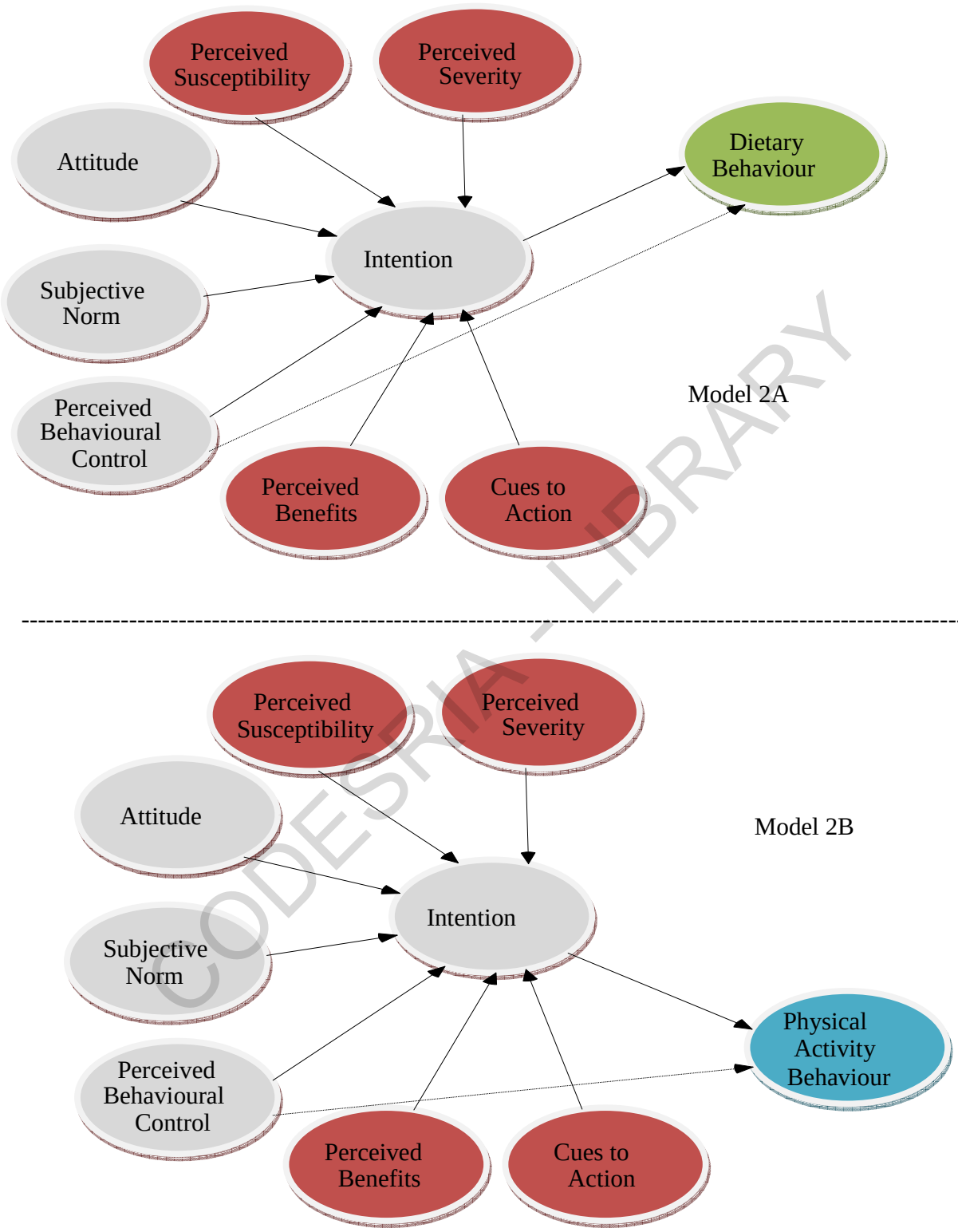


Figure 1.3 TPB model (A&B) with perceived susceptibility, perceived severity, perceived benefits and cues to action as additional predictor of intention construct applied within dietary and physical activity behaviours

(Modified from Ajzen, 1991)

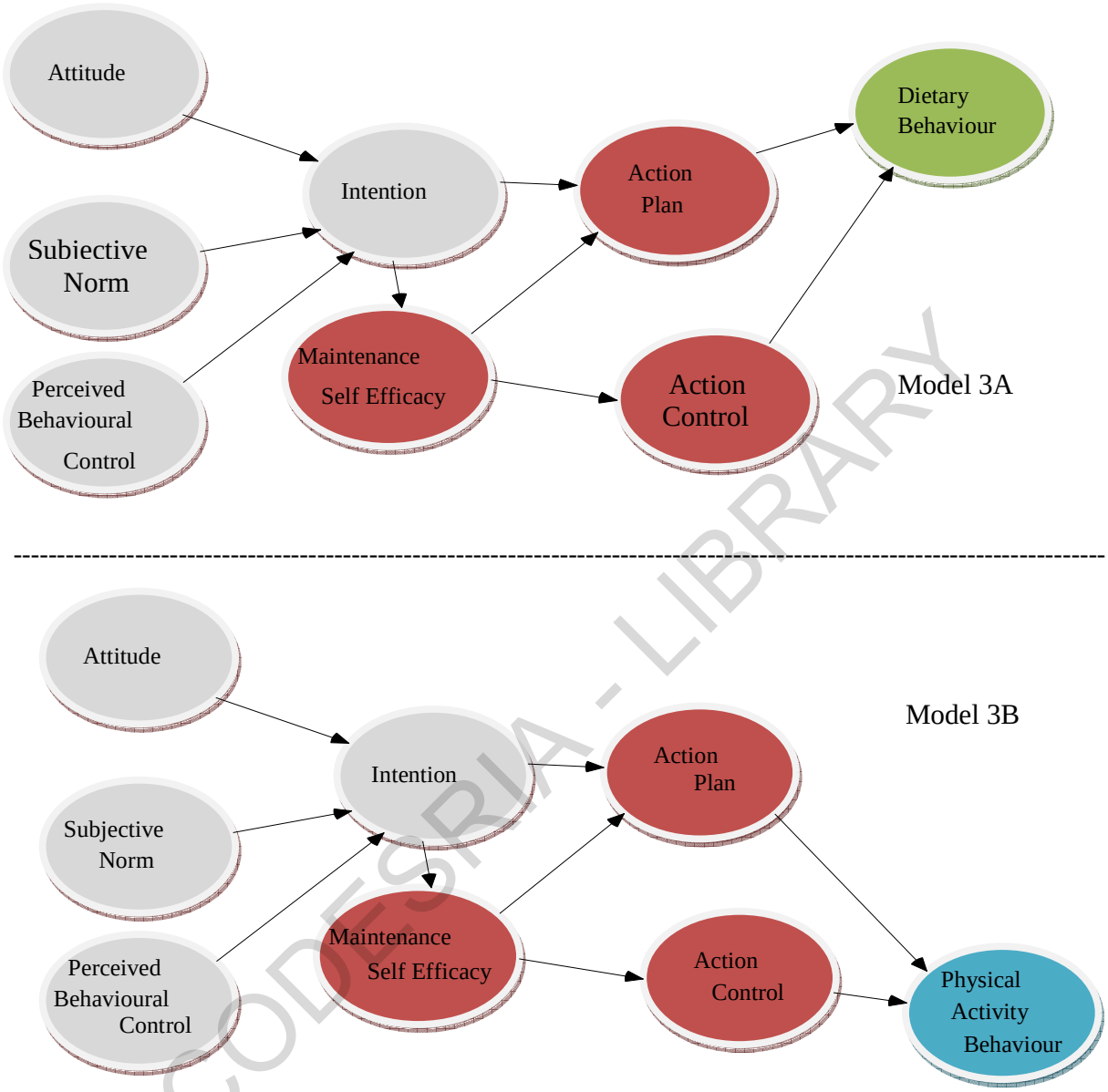


Figure 1.4 TPB model with action control, action plan and maintenance self efficacy as mediators between intention, dietary behaviours and physical activity

(Modified from Ajzen, 1991)

2.0 CHAPTER TWO: LITERATURE REVIEW

Ensuring adherence to recommended diet and adequate physical activity among patients with Type II diabetes poses a challenge to health initiatives. This process may be facilitated using health behaviour theories. Psychological theories of behaviour change in health promotion discipline could be as many as above 30, which makes it difficult to choose the most useful one when designing different kinds of behaviour change interventions. Existing theories need to be re-examined further to determine their relevance in promoting long-term engagement of physical activity and healthy diet among Type II diabetics and other groups with specialized disease conditions.

This chapter locates the Theory of Planned Behaviour within the five main theoretical perspectives related to treatment adherence (Leventhal & Cameron, 1987; Salla *et al.*, 2007). Even though these five domains of behaviour change were viewed as perspectives the researcher describes them as theoretical paradigms of behaviour change. These paradigms seemed useful in determining which theory could be relevant in identifying the psychosocial factors determining adherence to physical activity and health dietary recommendations among Type II diabetics. The chapter goes further to discuss the history of the Theory of Planned Behaviour and narrowing down to its application in health behaviour related research. Finally, it identifies and justifies the gaps that needed to be filled during this study.

2.1 Paradigms of Behavioural Theories

Behavioural theories may be categorized into five main paradigms including biomedical paradigm, behavioural learning paradigm, communication paradigm, self regulation paradigm,

stage paradigm and cognitive paradigm. Sella *et al.* (2007) discusses the relevance of these paradigms in the treatment adherence related to HIV and AIDS medication. On the other hand the researcher focuses on how these paradigms can be applied in the context of physical activity and dietary practice adherence among Type 2 diabetics.

The biomedical paradigm regards patients as passive recipients of doctors' or health providers' instructions. In this paradigm health or disease becomes a function of biomedical causes for example bacteria and/or viruses body (Ross & Deverell, 2004) with main focus given to body treatment. However, patients are often seen as active decision makers and do not merely receive and follow instructions as provided. This paradigm therefore may not apply in physical activity and dietary promotion at primary level of intervention. Probably, it may only apply during the curative stages of disease prevention and more so at tertiary level.

Behavioural learning paradigm uses the principles of causes and consequences and how they influence behaviour (WHO, 2003b). It looks as causes as either internal (thoughts) or external (environmental cues) while consequences may be punishments or rewards associated with physical activity and dietary practices. Its success depends on the extent to which rewards are valued and punishments feared. Ignoring patients' perspective is a big gap for this theory and probably suggests that it may not be better framework for promoting healthy diet and physical activity among Type II diabetic patients.

Communication paradigm focuses on the relationship between the patient and the client. This paradigm suggests that patients who follow a health provider's instruction are probably those

who develop good rapport with the provider. Such patients also tend to follow health provider's instructions carefully to avoid losing trust (Salla, *et al*., 2007). Communication components have been used in several diabetic clinics to promote physical activity and healthy diet but not as the main component. Interventions based on communication paradigms are unlikely to succeed in isolation in improving long-term adherence to physical activity and healthy dietary recommendations among Type II diabetic patients. This is because of the influence of external factors, such as the costs of accessing healthcare for treatment and the difficulties associated with establishment of a rapport between the health provider and the patient. Because communication interventions are typically restricted to provider-client interactions, additional social or financial support may thus be required.

Self-regulation paradigm focuses on self-regulatory theory which examines individuals' subjective experience of health threats to understand the way in which they adjust to these threats (Leventhal *et al.,* 1992). According to this theory, individuals form cognitive representations which help in selecting strategies for coping with health threats, and consequently influence associated outcomes (Benyamini *et al.,* 2004). The theory only dwells on patient's personality and religious, social and cultural context but ignore mental related factors which are important factors and the main focus for this study. It also offers little guidance related to the design of interventions and suggests that specific suggestions are needed as to how these processes could promote adherence (Salla *et al*., 2007; WHO, 2003b).

Stage paradigm has *the transtheoretical model (TTM)* as the single most important theory. In this model a number of qualitatively different, discrete stages and processes of change, and reasons

that people move through these stages, typically relapsing and revisiting earlier stages before success (Sutton, 2000) are emphasized. The perceived advantages and disadvantages of behaviour are seen to be crucial to behaviour change (Prochaska, 1994). For example if the change is targeting healthy eating and physical activity engagement, the advantages and disadvantages in reference of Type II diabetes remains key in determining that change. However, advantages and disadvantages may not necessarily be internal factors and patient related. This puts this theory on debate particularly on psychosocial mental health related studies.

The cognitive paradigm includes theories such as the health belief model (HBM), social-cognitive theory (SCT), the theories of reasoned action (TRA) and planned behaviour (TPB) and the protection motivation theory (PMT). These theories dwell on mental aspect of behaviour change, and are based on common assumptions that attitudes, beliefs expectations of future events and outcomes are major determinants of health related behaviour. Within the context of this study, diabetic patients would adhere to physical activity recommendations and healthy diet if these two actions wuold lead most likely to positive outcomes. The HBM views health behaviour change as the balance between the barriers to and benefits of action (Blackwell, 1992). In this theory the entire constructs such as perceived susceptibility, perceived severity, perceived benefits and cues to action (Glanz, *et al.,* 2002) are independent and directly related to behaviour in question. There is evidence that some components such as perceived severity may have a weak correlation with health action and might even result in avoidance of protective action (Bandura, 1997). This implies that a Type II diabetic patients who observes severe outcome of the condition may shy away from following recommended diet and physical activity. Another important weakness on this theory is failure to consider mediating factors specifically the

intention construct (Stroebe, 2000). It could be important to consider the influence of additional socio-psychological factors that mediates main concepts in the model with behaviour when applying this theory to promote long-term physical activity and healthy dietary practice. The most important factor in patients' decision making process is the intention to engage in behaviour on focus.

The Protection-Motivation Theory focuses on three components of fear including the magnitude of harm of a depicted event, the probability of an event's occurrence; and the efficacy of the protective response (Rogers, 1975). These three fear components determine the level of motivation. For example fear of the hidden and direct consequences of Type II diabetes may motivate an individual to engage in physical activity and healthy dietary practice. However, the theory ignores several mental factors and does not give room for addition of new concepts. Social-cognitive theory has its roots from social learning theory and probably the most comprehensive theory of behaviour change developed (Redding *et al.,* 2000). In this theory a network of causal structure regulates human motivation, action and well-being (Bandura, 2000). In this theory individual, the environment and behaviour (Redding *et al.,* 2000) are seen to be in constant interaction. Social-cognitive theory recognizes additional self-influences necessary for change to occur other than knowledge of health risks and benefits (Bandura, 2004). However, it does not specify which of these patients' related factors are important. Again in this theory behaviours are enacted if people perceive that they have control over the outcome, that there are few external barriers and when individuals have confidence in their ability to execute the behaviour (Armitage & Conner, 2000). Diabetic patients may develop good eating habits and

engage in adequate physical activity only when they are sure that factors which hinder them to do so will be overcome.

Theory of Planned Behaviour (TPB) and the Theory of Reasoned Action (TRA) go together in this paradigm. The TRA (Fishbein & Ajzen, 1975) assumes that most socially relevant behaviours are under volitional control, and that a person's intention to perform a particular behaviour is both the immediate determinant and the single best predictor of that behaviour (Sutton, 1997). The authors argue that other variables besides those described above can only influence the behaviour if such variables have significant effects on attitudes or subjective norms. The authors later on extended the theory to include behavioural control and changed the name to the Theory Planned Behaviour (Ajzen, 1991). This theory has definite concepts with surrounds the decision making concept labeled intention. Due to its latest development whereby perceived behavioural control became an additional concept, the theory stood in a better position to help exhaust as many psychosocial factors as possible.

Information-motivation-behavioural skills (IMB) theory was developed to promote contraceptive use and prevent HIV (Fisher & Fisher, 1992). Its main focus is on motivation and behaviour skills. Information in this context refers to knowledge about a medical condition which determines behaviour. Behavioural skills include factors such as ensuring that the patient has the skills, tools and strategies to perform the behaviour as well the belief that they can achieve the behaviour. There is a possibility of this theory to fit interventions that target physical activity and healthy dietary promotion for patients suffering from Type II diabetes. The theory has some close links to Theory of Planned Behaviour based on attitudes towards behaviour; perceived

social support for the behaviour; and the patients' subjective norm or perception of how others with the condition might behave (WHO, 2003b).

In summary there appeared to be evidence that many theories exist in health promotion and can be adopted for behaviour change interventions and more so in promoting health dietary practice and physical activity among Type II diabetics. The Theory of Planned Behaviour which draws in roots from cognitive paradigm was chosen as a powerful model that could help come up with a more comprehensive behaviour change framework for promoting healthy dietary and physical activity behaviours to address our research problem. This theory demonstrated high potential to include more patients' related mental factors and befitted the intended scope of research. Its evolvement over time and its focus on intention as a mediator between the underlying psychosocial factors and behaviour identified two gaps that could be filled to develop a wider patient friendly structural network of behaviour change model.

2.2 Theory of Planned Behaviour (TPB) as a Model of Choice

In this section the researcher focuses on the historical development of the Theory of Planned Behaviour and how the theory has involved since discovery. Ajzen and Fishbein (1980) formulated the theory of reasoned action (TRA) from attitude research based on the Expectancy Value Models. In their study an attempt was made to estimate the difference between attitude and behaviour. A person's behaviour was found to be determined by his intention to perform the behaviour and that this intention is a function of attitude toward the behaviour and his/her subjective norm. Attitudes in this case are made up of the beliefs that a person accumulates over his/her some of which are formed from direct experience while others come from outside

information and others are inferred or self generated. However, only a selected set of beliefs can influence attitude and are called salient beliefs (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). An attitude is therefore a person's salient belief about whether the outcome of his/her action will be positive or negative. If a person has positive salient beliefs about the outcome of his/her behaviour then he/she is said to have a positive attitude towards the behaviour. On the other hand if a person has negative salient beliefs about the outcome of his/her behaviour he/she is said to have a negative attitude. The beliefs are rated for the probability that engaging in the behaviour will produce the believed outcome. This is called the belief strength. Next, the perception of whether this outcome is positive or negative is evaluated using a likert scale (Ajzen, 1991). These two factors, belief strength and evaluation, are then multiplied to give the attitude. The following equation describes this integration process:

$$A_B = \sum_{i=1}^{N} b_i e_i$$

Where: A_B= attitude toward the behaviour; b= beliefs the individual has about the fact that performing the behaviour B leads to a consequence or outcome i; e= evaluation of the outcome i; i= the specific behavioural belief number, from 1to N (Fishbein & Ajzen, 1975).

Subjective norms (SN) are beliefs about what others will think about the behaviour. They are perceptions about how significant others will perceive the outcome of the behaviour i.e. normative belief (NB) and the degree to which this influences whether the behaviour is carried out i.e. motivation to comply (MC). These two factors are multiplied to give the subjective norm.

Subjective norms are formed specifically in relation to the opinions of persons considered to be significant or important. This formulation is presented in the following equation:

$$SN = \sum_{i=1}^{M} (NB)_i \, (MC)_i$$

Where: M= specific number of reference group from 1 to M. (Fishbein & Ajzen, 1975)

Intention is the probability as rated by the subject and focuses on the willingness that he/she will engage in behaviour. This intention is made up of the attitudes and subjective norms previously discussed and variables not included in the model could affect intention and consequently, behaviour (Ajzen & Fishbein, 1980). However, these variables must significantly affect the attitude or normative belief component and their weights. These factors include demographic variables and personality traits. If an intention is transmitted into action then it forms behaviour. The theory is represented symbolically as follows:

$$B \sim I = (Aact)\, W_1 + (SN)\, W_2 + error$$

Where: B= behaviour; I= intention; Aact= individual's attitude toward the behaviour; SN= subjective norms; W= Weight (Fishbein and Ajzen, 1980).

This TRA was found to be more related to voluntary behaviour (Ajzen, 1991). Later on behaviour appeared not to be 100 percent voluntary and was seen to be under control, this resulted in the addition of perceived behavioural control (PBC) construct into the model. With this addition the theory was called the Theory of Planned Behaviour (TPB). Perceived behavioural controls are beliefs about the presence of factors that may facilitate or impede

performance of the behaviour (control belief strength) and the perceived power of these factors (control belief power). These two factors are multiplied to give the perceived behavioural control.

$$PBC = \sum_{i=1}^{N} C_i P_i$$

Where N=the specific control belief number, from 1to N.

The Theory of Planned Behaviour is a theory which predicts deliberate behaviour, because behaviour can be deliberative and planned. In summary, the Theory of Planned Behaviour states that human action is guided by three kinds of considerations: beliefs about the likely outcomes of the behaviour and the evaluations of these outcomes (behavioural beliefs), beliefs about the normative expectations of others and motivation to comply with these expectations (normative beliefs), and beliefs about the presence of factors that may facilitate or impede performance of the behaviour and the perceived power of these factors (control beliefs) (Azjen, 1991). This theory can then be represented symbolically as:

B~I= (Aact) W_1 + (SN) W_2 + (PBC) W_3 + error; with an additional component of the perceived behavioural control (Ajzen, 1991).

2.3 TPB Model applied to Physical Activity and Dietary Behaviour Research

The TPB has been used in a number of studies to understand or predict different kinds of behaviours related to physical exercise, diet and some of such studies have yielded positive results on the predictability of the TPB. Åstrøm & Okullo (2004) validated the usefulness of TPB in predicting intended and self-perceived sugar consumption among adolescents, where major constructs of the theory including attitude and perceived behavioural control predicted intended

sugar consumption at Time 1 and Time 2, accounting for 58 percent (R^2= 0.58) and 19 percent (R^2= 0.19) respectively. Other studies have also supported the efficacy of TPB in predicting dietary behaviour (Armitage & Conner, 1999; Furnham & Lovett, 2001; Norman & Hoyle, 2004). However, studies of this nature are limited in the Kenyan literature giving a clear indication of the need for nutrition and health research based on behavioural theories.

Current studies in the developed world are now concerned with the modification and extension of the Theory of Planned Behaviour. There appears to be a growing empirical evidence to support addition of variables such as past behaviour, self efficacy, moral norms, self-identity, social support and affective beliefs (Armitage & Conner, 1998) among others to the TPB. Nejad *et al.,* (2004) attempted to predict dieting behaviour of female undergraduate students in Australia, using a modified version of the TPB that included prior dieting as additional component. They found out that the strongest predictor of intention to diet was direct attitude while prior dieting only predicted follow-up dieting. Prior dieting in this case represented the past behaviour as additional key component to the TPB. Within this context there are variables that only come in as additional measures of the major constructs of the TPB. For example Ajzen (2002) added self-efficacy and controllability items to perceived behavioural controls. Self-efficacy in this case is the belief an individual has that he or she can accomplish a specified task, while controllability items are those specific behaviour determinants that an individual beliefs he or she has full control over. Instead of extending or modifying the TPB, Courneya *et al.,* (2000) considered replacement of subjective norm with social support based on the results of their study and found social support to be more superior to subjective norm in predicting exercise intention.

The researcher proposed to focus on both the use of the TPB to understand dietary and physical activity behaviour in addition to the extension or modification while controlling a number of factors that may intervene. The main reasons for giving the study this kind of approach is because there seemed to be controversy in some situations where certain studies have found that the theory sometimes fail to predict behaviour. For example, Gardner & Hausenblas (2004) noticed a failure of the TPB in predicting exercise adherence, exercise intention and diet intention in a prospective study that targeted women enrolled in a Weight-Loss Program. This implies that there is need to continue testing the efficacy of this theory among unique populations, in different settings and for different behaviour situations. The most recent study by Blue (2007) explored the utility of the TPB in explaining physical activity and healthy eating intentions in persons at risk for diabetes. Major constructs of the theory were good predictors of intention to be active or eat healthy diet. This study concentrated in utilization rather than expansion of the TPB model and suggests that utility of models is also another area that needs to be explored further. On the other hand there is a growing need toward expansion of behaviour change theories if we target using them as intervention tools for behaviour change communication within clinical settings and also for the general public. Therefore working on the gaps that exist within the Theory of Planned Behaviour could help improve on the theoretical model.

2.4 The Intention Gap within the Theory of Planned Behaviour

Psychosocial attributes may have a substantial contribution towards decision–making process among Type II diabetic patients within physical activity and dietary practice domains. The decision making process rely on the intention construct from a social cognitive perspective.

Intention construct is explained by a number of social cognitive theories as a key factor in predicting behaviour (Armitage & Conner, 2000; Abraham & Heeran, 2003; Wallston & Armstrong, 2002; Weistern, 2003). The main attributes in the Theory of Planned Behaviour such as attitude, subjective norm and perceived behavioural control are powerful predictors of intention, but the intention construct was found to be a weaker predictor of exercise behaviour (Blanchard *et al*., 2002). This implied that post–intentional processes are not yet well understood and therefore, further research on the latter phase of health behaviour change was necessary (Ades, 2001; Donker, 2000; Blanchard, *et al.,* 2001). In this paradigm, intentions were defined as explicit decisions to act in a certain way, for example engage in adequate physical activity and practice healthy dietary behaviour. These explicit decisions appear to be at the center and are surrounded by two phases within the TPB model. Two phases were core for investigation during this study. This included the pre-intentional (motivational) and the post-intentional (volitional) phases (Heckhausen, 1991). In the motivational phase (pre-intentional phase) attitude, subjective norm and perceived behavioural control are motivating factors (Ajzan, 1991) but there was need to consider other moderating effect of factors such as perceived susceptibility, perceived severity, perceived benefits, cues to action (Glanz *et al*., 2002) and mediating effect of knowledge which the model ignored yet very important in understanding health behaviour and could be powerful intention's predictors within the model. Likewise, the volitional phase was not yet well understood in the TPB model and the major concern was that some people may intend to behave in a certain way, but in the end fails to take action. Therefore, there was yet another need to shift focus to the post-intentional mediators such as action control, action plans and maintenance self–efficacy (Falko *et al*., 2005) in order to close this gap.

3.0 CHAPTER THREE: RESEARCH METHODS

This chapter focuses on the logical procedures that were followed to achieve the objectives of the study. First, it identifies and describes the nature of study setting. It also describes research design used, the study population, sample size determination and sampling procedures, variable measurement procedures, data collection and analysis methods and ethical considerations followed.

3.1 Study Setting

3.1.1 Choice of Setting

This study was intended to be conducted in Nyanza Province specifically within Level-V Hospitals in the national hospital category. These hospitals tend to cover a larger population of Type II diabetic patients in addition to hosting well established diabetic clinic sections. Only two hospitals met the criteria set in the province and the researcher intended to choose one for homogeneity of the patients which was necessary in theory building without bias. These included New Nyanza Provincial Hospital and Kisii Level-V Hospital. Based on a preliminary survey of the number of patients attending the clinics regularly in the two hospitals, Kisii Level-V Hospital was found to record twice as much as Type II diabetic patients on monthly basis compared to New Nyanza Provincial Hospital. In addition, the diabetic centre for Kisii was more advanced in terms of patient support programmes compared to the centre at New Nyanza Provincial Hospital. Patients attending New Nyanza Provincial Hospital clinic were less willing to participate in the study compared to patients attending Kisii Level-V Hospital. Most patients at New Nyanza Provincial Hospital were hesitant to participate based on a claim that researchers have always used them to collect information but have never given them any feedback. In addition, more

patients would be recruited in Kisii Level-V Hospital compared to the New Nyanza Provincial Hospital having considered the period allocated for data collection and analysis method which required a minimum of 200 patients. At New Nyanza Provincial Hospital regular patients attending the clinic on monthly basis could hardly reach 200 in number.

3.1.2 Actual Setting

The study was finally conducted at Kisii Level-V Hospital. This is a provincial referral hospital located at the centre of Kisii town. The hospital was started in 1916 by the colonial government to treat natives and injured soldiers. It grew over time to a district hospital and in 2007 the hospital was elevated to level 5 in the Hospital categories. The hospital operates within cost sharing principles in order to generate enough funds for improved service delivery. The hospital attends to approximately 16, 000 out patients per month with a limited number of staff. All the departments do not have adequate personnel. The diabetic clinic in the Hospital is currently hosted within the blood transfusion premises. This clinic is operated by the one consultant doctor, five doctors, six clinical officers, four nurses and one nutritionist. Until the period of data collection diabetic patients attended the clinic every Tuesdays and Fridays. During each clinic day, the patients arrive at 8.30 am and are tagged with numbers as they come in. As they wait to begin the clinical processes a session of education is conducted by a chosen health professional for the day. The patients then go through the normal processes beginning with screening of blood to determine sugar level. This is followed by medical prescription by the medical officer and individual counseling by a nurse before they proceed to the pharmacy. Within the premise there is a wide waiting bay with a capacity of a 100 patients. There is also television screen showing normal television programmes but once in a while showing films related to diabetes and other

diseases including HIV and AIDS and their related impact. There are a number of posters related to diabetic condition, most of which show severe outcomes of Type 1 and Type II diabetes.

3.2 Study Design

This study used a Sequential Exploratory Mixed Methods Design (Figure 3.1). This is a three-phase approach where the researcher first gathered qualitative data using Focus Group Discussions and analyzed it using *Constant Comparative Approach of Grounded Theory Analysis* (phase 1) and then went further to develop an instrument based on the qualitative analysis results (phase 2) subsequently administering the questionnaire to a sample of population (Phase 3; Creswell & Plano Clark, 2007). This study proposed to use *Sequential Exploratory Mixed Method Design* because it is relevant for grounded theory investigation (Creswell, 2009). The purpose of this strategy was to use quantitative data and results for the interpretation of the qualitative findings. This design was appropriate to use when testing elements of an emerging theory resulting from qualitative findings (Morgan, 1998). Mixed method approaches are now being emphasized in social and human sciences in diverse fields such as occupational therapy (Lysack & Krefting, 1994), interpersonal communication (Boneva, Kraut & Frohlich, 2001) and gained popularity in the field of social science research. The design was implemented following a Cross-Model approach which required that two population cohorts be identified and each cohort engaged in a qualitative study and followed later for a quantitative study within dietary and physical activity behaviour domains.

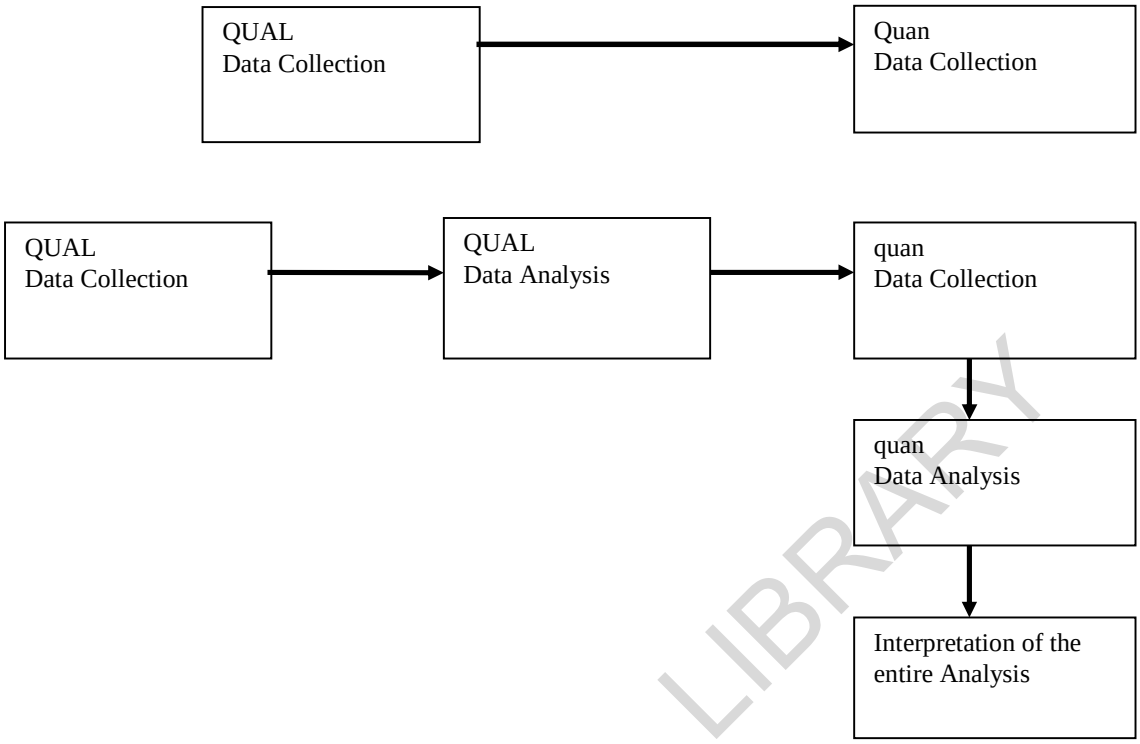


Figure 3.1 An illustration of Sequential Exploratory Mixed Method Design

Note:

→	Arrow indicates sequential form of data collection with one form (e.g. qualitative data) building on another form (e.g. quantitative data)
'QUAL"	Upper case indicates that qualitative method is emphasized more and has more weight
"quan"	Lower case indicates less emphasis is given to quantitative method

(Creswell *et al.*, 2003)

3.3 Study Population

Three Type II diabetic patients' cohorts existed within the clinic at Kisii Level-V Hospital. Each cohort was seen every three month cycle. The population was made up of two independent cohorts of all Type II diabetic patients who attended the diabetes clinic within a period of one month and had attended the clinic for at least twice. The first cohort was involved in the dietary survey while the second cohort was involved in physical activity survey following the principle

of Cross-Model approach. Based on the past one year record at the clinic beginning from June 2008 to June 2009, the total number of Type II diabetic patients who attended the clinic ranged from 350 to 400 patients per month. The maximum number of patients ever recorded at the clinic during the past one year was then chosen to work out a sampling frame for Type II diabetic patients who attended the clinic for a period of one month for each group, hence the working population was 400 Type II diabetic patients for dietary survey cohort and another 400 Type II diabetic patients for physical survey cohort, making a total of 800 patients involved in the study. Dietary survey cohort was engaged in the Month of June, 2009 for a qualitative survey and followed again in the Month of October, 2009 for a quantitative survey, while physical activity cohort was engaged in the Month of July for a qualitative survey and followed again in the Month of November, 2009 for a quantitative survey.

3.4 Sampling Procedures

Sampling of the participants was done at two levels. This included sampling during the qualitative phase and sampling during the quantitative phase. Qualitative phase adopted *theoretical sampling* technique where 8 participants (optimal number for an FGD) for each focus group discussion were purposively selected based on the criteria that they could help in building the opening and axial coding of the theory. Heterogeneous approach was followed in identifying these patients. In this case, half of the patients who strictly followed the recommended diet or engaged in adequate physical activity and the other half who did not were purposively selected for FGDs following the initial one-on-one interview with patients who reported to the clinic each clinic day. Quantitative phase recruited participants in this study every Tuesdays and Friday of the week for a period of two months during dietary and physical activity studies. Using Creative

Research Systems' (2003) formula to generate a representative sample size, we required a minimum of 217 patients for dietary survey and another 217 patients for physical activity survey. Creative Research Systems' (2003) formula has gained popularity in many surveys and has been used by a number of authors (Ibironke, 2002; Mugnaini, *et al.,* 2008) in sample size determination.

The sample size was determined as follows:

$SS= \{Z^2*(P)*(1-P)\} \div C^2$

Where: SS=Sample size; Z=1.96 (for 95 percent level of confidence); P=0.5 (the worst percentage that can ever pick a choice); C=0.045 (confident intervals)

$SS= \{(1.96)^2 *(0.5)*(1-0.5)\} \div (0.045)^2$

SS=474 patients

However since the population was approximated to be about 400 patients, correction for finite population was made as follows:

New SS=SS÷ {1+ (SS-1) ÷Pop}

New SS= 474÷ {1+ (474-1) ÷400}

New SS=217 patients (Plus 15 percent non-response)

New SS= 249.55=250 patients

Simple random sampling technique was used to select individual participants. All the Type II diabetic patients who were expected to attend the clinic that month were assigned random numbers ranging from 1 to 400 and a random number table used to select 250 patients as follows:

1) The first step was to assign all the patients expected in a month numbers ranging from 1-400 having determined the population size of 400 and sample size of 250.
2) The next step was to determine starting point in table by randomly picking a page and dropping a finger on the page with eyes closed.
3) The third step was to choose a direction in which to read (up to down, left to right, or right to left).
4) The fourth step was to select the first 250 numbers read from the table whose last 3 digits were between 0 and 400. (This was done because 400 was a three digit number)
5) Once a number was chosen that number was not used again.
6) In case the end of the table was reached before obtaining the intended 250 unique numbers another starting point was picked and reading made in a different direction and using the first 3 digits until done.

This process was blinded for the research assistants and adopted when sampling patients for both dietary practice survey and physical activity survey. Following a Cross-Model approach we managed to involve 237 patients for the dietary survey and 230 patients for the physical activity survey.

3.5 Data Collection Instruments

Data was collected using Focus Group Discussion (FGD) guides and questionnaires. These tools were developed and written in English language but were translated into *Ekegusi* and *Kiswahili* and then back-translated into English to ensure that the meaning was not lost during a two day training of research assistants. Expert judgment was used to confirm the translation into local

language. Two experts used previously as translators in the hospital were given the tools to translate into local language and again back-translate them into English or *Kiswahili*. No much difference was noted during this process. Translation into local language was only required when a patient could not understand English or *Kiswahili*.

3.5.1 FGD Guide

FGD guides covered both dietary and physical activity behaviours. This approach was meant to help understand the theoretical concepts in different behaviour domains within the same population and was useful during the qualitative phase (phase1) of this study. Two main FGD guides were developed during this phase. The first FGD guide focused on dietary practice domain while the second guide focused on physical activity domain. The construction of the two guides was guided by the concepts of the Theory of Planned Behaviour (Ajzen, 1991) and health belief model (Glanz *et al*., 2002) and literature findings (Falko *et al.,* 2005). The main concepts drawn from the two theories included diet categories, physical activity categories, intention, attitude, subjective norm, perceived behavioural control, perceived susceptibility, perceived severity, perceived benefit and cues to action. Concepts drawn from Falko, *et al.* (2005) included action plan, action control and maintenance self efficacy. Questions with regard to these concepts were tailored to be used in both dietary and physical activity behaviour domains. Measurements of these concepts for each behaviour domain are explained in the subsequent paragraphs.

Guided by the concept the theory of planned behaviour, *dietary behaviour* was measured based on daily food consumption of diabetic patients. The patients were asked to list all the foods they

consume in everyday life and those they do not consume. They were also asked to explain why they eat certain foods and avoid some giving specific examples. Categorization of listed outcomes was done based on emerging salient outcomes as discussed by the patients. *Attitude towards dietary behaviour* was explored based on certain salient beliefs about eating certain foods and avoiding others. The patients were asked to explain what they believe about consuming the foods they choose to eat giving specific food examples listed under dietary behaviour. They were also asked to explain what they believe about consuming the foods they avoid in everyday life. The value of each outcome was explicitly discussed. *Subjective norm in relation to dietary practice* identified people important in the patients' lives and can influence what they eat in everyday life. As they mentioned those who can influence their eating, they were also asked to express their responses toward such influence with an intention to know whether they are motivated to comply with such influence or not. *Perceived behavioural control* was assessed by finding whether the discussants had some factors that hinder them from following recommended diet or avoiding the non-recommended food items. The discussion also inquired if the patients had control over the emerging hindering factors.

The next category of the concepts was built on the foundation of health belief model. These concepts included perceived susceptibility, perceived severity, perceived benefit and cues to action all drawn from the health belief model. *Perceived susceptibility* focused on the vulnerability of patients to negative outcomes of Type II diabetes if they failed to consistently follow recommended diet or if they continue taking inappropriate diet. The patients were asked to explain whether they could be prone to certain negative outcomes and also asked to mention those particular risks. *Perceived severity* dwelt on the magnitude of the injury. The discussion

focused on how deep the injuries could be due to consistent failure in following appropriate diet. Traumatizing outcomes were mainly on focus within this concept. *Perceived benefit* focused on the positive outcomes when patients consistently follow dietary recommendations. The patients were further asked to list and explain the benefits they could remember in relation to following appropriate foods and avoiding inappropriate lot. *Cues to action* dwelt on the existent of materials and actions that would make the patients consume appropriate diet. The focus of the discussion was on the existence of visual and written materials on appropriate diet for diabetic patients as well as education processes in the facility that focus on dietary practices for managing diabetes.

The final category of concepts was drawn from Falko *et al.,* (2005). *Action plan* measured the level of magnitude an individual associates with planning of when to take recommended diet, where to take the meals, how to select the meals and how to take the meals. *Action control* measured the magnitude an individual associates with constant self monitoring of appropriate dietary intake, careful watching of dietary recommendations, keeping dietary intentions in mind, trying hard to follow dietary recommendations and in accordance with the guidelines. *Maintenance self efficacy* measured the magnitude an individual associates with the confidence to stay on recommended diet despite challenging circumstances.

Physical activity behaviour was measured by asking the patients to list all the activities (manual, sport related, walking and sedentary) they engage in everyday life. They were also asked to explain why they engage in some activities and leave out others giving specific examples. *Attitude towards physical activity behaviour* explored certain salient beliefs about engaging in

adequate physical activity (at least 30 minutes of moderate intense physical activity for five or more days weekly). The patients were asked to explain what they believe about doing exercises or engaging in manual activities giving specific activity examples. They were also asked to explain what they believe about getting involved in physical activities that they avoid in everyday life. The value of each outcome was explicitly discussed. *Subjective norm in relation to physical activity practice* identified the people important to patients' lives and can encourage or discourage them from engaging in any type of physical activity in everyday life. As they mentioned those who could influence their physical activity pattern, they were also asked to express their responses toward such influence with an intention to know whether they are motivated to comply with such influence or not. *Perceived behavioural control* was assessed by attempting to find whether the discussants had some factors that hinder them from engaging in appropriate activities or avoiding inappropriate activity levels. The discussion also inquired if the patients had control over the emerging hindering factors.

As in the case of dietary behaviour, the next category of the concepts was built on the foundation of health belief model. These concepts included perceived susceptibility, perceived severity, perceived benefit and cues to action. *Perceived susceptibility* focused on vulnerability of patients to negative outcomes of Type II diabetes if they failed to consistently engage in adequate physical activity or if they continue to be involved in bad category of physical activities (sedentary life). *Perceived severity* dwelt on the magnitude of the injury. The discussion focused the magnitude of the outcomes due to consistent failure to get involved in adequate physical activity. Traumatizing (for example, amputation, and blurred vision among others) outcomes were mainly on focus within this concept. *Perceived benefits* focused on the positive outcomes

when patients engage in adequate physical activity consistently. The patients were asked to list and explain a number of benefits that could be realized if they did enough exercise or got involved in enough manual activities and avoided sedentary life. *Cues to action* dwelt on the existent of materials and actions that would make the patients engage in adequate physical activities. The focus of the discussion was on the existence of visual and written materials on appropriate physical activity for diabetic patients as well as education processes in the facility that focus on physical activity for people living with diabetes.

The final category of concepts was also drawn from Falko *et al.,* (2005). *Action plan* measured the level of magnitude an individual associates with planning of when to engage in adequate physical activity, where to engage in those activities, how to be involved in activities and how to do the activities. *Action control* measured the magnitude an individual associates with constant self monitoring of adequate physical activity, careful watching of physical activity recommendations, keeping physical activity intentions in mind, trying hard to follow physical activity recommendations and in accordance with the guidelines. *Maintenance self efficacy* measured the magnitude an individual associates with the confidence to stay on doing recommended physical activities despite challenging situations.

3.5.2 Development of Questionnaires

Two separate questionnaires were developed during the second phase of the study design. The two questionnaires were developed after the analysis of qualitative data generated during the qualitative phase (phase 1). The first questionnaire focused on dietary behaviour while the second questionnaire focused on physical activity behaviour. Each questionnaire was intended to

explore on the results of the qualitative phase generated from Focus Group Discussions. Dietary questionnaire explored the results generated within dietary domain while physical activity questionnaire explored the results generated within physical activity domain. The details of how concepts were measured within dietary and physical activity questionnaires are as follows:

3.5.2.1 Dietary Practice Questionnaire

Measurements of variables in the dietary questionnaire were made within the results obtained. The questionnaire was divided into sections each measuring concepts generated from the new theories. A seven point likert scale was used to measure all the variables except for dietary behaviour, knowledge and personal characteristics. The likert scale was constructed in a continuum ranging from *totally disagree/not all/extremely unlikely=1; moderately disagree/not all/extremely unlikely =2; slightly disagree/not all/extremely unlikely =3; undecided=4; slightly agree/very much/extremely likely =5; moderately agree/ very much /extremely likely=6; to totally agree/ very much /extremely likely=7.*

Dietary Behaviour was measured by first identifying three dietary practice categories during the qualitative phase. Three questions measuring the frequency of consuming high fat diet, high sugar diet and recommended diet were then developed and measured as follows: *High fat diet* was measured using a statement "how often (number of times in a week) do you consume food items such as red meat (beef, mutton, goat meat), fried potatoes, ghee, chicken with skin and sausages?" *High sugar diet* was measured using the statement "how often (number of times in a week) do you consume food items such as sweets, sweet non-alcoholic beverages (sodas) and tea with sugar?" *Recommended diet* was measured using the statement "how often (number of times

in a week) do you consume fruits, vegetables, fish and *Omena (Rastrineobola argentia)*, poultry without skin, whole wheat flour, maize flour and unpolished rice grain?" The frequency of consumption for each diet category was marked on a continuum ranging from zero times a week to seven times a week. Scoring was done on a scale from zero (0) to seven (8) such that a frequency of 7 for high fat diet or high sugar diet scored zero (0) when frequency of zero (0) for the same diet categories scored eight (8). On the contrary, the frequency of 7 for the recommended diet scored 8 when the frequency of zero (0) scored zero (0). The scoring was based on the fact that individuals who are diabetic do well when they consume less of fat and sugar from diet or when they increase their intake of recommended diet. (Appendix 2.1)

Dietary Attitude measurement adopted the indirect measurement technique suggested by Fishbein and Ajzen (1975). During the qualitative phase, three categories of attitudes emerged and were labeled as attitude-1, 2 and 3. Measurement for attitude-1 focused on the five salient beliefs related to *high fat diet* while measurement for attitude-2 focused on five salient beliefs related to *high sugar diets*. Measurement for attitude-3 focused on five salient beliefs related to *recommended diet*. The belief strengths were measured using a bipolar likert scale ranging from 1 to 7, where 1 represented *extremely unlikely* while 7 represented *extremely likely*. The five salient beliefs for each diet category were put in statement form questions (Appendix 2.2). The final scoring for belief strengths were made in a way that either of the extreme ends had equal strength on a single polar likert scale ranging from 1 to 7. Extremely unlikely scored the same as extremely likely. When the belief strength tended toward positive (extremely likely) the score tended towards 7. Again, in a case when the belief strength tended toward negative (extremely likely) the score also tended towards 7. Evaluations of these factors were made based on the weight attached to the belief factor. This weighing was valued from 1 to 7, using a bipolar likert

scale ranging from extremely bad to extremely good for a positive belief factor. In case of a negative belief factor the weighting was valued from 1 to 7, using a bipolar likert scale ranging from extremely good to extremely bad belief factor. Thirteen evaluation statements were developed to complete the measurement of attitude (Appendix 2.3).

Dietary subjective norm measurement also adopted the indirect measurement suggested by Fishbein and Ajzen, (1975). The three diet categories were used to develop statement form questions to measure subjective norms. The statement inquired about the strength of influence individuals important in the participants lives could have on intake of high fat diet, high sugar diet and recommended diet. Six categories of individuals identified during qualitative phase included doctor/nurse/nutritionist, spouse, bother/sister, friend, child and neighbour. The strengths of influence (normative belief strength) were measured using a bipolar likert scale ranging for 1 to 7, where 1 represented *I should* while 7 represented *I should not*, in case of negative influence. On the contrary for positive influence 1 represented *I should not* while 7 represented *I should*. Normative beliefs for subjective norm-1 were measured within high fat diet; normative beliefs for subjective norm-2 were measured within high sugar diet while normative beliefs for subjective norm-3 were measured within recommended diet (Appendix 2.4). The normative beliefs were then weighed by the extent the participants would be willing to comply with the influence from each significant other. Six significant others related motivation factors were developed as measures of motivation to comply. Each of these factors were measured using a bipolar likert scale ranging from 1 to 7 where 1 represented *not at all* while 7 represented *very much*. A value of 7 was given more weight in this case. (Appendix 2.5)

Perceived behavioural control applied to dietary behaviour focused on measuring the barriers to appropriate dietary practice (reduced intake of high fat and high sugar diet while increasing intake of recommended diet). All the barriers (control beliefs) mentioned during the qualitative phase were grouped as factors interfering with appropriate dietary practice. The control belief strengths were measured on the basis of how frequent the participants encountered the barrier factors. Scoring was done using a single bipolar likert scale ranging from 1 to 7, where 1 represented *very rarely* while 7 represented *very frequently* and more weight was given to 7 (Appendix 2.6). The control beliefs were weighed by the extent the participants expressed control over the barriers (Control power). Three control factors were identified for each barrier domain and measured using a bipolar likert scale ranging from 1 to 7, where 1 represented *not at all* while 7 represented *very much* and more weight was given to 7. (Appendix 2.7)

Health belief concept measures focused on perceived susceptibility, perceived severity, perceived benefit and cues to action. Statements were generated from the qualitative results within each concept to be measured. "*Perceived susceptibility* "measured the perceived level of risk the participants attached to negative outcome of their conditions in relation to dietary practice. These outcomes were identified during the qualitative phase. Direct measurements using a bipolar likert scale ranging from 1 to 7, where 1 represented *totally disagree* while 7 represented *totally agree* was used. "*Perceived severity"* focused on the participants' perception of how severe their conditions could be if they failed to follow appropriate diet. Severe levels were identified and confirmed during the qualitative phase and measurement developed using a bipolar likert scale ranging from 1 to 7, where 1 represented *strongly disagree* while 7 represented *strongly agree*. "*Perceived benefits*" focused on the participants' perception of the benefits they could get if they followed appropriate or recommended diet. Benefits were

identified and confirmed during the qualitative phase and measurement developed using a bipolar likert scale ranging from 1 to 7, where 1 represented *strongly disagree* while 7 represented *strongly agree*. Finally, "*cues to action"* focused on whether the participants were aware of materials and processes that promote appropriate dietary practice. Three levels of triggering factors were identified during qualitative phase and measurement developed using a bipolar likert scale ranging from 1 to 7, where 1 represented *strongly disagree* while 7 represented *strongly agree*. More weight was given to 7 across all the concepts. (Appendix 2.8)

Dietary knowledge focused on perceived knowledge on dietary fat, sugar and recommended diet intakes as identified during qualitative phase. Knowledge on fat intake was labeled *knowledge-1*, sugar intake was labeled *knowledge-2* and recommended diet intake was labeled *knowledge-3*. Varied responses emerged during the discussions and we selected five best areas of concern to test under each sub-theme. The five areas for each category were developed into five statement form questions where participants were expected to choose whether such statements were true or false based on their knowledge. The corresponding answer agreed upon during FGDs for each statement question is on the right side of the table. (Appendix 2.9)

Dietary intention was assessed based on the extent to which the participants were willing to reduce the intake of fat and sugar while increasing consumption of recommended diet. Measurements of these factors were done using a bipolar likert scale ranging from 1 to 7 where 1 represented *not at all* while 7 represented *very much*. More weight was given to 7. (Appendix 2.10)

Post intention mediators applied to dietary behaviour focused on action plan, action control and maintenance self efficacy. Measurements of these factors identified during the discussions and presented in the qualitative phase (under section 4.1.1) were done using a bipolar likert scale ranging from 1 to 7 where 1 represented totally disagree while 7 represented totally agree. More weight was given to 7. (Appendix 2.11)

Indirect measures of dietary attitude, subjective norm and perceived behavioural control were to be computed after data collection using data obtained on the salient belief strengths, normative belief strengths and control belief strengths respectively. Salient belief strength for each factor was weighed by the corresponding evaluation strength. Normative belief strength for each significant other was weighed by the strength of motivation to comply while control belief strength for each variable was weighed by the control power. Attitude was computed based on the indirect formula suggested by Fishbein and Ajzen (1975). The summation of the product of salient belief strengths and corresponding evaluation weights was computed for attitude-1, attitude-2 and attitude-3. Subjective norm was also computed based on the indirect formula suggested by Fishbein and Ajzen (1975). The summation of the product of normative belief strengths and corresponding motivation to comply weight was computed for subjective norm-1, subjective norm-2 and subjective norm-3. Perceived behaviour control was computed by finding the product between control belief strength and control power weight, for perceived behavioural control-1, perceived behavioural control-2 and perceived behavioural control-3.

3.5.2.2 Physical Activity Questionnaire

Qualitative results generated from Focus Group Discussions within physical activity behaviour were used to develop physical activity questionnaire. Measurements of variables were made within the results obtained. The questionnaire was divided into sections each measuring concepts generated from the new theories. A seven point likert scale was used to measure all the variables except for knowledge and personal characteristics. The likert scale was also constructed in a continuum ranging from *totally disagree/not all/extremely unlikely=1; moderately disagree/not all/extremely unlikely =2; slightly disagree/not all/extremely unlikely =3; undecided=4; slightly agree/very much/extremely likely =5; moderately agree/ very much /extremely likely=6; to totally agree/ very much /extremely likely=7.*

Physical activity behaviour measurement was done by first identifying three physical activity categories. Three questions based on the frequency of participating in "moderate to heavy physical activity", "light/walking physical activity" and "sedentary lifestyle" were developed. These questions were constructed as follows: *Moderate to heavy activity* was measured using a statement "how often (number of times in a week) do you engage in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week." *Light/walking* was measured using the statement "how often (number of times in a week) do you engage in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week". *Sedentary lifestyle* was measured using the statement "how often (number of times in a week) do you sit down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week". The frequency of participating in each physical activity category was marked on a

continuum ranging from once a week to seven times a week. Scoring was done on a scale of 0 to 7 such that a frequency of 7 for moderate to heavy physical activity or light/walking category scored 8 when frequency of zero (0) for the same categories scored eight (0). On the contrary, the frequency of 7 for sedentary lifestyle scored zero (0) when the frequency of zero (0) scored 8. The scoring was based on the fact that individuals who are diabetic do well when they engage in adequate physical activity than when they lead sedentary life. (Appendix 3.1)

Physical activity attitude adopted the indirect measurement technique suggested by Fishbein and Ajzen (1975). During the qualitative phase, three categories of attitudes emerged and were labeled as attitude-1, 2 and 3. Measurement for attitude-1 focused on the five salient beliefs related to sedentary lifestyle while measurement for attitude-2 focused on five salient beliefs related to moderate to heavy physical activity. Measurement for attitude-3 focused on five salient beliefs related to light/waking physical activity. The belief strengths were measured using a bipolar likert scale ranging from 1 to 7, where 1 represented *extremely unlikely* while 7 represented *extremely likely.* The five salient beliefs for each diet category were put in statement form questions (Appendix 3.2). The final scoring for belief strength was again made in a way that either of the extreme ends had equal strength on a single polar likert scale ranging from 1 to 7. Extremely unlikely scored the same as extremely likely. When the belief strength tended towards positive (extremely likely) the score also tended towards 7. Again, in a case when the belief strength tended toward negative (extremely likely) the score also tended towards 7. Evaluations of these factors were made based on the weight attached to the belief factor. This weighing was valued from 1 to 7, using a bipolar likert scale ranging from extremely bad to extremely good for a positive belief factor. In case of a negative belief factor the weighting was valued from 1 to 7, using a bipolar likert scale ranging from extremely good to extremely bad

belief factor. Five evaluation statements were developed to complete the measurement of attitude (Appendix 3.3).

Physical activity subjective norm again adopted indirect measurement technique suggested by Fishbein and Ajzen, (1975). The three physical activity categories were used to develop statement form questions in order to measure subjective norms. The statement inquired about the strength of influence individuals important in the participants lives could have on their engagement into sedentary lifestyle, moderate to heavy activity and light/walking activity. Six categories of individuals identified during qualitative phase included doctor/nurse/nutritionist, spouse, bother/sister, friend, child and neighbour. The strengths of influence (normative belief strength) were measured using a bipolar likert scale ranging for 1 to 7, where 1 represented I should while 7 represented I should not, case of negative influence. On the contrary for positive influence 1 represented I should not while 7 represented I should. Normative belief for subjective norm 1 were measured within sedentary lifestyle, normative belief for subjective norm 2 were measured within moderate to heavy activity while normative belief for subjective norm 3 were measured within light/walking categories (Appendix 3.4). Normative beliefs were weighed by the extent the participants would be willing to comply with the influence from each significant other. The six significant others related motivation factors were developed as measures of motivation to comply. Each of these factors were measured using a single bipolar likert scale ranging from 1 to 7 where 1 represented *not at all* while 7 represented *very much.* A value of 7 was given more weight in this case. (Appendix 3.5)

Perceived behavioural control in relation to physical activity behaviour focused on the barriers to participation in adequate physical activity (reduced sedentary life while increasing

participation in moderate to heavy activities and light/walking activities). All the barriers (control beliefs) mentioned during the qualitative phase were grouped as factors interfering with engagement in adequate physical activity. The control belief strengths were measured on the basis of how frequent the participants encountered the barrier factors. Scoring was done using a bipolar likert scale ranging from 1 to 7, where 1 represented very rarely while 7 represented very frequently and more weight was given to 7 (Appendix 3.6). Control beliefs were weighed by the extent the participants expressed control over the barriers (Control power). Three control factors were identified for each barrier domain and measured using a bipolar likert scale ranging from 1 to 7, where 1 represented *not at all* while 7 represented *very much* and more weight was given to 7. (Appendix 3.7)

Health belief concept measures (pre-intention moderators) in relation to physical activity behaviour focused on perceived susceptibility, perceived severity, perceived benefit and cues to action. Statements were generated from the qualitative results within each concept to be measured. "*Perceived susceptibility"* measured the perceived level of risk the participants attached to negative outcome of their conditions in relation to physical activity behaviour. These outcomes were identified during the qualitative phase. Direct measurements using a bipolar likert ranging from 1 to 7, where 1 represented *totally disagree* while 7 represented *totally agree* was used. "*Perceived severity*" focused on the participants' perception of how severe their conditions could be if they failed to engage in adequate physical activity or if they failed to reduce time spent in sedentary activities. Severe levels were identified and confirmed during the qualitative phase and measurement developed using a bipolar likert scale ranging from 1 to 7, where 1 represented *strongly disagree* while 7 represented *strongly agree*. "*Perceived benefits*" focused on the participants' perception of the benefits they could get if they engaged in adequate physical

activity or if they reduced time spent in sedentary activities. Benefits were identified and confirmed during the qualitative phase and measurement developed using a bipolar likert scale ranging from 1 to 7, where 1 represented *strongly disagree* while 7 represented *strongly agree*. Finally, "*cues to action*" focused on whether the participants were aware of materials and processes that promote appropriate physical activity. Three levels of triggering factors were identified during qualitative phase and measurement developed using a bipolar likert scale ranging from 1 to 7, where 1 represented *strongly disagree* while 7 represented *strongly agree*. More weight was given to 7 across all the concepts. (Appendix 3.8)

Physical activity knowledge tested perceived knowledge within two major sub-themes of physical activity in relation to diabetes. These included *light-high level physical activity* and *sedentary lifestyle*. Knowledge on light-high level physical activity labeled Knowledge-1 while knowledge on sedentary lifestyle was labeled Knowledge-2. Varied responses emerged during the discussions and we selected five best areas of concern to test cognitive knowledge under each sub-theme. The five areas for each category were developed into five statement form questions where participants were expected to choose whether such statements were true or false based on their acquired knowledge. Corresponding answers to these questions agreed on during FGDs are also given. (Appendix 3.9)

Physical Activity intention assessed the extent to which the participants were willing to increase their participation in moderate to heavy and light/walking physical activities while decreasing time spent in sedentary activities. Measurements of these factors were done using a bipolar likert

scale ranging from 1 to 7 where 1 represented not at all while 7 represented *very much*. More weight was given to 7. (Appendix 3.10)

Post-intention mediators in relation to physical activity focused on measuring action plan, action control and maintenance self efficacy based on the items generated during qualitative phase. Measurements of these factors were made using the same techniques of Luszczynska & Schwarzer (2003) and scaling were done using a bipolar likert scale ranging from 1 to 7 where 1 represented totally disagree while 7 represented totally agree. More weight was given to 7. (Appendix 3.11)

Indirect measures of physical activity attitude, subjective norm and perceived behavioural control were computed using data obtained on the salient belief strengths, normative belief strengths and control belief strengths respectively. Salient belief strength for each factor was weighed by the corresponding evaluation strength. Normative belief strength for each significant other was weighed by the strength of motivation to comply while control belief strength for each variable was weighed by the control power. Attitude was computed based on the indirect formula where the summation of the product of salient belief strength and corresponding evaluation weight for each attitude category (attitude-1, 2 and 3) was obtained (Fishbein and Ajzen, 1975). Subjective norm was also computed based on the indirect formula and the summation of the product of normative belief strengths and corresponding motivation to comply weight for each attitude category was generated for subjective norm-1, 2 and 3 *ibid*. Perceived behaviour control was computed by finding the product between control belief strength and control power weight, for perceived behavioural control-1, 2 and 3 (Ajzen, 1991).

3.5.3 Pre-testing of the Instruments

To determine the effectiveness of the two survey questionnaires, it was necessary to pretest them before using them during the main survey. Pretesting was conducted at Kisii Level-V Hospital during the last week of the month of August using different groups of patients. Pretesting was useful in determining the strengths and weaknesses of the surveys concerning question format, wording and order. It was also necessary to pretest for the reliability and validity of the questionnaires. The same pretesting procedure was followed for both dietary and physical activity questionnaires. Two methodologies were applied during this pretesting exercise. The first pretest method was *participating pretests* where the respondents were informed that the pretest is a practice run. They were asked to explain reactions to question form, wording and order. This kind of pretest was useful to determine whether the questionnaire was understandable.

The second pretest method was an *undeclared pretest*, where the respondents were not informed that the exercise was a pretest. The survey was given just the same way as it would happen for the real survey. This type of pretest was useful in checking choice of analysis and the standardization of the survey. A part from participating or undeclared pretest, we also pretested specifically for question variation, meaning, task difficulty, and respondent interest and attention. All questions were pretested including those borrowed from past studies. Also included during this exercise were the flow, order, timing, and overall respondents' well-being.

Finally the questionnaires were subjected into pretest for *reliability* and *validity*. In the case of *reliability*, we intended to find out if all questions measuring the same factor could be answered

the same way using Cronbach's alpha (George & Mallery, 2003). Twenty (20) percent of the intended sample size was randomly selected to be involved in this pilot. The questionnaires were fully administered to the respondents. Data from each set were entered into SPSS version 15 data spread sheet and Cronbach's alpha generated to determine how closely or distantly grouped measures for each factor appeared. Validity of the questionnaires was determined by how well they measured the concept(s) they intended to measure. Both convergent validity and divergent validity were determined by comparing answers to each question measuring the same concept, then by measuring this answer to the participant's response to a question that asks for the exact opposite answer.

3.6 Data Collection Process

3.6.1 Qualitative Phase

During the qualitative phase Focus Group Discussions (FGDs) were conducted with optimum number of eight (8) Type II diabetic patients. FGDs were conducted by three trained nutritionist in Kisii Level-V hospital. One of the nutritionists was a bachelor degree holder while the remaining two were holders of diploma degree. The research assistants were trained on steps of conducting FGDs, note taking skills and ethical issues of qualitative research. During the training process all questions in the guide were read, understood and checked for grammatical and typographical errors. Translation of questions in the guide into local language *Ekegusi* was done by two experienced experts. Back translation was done to check for reliability of the translation. Each nutritionist leading FGDs had a role to play. The most qualified nutritionist was in charge of the facilitation, the second and third was either an observer or note taker. The participants

were first interviewed on arrival in order to identify group categories for equal representation. Two groups were identified for each behaviour domain. Within dietary practice behaviour, group 1 was made up of patients who consistently follow recommended diet, while group 2 was made up of patients who sometimes fail to follow recommended diet. Within physical activity behaviour, group 1 was made up of patients who engage in at least 30 minutes of moderate daily activity equivalent for more than five days in a week, while group 2 was made up of patients who were leading sedentary life. Group 1 and 2 were combined for the discussions for each behaviour domain with a total of eight patients involved. A total of eight (8) FGDs were conducted during the month of June for dietary practice and seven (7) FGDs conducted during the month of July for physical activity behaviour. All the FGD sessions were tape recorded alongside note taking.

Four (4) FGDs were first conducted within dietary behaviour domain until a saturation point (the point at which no more additional information could be generated during the discussions) was reached. The four (4) sessions were conducted for two consecutive Fridays. Two (2) sessions were conducted each morning for a period of approximately one and a half hour. These sessions were guided by the questions developed within the traditional theory of planned behaviour. The next two (2) sessions of FGD attempted to relate dietary behaviour results obtained during the initial four sessions with the proposed moderators and knowledge, while the final two (2) FGD sessions attempted to relate dietary behaviour results with the proposed mediators. On the other hand three (3) FGD sessions were conducted within physical activity behaviour domain until a saturation point was reached. The three (3) sessions were conducted for two consecutive Fridays. Two (2) sessions were conducted each morning for a period of approximately one and a half

hour. These sessions also were guided by the questions developed within the traditional theory of planned behaviour. The next two (2) sessions of FGD were attempted to relate physical activity behaviour results obtained during the initial three sessions with the proposed moderators and knowledge, while the final two (2) FGD sessions attempted to relate physical activity behaviour results with the proposed mediators.

3.6.2 Quantitative Phase

Quantitative data collection involved adiministering of questionnaires to Type II diabetes patients by research assistants. Eight research assistants were trained prior to data collection exercise. The training content included a brief presentation of the research project (including objectives, hypothesis, significance of the study theoretical framework), sampling procedures, ethical issues for research involving human subjects and reading and understanding informed consent forms. Two questionnaires were developed to be administered during the quantitative phase. The first questionnaire targeted dietary practice, while the second questionnaire focused on physical activity behaviour. The two categories of questionnaires were administered sequentially after one month period. Administeration of each questionnaire took approximately one hour for both dietary and physical activity questionnaires.

3.7 Ethical Considerations

This study was presented and approved by the board of the School of Graduate Studies, Maseno University and the National Council for Science and Technology (NCST). NCST is a national body in Kenya in-charge of research authorization. Permission was also granted by the institution within which the research was conducted. All the participants signed informed consent forms

before participating in the research process (Appendix 6.0). During this exercise all patients read the informed consent forms before the interviews began. Patients who could not read were read for by the research assistants. The patients who agreed to continue with participation were asked to sign informed consent forms before proceeding on with the interview process. They were also assured that the information obtained from them will be treated with confidence. All documents related to the patients and intended to be used in the study remained under the custody of the principal researcher and cannot be accessed by any unauthorized person except supervisors. To ensure minimal disruption of the usual diabetic activity at the centre within the setting, the research assistants were advised to interview patients and allow them to continue with other processes whenever they were called upon. The interview process would then continue after patients had gone through all the processes.

3.8 Data Analysis

3.8.1 Qualitative Phase

The study used *Constant Comparative Approach for Grounded Theory Analysis* to analyse qualitative data obtained from FGDs. During this analysis, three phases of coding including open, axial and selective coding (Creswell, 2007) were followed. In the open coding phase, we examined the fieldnotes generated during FGD sessions and updated by listening to tapes in order to identify salient categories of information supported by the text. Using constant comparative approach, an attempt was made to “saturate” the categories by looking for responses that represent the category and to continue with FGDs until the new information obtained does

not further provide insight into the category. Once an intial set of categories had been developed, we identified a single category from the open coding list as the central phenomenon of interest.

The open coding category selected for this purpose is one which was of particular conceptual interest bacause it seemed central to the Theory of Planned Behaviourbeing studied. The central phenomena were then positioned at the centre of the theory and linked with other categories (axial coding). More information trying to relate the central category with other categories were collected and again analysed to identify hypothetical causal relationships. The information obtained from this coding phase were then organized into a coding pradigm that presents a theoritical model of the process under investigation. In this way an attempt was made to build up a theory. From this theory statements that interrelate the categories in the coding paradigm were generated (selective coding).

3.8.2 Quantitative Phase

Structural Equation Modelling (SEM) in AMOS 7.0 using Maximum Likelihood (ML) estimation was used to test hypotheses within physical activity and dietary behaviour domains. Presentations were made in tables and figures. Cronbach's alpha was used to test for internal consistency of questions measuring the same concept. Exploratory factor analysis in SPSS version 15.0 was applied to test for the dimensionality of the questions measuring the same concepts. Means and standard deviations were used to assess any irregularites in the answering of questions. Skew and kurtosis tests were used to assess for the normality of data obtained. Pearson correlations were used to assess the associations between observed variables for each model. The overall model fit was evaluated using chi-square (CMIN) and relative chi-square

(CMIN/df), comparative fit index (CFI), the standardized root-mean-square error of approximation (RMSEA), Hoelter's critical N, the Tucker-Lewis-Index (TLI) and Bollestine-stine bootsrap. Both measurement and structural models were presented. CFI and TLI values greater than 0.90 were considered satisfactory (Garson, 2009). RMSEA less than 0.08 was also considered satisfactory (Schumacker & Richard, 2004). Relative chi-square was considered fit when within 3:1 range and considered more superior when closer to but not less than 1(Kline, 1998). Hoelter's critical N was considered low below 75 cases and bootsrap samples were set at 200 (Garson, 2009).

4.0 CHAPETR FOUR: RESULTS

This chapter focuses on the results of the study. The presentation is organized into three main sections covering the three phases of the study design. Phase 1 (qualitative study) dwells on the results generated from Focus Group Discussions. Phase 2 (questionnaire development) explains and describes the internal consistency reliability and construct validity for both dietary and physical activity questionnaires generated by Cronbach's alpha and exploratory factor analysis. Phase 3 (quantitative study) focuses on the quantitative aspects of the study and gives detailed interpreted findings based on Structural Equation Modelling and guided by hypotheses.

4.1 Qualitative Results (*Phase 1*)

This phase identified salient factors related to attitude, subjective norm, perceived behavioural control, perceived susceptibility, perceived severity, perceived benefit, cues to action, action control, action plan and maintenance self efficacy. These factors represented the key thematic outcomes within the modified versions of the Theory of Planned Behaviour applied to dietary and physical activity behaviours. In this section, certain subjective terms are used to attach weight to qualitative responses. The term "majority" means more than half of the participants were in agreement with the response in question. The term "all" means all the participants were in agreement with the response in question. The term "some" means less than half but more than a quarter of the participants were in agreement with the response in question. And the term "a few" means less than a quarter of the participants were in agreement with the response in question. These terms are not quantified in values because the sampling technique was qualitative based and did not required any form of quantification due to their subjectivity.

4.1.1 Theoretical Concepts applied to Dietary Behaviour

This section of phase 1 contains major concepts drawn from the Theory of Planned Behaviour and additional concepts applied to dietary behaviour. The concepts were discussed with the patients and identified through open coding process as the main thematic factors. The concepts are described in the subsequent paragraphs.

Dietary Behaviour was identified based on food items frequently consumed or avoided by Type II diabetic patients in everyday life. Among the foods which are currently consumed brown rice, green vegetables, green bananas, fresh milk, chicken with skin, fish, white rice, white *ugali* (cornmeal), groundnuts, beef, chapatti, bean, eggs, tea without sugar, sweet potatoes, Irish potatoes, green grams, carrots, *omena* (*Rastrineobola argentia*) and arrow roots were mentioned. Foods which were avoided included fatty meat, sifted flour, soda, cakes, ice cream, chocolates, sugared beverages, alcohol, jam, chicken skin, glucose, honey, sweet potatoes, sweet bananas, pineapples, mangos, egg yolk, boiled maize, fried potato chips, Irish potatoes and roast meat. It should be noted that during open coding certain foods were consumed by half of the participants and at the same time avoided by half. During the subsequent discussions participants were involved in in-depth discussions centred on why certain foods were consumed, while others were avoided. It appeared that certain foods are avoided because they are rich in fats and fatty foods are perceived to be “bad foods” that Type II diabetic patients need to avoid. Foods that were avoided due to high fat content were grouped and labeled “high fat diet”. In addition, the participants also reported that certain categories of foods are avoided due to high sugar content. This category of food is perceived as “bad foods” for health and was labeled “high sugar diet”. The last sub-category of food perceived as “good foods” for health and mostly consumed by

Type II diabetic patients and was labeled “recommended diet.” Further discussions were held to classify foods that were avoided and those consumed in everyday life into sub-categories in order to describe dietary behavior. (Figure 4.1)

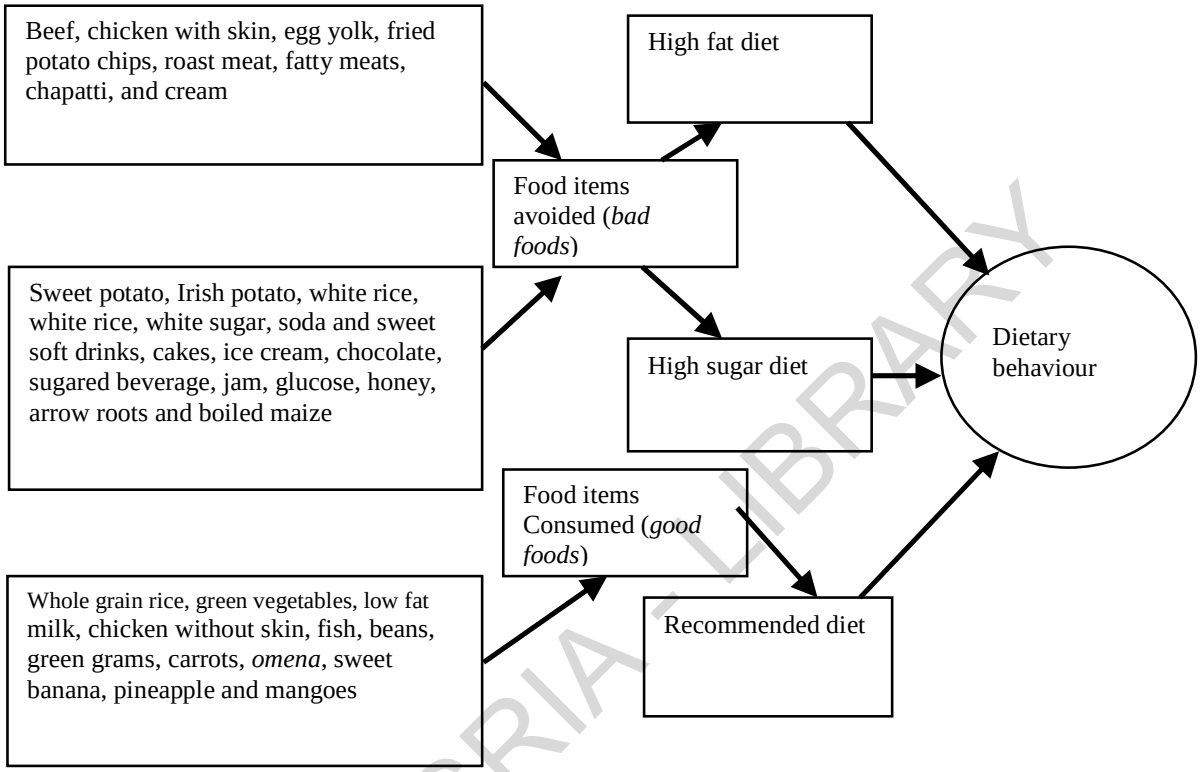


Figure 4.1 Determinants of dietary behaviour identified by open and axial coding

Dietary intention sought to find out how the patients intended to eat in the next one month with a focus given to the three diet categories identified. All the participants agreed that they intended to reduce intake of high fat and high sugar diets by half in the next one month. On the contrary, the participants agreed that they needed to increase the intake of recommended diet. During these discussions the participants were reminded that high fat diet consisted of red meat, fried potatoes, cream and chicken with skin. High sugar diet included sweet non-alcoholic beverages, sugared beverages, sweet potatoes and boiled maize. Recommended diet included most fruits and vegetables, whole grain rice and whole maize flour, fish and low fat milk.

Dietary attitude focused on the salient belief factors related to each diet category and their corresponding evaluation strengths. The initial discussion sessions were made within *high fat diet* sub-category. Participants believed that high fat diet "increases progression into comma". The participants evaluated this belief by explaining that Type II diabetic patients who consume a lot of food items rich in fat are more likely to go into a comma compared to those who consume less. It also emerged that high fat diet leads to "high blood sugar levels". Most participants agreed that long term consumption of foods rich in fat increases blood sugar levels. Other emerging sub-themes related to high fat diet included "quick loss of life". The discussants identified quick loss of life as an end result of consuming high fat diet. "Vomiting" also emerged as a sub-theme during the discussions. Majority of the participants expressed their experience with high fat for the period they have lived with Type II diabetes. On several occasions the patients experienced vomiting when they consumed food rich in fat. The final sub-theme identified as related to consumption of high fat diet is "increased complications" related to Type II diabetes. Half of the participants believed that high fat diet increases complications related to Type II diabetes after long period of consumption. The discussants expressed their concern about the outcomes of consuming high fat diet. It appeared that all the participants were in agreement that the outcomes are very bad for the patients living with Type II diabetes.

The second discussion sessions were made within *high sugar diet* sub-theme. Five key sub-categories with regard to patients' beliefs about consumption of high sugar diet emerged. The participants agreed that high sugar diet "raises blood sugar levels". When asked about their concern on increased sugar levels, the discussants expressed deep negative feelings about increased sugar levels for Type II diabetics. Another key sub-category saturated during the

discussions was “increased medical bills”. Majority of the patients felt that consuming high sugar diet is likely to have indirect increase on medical bills. Some patients expressed that they had experienced such an outcome before during their early stages of diabetic condition. Increased medical bill was not welcome by all patients who participated in the discussions. Some participants raised the issue of “increased fatigue” when they consume high sugar diet. Majority agreed that any time they consumed any food with high sugar content they experienced high level of fatigue (the common term used in Kiswahili was “*uchovu*”). The participants expressed their negative feelings about increased fatigue. Some patients reported that fatigue lowers their ability to perform their duties properly and they would not advocate for anyone to be fatigued. “Overweight” also emerged as a key sub-theme related to high sugar diet. The participants agreed that too much sugar in the diet may lead to increased weight gain. They attached bad feelings to overweight arguing that, overweight makes their diabetic condition worse. Finally, the participants agreed that high sugar diet may lead to “quick loss of life”. Most participants believed that Type II diabetics who do not control their sugar consumption risk losing their lives faster than they could if they controlled their sugar intake. Quick loss of life was unwelcome as a positive experience by all the participants.

The third discussions were centred within *recommended diet* sub-theme. Following the recommended diet was very much associated with “maintained blood sugar level within normal range”. Maintained blood sugar level was highly welcome by all participants. They expressed their in-depth feelings about how good it could be if their sugar levels were maintained. The participants also believed that following recommended diet “prolongs life” of individuals with Type II diabetes. Prolonged life was again welcome by all the participants. Another sub-category

associated with consumption of recommended diet "reduced frequency of hospital visits". Even though the participants agreed that following recommended diet reduces frequency of hospital visits, more than half of the participants did not welcome the outcome. They argued that Type II diabetes is not curable and hence regular and frequent seeing of a doctor, nurse or nutritionist would be the best routine if practiced by Type II diabetic patients. Majority of the participants agreed that reducing the frequency of hospital visits can make patients pass on suddenly. Other factors identified as being associated with consumption of recommended diet included "improved health condition" and "increased strength". The participants expressed their feelings on how their general health and strength have improved in the past when they strictly followed recommended diet. The two sub-categories were highly welcome by the participants as good outcomes.

Subjective norm in relation to dietary behaviour sought to find out significant others who may influence patients' diet. This concept was discussed within the three dietary categories. Five categories of individuals were identified to influence consumption of *high fat diet*. These included spouse, doctor/nurse/nutritionist, children, friend, brother/sister and neighbour. However, even though the five categories of significant others played a greater role in influencing dietary practice of the patients, compliance across the five significant others did not have equal weight. All the participants agreed that the health professionals' (doctor/nurse/nutritionist) pieces of advice were highly complied to. Majority of the participants reported that they would very much comply with the demands of their spouses and friends when taking foods in this category. Half of the participants reported that they would very much comply with influence of their siblings (brother/sister), children and neighbour. The above pattern of

responses was similar for *high sugar diet*. However, compliance for the *recommended diet* category was quite different from high fat and high sugar diet categories. All the participants expressed high level of compliance with the influence of the five categories of significant others with regard to consumption of recommended diet. They reported that most of the people important in their life always make reference to the health professionals' recommendations whenever they advise them on the kinds of foods appropriate for their condition.

Perceived behavioural control in relation to dietary behaviour sought to find out the existent factors that prevent Type II diabetic patients from following appropriate diet. The participants were involved with the discussions about barriers to dietary behaviour and mentioned a number of factors that influence choice of food categories. Key sub-themes which emerged as barriers during the discussions include poverty, lack of social support, lack enough time for food preparation, lifestyle, hunger and unreliable food items. The participants agreed that these factors prevent their attempt to reduce consumption of high fat and high sugar diet or consistently follow recommended diet. "Poverty" which the participants described as lack of access to basic needs was a key barrier to selective eating. The participants agreed that an individual who lack access to basic livelihood factors including food may not be selective in their food choice. It appeared that majority of the participants had very little control over poverty. "Social support" from friend and relatives was also another barrier to selective eating. Social support was described as all the necessary emotional and physical support obtained from significant others in a social setting. Most participants had control over this barrier. These participants argued that social support is a barrier toward selective eating that can be ignored to give way for appropriate eating behaviour. "Lack of enough time for food preparation" was a key barrier towards selective

eating. Majority of the participants agreed that they have had problems with time to prepare food. This barrier makes them resort to readymade foods which have little consideration for appropriate preparation. In addition, some of the patients have no choice but to eat what is prepared by other people living with them in the same house. However, it appeared that minority of the patients still had control over time by reporting that they had no choice but to continue. This was quite common among patients who were involved in business activities or those who were employed as civil savants. “Food preparation methods” was also a key barrier for selective eating. Majority of the participants agreed that they have adopted new food preparation styles that make it difficult for them to consume appropriate foods. They often used excessive cooking fats or oils when preparing vegetables and recommended foods such as fish, green grams, and beans among others. They also agreed that this was a difficult habit to change. “Hunger” also featured during the discussions about barrier to selective eating. Half of the participants reported that whenever they experienced hunger, they are sometimes forced to eat what is available at that time without giving serious thoughts to what is good for their condition. However, in the subsequent discussions majority of the participants agreed that hunger is something that is short term and can be controlled. Finally, the participants identified “unreliable food items” as another barrier to selective eating. All the participants agreed that most foods recommended for them are in most cases not available all the times. However, it appeared that the participants had very much control over unreliability of the foods. Whether the foods they required were available or not, they still chose what was available with their diabetic condition in mind.

Health belief concepts were discussed as pre-intention moderators applied to dietary behaviour during FGDs. Four concepts proposed as key competing factors to attitude, subjective norms and

perceived behavioural control were put to test in the subsequent discussions with the Type II diabetic patients. Factors including perceived susceptibility, perceived severity, perceived benefit and cues to action were at the centre for discussions. Relationships between these factors with dietary behaviour were discussed in relation to the possible outcomes through axial coding. The discussions began with identification of symptoms related to Type II diabetes. The three symptoms frequently mentioned and agreed upon by majority of the participants were elevated blood sugar levels (hyperglycemia), blurred vision and loss of strength. The initial discussions were first focused on high fat diet and high sugar diet. Majority of participants raised concern that increased consumption of foods rich in fats or sugar may lead to high chances of experiencing elevated blood sugar levels, blurred vision and loss of strength. The same experiences were also possible with reduced intake of fruits and vegetables. Increased chances of experiencing elevated sugar levels, blurred vision and loss of strength identified "perceived susceptibility" of the participants. The next discussions were focused on indicators of severe levels of Type II diabetes condition. Amputation, going into a comma or skin irritation was frequently mentioned as the most serious outcome of diabetes. In an attempt to relate these factors with dietary categories, participants associated consumption of high fat and high sugar diets with these severe outcomes of diabetes. They agreed that increased vegetable and fruit consumption may slow down the progression of the Type II diabetes to severe levels. Progression of Type II diabetes to severe levels including amputation, going into a comma or skin irritation identified "perceived severity". The next focus was to discuss the benefits of reducing the intake of high fat and high sugar diet while increasing fruits and vegetable consumption. This was the most common dietary recommendation the patients were aware of. Three benefits were mentioned during the discussions. The participants agreed that adhering to

dietary recommendations consistently would maintain blood sugar level within normal range. Other factors which had relations with following recommended diet consistently included improved work productivity and reduced complications associated with elevated blood sugar level such as blurred vision and amputation. This form of relationship identified "perceived benefits." The final discussions targeted factors that shape dietary behaviour. The participants were asked to express their opinion about visual material in the clinic and their contents in relation to diet. The most commonly mentioned visual material present in the clinic included television, booklets, magazines and posters. There were mixed reactions on the content of these materials. Some patients agreed that booklets and magazines only focused on the relationship between diet and diabetes. However, majority argued that these materials could not be accessed by all patients. Posters and television were the most widely used visual materials and focused on educating patients on which foods to eat and which ones to avoid. However, television messages were presented occasionally. The final discussion was centered on diabetic education organized by health professionals. This was the most common activity reported by the participants. The mentioning of these factors that trigger action identified "cues to action".

Perceived knowledge on dietary behaviour was another pre-intention mediator. Participants' knowledge was tested during open discussions and related with three categories of dietary behaviour through axial coding. Participants were asked to give their opinion about fat intake. This was necessary to determine their thinking about consumption of high fat diet. Three areas of test emerged during the discussions. These areas included fat intake, sources of protein and weight. The participants were asked what they think about fat intake, plant and animal sources of protein and weight gain in relation to Type II diabetes. Varied responses were later used to

develop five test questions. There appeared to be mixed opinion on whether reduced fat intake lowers the chances of developing Type II diabetes. In addition, divided reactions emerged on the best sources of protein. Majority of the participants agreed that plant proteins including peas, nuts, beans, green grams are best compared to animal proteins for people living with diabetes. Among the animal sources of protein varied opinions were recorded on the most advisable meat source. Less than half of participants were not aware of the different meat classifications. The difference between beef and fish was clear for majority of participants; however, a few were unable to recognize the difference in terms of their contributions toward health. The participants finally hinted that high fat diet increases body weight. However, when asked whether fatness is a risk to Type II diabetes, some expressed doubt while majority agreed. The second knowledge category focused on high sugar diet. The participants were asked to express their opinion about sugar intake. Two knowledge factors related to diet emerged during the discussions. This included knowledge on sugar intake and sugar sources. Five areas of concern emerged during the discussions. All the participants agreed that diabetic individuals need to control their sugar intake as opposed to none diabetic individuals. Complex sugars were preferred to simple sugars. The participants expressed mixed opinion of sugar free diet. A few of the participants felt that diabetic individuals should not consume sugar at all, while majority agreed that they should consume sugar in moderation. The general agreement was that there should be a balance between the sugar consumed and the amount utilized. Majority of participants believed that sugar is the main cause of diabetes. The participants also agreed that fruit sugar could be an alternative to table sugar. The final dietary knowledge focused on recommended diet. The participants were asked to express their opinion of the kinds of foods they were comfortable with due to their condition. Fruits and vegetables were preferred by majority of the participants. Brown bread was

preferred to white bread. Plant proteins including beans and peas were preferred to beef and goat meat. In addition, the number of meals in a day was at the centre of discussions. It emerged that people who are diabetic need to eat more meals in a day but in small quantities.

Post-intention mediators discussed concepts including action plan, action control and maintenance self efficacy applied to dietary behaviour. Participants were led through discussions which attempted to relate these concepts with dietary practice behaviour using axial coding. The *action plan* concept was identified by participants' responses to whether they plan when to take recommended diet, where to take the diet, how to select the diet/meals and how often to take the meals (Figure 4.2). There were varied responses expressed by the participants. Majority of the participants demonstrated elements of planning based on the four measures identified. Participants were then led through a discussion centred on their ability to control dietary behaviour so as to identify *action control.* They were asked whether they constantly monitored their diet, where majority demonstrated some elements of self monitoring through careful watching of daily diet as recommended by the health providers, having diet intentions in mind before choosing what to eat, and being awareness of the recommended diet. Majority of the participants could mention some of the foods they have always been recommended to consume. However, some participants reported cases of barriers to food selection; majority reported that they have consistently tried to follow the recommended diet. The final discussions were centred on the confidence of the participants to follow recommended diet during tough conditions.

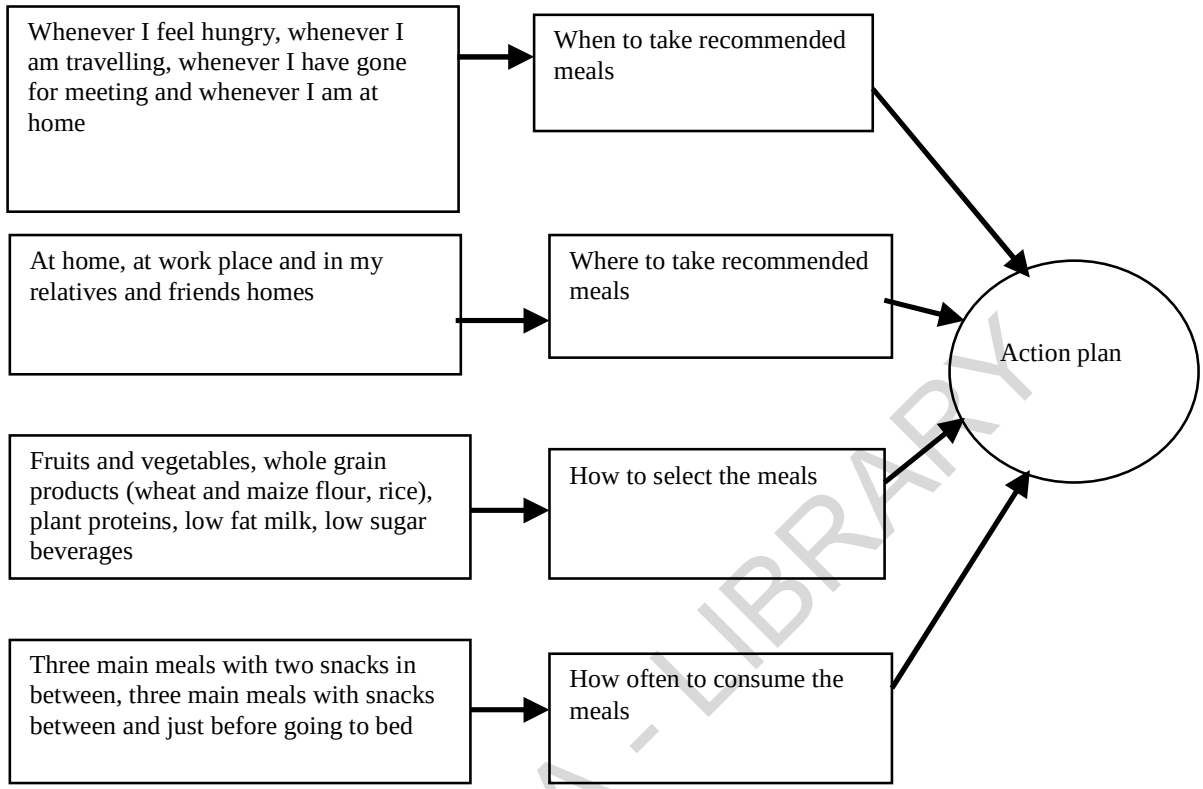


Figure 4.2 Action plan identified through open and axial coding

The participants were asked to reflex on their experience after following the recommended diet. They were asked what they would do if positive changes were not forth coming. Majority agreed that they will continue following the recommended diet with or without positive changes. Next was to seek their opinion about the influence of relatives and friends. They were asked to explain what they would do when they are in the company of friends and relatives who do not follow a diet similar to theirs. Some participants agreed that this may be a big challenge to them, however, majority agreed to continue with the diet as recommended regardless of the influence from friends and relatives. They explained that this was 'a matter of life and death' and it was upon them to choose which way to go.

4.1.2 Building up Theories within Dietary Behaviour

The objectives of this study were stated based on the fact that some new concepts were to be included within the structural network of the Theory of Planned Behaviour to develop new theories within dietary practice domain. The first objective focused on determining predictive power of the TPB model applied to dietary behaviour. The second objective focused on determining influence of perceived knowledge as a pre-intention mediator between attitude, subjective norm, perceived behavioural control and intention within the TPB model applied to dietary behaviour. The third objective focused on determining moderating influence of perceived susceptibility, perceived severity, perceived benefits and cues to action in predicting intention construct within the TPB model applied to dietary behaviour. The fourth objective focused on determining the mediating influence of action plan, action control and maintenance self-efficacy at the post-intention phase within the TPB model applied to dietary behaviour. Guided by the four objectives the researcher identified three theories through selective coding during this qualitative phase of the study within dietary behaviour domain.

Theory 1: Planned behaviour knowledge theory

Based on the first objective knowledge was positioned to mediate the relationship between attitude, subjective norm and perceived behavioural control and intention within the theory of planned behaviour. This new theory postulates that dietary behaviour can be predicted by the dietary intention. The dietary intention can be predicted by perceived knowledge of an individual weighed by perceptual understanding of dietary behaviour outcomes. Perceived knowledge can be predicted by attitude, subjective norm and perceived behavioural control. Attitude is the belief an individual has about the outcome of the dietary behaviour weighed by the value attached to

the outcome. Subjective norm is the belief of an individual that people important in their life can influence them to follow a specific dietary pattern weighed by their motivation to comply. Perceived behavioural control is the belief an individual has that some factors influence their dietary practice weighed by the control power they have over such factors.

Theory 2: Planned behaviour health belief theory

Guided by the second objective a new theory was advanced where these concepts were combined with the concepts within the traditional theory of planned behaviour. This theory postulates that dietary behaviour can be predicted by intention. Dietary intention can be predicted by attitude, subjective norm, perceived behaviour control, perceived susceptibility, perceived severity, perceived benefit and cues to action. Attitude is the belief an individual has about the outcome of the dietary behaviour weighed by the value attached to the outcome. Subjective norm is the belief an individual has that people important in their life can influence them to follow a specific dietary pattern weighed by their motivation to comply. Perceived behavioural control is the belief an individual has that some factors influence their dietary practice weighed by the control power they have over such factors. Perceived susceptibility is the magnitude of risk an individual associates with the negative outcomes of dietary behaviour weighed by the level of agreement or disagreement that the risk exists. Perceived severity is the magnitude of severity an individual associates with the negative outcome of dietary behaviour weighed by the level of agreement or disagreement that the severity exists. Perceived benefit is the magnitude an individual associates with the positive outcome of dietary behaviour weighed by the level of agreement or disagreement that the benefit exists. Cues to action is the magnitude an individual associates with

the presence of materials and processes that promote positive dietary behaviour weighed by the level of agreement or disagreement that such materials and processes exist.

Theory 3: Planned behaviour maintenance and control theory

Based on the third objective a new theory was advanced where these concepts were included during the post-intention phase of the traditional theory of planned behaviour. This new theory postulates dietary behaviour can be predicted by action plan and action control. Action plan can be predicted by dietary intention and maintenance self efficacy. Action control can be predicted by maintenance self efficacy. Dietary intention can be predicted by attitude, subjective norm and perceived behavioural control. Attitude is the belief an individual has about the outcome of the dietary behaviour weighed by the value attached to the outcome. Subjective norm is the belief an individual has that people important in their life can influence them to follow a specific dietary pattern weighed by their motivation to comply. Perceived behavioural control is the belief an individual has that some factors influence their dietary practice weighed by the control power they have over such factors. Action plan implies the magnitude an individual associates with when to take appropriate meals, where to take the meals, how to select the meals and where to take the meals weighed by the level of agreement or disagreement that these factors are true. Action control is the magnitude an individual associates with constant self monitoring of recommended diet consumption, careful watching of dietary intake, keeping diet intentions in mind, trying hard to consume recommended diet and eat in accordance with the guidelines weighed by the level of agreement or disagreement that those factors are true. Maintenance self efficacy is the magnitude an individual associates with the confidence to stay on recommended

diet despite challenging circumstances weighed by the level of agreement or disagreement that the confidence exists.

4.1.3 Theoretical Concepts applied to Physical Activity Behaviour

This section presents results of major concepts drawn from the Theory of Planned Behaviour as well additional concepts applied to physical activity behaviour. The concepts emerged as key thematic factors during the discussions with the patients and through open coding process.

Physical activity behaviour was identified as a main category during the discussions. The participants mentioned all the physical activities they do in everyday life including the ones avoided due their diabetic conditions. The most frequent physical activities mentioned by the participants include normal walking, digging/ ploughing, washing, cooking, sweeping, slashing, climbing staircase, cycling, jogging, running, dancing, hill climbing, fetching water from a stream, watching football on television, reading and writing, selling in a shop, playing football with grand children, herding cattle, hawking and fencing. During the subsequent discussions participants were involved in deeper discussions where focus was given on different physical activity categories. Three sub-categories emerged to explain physical activity pattern. A sub-category *moderate to heavy activity* emerged during the discussions. It appeared that majority of the participants perceived activities in this category as being appropriate and good for health. They also expressed their feelings that such activities utilize a lot of energy. Another sub-category identified during the discussions was *light/walking*. Participants agreed that activities in this category require just a little energy to perform. This category of physical activities was labeled appropriate for health and was the most commonly practiced. The last sub-category

sedentary lifestyle also emerged during the discussions. Some participants stated that they spend most of their time sitting down to rest, watching television, writing while seated or selling in a shop due to their diabetic conditions. Further discussions were held to classify physical activities mentioned into the identified sub-categories. Three categories were identified, as key factors describing physical activity behaviour (Figure 4.3).

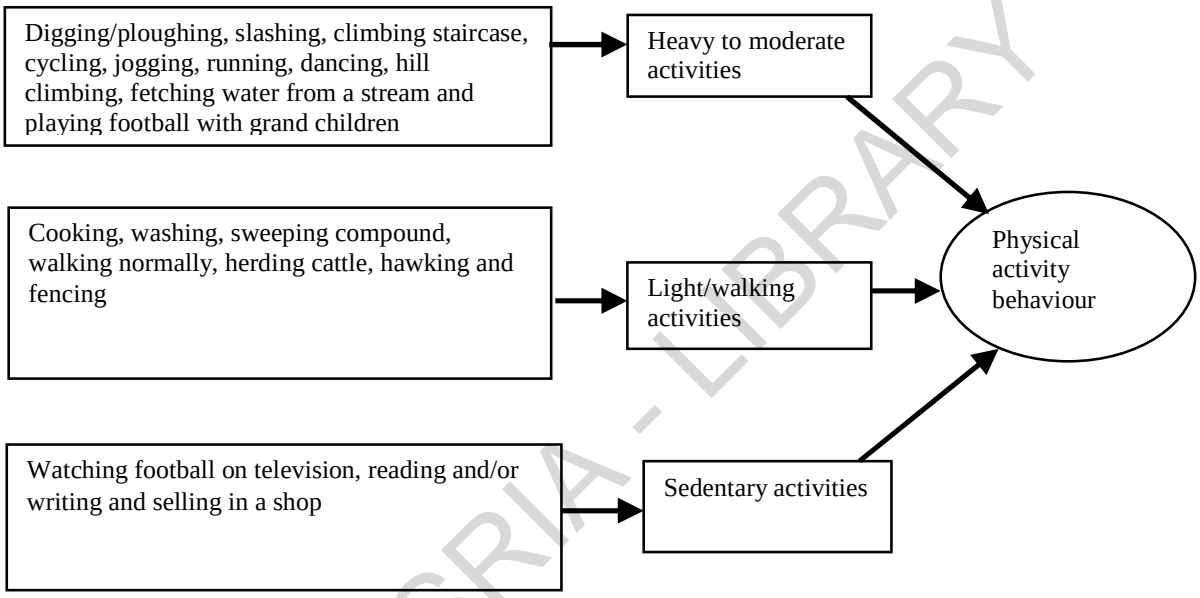


Figure 4.3 Physical activity behaviour identified through open coding

Physical activity intention sought to find out how discussants intended to engage in physical activity during the next one month. The three physical activity categories were on focus. All the participants agreed that they intended to increase their physical activity levels by half in the next one month. However, the participants on the other hand agreed that they needed to reduce time spent on sedentary activities, also by half. During these discussions the participants were reminded that moderate to heavy activities included digging/ploughing, slashing, climbing staircase, cycling, jogging, running, dancing, hill climbing, fetching water from a stream and playing football with grand children. Light/walking categories included cooking, washing,

sweeping compound, walking normally, herding cattle, hawking and fencing. Sedentary activities included watching football on television, reading and/or writing and selling in a shop.

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Physical activity attitude as a thematic factor identified during open coding focused on the participants' beliefs with regard to participating on physical activities of different categories. The first discussion sessions were made within *sedentary* sub-category. Participants expressed their opinion about leading a sedentary life. It emerged that sedentary life "raises blood sugar level". The participants affirmed that Type II diabetic patients who spend time sitting down watching television, selling in a shop, talking to friends and reading/writing most of the times are more likely to have their sugar levels increased. It also emerged that sedentary lifestyle "interferes with blood flow". Most participants agreed that long term practice of sedentary life destabilize blood flow. Other emerging sub-themes related to sedentary life included "increased accumulation of fluids in the body". The discussants felt that if they continued with sedentary life for long, they would be more likely to accumulate excessive body fluid. Another sub-theme identified as related to sedentary life is "reduced physical fitness". The participants agreed that sedentary life leads to body weakness. Such individuals find it difficult to walk and perform their daily activities. Finally, the discussants felt that sedentary life may lead to increase in weight and eventually to "overweight". They affirmed their concern by explaining that sedentary life leads to accumulation of fat in the body that eventually leads to overweight. The second discussion sessions were made within *moderate to heavy activity* sub-theme. Five key sub-categories with regard to patients' beliefs about engaging in moderate to heavy physical activity were identified. The participants agreed that this level of activity "lowers blood sugar level". Their response towards lowered sugar blood levels registered positive feelings. Another key sub-category that

emerged during the discussions was “maintained blood flow”. Majority of the patients felt that spending time doing exercise or engaging in physical activity of moderate to heavy intensity opens up the blood vessels and improves the flow of blood. Some participants raised the issue of “improved physical fitness” when they engage in lots of heavy physical activity. Majority agreed that any time they do exercise like jogging or engage in fetching water, they became physically fit. “Overweight” also re-emerged as a key sub-theme related/moderate to heavy physical activity. The participants agreed that long term exercise decreases weight. They attached bad feelings to overweight arguing that, overweight makes their diabetic condition worse. Finally, the participants agreed that moderate to heavy activity “prevents accumulation of body fluid”. Most patients believed that body fluid accumulates when the blood flow is not uniform. The third discussions were made within *light/walking* sub-theme. Similar factors mentioned under the moderate to heavy activity levels re-emerged within light/walking sub-theme. The participants agreed that if they sustained light/walking for at least 1 hour every day, their “sugar levels would go down” and their “blood flow would be normal”. Majority also agreed that sustained light/walking activity for at least 1 hour every day, “improves physical fitness”, “reduces weight” and “prevents accumulation of fluid in the body”. However, the participants argued that even though increasing physical activities was a priority, their condition does not require that they get involved in very heavy activities and they would be happy to engage in light/walking activity levels every day.

Subjective norm applied to physical activity was another main thematic factor identified during open coding. The participants were engaged in the discussions about people they value to be important in their lives and can influence their physical activity behaviour. This factor was

discussed within each physical activity category. Individuals who were identified as having significant influence on the participants involvement in any physical activity included spouses, doctors/nurses/nutritionists, children, friends, brothers/sisters and neighbours. However, their strength of influence varied from one significant other to another. The participants agreed that the health professionals' (doctor/nurse/nutritionist) pieces of advice were highly complied to. Majority of the participants reported that they would very much comply with the demands of their spouses and friends when taking foods in this category. Some participants reported that they would very much comply with influence from their siblings (brother/sister), children and neighbour. This response pattern appeared to be common for all the physical activity categories.

Perceived behavioural control applied to physical activity was saturated during open coding. The participants were involved with the discussions about barriers to engagement in appropriate physical activity and how they control them. A number of factors were mentioned under each category of physical activity. Key sub-themes which emerged as barriers during the discussions include lack of enough time, fear of injuries, lack of equipment and social environment. "Lack of enough time" was associated with moderate to heavy activity. Some of the participants reported that most of the times they were involved with office duties and they often have no time to be involved in physical exercise and household duties. They hire the services of the house helps who do most of household duties or sometimes they depend on services offered by their sons and daughters. "Fear of injuries" was associated with heavy activities. Participants felt that engaging in heavy strenuous activities like weight lifting would cause more harm to them. "Lack of equipment" was mentioned by participants who expressed their desire to engage in moderate sporting activities like riding a bicycle and light football. Finally, the participants expressed their

concern about “social environment”. Majority agreed that they would be laughed at by the people around them when seen engaging in sports and day long stretch walking.

Health belief concepts as pre-intention moderators applied to physical activity focused on perceived susceptibility, perceived severity, perceived benefit and cues to action. Relationships between these factors with physical activity behaviour were discussed in relation to the possible outcomes through axial coding. Symptoms related to Type II diabetes were first identified to begin the discussion and subsequent coding process. Three symptoms were frequently mentioned and agreed upon by majority of the participants. The symptoms included elevated blood sugar levels (hyperglycemia), blurred vision and loss of strength. The initial discussions were first focused on sedentary lifestyle. Majority of participants raised concern that sitting down watching television or talking to friends for a long time may lead to high chances of experiencing elevated blood sugar levels, blurred vision and loss of strength. Conversely, chances of experiencing elevated blood sugar levels, blurred vision and loss of strength would be lowered by engagement in heavy to moderate and light/walking at least 1 hour daily. Increased chances of experiencing elevated sugar levels, blurred vision and loss of strength identified *perceived susceptibility* of the participants. The next discussions were focused on indicators of severe levels of Type II diabetes condition. Amputations, going into a comma and skin irritation were frequently mentioned as the most serious outcome of diabetes. These factors were associated with physical activity categories where participants associated sedentary life with severe outcomes of Type II diabetes. They agreed that increased physical activity levels to moderate/heavy or light/walking activities for at least 1 hour daily may slow down the progression of the Type II diabetes to severe levels. Progression of Type II diabetes to severe levels including amputation, going into a comma or

skin irritation identified *perceived severity.* The next focus was to discuss the benefits of physical activity levels while avoiding sedentary life. Three benefits were mentioned during the discussions. The participants agreed that doing physical activity consistently would maintain blood sugar level within normal range. Other factors which had relations with following increased physical activity included improved work productivity and reduced complications associated with elevated blood sugar level such as blurred vision and amputation. This form of relationship identified *perceived benefits*. The final discussions targeted factors that promote physical activities. The participants were asked to express their opinion about visual materials in the clinic including their contents in relation physical activity. The most commonly mentioned visual material present in the clinic included television, booklets, magazines and posters. There were mixed reactions on the content of these materials. Majority of participants agreed that booklets and magazines did not have adequate information about physical activity. In addition, majority argued that these materials were not enough to be accessed by all patients. Posters and television was the most widely used visual materials and focused on educating patients on which on which physical activities to engage in. There was no physical activity education. The final discussions were centered on diabetic education organized by health professionals. This emerged as the most common method of promoting physical activity reported by the participants. These factors that trigger action were labeled *cues to action.*

Physical activity knowledge as a pre-intention mediator tested the participants' perceived knowledge during open discussions as related to physical activity behaviour categories through axial coding process. Participants were asked to give their opinion about physical activity. Two broad categories of physical activity included high level physical activities and sedentary

activities. Higher level physical activity merged light/walking activities for at least 1 hour daily, moderate activities for at least 30 minutes daily and heavy activities for at least 20 minutes daily. Sedentary included all activities done while sitting down. Within higher level physical activity category, the participants were asked to express their opinion about how long they should take in engaging in heavy physical activities. Majority reported that heavy activities were not recommended at all for individuals living with Type II diabetes. However, a few patients disagreed and reported that heavy activities are equally good for Type II diabetes, although not advisable due to high risk of injuries associated with it. Moderate physical activities were highly welcomed by the participants. Majority thought that at least 1 hour of moderate physical activity is adequate for Type II diabetes individuals. When asked whether all Type II diabetic patients should engage in adequate physical activities, their appeared to be mixed reactions. Some participants felt that only Type II diabetes individuals who are overweight should be involved in higher level physical activities. Others felt that higher level physical activity was meant for everybody including none diabetic individuals. Discussions on specific examples indicated that majority of the participants were aware that household chores such as washing, cooking and gardening were examples of higher level activities needed for Type II diabetes individuals. Finally, the participants' opinion about walking also received mixed reactions. Some participants felt that walking alone for at least 60 minutes daily is not adequate for Type II diabetics. Some felt that walking was adequate as long as it is done at moderate pace (brisk walk) and for at least 60 minutes daily. Within sedentary activity category, participants were put to task to brain storm on certain issues related to sedentary life. At the beginning discussions were centred on types of sedentary activities. Having been informed that sedentary activities are those done while sitting down and require very little energy, the participants gave examples of like washing/cooking

while sitting down as sedentary activities. When asked whether this response was true, some participants disagreed and argued that washing/cooking while sitting down require more energy due to body movement. This prompted additional question posed to the participants, which inquired whether diabetic individuals are suppose to watch television or listen to radio. The discussants felt that diabetic condition cannot restrict an individual from watching television or listening to radio, however, if this activity becomes part of life at the expense of other energy utilizing physical activities then worse outcomes may be experienced. Overweight also emerged during the discussions. The participants felt that sedentary lifestyle is the main cause of overweight and this happens when an individual consistently remains sedentary. Finally, some participants raised the issue of Type II diabetic patients who have reached severe stages of life and cannot engage in higher level physical activity. Majority expressed their opinion that the condition for this category of Type II diabetic individuals would worsen if they lead sedentary life and they should indeed engage in some high energy expenditure activities to reduce chances of weight gain.

Post-intention mediators applied to physical activity behaviour focused on action plan, action control and maintenance self efficacy. Participants were led through discussions which attempted to relate these concepts with physical activity behaviour using axial coding technique. The *action plan* concept was identified by participants' responses to whether they plan when to engage in high level physical activities, where to do physical activities, how to select the activities and how often to engage in physical activities. There were varies responses expressed by the participants. Majority of the participants demonstrated elements of planning based on the four measures identified. Participants were then led through a discussion centred on their ability

to control physical activity behaviour so as to identify *action control*. Participants were asked whether they constantly monitored their physical activity, where majority demonstrated some elements of self monitoring. Only a few of participants agreed that they carefully watch their physical activity as recommended by the health providers. Majority reported that they always have their physical activity intentions in mind. However, some participants reported cases of barriers to physical activity; majority reported that they have consistently tried to engage in physical activity. The final discussions were focused on the confident of the participants to engage in high level physical activity during tough conditions. The participants were asked to reflex their experience with engaging in physical activity. They were asked what they would do if positive changes were not forth coming. Majority agreed that they will continue engaging in physical activity with or without positive changes. Next was to seek their opinion about the influence of relative and friends. They were asked to explain what they would do when they are in the company of friends and relatives who do not engage in physical activity. Majority agreed to continue doing physical activity as recommended by health professionals regardless of the influence from friends and relatives (Figure 4.4).

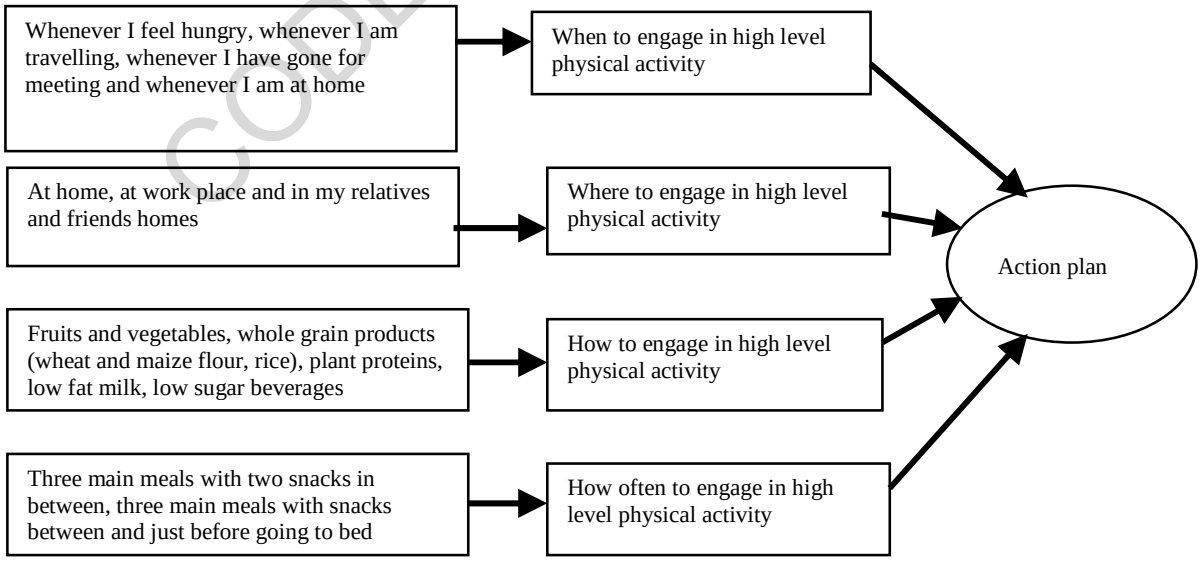

Figure 4.4 Action plan identified through open and axial coding

4.1.4 Building up Theories within Physical Activity Behaviour

In this section the researcher took note that Cross-Model Approach and repeated theory building within physical activity behaviour domain. The theoretical constructs appeared to take a similar format like the case of dietary behaviour. Like in the dietary behaviour, the first objective focused on determining predictive power of the TPB model applied to physical activity behaviour. The second objective focused on determining influence of perceived knowledge as a pre-intention mediator between attitude, subjective norm, perceived behavioural control and intention within the TPB model applied to physical activity behaviour. The third objective focused on determining moderating influence of perceived susceptibility, perceived severity, perceived benefits and cues to action in predicting intention construct within the TPB model applied to physical activity behaviour. The fourth objective focused on determining the mediating influence of action plan, action control and maintenance self-efficacy at the post-intention phase within the TPB model applied to physical activity behaviour. The four objectives were used to develop three theories through selective coding during this qualitative phase of the study within physical activity behaviour domain.

Theory 1: Planned behaviour knowledge theory

Guided by the fourth objective, knowledge was positioned to mediate the relationship between attitude, subjective norm and perceived behavioural control and intention within the theory of planned behaviour. This new theory postulates that physical activity behaviour can be predicted by the physical activity intention. The physical activity intention can be predicted by perceived knowledge of an individual weighed by factual understanding of the physical activity behaviour outcomes. Perceived knowledge can be predicted by attitude, subjective norm and perceived

control. Attitude is the belief an individual has about the outcome of the physical activity behaviour weighed by the value attached to the outcome. Subjective norm is the belief of an individual that people important in their life can influence them to engage in a specific physical pattern weighed by their motivation to comply. Perceived behavioural control is the belief an individual has that some factors influence their physical activity behaviour weighed by the control power they have over such factors.

Theory 2: Planned behaviour health belief theory

Based on the fifth objective a new theory was advanced where these concepts were combined with the concepts within the traditional theory of planned behaviour. This theory postulates that physical activity behaviour can be predicted by intention. Physical activity intention can be predicted by attitude, subjective norm, perceived behaviour control, perceived susceptibility, perceived severity, perceived benefit and cues to action. Attitude is the belief an individual has about the outcome of the physical activity behaviour weighed by the value attached to the outcome. Subjective norm is the belief of an individual that people important in their life can influence them to engage in a specific physical activity pattern weighed by their motivation to comply. Perceived behavioural control is the belief an individual has that some factors influence their physical activity behaviour weighed by the control power they have over such factors. Perceived susceptibility is the magnitude of risk an individual associates with the negative outcomes of physical activity behaviour weighed by the level of agreement or disagreement that the risk exists. Perceived severity is the magnitude of severity an individual associates with the negative outcome of physical activity behaviour weighed by the level of agreement or disagreement that the severity exists. Perceived benefit is the magnitude an individual associates

with the positive outcome of physical activity behaviour weighed by the level of agreement or disagreement that the benefit exists. Cues to action is the magnitude an individual associates with the presence of materials and processes that promotes positive physical activity behaviour weighed by the level of agreement or disagreement that such materials and processes exist.

Theory 3: Planned behaviour maintenance and control theory

Guided by the sixth objective a new theory was advanced where these concepts were included during the post-intention phase of the traditional theory of planned behaviour. This new theory postulates physical activity behaviour can be predicted action plan and action. Action plan can be predicted by physical activity intention and maintenance self efficacy. Action control can be predicted by maintenance self efficacy. Physical activity intention can be predicted by attitude, subjective norm and perceived behavioural control. Attitude is the belief an individual has about the outcome of the physical activity behaviour weighed by the value attached to the outcome. Subjective norm is the belief of an individual that people important in their life can influence them to engage in a specific physical activity pattern weighed by their motivation to comply. Perceived behavioural control is the belief an individual has that some factors influence their physical activity behaviour weighed by the control power they have over such factors. Action plan is the level of magnitude an individual associates with when to engage in appropriate physical activity, where to engage in physical activity, how to select physical activities and where to engage in physical activities weighed by the level of agreement or disagreement that these factors are true. Action control is the magnitude an individual associates with constant self monitoring of recommended physical activities, careful watching of physical activity recommendations, keeping physical activity intentions in mind, trying hard to engage in

recommended physical activities and do physical activities in accordance with the guidelines weighed by the level of agreement or disagreement that those factors are true. Maintenance self efficacy is the magnitude an individual associates with the confidence to stay on doing physical activities despite challenging circumstances weighed by the level of agreement or disagreement that the confidence exists.

4.2 Questionnaire Results (*Phase 2*)

This phase was build upon the qualitative results obtained during phase 1 of the study. The main aim was to use the qualitative information from both dietary and physical activity behaviours to develop reliable and valid questionnaires for each behaviour domain to help generate quantitative results. In the following sub-sections, international consistency reliability and construct validity of the two questionnaires are presented.

4.2.1 Internal Consistency (Reliability) of Dietary Questionnaire

Reliability test for the dietary questionnaire was conducted at two levels. The first reliability test was done during pre-testing of the tool while the second one was done after the main data survey. Reliability tests were done across all measures within the questionnaire except for evaluation, motivation to comply and control power. These measures were only intended to be used for weighing purposes and not for measuring a concept. Appendix 4.1 shows internal consistency reliability coefficients for all the grouped factors measuring each concept within the questionnaire. Cronbach's alpha reliability coefficient normally ranges between 0 and 1. However, there is actually no lower limit to the coefficient. The closer Cronbach's alpha coefficient is to 1.0 the greater the internal consistency of the items in the scale. George and

Mallery (2003) rules of thumb was used to classify the Cronbach's alpha coefficients generated. These rules of thumb provide the following: "> .9 – Excellent, > .8 – Good, > .7 – Acceptable, > .6 – Questionable, > .5 – Poor, and < .5 – Unacceptable" (p. 231). During pre-testing *dietary behaviour* measures registered unacceptable reliability, *attitude* measures registered questionable reliability, except for Salient belief measures for *attitude-2*. All measures of *subjective norm* registered good reliability. *Perceived behavioural control* registered acceptable reliability for *control belief strengths*. *Intention* measures registered poor reliability while *pre-intention moderators* registered varied reliability levels for each category of measures. *Perceived susceptibility* registered poor reliability in the group followed by cues to action which registered questionable reliability. *Perceived severity* registered acceptable reliability while perceived benefits registered excellent reliability. *Knowledge* measures registered poor reliability. *Post-intention mediators* registered excellent reliability for *action plan*, good reliability for *action control* and *maintenance self efficacy*. After the actual survey, *dietary behaviour* measures registered unacceptable reliability but more compared to the coefficient obtained during pre-testing, *attitude* measures registered acceptable reliability. Salient belief measures for *attitude-2* registered improved reliability though still poor. All measures of *subjective norm* registered good reliability. *Perceived behavioural control* registered acceptable reliability for *control belief strengths*. *Intention* measures registered poor but improved reliability while *pre-intention moderators* registered varied reliability levels for each category of measures. *Perceived susceptibility* registered poor but improved reliability in the group followed by perceived severity which registered questionable reliability. *Cues to action* registered acceptable reliability while perceived benefits registered good reliability. *Knowledge* measures registered unacceptable

reliability. *Post-intention mediators* registered excellent reliability for *action plan*, good reliability for *action control* and acceptable reliability *maintenance self efficacy*.

4.2.2 Dimensionality (Construct Validity) of Dietary Practice Questionnaire

It was noted that while a high value for Cronbach's alpha indicates good internal consistency of the items in the scale, it does not mean that the scale is unidimensional. Factor analysis was performed after the main survey to determine the dimensionality of the scales within the dietary questionnaire before computing the final measures to be fitted into the structural equation modelling. Evaluation, motivation to comply and control power measures were excluded from factor analysis. These were only meant for weighing of salient belief, normative belief and control belief strengths respectively when computing the indirect measurements. Each respondent could respond to these questions in a unique way. Appendix 4.2 shows factor loading for each variable on the rotated components. All the measurement items for each concept in the dietary practice questionnaire were subjected to *KMO and Bartlett's test of sphericity* which process Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test. The value of KMO was greater than 0.5 for all the measurement items and Bartlett's test was also significant ($p<0.0001$) indicating adequate sample size (Field, 2005).

The initial variables subjected to principal component analysis focused on *dietary behaviour*. Three dietary behaviour variables loaded into one linear component accounting for 48.94 percent of the total variance of the dietary behaviour variables. This factor was labelled "dietary behaviour." The average of the three dietary behaviour communalities was 0.69 which is acceptable for the measurement.

The next category of variables focused on *attitude*. Attitude was categorized into *attitude-1*, *attitude-2* and *attitude-3*, each with a set of five variables to be loaded. Five attitude-1 variables loaded into one linear component accounting for 52.1 percent of the total variance of the five attitude-1 variables. This factor was labelled "attitude towards fat intake". The average of the five attitude-1 communalities was 0.72 which is good for the measurement. In addition, five attitude-2 variables loaded into two linear components. The first component accounted for 40.63 percent of the total variance of the five attitude-2 variables. This component was labelled "attitude towards sugar intake". The average of the five attitude -2 communalities for the first component was 0.622 which is acceptable for the measurement. The second component accounted for 23.77 percent of the total variance of the five attitude-2 variables. This component was labelled "hidden attitude towards sugar intake". The average of the five attitude-2 communalities for the second component was 0.066 which is unacceptable for the measurement. Finally, five attitude-3 variables loaded also loaded into two linear components. The first component accounted for 48.17 percent of the total variance of the five attitude-3 variables. This component was labelled "attitude towards recommended diet". The average of the five attitude-3 communalities for the first component was 0.673 which is acceptable for the measurement. The second component accounted for 24.85 percent of the total variance of the five attitude-3 variables. This component was labelled "hidden attitude towards recommended diet". The average of the five attitude-3 communalities for the second component was 0.11 which is unacceptable for the measurement.

Measurements of *subjective norm* were also subjected to factor analysis. Subjective norm was categorized into *subjective norm-1*, *subjective norm-2* and *subjective norm-3*, each with a set of

six variables to be loaded. Six subjective norm-1 variables loaded into one linear component accounting for 56.24 percent of the total variance of the subjective norm- 1 variables. This factor was labelled “subjective norm in relation to fat intake”. The average of the six subjective norm-1 communalities was 0.74 which is good for the measurement. In addition, six subjective norm-2 variables loaded into one linear component accounting for 61.93 percent of the total variance of the six subjective norm-2 variables. This component was labelled “subjective norm in relation to sugar intake”. The average of the six subjective norm-2 communalities was 0.785 which is good for the measurement. Finally, six subjective norm-3 variables loaded also loaded into one linear component accounting for 53.44 percent of the total variance of the subjective norm-3 variables. This component was labelled “subjective norm in relation to recommended diet”. The average of the six subjective norm-3 communalities for the first component was 0.722 which is acceptable for the measurement.

Next in the factor analysis were measurements of *control belief strengths*. Three variables were loaded into two linear components. The first component accounted for 59.28 percent of the total variance of the three control belief strength variables. This component was labelled “control belief strength in relation to dietary practice”. The average of the three control belief strength communalities for the first component was 0.648 which is acceptable for the measurement. The second component accounted for 33.56 percent of the total variance of the three control belief strength variables. This component was labelled “hidden belief strength in relation to dietary practice”. The average of the three control belief strength communalities for the second component was 0.31 which is unacceptable for the measurement.

Pre-intention moderators were categorized into perceived susceptibility, perceived severity, perceived benefit and cues to action. Three perceived susceptibility variables were loaded into one linear factor accounting for 53.58 percent of the total variance of the three perceived susceptibility variables. This component was labelled "perceived susceptibility in relation to dietary practice". The average of the three perceived susceptibility communalities was 0.732 which is good for the measurement. In addition, three perceived severity variables were loaded into one linear component accounting for 64.93 percent of the total variance of the three perceived severity variables. This component was labelled "perceived severity in relation to dietary practice". The average of the three perceived severity communalities was 0.80 which is superb for the measurement. Again, three perceived benefit variables were loaded into one linear component accounting for 79.23 percent of the total variance of the three perceived benefit variables. This component was labelled "perceived benefit in relation to dietary practice". The average of the three perceived benefit communalities was 0.90 which is superb for the measurement. Finally, three cues to action variables were loaded into one linear component accounting for 63.54 percent of the total variance of the three cues to action variables. This component was labelled "cues to action in relation to dietary practice". The average of the three cues to action communalities was 0.79 which is good for the measurement.

Perceived dietary knowledge was another main variable subjected to factor analysis. Three dietary knowledge variables were loaded into one linear component accounting for 46.33 percent of the total variance of the three dietary knowledge variables. This component was labelled "Perceived dietary knowledge". The average of the three perceived dietary knowledge communalities was 0.674 which is acceptable for the measurement.

Another group of variable measured *dietary intention.* Three variables measuring intention were loaded into one linear components accounting for 55.93 percent of the total variance of the three dietary intention variables. This component was labelled “dietary intention”. The average of the three dietary intention communalities was 0.76 which is good for the measurement.

Post-intention mediators were also subjected to principal component analysis. These mediators included action plan, action control and maintenance self efficacy. Four action plan variables loaded into one linear component accounting for 78.21 percent of the total variance of the four action plan variables. This component was labelled “action plan in relation to dietary practice”. The average of the four action plan communalities was 0.804 which is superb for the measurement. In addition, six action control variables loaded into one linear component accounting for 63.2 percent of the total variance of the six action control variables. This component was labelled “action control in relation to dietary practice”. The average of the six action control communalities was 0.793 which is good for the measurement. Finally, three maintenance self efficacy variables loaded into one linear component accounting for 66.56 percent of the total variance of the three maintenance variables. This component was labelled “maintenance self efficacy in relation to dietary practice”. The average of the three maintenance self efficacy communalities was 0.82 which is superb for the measurement.

The indirect measures were also subjected to reliability test before being fitted into Structural Equation Modelling. Appendix 4.3 shows internal consistently reliabilities for indirect measures of attitude, subjective norm and perceived behavioural control after integration. Both *attitude* and

perceived behavioural control registered poor reliability although the Cronbach's coefficient was above average. *Subjective norm* registered excellent reliability coefficient.

A test for dimensionality for the indirect measures was conducted using factor analysis to determine how the three variables measuring attitude, subjective norm and perceived behavioural control loaded into factors. Appendix 4.4 shows factor loading for each variable on the rotated components. The initial variables subjected to principal component analysis focused on *indirect attitude*. Three indirect attitude variables loaded into one linear component accounting for 50.01 percent of the total variance of the indirect attitude variables. This factor was labelled "indirect dietary attitude." The average of the three indirect attitude communalities was 0.70 which is good for the measurement. The next category of variables focused on *indirect subjective norm.* Three indirect subjective norm variables loaded into one linear component accounting for 90.08 percent of the total variance of the three indirect subjective norm variables. This factor was labelled "indirect subjective norm in relation to dietary practice". The average of the three subjective norm communalities was 0.95 which is superb for the measurement. Finally, three variables measuring *indirect perceived behavioural control* were loaded into one linear component accounting for 59.35 percent of the total variance of the indirect perceived behavioural control variables. This factor was labelled "indirect perceived behavioural control in relation to dietary practice." The average of the three indirect attitude communalities was 0.69 which is acceptable for the measurement.

4.2.3 Internal Consistently (Reliability) for Physical Activity Questionnaire

Reliability test for the physical activity questionnaire was conducted during pre-testing of the tool and after the main survey. Reliability tests were done across all measures within the questionnaire except for evaluation, motivation to comply and control power. These categories of measurements were intended to be used for weighing purposes and did not necessarily measure concepts. Appendix 4.5 shows internal consistency reliability coefficients for all the grouped factors measuring each concept within the questionnaire. George and Mallery (2003) rules of thumb was used to classify the Cronbach's alpha coefficients generated. These rules of thumb provide the following: "> .9 – Excellent, > .8 – Good, > .7 – Acceptable, > .6 – Questionable, > .5 – Poor, and < .5 – Unacceptable" (p. 231). During pre-testing *physical activity behaviour* measures registered unacceptable reliability, *attitude-1* measures registered acceptable reliability, *attitude-2* measures registered questionable reliability, while Salient belief measures for *attitude-3* registered poor reliability. All measures of *subjective norm* registered good reliability except normative belief measures for *subjective norm-1* which registered excellent reliability. *Perceived behavioural control* registered questionable reliability for *control belief strengths*. Intention measures also registered questionable reliability coefficient. *Pre-intention moderators* registered varied reliability levels for each category of measures. *Perceived susceptibility* registered poor reliability in the group followed by *perceived benefits* which registered unacceptable reliability. *Perceived severity* registered acceptable reliability while *cues to action* registered poor reliability. *Knowledge* measures registered questionable reliability. *Post-intention mediators* registered excellent reliability for *action plan*, acceptable reliability for *action control* and *maintenance self efficacy*. After the main survey *physical activity behaviour* measures registered poor reliability with an improvement compared to the coefficient obtained during pre-testing,

attitude-1 measures registered acceptable reliability, *attitude-2* measures registered questionable reliability, while Salient belief measures for *attitude-3* registered poor reliability. All measures of subjective norm registered good reliability except normative belief measures for *subjective norm-3* which registered excellent reliability. *Perceived behavioural control* registered acceptable reliability for *control belief strengths*. *Intention* measures registered questionable and reduced reliability while *pre-intention moderators* registered varied reliability levels for each category of measures. *Perceived susceptibility* registered questionable and improved reliability in the group while *perceived severity* which registered good reliability. *Cues to action* registered acceptable reliability while perceived benefits registered unacceptable reliability. *Knowledge* measures also registered poor reliability. *Post-intention mediators* registered excellent reliability for *action plan* and good reliability for both *action control* and *maintenance self efficacy*.

4.2.4 Dimensionality (Construct Validity) for Physical Activity Questionnaire

Having noted again that a high value for Cronbach's alpha indicates good internal consistency of the items in the scale, but does not mean that the scale is unidimensional, measurements of key concepts were subjected into factor analysis after the main survey to determine the dimensionality of the scales within the physical activity questionnaire before computing the final measures to be fitted into the structural equation modelling. Evaluation, motivation to comply and control power measures were excluded from factor analysis. Like in the case of dietary questionnaire, these were only to be used for weighing of salient belief, normative belief and control belief strengths respectively. Appendix 4.6 shows factor loading for each variable on the rotated components. All the measurement items for each concept in the physical activity questionnaire were subjected to *KMO and Bartlett's test of sphericity* which process Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test. The value of KMO was greater

than 0.5 for all the measurement items and Bartlett's test was also significant ($p<0.0001$) indicating adequate sample size (Field, 2005).

The initial variables subjected to principal component analysis focused on *physical activity behaviour*. Three physical activity behaviour variables loaded into one linear component accounting for 45.15 percent of the total variance of the physical activity behaviour variables. This factor was labelled "physical activity behaviour." The average of the three dietary behaviour communalities was 0.67 which is acceptable for the measurement. The next category of variables focused on *attitude*. Attitude was categorized into *attitude-1*, *attitude-2* and *attitude-3*, each with a set of five variables to be loaded. Five attitude-1 variables loaded into one linear component accounting for 47.89 percent of the total variance of the five attitude-1 variables. This factor was labelled "attitude towards sedentary lifestyle". The average of the five attitude-1 communalities was 0.68 which is acceptable for the measurement. In addition, five attitude-2 variables loaded into one linear component accounting for 48.39 percent of the total variance of the five attitude-2 variables. This component was labelled "attitude towards moderate to heavy physical activity". Finally, five attitude-3 variables loaded into two linear components. The first component accounted for 48.01 percent of the total variance of the five attitude-3 variables. This component was labelled "attitude towards light/walking physical activity". The average of the five attitude-3 communalities for the first component was 0.62 which is acceptable for the measurement. The second component accounted for 25.2 percent of the total variance of the five attitude-3 variables. This component was labelled "hidden attitude towards light/walking physical activity". The average of the five attitude-3 communalities for the second component was 0.21 which is unacceptable for the measurement.

Measurements of *subjective norm* were also subjected to factor analysis. Subjective norm was categorized into *subjective norm-1*, *subjective norm-2* and *subjective norm-3*, each with a set of six variables to be loaded. Six subjective norm-1 variables loaded into one linear component accounting for 62.1 percent of the total variance of the subjective norm-1 variables. This factor was labelled "subjective norm in relation to sedentary lifestyle". The average of the six subjective norm-1 communalities was 0.78 which is good for the measurement. In addition, six subjective norm-2 variables loaded into one linear component accounting for 68.72 percent of the total variance of the six subjective norm-2 variables. This component was labelled "subjective norm in relation to moderate to heavy physical activity". The average of the six subjective norm-2 communalities was 0.83 which is superb for the measurement. Finally, six subjective norm-3 variables loaded also loaded into one linear component accounting for 71.9 percent of the total variance of the subjective norm-3 variables. This component was labelled "subjective norm in relation to light/walking physical activity". The average of the six subjective norm-3 communalities for the first component was 0.84 which is acceptable for the measurement.

Next in the factor analysis were measurements of *control belief strengths*. Three variables were loaded into one linear component accounting for 72.2 percent of the total variance of the three control belief strength variables. This component was labelled "control belief strength in relation to physical activity behaviour". The average of the three control belief strength communalities for the first component was 0.84 which is superb for the measurement.

Pre-intention moderators were categorized into *perceived susceptibility, perceived sever*ity, *perceived benefit*s and *cues to action*. Three perceived susceptibility variables were loaded into one linear factor accounting for 62.62 percent of the total variance of the three perceived susceptibility variables. This component was labelled "perceived susceptibility in relation to physical activity behaviour". The average of the three perceived susceptibility communalities was 0.79 which is good for the measurement. In addition, three perceived severity variables were loaded into one linear component accounting for 82.7 percent of the total variance of the three perceived severity variables. This component was labelled "perceived severity in relation to physical activity behaviour". The average of the three perceived severity communalities was 0.91 which is excellent for the measurement. Again, three perceived benefit variables were loaded into one linear component accounting for 50.4 percent of the total variance of the three perceived benefit variables. This component was labelled "perceived benefits in relation to physical activity behaviour". The average of the three perceived benefits communalities was 0.71 which is good for the measurement. Finally, three cues to action variables were loaded into one linear component accounting for 57.49 percent of the total variance of the three cues to action variables. This component was labelled "cues to action in relation to physical activity behaviour". The average of the three cues to action communalities was 0.72 which is good for the measurement.

Perceived physical activity knowledge was another main variable subjected to factor analysis. Three physical activity knowledge variables were loaded into one linear component accounting for 50.48 percent of the total variance of the two physical activity knowledge variables. This component was labelled "perceived physical activity knowledge". The average of the two

perceived physical activity knowledge communalities was 0.71 which is good for the measurement.

Another group of variable measured *physical activity intention*. Three variables measuring intention were loaded into one linear components accounting for 60.71 percent of the total variance of the three physical activity intention variables. This component was labelled “physical activity intention”. The average of the three physical activity intentions communalities was 0.78 which is good for the measurement.

Post-intention mediators were also subjected to principal component analysis. These mediators included *action plan, action control* and *maintenance self efficacy*. Four action plan variables loaded into one linear component accounting for 88.21 percent of the total variance of the four action plan variables. This component was labelled “action plan in relation to physical activity behaviour”. The average of the four action plan communalities was 0.94 which is excellent for the measurement. In addition, six action control variables loaded into one linear component accounting for 59.78 percent of the total variance of the six action control variables. This component was labelled “action control in relation to physical activity behaviour”. The average of the six action control communalities was 0.77 which is good for the measurement. Finally, three maintenance self efficacy variables loaded into one linear component accounting for 73.44 percent of the total variance of the three maintenance variables. This component was labelled “maintenance self efficacy in relation to physical activity”. The average of the three maintenance self efficacy communalities was 0.85 which is superb for the measurement.

The indirect measures applied to physical activity were also subjected to reliability test before being fitted into Structural Equation Modelling. Appendix 4.7 shows internal consistently reliabilities for indirect measures of attitude, subjective norm and perceived behavioural control after integration. Both *indirect attitude* and *subjective norm* registered excellent reliability. *Indirect perceived behavioural control* registered poor reliability coefficient.

A test for dimensionality was again conducted using factor analysis to determine how the three variables measuring attitude, subjective norm and perceived behavioural control loaded into factors. Appendix 4.8 shows factor loading for each variable on the rotated components. The initial variables subjected to principal component analysis focused on *indirect attitude*. Three indirect attitude variables loaded into one linear component accounting for 80.7 percent of the total variance of the indirect attitude variables. This factor was labelled "indirect attitude in relation to physical activity behaviour." The average of the three indirect attitude communalities was 0.90 which is excellent for the measurement. The next category of variables focused on indirect subjective norm. Three *indirect subjective norm* variables loaded into one linear component accounting for 93.6 percent of the total variance of the three indirect subjective norm variables. This factor was labelled "indirect subjective norm in relation to physical activity behaviour". The average of the three subjective norm communalities was 0.97 which is excellent for the measurement. Finally, three variables measuring *indirect perceived behavioural control* were loaded into one linear component accounting for 68.96 percent of the total variance of the indirect perceived behavioural control variables. This factor was labelled "indirect perceived behavioural control in relation to physical activity behaviour." The average of the three indirect attitude communalities was 0.81 which is superb for the measurement.

4.3 Quantitative Results (*Phase 3*)

This phase was meant to explore the results obtained during the qualitative phase (*phase 1*). Specifically the phase was intended to give an objective account of the theories developed during selective coding. These theories included *planned behaviour knowledge theory, planned behaviour health belief theory and planned behaviour maintenance and control theory*. Objective assessment of the validity of these theories involved testing of hypotheses generated from the theoretical constructs of the theories on focus. The questionnaires developed during phase 1 were used to gather information from the Type II diabetic patients and each hypothesis tested within dietary and physical activity domains following a Cross-Model Approach.

This analysis first dwelt on the patients characteristics in order to describe the population of patients engaged during this survey (Table 4.1). Among the participants involved in dietary survey, 51(21.5 percent) did not go to school at, 77(32.5 percent) completed primary level education, 84(35.4 percent) completed secondary level education, 18(7.6 percent) went to tertiary college while only 7(3.0 percent) completed University education. This implied that more than 60 percent of the participants went through formal education. In addition, among the participants involved in physical activity survey, 49(21.3 percent) did not go to school at, 76(33.0 percent) completed primary level education, 81(30.9 percent) completed secondary level education, 27(11.7 percent) went to tertiary college while only 7(3.0 percent) completed University education. About 237(Female; 144:60.8 percent and Male 93:39.2 percent) and 230(Female; 130:56.5 percent and Male; 100:43.5 percent) of Type II diabetic patients participated in the study during dietary and physical activity surveys respectively. Concerning family diabetic history, 166 (70.0 percent) did not have any of the family members who was

living with the condition, while 71(30.0 percent) had at least one member living with the condition among patients who participated in dietary survey. About 172 (74.8 percent) did not have any of the family members who was living with the condition, while 58(25.2 percent) had at least one member living with the condition among patients who participated in physical activity survey.

Table 4.1 **Patients Characteristics**

Descriptive Characteristics	Dietary Survey (N=237, C.I= ± 4.07 percent)	Physical Activity Survey N=230, C.I= ± 4.22 percent)
Sex		
Male	144 (60.8 %)	130 (56.5 %)
Female	93 (39.2 %)	100 (43.5 %)
Level of Education		
Never	51(21.5 %)	49 (21.3 %)
Primary	77 (32.5 %)	76 (33.0 %)
Secondary	84 (35.4 %)	71(30.9 %)
Tertiary	18 (7.6 %)	27 (11.7 %)
University	7 (3.0 %)	7 (3.0 %)
Family diabetic history		
No	166 (70.0 %)	172 (74.8 %)
Yes	71 (30.0 %)	58 (25.2 %)
Frequent cadre attending to patients		
Doctor/clinical officer	156 (65.8 %)	172 (74.8 %)
Nurse	21 (8.9 %)	19 (8.3 %)
Nutritionist	1 (.4 %)	1(.4 %)
Nurse and nutritionist	19 (8.0 %)	16 (7.0 %)
All the cadres	40 (16.9 %)	22 (9.6 %)
Current age in years (mean)	55.73 ±12.25	55.5±12. 82
Age at onset in years (minimum)	38	37

The mean age 55.73 ±12.25 (years; dietary survey) and 55.5±12.82 (years; physical activity survey) implied that most participants who suffered from Type II diabetes were above 35 years. In addition, the minimum age for onset of diabetes was above 35 years, implying that most participants suffered from Type II diabetes; not Type I diabetes. The most frequent cadre attending to patients the doctor/clinical officers {dietary survey; 156 (65.8%) and physical activity; 172 (74.8%)}, followed by nurse {dietary survey; 21 (8.9%) and physical activity 19

(8.3%)}, nurse and nutritionists {dietary survey; 19 (8.0%) and physical activity; 16 (7.0%)} and nutritionists alone {dietary survey; 1 (0.4%) and physical activity; 1 (0.4%)}.

4.3.1 Structural Equation Modelling applied to Dietary Behaviour

Dietary behaviour was the initial behaviour domain intended for theoretical building and hypothesis testing. This quantitative phase applied to dietary behaviour intended to establish whether: 1) the TPB model fits the data on dietary behaviour acceptably among Type II diabetic patients; 2) the TPB model with perceived knowledge as mediator between attitude, subjective norm, perceived behavioural control and intention fits the data on dietary behaviour acceptably among Type II diabetic patients; 3) the Theory of Planned Behaviour (TPB) model with perceived susceptibility, perceived severity, perceived benefits and cues to action as moderators of attitude, subjective norm and perceived behavioural control fits the data on dietary behaviour acceptably among Type II diabetic patients and; 4) the Theory of Planned Behaviour (TPB) model with action plan, action control and maintenance self–efficacy as mediators between intention and behaviour fits the data on dietary behaviour acceptably among Type II diabetic patients.

4.3.1.1 Testing Hypothesis 1

The TPB model fits the data on dietary behaviour acceptably among Type II diabetic patients.

This hypothesis was focused towards determining the predictive power of a model specified based on the construct of the traditional Theory of Planned Behaviour to form a bench mark for comparisons with other newly developed theories. Both item measurements analysis and measurement model analysis were performed using observed endogenous and unobserved

exogenous variables in attempt to test the extent to which the model fits the data. These variables are presented in Table 4.2 and displayed in a measurement model (Appendix 1.1).

Table 4.2 **Endogenous and Exogenous Variables in the TPB Model (MODEL A)**

Endogenous Variables	Exogenous Variables (Unobserved)
Observed	Attitude
Attitude-1 (A1)	e1
Attitude-2 (A2)	e2
Attitude-3 (A3)	e3
Subjective norm-1 (SN1)	Subjective norm
Subjective norm-2 (SN2)	e4
Subjective norm-3(SN3)	e5
PBC-1 (PC1)	e6
PBC-2 (PC2)	Perceived Behavioural Control (PBC)
PBC-3 (PC3)	e7
Intention (IN1)	e8
Intention (IN2)	e9
Intention (IN3)	Intention
Diet class-1(D1)	e10
Diet class-2 (D2)	e11
Diet class-3 (D3)	e12
Unobserved	Dietary Behaviour
Intention	e13
Dietary Behaviour	e14
	e15
	Other 1
	Other 2

e= error

It was again necessary to subject cases to both univariate and multivariate screening to test for the normality of the data for each variable observed before fitting the model (Table 4.3). The means and standard deviations for all the measures are presented in the table. All the measures were subjected to skewness test based on the recommended ±2 range for normal distribution. Measures of dietary behaviour were negatively skewed except for diet class-1 which appeared to be normally distributed. Measures of intention were all negatively skewed. Measures of perceived behavioural control were normally distributed, while subjective norm measures were negatively skewed except for subjective norm-1 which appeared to be normally distributed. Attitude measures were all normally distributed. On the overall data violated normality assumption based on skewness. Kurtosis also indicated that most measures were outside the ±2

range for normal distribution except for diet class-1 and perceived behavioural control measures. Attitude-1 also registered normality.

Table 4.3 **Measurement Level Descriptive Statistics, Univariate and Multivariate Normality for the TPB Model (MODEL A, n = 237)**

Variable	min	max	mean	s.d.	skew	c.r.	kurtosis	c.r.
D3	1.000	7.000	7.27	.051	-3.242	-20.378	9.942	31.242
D2	4.000	8.000	7.74	.037	-2.799	-17.594	10.447	32.829
D1	4.000	8.000	7.27	.051	-.970	-6.093	.815	2.562
IN1	3.000	7.000	6.72	.044	-3.097	-19.467	10.696	33.613
IN2	3.000	7.000	6.84	.032	-4.636	-29.136	28.659	90.058
IN3	4.000	7.000	6.84	.027	-3.071	-19.298	11.485	36.091
PC1	1.000	49.000	24.75	1.164	.279	1.754	-1.617	-5.082
PC2	1.000	49.000	27.08	1.234	.045	.285	-1.777	-5.583
PC3	1.000	49.000	16.68	1.064	1.070	6.722	-.489	-1.537
SN1	56.000	294.000	256.98	3.419	-1.728	-10.859	2.637	8.286
SN2	35.000	294.000	261.29	3.323	-2.079	-13.064	4.348	13.663
SN3	56.000	294.000	265.00	2.895	-2.098	-13.184	4.978	15.642
A1	29.000	245.000	184.33	3.278	-.847	-5.324	.365	1.147
A2	35.000	294.000	221.95	2.013	-1.837	-11.548	5.800	18.225
A3	113.000	245.000	198.72	1.030	-1.688	-10.612	8.288	26.045
Multivariate							195.123	66.507

Item level measurements were performed due to the difference in the measurement scales. The model was recursive with a *df*=77. Standardized regression weights for the endogenous variables are displayed in the measurement model (Appendix 1.1). It appears items defining attitude, subjective norm, perceived behavioural control, intention and dietary behaviour had very high regression weights close to 1.00. The squared multiple correlation indicated that predictors of subscales accounted for >90 percent except for perceived behavioural control (PBC3) for the recommended diet where the predictors accounted for 43.9 percent of the variance of PBC3 itself. Correlations between observed variables in the model were strong (p<0.001) and positive except PBC3 which registered lower but significant positive correlation coefficient (p<0.01). Modification indices suggested specifying relationships among items within and between the scales, which suggest multicollinearity.

The goodness of fit statistics were statistically non-significant at the .01 level but the model should be rejected at the .05 level (χ^2 = 223.3, *df* = 77, *p* = .02, χ^2/df = 2.9). However, the relative chi-square was within the recommended 3:1 range indicating acceptable fit after significant modification indices were uncorrelated. Other fit indices {*TLI* = .93; *CFI* =.91; *RMSEA* (90CI) = .090(.039, .146)} also demonstrated a good model fit. Hoelter's critical N values suggest that the model would have been accepted at the .05 significance level with 194 cases and the upper limit of *N* for the .01 significance level is 200. No Modification Index was above the customary cutoff value of 4.00. Because the data violated the normality assumption, bootstrapped chi-square values were also calculated and the model fits better in 200 bootstrapped samples. The Bollen-Stine *p* = 0.025 provided further reassurance about the model fit. It was then necessary to advance the Theory of Planned Behaviour using structural model (Figure 4.5). Standardized regression weights in Figure 4.5, indicates that attitude was a better predictor of intention (β=0.79, *p*<0.01, *n*=237), followed subjective norm (β=*0.33 p*<0.05, *n*=237) while perceived behavioural control poorly (β=-0.02 *p*>0.05, *n*=237) predicted intention. Intention in turn strongly predicted dietary behaviour (β=0.99 *p*<0.001, *n*=237). This implies that when attitude goes up 1 standard deviation, intention goes up by 0.79 standard deviations. In addition when subjective norm goes up by 1 standard deviation, intention goes up by 0.33 standard deviations. However, when perceived behavioural control goes up by 1 standard deviation, intention goes down by 0.02 standard deviations. Finally, when intention goes up by 1 standard deviation, dietary behaviour goes up by 0.99 standard deviations. Intention predictors put together accounted for 100 percent of the variance on intention. Finally, intention and perceived behavioural control also explained 100 percent of the variance on dietary behaviour.

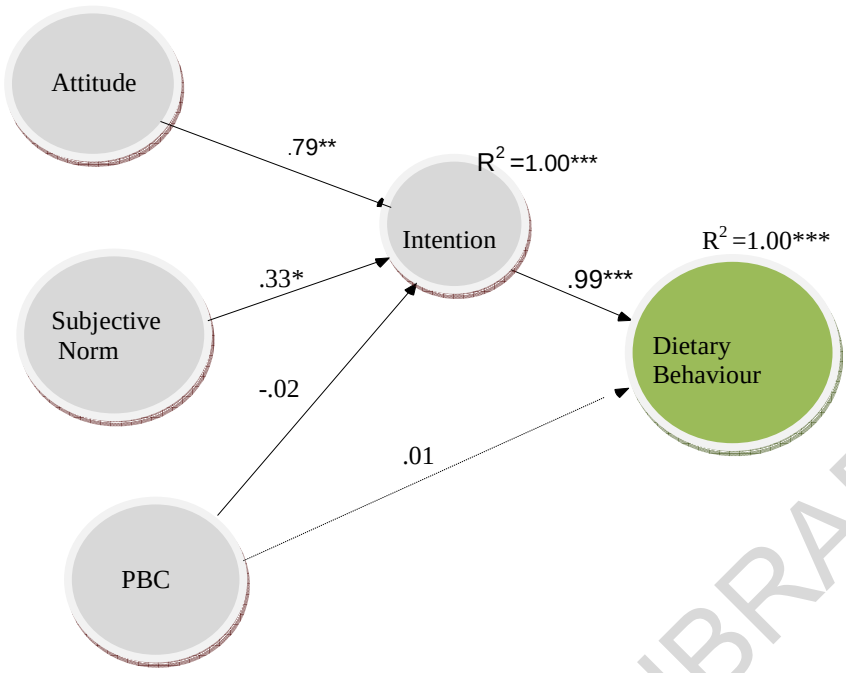

Figure 4.5 Theory of Planned Behaviour structural model applied to dietary practice (Model B)

4.3.1.2 Testing Hypothesis 2

The TPB model with perceived knowledge as mediator between attitude, subjective norm, perceived behavioural control and intention fits the data on dietary behaviour acceptably among Type II diabetic patients.

Hypothesis 2 intended to include knowledge as a mediator during the pre-intention phase. This hypothesis is in line with the proposed *planned behaviour knowledge theory* (theory 1). Analysis was initiated by first specifying a measurement model based on the traditional concepts of planned behaviour knowledge theory. Both item measurements analysis and measurement model analysis were performed using observed/unobserved endogenous and unobserved exogenous variables. These variables are presented in Table 4.4 and displayed in a measurement model in

Appendix 1.2. Table 4.4 shows all the variables included in the specified measurement Model 1A attempting to advance planned behaviour knowledge theory.

Table 4.4 **Endogenous and Exogenous Variables (MODEL 1A)**

Endogenous Variables	Exogenous Variables (Unobserved)
Observed	Attitude
Attitude-1 (A1)	e1
Attitude-2 (A2)	e2
Attitude-3 (A3)	e3
Knowledge -1 (KN1)	Knowledge
Knowledge-2 (KN2)	e16
Knowledge-3 (KN3)	e17
Subjective norm-1 (SN1)	e18
Subjective norm-2 (SN2)	Subjective norm
Subjective norm-3 (SN3)	e4
PBC-1 (PC1)	e5
PBC-2 (PC2)	e6
PBC-3 (PC3)	Perceived Behavioural Control (PBC)
Intention-1 (IN1)	e7
Intention-2 (IN2)	e8
Intention-3 (IN3)	e9
Diet class-1 (D1)	Intention
Diet class-2 (D2)	e10
Diet class-3 (D3)	e11
Unobserved	e12
Knowledge	Dietary Behaviour
Dietary Behaviour	e13
Intention	e14
	e15
	other 1
	other 2
	other 3

e= error; other=other factors

Cases were subjected to both univariate and multivariate screening to test for the normality of the data for each variable observed before fitting the model. The means and standard deviations for all the measures within Model 1A are presented (Table 4.5). All the measures were subjected to skewness test based on the recommended ±2 range for normal distribution. Measures of dietary behaviour were negatively skewed except for diet class-1 which appeared to be normally distributed. Measures of intention were all negatively skewed. All measures of knowledge and perceived behavioural control were normally distributed, while subjective norm measures

appeared to be negatively skewed except for subjective norm-1 which was normally distributed. Attitude measures were all normally distributed. On the overall data violated normality assumption based on skewness. Kurtosis also indicated that all measures were outside the ±2 range for normal distribution except for diet class-1, knowledge-3, knowledge-1 and perceived behavioural control measures. Attitude-1 also registered normality.

Table 4.5 **Measurement Level Descriptive Statistics, Univariate and Multivariate Normality (MODEL 1 A; n = 237)**

Variable	min	max	mean	s.d.	skew	c.r.	kurtosis	c.r.
D3	1.000	7.000	7.27	.051	-3.242	-20.378	9.942	31.242
D2	4.000	8.000	7.74	.037	-2.799	-17.594	10.447	32.829
D1	4.000	8.000	7.27	.051	-.970	-6.093	.815	2.562
IN1	3.000	7.000	6.72	.044	-3.097	-19.467	10.696	33.613
IN2	3.000	7.000	6.84	.032	-4.636	-29.136	28.659	90.058
IN3	4.000	7.000	6.84	.027	-3.071	-19.298	11.485	36.091
KN3	1.000	5.000	4.05	.056	-.303	-1.905	-.030	-.093
KN2	1.000	5.000	4.19	.050	-1.239	-7.790	2.663	8.370
KN1	1.000	5.000	4.05	.056	-.667	-4.193	.197	.618
PC1	1.000	49.000	24.75	1.164	.279	1.754	-1.617	-5.082
PC2	1.000	49.000	27.08	1.234	.045	.285	-1.777	-5.583
PC3	1.000	49.000	16.68	1.064	1.070	6.722	-.489	-1.537
SN1	56.000	294.000	256.98	3.419	-1.728	-10.859	2.637	8.286
SN2	35.000	294.000	261.29	3.323	-2.079	-13.064	4.348	13.663
SN3	56.000	294.000	265.00	2.895	-2.098	-13.184	4.978	15.642
A1	29.000	245.000	184.33	3.278	-.847	-5.324	.365	1.147
A2	35.000	294.000	221.95	2.013	-1.837	-11.548	5.800	18.225
A3	113.000	245.000	198.72	1.030	-1.688	-10.612	8.288	26.045
Multivariate							204.112	58.553

Item level measurements were performed due to the difference in the measurement scales. The model was recursive with a *df*=121. Standardized regression weights for the endogenous variables are displayed in the measurement model (Appendix 1.2). It appears items defining attitude, subjective norm, perceived behavioural control, intention, knowledge and dietary behaviour had very high regression weights close to 1.00. The squared multiple correlation indicated that predictors of subscales accounted for >90 percent except for perceived behavioural control (PBC3) for the recommended diet where the predictors accounted for 44 percent of the

variance of PBC3 itself. Predictors of knowledge accounted for 100 percent of the variance of knowledge itself. Correlations between observed variables in the model were strong (p<0.001) and positive except PBC3 which registered lower but significant positive correlation coefficient (p<0.01). Modification indices suggested specifying relationships among items within and between the scales, which suggest multicollinearity.

The goodness of fit statistics were statistically non-significant at the .05 level (χ^2 = 256.7, df = 121, p = .07, χ^2/df = 2.12). However, the relative chi -square was within the recommended 3:1 range indicating acceptable fit after significant modification indices were uncorrelated. Other fit indices {*TLI* = .95*; CFI* =.93*; RMSEA* (90CI) = .075(.003, .077)} also demonstrated a good model fit. Hoelter's critical N values suggest that the model would have been accepted at the .05 significance level with 165 cases and the upper limit of N for the .01 significance level is 199. No Modification Index was above the customary cutoff value of 4.00. Because the data violated the normality assumption, bootstrapped chi-square values were also calculated and the model fits better in 200 bootstrapped samples. The Bollen-Stine p = 0.075 provided further reassurance about the model fit. Based on the goodness of fit statistics an attempt was made to advance the *planned behaviour knowledge theory* using structural model (Figure 4.6). Standardized regression weights (Figure 4.6) indicates that attitude was a better predictor of knowledge (β=0.65, p<0.01, n=237), followed subjective norm (β=0.43 p<0.05, n=237) while perceived behavioural control poorly (β=-0.02 p>0.05, n=237) predicted intention and dietary behaviour (β=0.01, p>0.05, n=237). Knowledge strongly predicted intention (β=1.00, p<0.001, n=237) while intention still had a strong prediction for dietary behaviour (β=*1.00* p<0.001, n=237). This implies that when attitude goes up 1 standard deviation, knowledge goes up by 0.65 standard

deviations. In addition when subjective norm goes up by 1 standard deviation, knowledge goes up by 0.43 standard deviations. However, when perceived behavioural control goes up by 1 standard deviation, knowledge goes down by 0.02 standard deviations. Again, when knowledge goes up by 1 standard deviation, intention also goes up by 1standard deviations. Finally, when intention goes up by 1 standard deviation, dietary behaviour goes up by 0.99 standard deviations. Knowledge predictors put together accounted for 100 percent of the variance on knowledge. Finally, intention and perceived behavioural control also explained 100 percent of the variance on dietary behaviour.

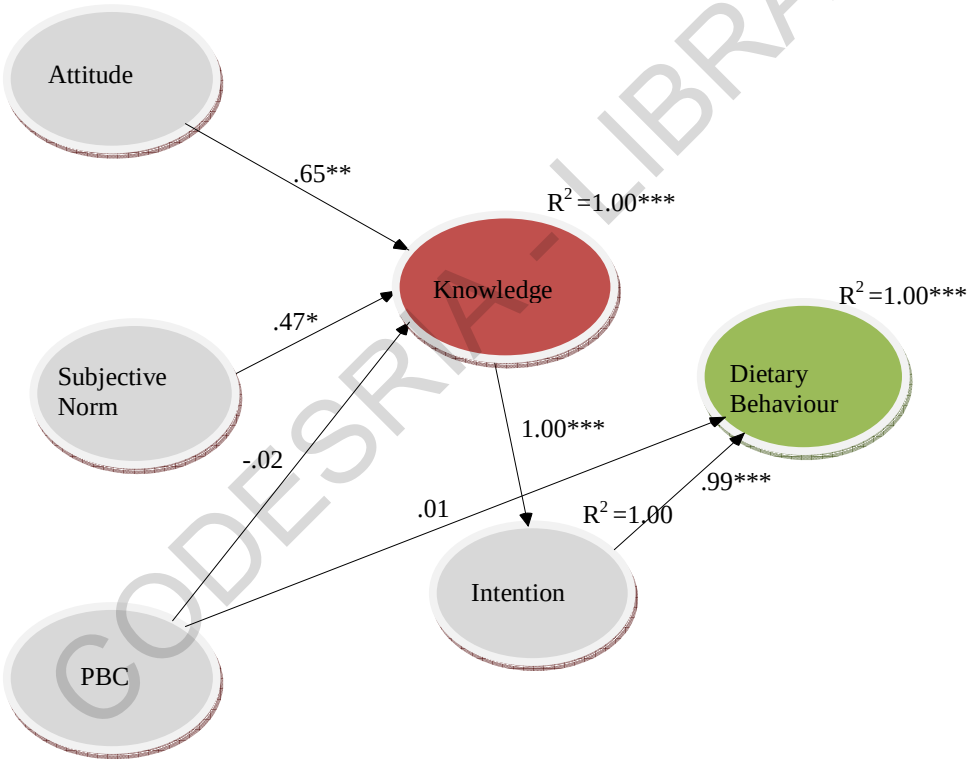

Figure 4.6Planned behaviour knowledge structural model applied to dietary practice (Model 1A)

4.3.1.3 Testing Hypothesis 3

The Theory of Planned Behaviour (TPB) model with perceived susceptibility, perceived severity, perceived benefits and cues to action as moderators of attitude, subjective norm and perceived behavioural control fits the data on dietary behaviour acceptably among Type II diabetic patients.

Hypothesis 3 attempted to include perceived susceptibility, perceived severity, perceived benefits and cues to action as additional intention predictors within the TPB model. This hypothesis is in line with the proposed *planned behaviour health belief theory* (theory 2). A measurement model was specified based on the concepts of planned behaviour cognitive theory. Item measurements analysis and measurement model analysis were performed using observed/unobserved endogenous and unobserved exogenous variables. These variables are presented in Table 4.6, which shows all the variables included in the specified measurement Model 2A attempting to advance planned behaviour health belief theory and displayed in a measurement model in Appendix 1.3.

Table 4.6 **Endogenous and Exogenous Variables (MODEL 2A)**

Endogenous Variables	Exogenous Variables (*Unobserved*)
Observed	Perceived Benefits
Attitude-1 (A1)	Cues to Action
Attitude-2 (A2)	Perceived Susceptibility
Attitude-3 (A3)	Perceived Severity
Perceived susceptibility-1 (PS1)	PBC
Perceived susceptibility-2 (PS2)	Attitude
Perceived susceptibility-3 (PS3)	e3
Perceived severity-1 (SE1)	e2
Perceived severity-2 (SE2)	e1
Perceived severity-3(SE3)	c6
Subjective norm-1 (SN1)	c5
Subjective norm-2 (SN2)	c4
Subjective norm-3 (SN3)	c3
PBC-1 (PC1)	c2
PBC-2 (PC2)	c1
PBC-3 (PC3)	Subjective Norm
Intention-1 (IN1)	e6
Intention -2 (IN2)	e5
Intention -3 (IN3)	e4
Cues to action-1 (CA1)	e13
Cues to action-2 (CA2)	e14
Cues to action-3 (CA3)	e15
Perceived benefits-1 (PB1)	c12
Perceived benefits-2 (PB2)	c11
Perceived benefits-3 (PB3)	c10
Diet class-1 (D1)	c9
Diet class-2 (D2)	c8
Diet class-3 (D3)	c7
Unobserved	e9
Intention	e8
Dietary Behaviour	e7
	other1
	other2
	e10
	e11
	e12

e/c= error; other=other factors

Cases were subjected to both univariate and multivariate screening to test for the normality of the data for each variable observed before fitting the model. The means and standard deviations for all the measures within Model 2A are displayed (Table 4.7). All the measures were subjected to skewness test and based on the recommended ±2 range for normal distribution measures of dietary behaviour were negatively skewed except for diet class-1 which appeared to be normally

distributed. Measures of intention were all negatively skewed. All measures of cues to action and perceived behavioural control were normally distributed, while subjective norm measures, perceived benefits, perceived severity appeared to be negatively skewed. Perceived susceptibility measures were negatively skewed except for perceived susceptibility-1 which was normally distributed. Attitude measures were all normally distributed. On the overall data violated normality assumption based on skewness. Kurtosis also indicated that all measures were outside the ±2 range for normal distribution except for diet class-1, and perceived behavioural control measures, attitude-1 and perceived susceptibility-3.

Table 4.7 **Measurement Level Descriptive Statistics, Univariate and Multivariate Normality (MODEL 2 A; n= 237)**

Variable	min	max	mean	s.d	skew	c.r.	kurtosis	c.r.
IN3	4.000	7.000	6.72	.044	-3.071	-19.298	11.485	36.091
IN2	3.000	7.000	6.84	.032	-4.636	-29.136	28.659	90.058
IN1	3.000	7.000	6.84	.027	-3.097	-19.467	10.696	33.613
PC1	1.000	49.000	24.75	1.164	.279	1.754	-1.617	-5.082
PC2	1.000	49.000	27.08	1.234	.045	.285	-1.777	-5.583
PC3	1.000	49.000	16.68	1.064	1.070	6.722	-.489	-1.537
PB1	1.000	7.000	6.76	.064	-5.248	-32.984	27.635	86.840
PB2	1.000	7.000	6.70	.067	-4.549	-28.591	21.067	66.203
PB3	1.000	7.000	6.57	.088	-3.558	-22.362	11.422	35.895
CA1	1.000	7.000	3.48	.174	.362	2.276	-1.710	-5.373
CA2	1.000	7.000	3.13	.168	.629	3.953	-1.420	-4.463
CA3	1.000	7.000	5.65	.138	-1.367	-8.589	.255	.800
D3	1.000	7.000	7.27	.051	-3.242	-20.378	9.942	31.242
D2	4.000	8.000	7.74	.037	-2.799	-17.594	10.447	32.829
D1	4.000	8.000	7.27	.051	-.970	-6.093	.815	2.562
SN1	56.000	294.000	256.98	3.419	-1.728	-10.859	2.637	8.286
SN2	35.000	294.000	261.29	3.323	-2.079	-13.064	4.348	13.663
SN3	56.000	294.000	265.00	2.895	-2.098	-13.184	4.978	15.642
PSE1	1.000	7.000	6.46	.093	-2.810	-17.661	6.981	21.938
PSE2	1.000	7.000	6.65	.072	-3.915	-24.607	15.352	48.244
PSE3	1.000	7.000	6.46	.093	-2.205	-13.858	3.416	10.733
PS1	1.000	7.000	6.48	.091	-3.049	-19.166	8.468	26.610
PS2	1.000	7.000	6.76	.058	-5.202	-32.694	28.998	91.124
PS3	1.000	7.000	5.99	.129	-1.867	-11.732	1.858	5.837
A1	29.000	245.000	184.33	3.278	-.847	-5.324	.365	1.147
A2	35.000	294.000	221.95	2.013	-1.837	-11.548	5.800	18.225
A3	113.000	245.000	198.72	1.030	-1.688	-10.612	8.288	26.045
Multivariate							425.543	82.774

Item level measurements were again performed for model 2a due to the difference in the measurement scales. The model was recursive with a *df*=301. Standardized regression weights for the endogenous variables are displayed in the measurement model (Appendix 1.3). Items defining attitude, subjective norm, perceived behavioural control, perceived susceptibility, perceived severity, perceived benefits, cues to action, intention and dietary behaviour had very high regression weights close to 1.00. The squared multiple correlation indicated that predictors of subscales accounted for >90 percent except for perceived behavioural control (PBC3) for the recommended diet and cues to action-3 where the predictors accounted for 44 percent and 77.8 percent of the variances respectively. Correlations between variables in the model were strong ($p<0.001$) and positive except PBC3 which registered lower but significant positive correlation coefficient ($p<0.01$). Modification indices suggested specifying relationships among items within and between the scales, which suggest multicollinearity.

The goodness of fit statistics were statistically non-significant at the .01 level but the model should be rejected at the .05 level (χ^2 = 743.47, *df* = 301, p = .019, χ^2/df = 2.47). However, the relative chi-square was under the recommended 3:1 range indicating acceptable fit after significant modification indices were uncorrelated. Other fit indices {*TLI* = .90; *CFI* =.91; *RMSEA* (90CI) = .079(.031, .14)} also demonstrated a good model fit. Hoelter's critical N values suggest that the model would have been accepted at the .05 significance level with 161 cases and the upper limit of *N* for the .01 significance level is 197. No Modification Index was above the customary cutoff value of 4.00. Because the data violated the normality assumption, bootstrapped chi-square values were also calculated and the model fits better in 200 bootstrapped samples. The Bollen-Stine p = 0.02 provided further reassurance about the model fit. Based on the goodness of fit statistics an attempt was made to advance the *planned behaviour health belief*

theory using structural model (Figure 4.7). Standardized regression weights (Figure 4.7) indicates that attitude was a better predictor of knowledge (β=0.56, p<0.01, n=237), followed subjective norm (β=0.38, p<0.05, n=237). Perceived behavioural control insignificantly predicted (β=-0.01, p>0.05, n=237) intention and dietary behaviour (β=0.01, p>0.05, n=237). Perceived susceptibility (β=0.03, p>0.05, n=237), perceived severity (β=0.02, p>0.05, n=237), perceived benefits (β=0.07, p>0.05, n=237) and cues to action (β=0.06, p>0.05, n=237) insignificantly predicted intention while intention still had a strong prediction for dietary behaviour (β=1.00, p<0.001, n=237).

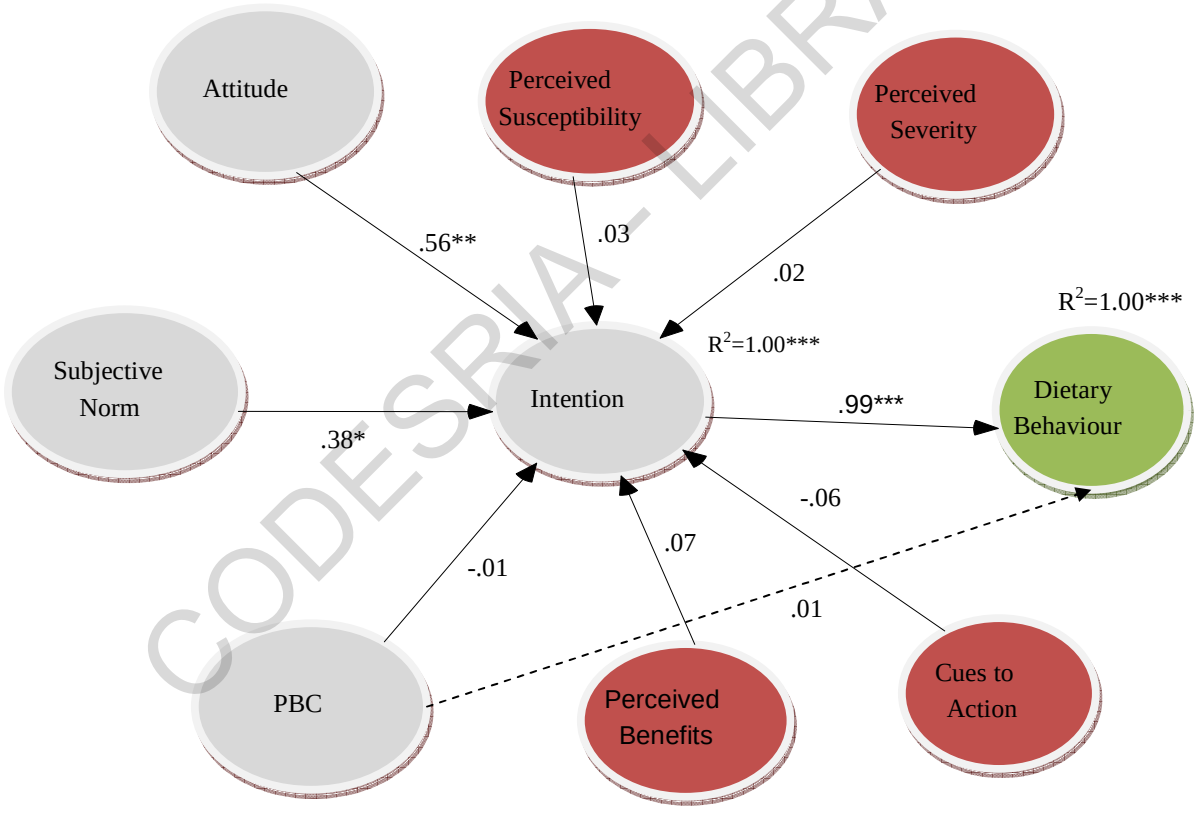

Figure 4.7 Planned behaviour health belief structural model applied to dietary practice (Model 2A)

4.3.1.4 Testing Hypothesis 4

The Theory of Planned Behaviour (TPB) model with action plan, action control and maintenance self–efficacy as mediators between intention and behaviour fits the data on dietary behaviour acceptably among Type II diabetic patients.

Hypothesis 4 attempted to include action plan, action control and maintenance self–efficacy as mediators between intention and behaviour. This hypothesis is in line with the proposed *planned behaviour maintenance and control theory* (theory 3). A measurement model was specified based on the proposed concepts of planned behaviour cognitive theory. Both item measurements analysis and measurement model analysis were performed using observed/unobserved endogenous and unobserved exogenous variables. These variables are presented in Table 4.8, which shows all the variables included in the specified measurement Model 2A attempting to advance planned behaviour health belief theory and displayed in a measurement model in Appendix 1.4.

Table 4.8 **Endogenous and Exogenous Variables (MODEL 3A)**

Endogenous Variables	Exogenous Variables (*Unobserved*)
Observed	Attitude
Attitude-1(A1)	e3
Attitude-2(A2)	e2
Attitude-3(A3)	e1
Subnorm-1(SN1)	Subjective Norm
Subnorm-2(SN2)	e6
Subnorm-3(SN3)	e5
PBC-1(PC1)	e4
PBC-2(PC2)	PBC
PBC-3(PC3)	e9
Actionplan-1(AP1)	e8
Actionplan-2(AP2)	e7
Actionplan-3(AP3)	m2
Actionplan-4(AP4)	m3
Diet class-1(D1)	m4
Diet-class2(D2)	e13
Diet-class3(D3)	e14
Self efficacy-1(ME1)	e15
Self efficacy-2(ME2)	m7
Self efficacy-3(ME3)	m6
Action control-1(AC1)	m5
Action control-2(AC2)	m13
Action control-3(AC3)	m12
Action control-4(AC4)	m11
Action control-5(AC5)	m10
Action control-6(AC6)	m9
Intention1(IN1)	m8
Intention2(IN2)	other2
Intention3(IN3)	other6
Unobserved	other4
Action Plan	Other1
Dietary Behaviour	e12
Maintenance Self Efficacy	e11
Action Control	e10
Intention	m1

e/m= error; other=other factors

Cases were subjected to both univariate and multivariate screening to test for the normality of the data for each variable observed before fitting the model. The means and standard deviations for all the measures within Model 3A are displayed (Table 4.9). All the measures were subjected to skewness test and based on the recommended ±2 range for normal distribution measures of dietary behaviour were negatively skewed except for diet class-1 which appeared to be normally distributed. Measures of intention were all negatively skewed. All measures of action plan and perceived behavioural control were normally distributed, while subjective norm measures, action

control measures, maintenance self efficacy appeared to be negatively skewed. Attitude measures were all normally distributed. On the overall data violated normality assumption based on skewness. Kurtosis also indicated that all measures were outside the ±2 range for normal distribution except for diet class-1, and perceived behavioural control measures, attitude-1 and action plan-1, 2 and 4.

Table 4.9 **Measurement Level Descriptive Statistics, Univariate and Multivariate Normality (MODEL 3 A; n= 237)**

Variable	min	max	mean	s.d	skew	c.r.	kurtosis	c.r.
IN1	3.000	7.000	4.05	.056	-3.097	-19.467	10.696	33.613
IN2	3.000	7.000	4.19	.050	-4.636	-29.136	28.659	90.058
IN3	4.000	7.000	3.69	.055	-3.071	-19.298	11.485	36.091
AC1	1.000	7.000	6.19	.098	-2.181	-13.705	4.069	12.786
AC2	1.000	7.000	6.38	.084	-2.576	-16.189	6.396	20.098
AC3	1.000	7.000	6.51	.074	-3.024	-19.006	9.464	29.740
AC4	1.000	7.000	6.65	.056	-3.389	-21.297	13.390	42.078
AC5	1.000	7.000	6.55	.066	-3.016	-18.953	9.722	30.549
AC6	1.000	7.000	6.57	.064	-3.290	-20.680	12.460	39.156
ME1	1.000	7.000	6.68	.066	-4.078	-25.627	16.781	52.735
ME2	1.000	7.000	6.72	.050	-3.872	-24.333	18.348	57.656
ME3	2.000	7.000	6.70	.047	-3.402	-21.379	13.956	43.856
D3	1.000	7.000	6.54	.081	-3.242	-20.378	9.942	31.242
D2	4.000	8.000	7.74	.037	-2.799	-17.594	10.447	32.829
D1	4.000	8.000	7.27	.051	-.970	-6.093	.815	2.562
AP4	1.000	7.000	5.72	.134	-1.472	-9.250	.579	1.821
AP3	1.000	7.000	5.81	.123	-1.560	-9.807	1.068	3.355
AP2	1.000	7.000	5.30	.145	-1.029	-6.468	-.543	-1.706
AP1	1.000	7.000	5.50	.143	-1.194	-7.502	-.191	-.601
PC1	1.000	49.000	24.75	1.164	.279	1.754	-1.617	-5.082
PC2	1.000	49.000	27.08	1.234	.045	.285	-1.777	-5.583
PC3	1.000	49.000	16.68	1.064	1.070	6.722	-.489	-1.537
SN1	56.000	294.000	256.98	3.419	-1.728	-10.859	2.637	8.286
SN2	35.000	294.000	261.29	3.323	-2.079	-13.064	4.348	13.663
SN3	56.000	294.000	265.00	2.895	-2.098	-13.184	4.978	15.642
A1	29.000	245.000	184.33	3.278	-.847	-5.324	.365	1.147
A2	35.000	294.000	221.95	2.013	-1.837	-11.548	5.800	18.225
A3	113.000	245.000	198.72	1.030	-1.688	-10.612	8.288	26.045
Multivariate							491.251	92.256

Item level measurements were performed due to the difference in the measurement scales. The model was recursive with a *df*=357. Standardized regression weights for the endogenous variables are displayed in the measurement model (Appendix 1.4). Items defining attitude, subjective norm, perceived behavioural control, intention, action plan, action control,

maintenance self efficacy and dietary behaviour had varied regression weights. The squared multiple correlation indicated that predictors of subscales across measurements (Appendix 1.4). Correlations between variables in the model were weak and positive. Modification indices suggested specifying relationships among items within and between the scales, which suggest multicollinearity.

The goodness of fit statistics were statistically non-significant at the .01 level but the model should be rejected at the .05 level (χ^2 = 1004.26, *df* = 337, *p* = .025, χ^2/df = 2.98). However, the relative chi-square was under the recommended 3:1 range indicating acceptable fit after significant modification indices were uncorrelated. Other fit indices {*TLI* = .92; *CFI* =.94; *RMSEA* (90CI) = .067(.011, .07)} also demonstrated a good model fit. Hoelter's critical N values suggest that the model would have been accepted at the .05 significance level with 128 cases and the upper limit of *N* for the .01 significance level is 187. No Modification Index was above the customary cutoff value of 4.00. Because the data violated the normality assumption, bootstrapped chi-square values were also calculated and the model fits better in 200 bootstrapped samples. The Bollen-Stine *p* = 0.025 provided further reassurance about the model fit. Based on the goodness of fit statistics an attempt was made to advance the *planned behaviour maintenance and control theory* using structural model (Figure 4.8). Standardized regression weights (Figure 4.8) indicates that subjective norm was a better predictor of intention (β=0.61, p<0.01, n=237), followed attitude (β=0.40, p<0.05, n=237). Perceived behavioural control insignificantly predicted (β=-0.15, p>0.05, n=237) intention. Intention predicted maintenance self efficacy (β=0.71, p<0.01, n=237) and accounted for 51 percent of the variance. Intention also predicted action control (β=0.45, p<0.05, n=237) and when combined with maintenance self efficacy accounted for 71 percent of the variance of action control. However, intention did not predict

action plan (β=0.00, p>0.05, n=237) and when combined with maintenance self efficacy only accounted for 16 percent of the variance of action plan. Maintenance self efficacy predicted action plan (β=0.41, p<0.05, n=237) and action control (β=0.46, p<0.05, n=237). Both action plan (β=0.02, p>0.05, n=237) and action control (β=0.07, p>0.05, n=237) only accounted for 7 percent of the variance on dietary behaviour with insignificant prediction.

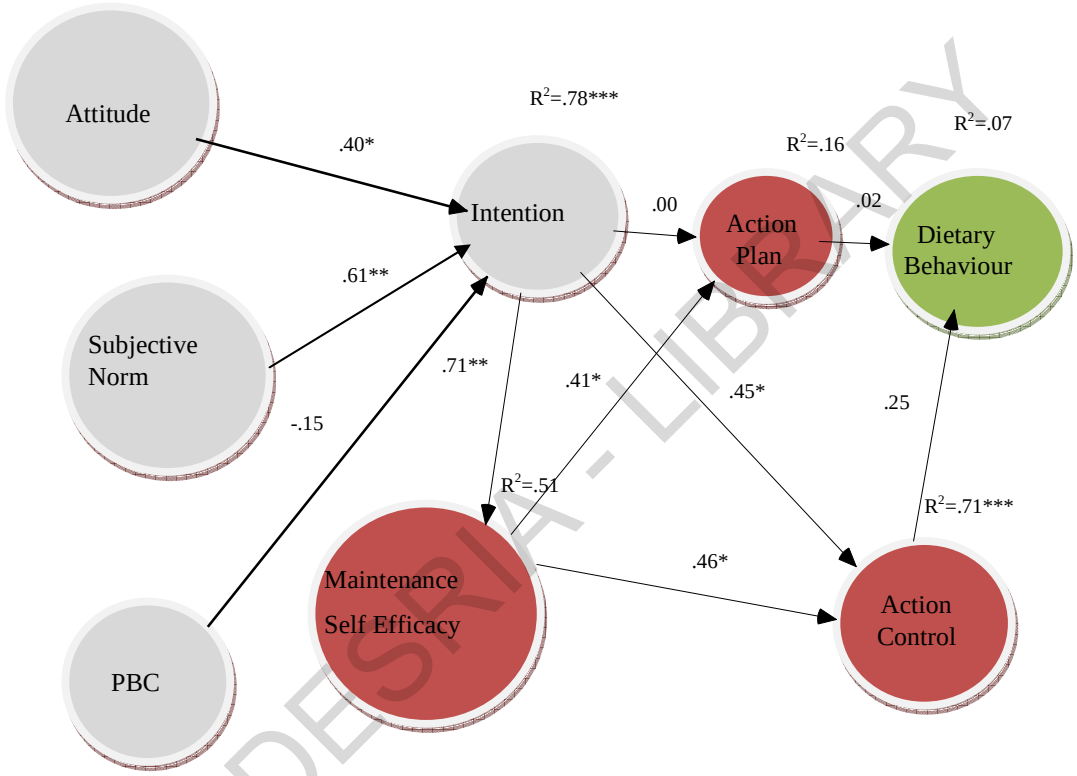

Figure 4.8 Planned behaviour maintenance and control structural model applied to dietary practice (Model 3A)

4.3.2 Structural Equation Modelling applied to Physical Activity Behaviour

Physical activity behaviour was also intended for theoretical building and hypothesis testing. The quantitative phase applied to physical activity behaviour intended to establish whether: 5) The TPB model fits the data on physical activity behaviour acceptably among Type II diabetic patients; 6) The TPB model with perceived knowledge as mediator between attitude, subjective norm, perceived behavioural control and intention fits the data on physical activity behaviour

acceptably among Type II diabetic patients; 7) The Theory of Planned Behaviour (TPB) model with perceived susceptibility, perceived severity, perceived benefits and cues to action as moderators of attitude, subjective norm and perceived behavioural control fits the data on physical activity behaviour acceptably among Type II diabetic patients; 8) The Theory of Planned Behaviour (TPB) model with action plan, action control and maintenance self–efficacy as mediators between intention and behaviour fits the data on physical activity behaviour acceptably among Type II diabetic patients.

4.3.2.1 Testing Hypothesis 5

The TPB model fits the data on physical activity behaviour acceptably among Type II diabetic patients

Like the case of dietary practice behaviour, this hypothesis was focused towards determining the predictive power of a model specified based on the construct of the traditional Theory of Planned Behaviour in order to set a bench mark for comparisons with other newly developed theories. Both item measurements analysis and measurement model analysis were performed using observed endogenous and unobserved exogenous variables. These variables are presented in Table 43 and displayed in a measurement model in Appendix 1.5. Table 4.10 shows all the variables included in the specified measurement Model B in attempt to test the extent to which the model fits the data.

Table 4.10 **Endogenous and Exogenous Variables in the TPB Model (MODEL B)**

Endogenous Variables	Exogenous Variables (*Unobserved*)
Observed	Attitude
Attitude-1 (A1)	e1
Attitude-2 (A2)	e2
Attitude-3 (A3)	e3
Subjective norm-1 (SN1)	Subjective norm
Subjective norm-2 (SN2)	e4
Subjective norm-3(SN3)	e5
PBC-1 (PC1)	e6
PBC-2 (PC2)	Perceived Behavioural Control (PBC)
PBC-3 (PC3)	e7
Intention (IN1)	e8
Intention (IN2)	e9
Intention (IN3)	Intention
Activity class-1(PA1)	e10
Activity class-2 (PA2)	e11
Activity class-3 (PA3)	e12
Unobserved	Physical Activity Behaviour
Intention	e13
Physical Activity Behaviour	e14
	e15
	Other 1
	Other 2

e= error; other=other factors

Cases were subjected to both univariate and multivariate screening to test for the normality of the data for each variable observed before fitting the model. The means and standard deviations for all the measures in model b are presented (Table 4.11). All these measures were subjected to skewness test based on the recommended ±2 range for normal distribution. Measures of physical activity behaviour were normally distributed. Measures of intention were all negatively skewed. Measures of perceived behavioural control and subjective norm were normally distributed, while measures of attitude were negatively skewed except for attitude-1 which appeared to be normally distributed. On the overall data violated normality assumption based on skewness. Kurtosis also indicated that all measures were within the ±2 range for normal distribution except for measures of intention, attitude-2 and attitude-3 measures.

Table 4.11 **Measurement Level Descriptive Statistics, Univariate and Multivariate Normality (MODEL B; n = 230)**

Variable	min	max	mean	s.d	skew	c.r.	kurtosis	c.r.
PC1	1.000	49.000	22.10	16.850	.500	3.098	-1.345	-4.164
PC2	1.000	49.000	16.03	14.671	1.266	7.836	.121	.374
PC3	1.000	49.000	16.27	14.884	1.298	8.034	.066	.203
PA3	4.000	8.000	6.83	.707	-.938	-5.809	1.671	5.174
PA2	3.000	8.000	6.59	.984	-1.056	-6.540	1.019	3.154
PA1	1.000	8.000	5.33	2.420	-.825	-5.105	-.854	-2.644
SN1	118.000	294.000	248.98	51.129	-.736	-4.556	-.779	-2.411
SN2	110.000	294.000	258.01	49.926	-1.146	-7.098	.034	.104
SN3	103.000	294.000	258.48	50.246	-1.139	-7.050	.026	.081
IN3	2.000	7.000	6.79	.563	-4.279	-26.494	26.275	81.339
IN2	1.000	7.000	6.75	.665	-4.214	-26.092	25.878	80.111
IN1	4.000	7.000	6.74	.628	-2.706	-16.752	7.261	22.479
A1	56.000	245.000	248.98	51.129	-1.170	-7.247	1.070	3.311
A2	58.000	245.000	221.89	34.755	-2.063	-12.774	5.613	17.375
A3	53.000	245.000	219.60	32.503	-2.023	-12.522	7.103	21.990
Multivariate							144.985	48.683

Item level measurements were performed due to the difference in the measurement scales. The model was recursive with a *df=84*. Standardized regression weights for the endogenous variables are displayed in the measurement model (Appendix 1.5). It appears items defining attitude, subjective norm, perceived behavioural control, intention and physical behaviour had very high regression weights close to 1.00. The squared multiple correlation indicated that predictors of subscales accounted for >90 percent except for perceived behavioural control (PBC-1) for sedentary activity where the predictors accounted for 58.5 percent of the variance of PBC-1 itself. Correlations between observed variables in the model were strong ($p<0.001$) and positive except PBC3 which registered lower but significant positive correlation coefficient ($p<0.01$). Modification indices suggested specifying relationships among items within and between the scales, which suggest multicollinearity.

Finally the goodness of fit statistics were statistically non-significant at the .05 level (χ^2 = 213, *df* = 84, p = .061, χ^2/df = 2.53). The relative chi-square was under the recommended 3:1 range

indicating acceptable fit after significant modification indices were uncorrelated. Other fit indices {*TLI* = .97; *CFI* =.96; *RMSEA* (90CI) = .073(.029, .08)} also demonstrated a good model fit. Hoelter's critical N values suggest that the model would have been accepted at the .05 significance level with 167 cases and the upper limit of *N* for the .01 significance level is 192. No Modification Index was above the customary cutoff value of 4.00. Because the data violated the normality assumption, bootstrapped chi-square values were also calculated and the model fits better in 200 bootstrapped samples. The Bollen-Stine p = 0.065 provided further reassurance about the model fit. It was then necessary to advance the Theory of Planned Behaviour using the structural model (Figure 4.9). Standardized regression weights in Figure 4.9, indicates that attitude was a better predictor of intention (β=0.56, p<0.01, n=230), followed subjective norm (β=0.38, p<0.05, n=230) while perceived behavioural control poorly (β=0.06 p>0.05, n=230) predicted intention. Intention in turn strongly predicted physical activity behaviour (β=0.99 p<0.001, n=230). This implies that when attitude goes up 1 standard deviation, intention goes up by 0.56 standard deviations. In addition when subjective norm goes up by 1 standard deviation, intention goes up by 0.38 standard deviations. Again, when perceived behavioural control goes up by 1 standard deviation, intention goes up by 0.06 standard deviations. Finally, when intention goes up by 1 standard deviation, physical activity behaviour goes up by 0.99 standard deviations. Intention predictors put together accounted for 99 percent of the variance on intention leaving only 1 percent for other factors. Finally, intention and perceived behavioural control also explained 99 percent of the variance on physical activity behaviour leaving only 1 percent for other factors.

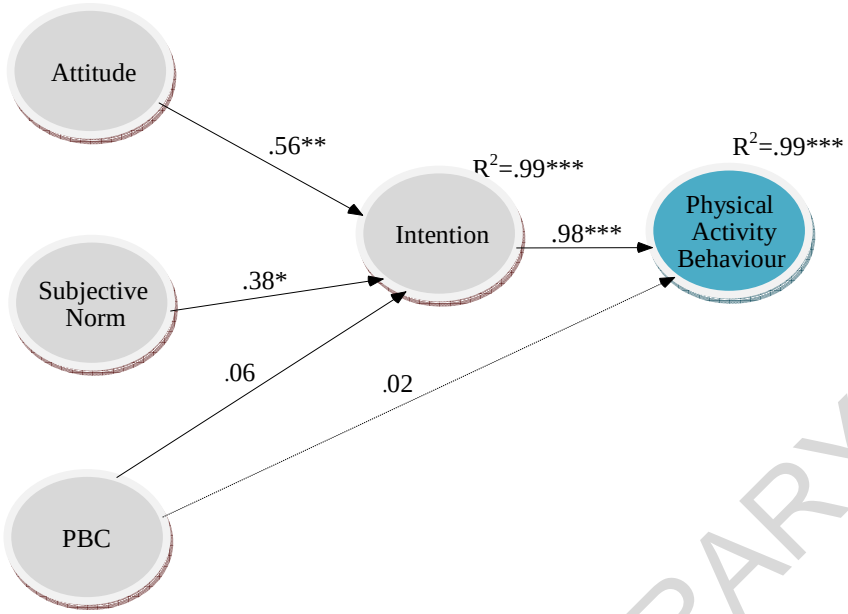

Figure 4.9 Theory of Planned Behaviour structural model applied to physical activity behaviour (Model B)

4.3.2.2 Testing Hypothesis 6

The TPB model with perceived knowledge as mediator between attitude, subjective norm, perceived behavioural control and intention fits the data on physical activity behaviour acceptably among Type II diabetic patients

Hypothesis 6 focused on knowledge as a mediator during the pre-intention phase. This hypothesis is in line with the proposed *planned behaviour knowledge theory* (theory 1). A measurement model was specified based on the traditional concepts of planned behaviour knowledge theory. Both item measurements analysis and measurement model analysis were performed using observed/unobserved endogenous and unobserved exogenous variables. These variables are presented in Table 4.12, showing all the variables included in the specified measurement Model 1B attempting to advance planned behaviour knowledge theory and displayed in a measurement model in Appendix 1.6.

Table 4.12 **Endogenous and Exogenous Variables (MODEL 1B)**

Endogenous Variables	Exogenous Variables (*Unobserved*)
Observed	Attitude
Attitude-1 (A1)	e1
Attitude-2 (A2)	e2
Attitude-3 (A3)	e3
Knowledge -1 (KN1)	Knowledge
Knowledge-2 (KN2)	e16
Knowledge-3 (KN3)	e17
Subjective norm-1 (SN1)	e18
Subjective norm-2 (SN2)	Subjective norm
Subjective norm-3 (SN3)	e4
PBC-1 (PC1)	e5
PBC-2 (PC2)	e6
PBC-3 (PC3)	Perceived Behavioural Control (PBC)
Intention-1 (IN1)	e7
Intention-2 (IN2)	e8
Intention-3 (IN3)	e9
Activity class-1 (D1)	Intention
Activity class-2 (D2)	e10
Activity class-3 (D3)	e11
Unobserved	e12
Knowledge	Physical Activity Behaviour
Physical Activity Behaviour	e13
Intention	e14
	e15
	other 1
	other 2
	other 3

e= error; other=other factors

Cases were subjected to both univariate and multivariate screening to test for the normality of the data for each variable observed before fitting the model. The means and standard deviations for all the measures within Model 1B are presented (Table 4.13). All the measures were subjected to skewness test based on the recommended ±2 range for normal distribution. Measures of physical activity behaviour were normally distributed. Measures of intention were all negatively skewed. Measures of perceived behavioural control and subjective norm were normally distributed, while measures of attitude were negatively skewed except for attitude-1 which appeared to be normally distributed. Measures of knowledge were normally distributed. On the overall data violated normality assumption based on skewness. Kurtosis also indicated that all measures were within

the ±2 range for normal distribution except for measures of intention, attitude-2 and attitude-3 measures.

Table 4.13 **Measurement Level Descriptive Statistics, Univariate and Multivariate Normality (MODEL 1B; n= 230)**

Variable	min	max	mean	s.d	skew	c.r.	kurtosis	c.r.
KN2	1.000	5.000	3.39	.773	-.174	-1.077	-.226	-.699
KN1	1.000	5.000	3.93	.792	-.449	-2.781	.397	1.230
PC1	1.000	49.000	22.10	16.850	.500	3.098	-1.345	-4.164
PC2	1.000	49.000	16.03	14.671	1.266	7.836	.121	.374
PC3	1.000	49.000	16.27	14.884	1.298	8.034	.066	.203
SN1	118.000	294.000	248.98	51.129	-.736	-4.556	-.779	-2.411
SN2	110.000	294.000	258.01	49.926	-1.146	-7.098	.034	.104
SN3	103.000	294.000	258.48	50.246	-1.139	-7.050	.026	.081
IN3	2.000	7.000	6.79	.563	-4.279	-26.494	26.275	81.339
IN2	1.000	7.000	6.75	.665	-4.214	-26.092	25.878	80.111
IN1	4.000	7.000	6.74	.628	-2.706	-16.752	7.261	22.479
PA3	4.000	8.000	6.83	.707	-.938	-5.809	1.671	5.174
PA2	3.000	8.000	6.59	.984	-1.056	-6.540	1.019	3.154
PA1	1.000	8.000	5.33	2.420	-.825	-5.105	-.854	-2.644
A1	56.000	245.000	248.98	51.129	-1.170	-7.247	1.070	3.311
A2	58.000	245.000	221.89	34.755	-2.063	-12.774	5.613	17.375
A3	53.000	245.000	219.60	32.503	-2.023	-12.522	7.103	21.990
Multivariate							149.402	44.573

Item level measurements were performed due to the difference in the measurement scales. The model solution was inadmissible with a *df*=113. This indicates that some variances estimates are negative or that some exogenous variables have an estimated covariance matrix that is not positive definite. It suggests that either the model is wrong or that the sample size is small (Jöreskog and Sörbom, 1984). Standardized regression weights for the endogenous variables are displayed in the measurement model (Appendix 1.6). It appears items defining attitude, subjective norm, perceived behavioural control, intention, knowledge and physical behaviour had very high regression weights close to 1.00. The squared multiple correlation indicated that predictors of subscales accounted for >90 percent except for perceived behavioural control (PBC-1) for the recommended diet where the predictors accounted for 58.5 percent of the variance of PBC3 itself. Correlations between observed variables in the model were strong (p<0.001) and positive except PBC-1 which registered lower but significant positive correlation

coefficient (p<0.01). Modification indices suggested specifying relationships among items within and between the scales, which suggest multicollinearity.

Overall the goodness of fit statistics were statistically significant at the .01 level (χ^2= 1256.7, *df* = 113, p = .00, χ^2/df = 11.12). However, the relative chi -square was above the recommended 3:1 range indicating unacceptable fit after significant modification indices were uncorrelated. Other fit indices {*TLI* = .47*; CFI* =.56*; RMSEA* (90CI) = .22 (.108, .24)} also demonstrated a poor model fit. No Modification Index was above the customary cutoff value of 4.00. Because the data violated the normality assumption, bootstrapped chi-square values were also calculated and the model fits poorly in 200 bootstrapped samples. The Bollen-Stine p = 0.005 provided further reassurance about the model's poor fit. Based on the goodness of fit statistics no attempt was made to advance the *planned behaviour knowledge theory* using structural model and therefore standardized regression weights had no meaning.

4.3.2.3 Testing Hypothesis 7

The Theory of Planned Behaviour (TPB) model with perceived susceptibility, perceived severity, perceived benefits and cues to action as moderators of attitude, subjective norm and perceived behavioural control fits the data on physical activity behaviour acceptably among Type II diabetic patients

Hypothesis 7 included perceived susceptibility, perceived severity, perceived benefits and cues to action as additional intention predictors within the TPB model. This hypothesis is in line with the proposed *planned behaviour health belief theory* (theory 2). A measurement model was specified using the concepts of planned behaviour cognitive theory. Item measurements analysis

and measurement model analysis were performed using observed/unobserved endogenous and unobserved exogenous variables. These variables are presented in Table 4.14, showing all the variables included in the specified measurement Model 2B attempting to advance planned behaviour health belief theory and displayed in a measurement model in Appendix 1.7.

Table 4.14 **Endogenous and Exogenous Variables (MODEL 2B)**

Endogenous Variables	Exogenous Variables (*Unobserved*)
Observed	Perceived Benefits
Attitude-1 (A1)	Cues to Action
Attitude-2 (A2)	Perceived Susceptibility
Attitude-3 (A3)	Perceived Severity
Perceived susceptibility-1 (PS1)	PBC
Perceived susceptibility-2 (PS2)	Attitude
Perceived susceptibility-3 (PS3)	e3
Perceived severity-1 (SE1)	e2
Perceived severity-2 (SE2)	e1
Perceived severity-3(SE3)	c6
Subjective norm-1 (SN1)	c5
Subjective norm-2 (SN2)	c4
Subjective norm-3 (SN3)	c3
PBC-1 (PC1)	c2
PBC-2 (PC2)	c1
PBC-3 (PC3)	Subjective Norm
Intention-1 (IN1)	e6
Intention -2 (IN2)	e5
Intention -3 (IN3)	e4
Cues to action-1 (CA1)	e13
Cues to action-2 (CA2)	e14
Cues to action-3 (CA3)	e15
Perceived benefits-1 (PB1)	c12
Perceived benefits-2 (PB2)	c11
Perceived benefits-3 (PB3)	c10
Activity class-1 (PA1)	c9
Activity class-2 (PA2)	c8
Activity class-3 (PA3)	c7
Unobserved	e9
Intention	e8
Physical Activity Behaviour	e7
	other1
	other2
	e10
	e11
	e12

e/c= error; other=other factors

Cases were subjected to both univariate and multivariate screening to test for the normality of the data for each variable observed before fitting the model. The means and standard deviations for all the measures within Model 2B are displayed (Table 4.15). All the measures were subjected to

skewness test and based on the recommended ±2 range for normal distribution measures of physical activity behaviour were normally distributed. Measures of intention were all negatively skewed. All measures of cues to action, subjective norm and perceived behavioural control were normally distributed, while measures of perceived benefits, perceived severity appeared to be negatively skewed except for perceived severity-2, which was normally distributed. Perceived susceptibility measures were negatively skewed. Attitude measures were negatively skewed except for attitude-1 which appeared to be normally distributed. On the overall data violated normality assumption based on skewness. Kurtosis also indicated that all measures were outside the ±2 range for normal distribution except for activity class-1, cues to action measures, and perceived behavioural control measures, subjective norm measures and attitude-1.

Table 4.15 **Measurement Level Descriptive Statistics, Univariate and Multivariate Normality (MODEL 2B, n= 230)**

Variable	min	max	mean	s.d	skew	c.r.	kurtosis	c.r.
PA3	4.000	8.000	6.83	.707	-.938	-5.809	1.671	5.174
PA2	3.000	8.000	6.59	.984	-1.056	-6.540	1.019	3.154
PA1	1.000	8.000	5.33	2.420	-.825	-5.105	-.854	-2.644
SE3	1.000	7.000	6.14	1.800	-2.249	-13.926	3.513	10.874
SE1	1.000	7.000	6.03	1.892	-1.981	-12.265	2.444	7.566
SE2	1.000	7.000	6.13	1.725	-2.140	-13.248	3.344	10.353
PS3	1.000	7.000	6.31	1.663	-2.525	-15.630	5.022	15.548
PS1	1.000	7.000	6.65	1.133	-4.032	-24.963	15.825	48.988
PS2	1.000	7.000	6.38	1.329	-2.830	-17.520	7.770	24.055
IN3	2.000	7.000	6.79	.563	-4.279	-26.494	26.275	81.339
IN2	1.000	7.000	6.75	.665	-4.214	-26.092	25.878	80.111
IN1	4.000	7.000	6.74	.628	-2.706	-16.752	7.261	22.479
CA1	1.000	7.000	6.45	1.437	-.175	-1.085	-1.759	-5.446
CA2	1.000	7.000	4.21	2.648	.383	2.373	-1.648	-5.101
CA3	1.000	7.000	3.44	2.616	-1.510	-9.352	.703	2.175
PB1	4.000	7.000	6.80	.532	-2.945	-18.231	8.889	27.518
PB2	2.000	7.000	6.73	.750	-4.255	-26.344	21.480	66.497
PB3	1.000	7.000	6.45	1.437	-3.062	-18.959	8.353	25.859
PC1	1.000	49.000	22.10	16.850	.500	3.098	-1.345	-4.164
PC2	1.000	49.000	16.03	14.671	1.266	7.836	.121	.374
PC3	1.000	49.000	16.27	14.884	1.298	8.034	.066	.203
SN1	118.000	294.000	248.98	51.129	-.736	-4.556	-.779	-2.411
SN2	110.000	294.000	258.01	49.926	-1.146	-7.098	.034	.104
SN3	103.000	294.000	258.48	50.246	-1.139	-7.050	.026	.081
A1	56.000	245.000	248.98	51.129	-1.170	-7.247	1.070	3.311
A2	58.000	245.000	221.89	34.755	-2.063	-12.774	5.613	17.375
A3	53.000	245.000	219.60	32.503	-2.023	-12.522	7.103	21.990
Multivariate							281.597	53.959

Item level measurements were again performed for model 2B due to the difference in the measurement scales. The model was recursive with a *df*=306. Standardized regression weights for the endogenous variables are displayed in the measurement model (Appendix 1.7). Items defining attitude, subjective norm, perceived behavioural control, perceived susceptibility, perceived severity, perceived benefits, cues to action, intention and dietary behaviour had very high regression weights close to 1.00. The squared multiple correlation indicated that predictors of subscales accounted for >90 percent except for perceived behavioural control (PBC-1) for the recommended diet and cues to action-1 where the predictors accounted for 58.3 percent and 76 percent of the variances respectively. Correlations between variables in the model were strong ($p<0.001$) and positive except PBC3 which registered lower but significant positive correlation coefficient ($p<0.01$). Modification indices suggested specifying relationships among items within and between the scales, which suggest multicollinearity.

The goodness of fit statistics were statistically non-significant at the .05 level ($\chi^2 = 705$, $df = 306$, $p = .06$, $\chi^2/df = 2.3$). The relative chi-square was under the recommended 3:1 range indicating acceptable fit after significant modification indices were uncorrelated. Other fit indices {*TLI* = .95*; CFI* =.96*; RMSEA* (90CI) = .080(.021, .07)} also demonstrated a good model fit. Hoelter's critical N values suggest that the model would have been accepted at the .05 significance level with 143 cases and the upper limit of *N* for the .01 significance level is 187. No Modification Index was above the customary cutoff value of 4.00. Because the data violated the normality assumption, bootstrapped chi-square values were also calculated and the model fits better in 200 bootstrapped samples. The Bollen-Stine $p = 0.065$ provided further reassurance about the model fit. Based on the goodness of fit statistics an attempt was made to advance the *planned behaviour*

health belief theory using structural model (Figure 4.10). Standardized regression weights (Figure 4.10) indicates that attitude was a better predictor of knowledge (β=0.56, p<0.01, n=237), followed subjective norm (β=0.38, p<0.05, n=237). Perceived behavioural control insignificantly predicted (β=-0.01, p>0.05, n=237) intention and dietary behaviour (β=0.01, p>0.05, n=237). Perceived susceptibility (β=0.03, p>0.05, n=237), perceived severity (β=0.02, p>0.05, n=237), perceived benefits (β=0.07, p>0.05, n=237) and cues to action (β=0.06, p>0.05, n=237) insignificantly predicted intention while intention still had a strong prediction for dietary behaviour (β=1.00, p<0.001, n=237). This implies that when attitude goes up 1 standard deviation, intention goes up by 0.56 standard deviations. In addition when subjective norm goes up by 1 standard deviation, knowledge goes up by 0.38 standard deviations. However, when perceived behavioural control goes up by 1 standard deviation, intention and dietary behaviour goes down by 0.01 standard deviations for each variable. Again, when perceived susceptibility goes up by 1 standard deviation, intention goes up by 0.03 standard deviations. In addition when perceived severity goes up by 1 standard deviation, intention goes up by 0.02 standard deviations. Further examination revealed that 1 standard deviation increase in perceived benefit and cues to action leads to 0.07 increase and 0.06 decrease on intention. Finally, when intention goes up by 1 standard deviation, dietary behaviour goes up by 1 standard deviation. Intention predictors put together accounted for 100 percent of the variance on knowledge while intention and perceived behavioural control also explained 100 percent of the variance on physical activity behaviour.

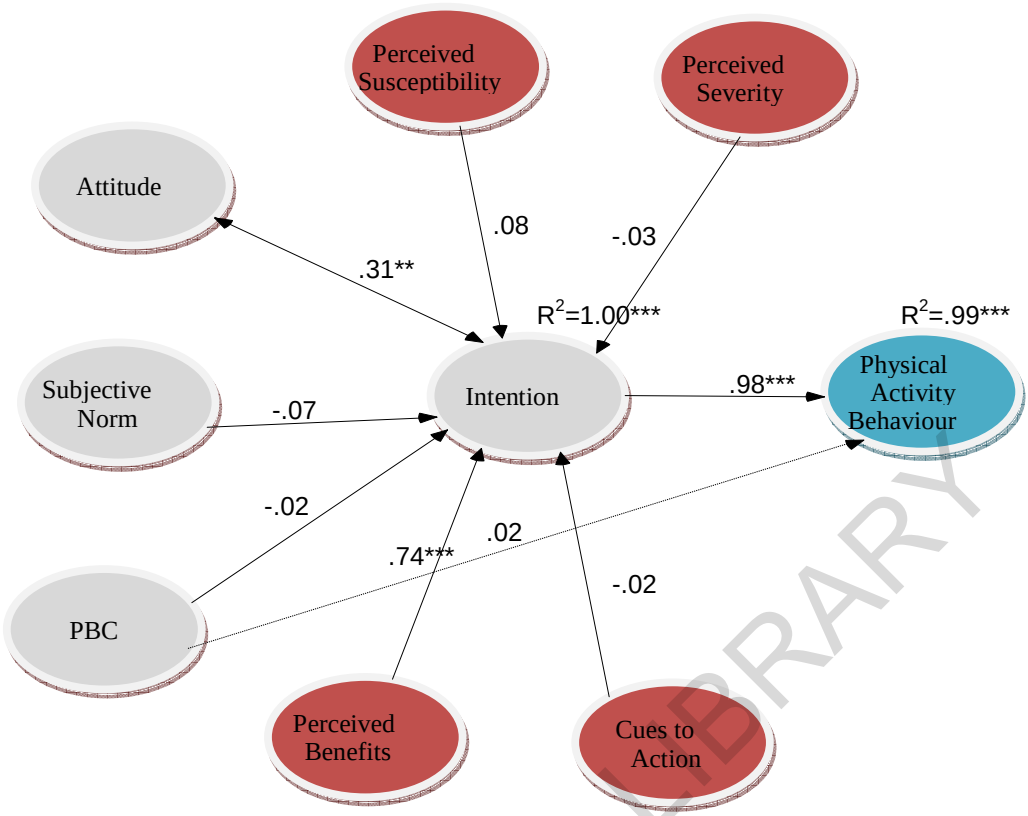

Figure 4.10 Planned behaviour health belief structural model applied to physical activity behaviour (Model 2B)

4.3.2.4 Testing Hypothesis 8

The Theory of Planned Behaviour (TPB) model with action plan, action control and maintenance self–efficacy as mediators between intention and behaviour fits the data on physical activity behaviour acceptably among Type II diabetic patients

Hypothesis 8 included action plan, action control and maintenance self–efficacy as mediators between intention and behaviour. This hypothesis is in line with the proposed *planned behaviour maintenance and control theory* (theory 3). A measurement model was specified based on the proposed concepts of planned behaviour cognitive theory. Both item measurements analysis and measurement model analysis were performed using observed/unobserved endogenous and

unobserved exogenous variables. These variables are presented in Table 4.16, showing all the variables included in the specified measurement Model 3B attempting to advance planned behaviour health belief theory and displayed in a measurement model in Appendix 1.8.

Table 4.16 **Endogenous and Exogenous Variables (MODEL 3B)**

Endogenous Variables	Exogenous Variables (*Unobserved*)
Observed	Attitude
Attitude-1(A1)	e3
Attitude-2(A2)	e2
Attitude-3(A3)	e1
Subjective norm-1(SN1)	Subjective_ Norm
Subjective norm-2(SN2)	e6
Subjective norm-3(SN3)	e5
PBC-1(PC1)	e4
PBC-2(PC2)	PBC
PBC-3(PC3)	e9
Actionplan-1(AP1)	e8
Actionplan-2(AP2)	e7
Actionplan-3(AP3)	m2
Actionplan-4(AP4)	m3
Activity class-1(PA1)	m4
Activity -class2(PA2)	e13
Activity -class3(PA3)	e14
Self efficacy-1(ME1)	e15
Self efficacy-2(ME2)	m7
Self efficacy-3(ME3)	m6
Action control-1(AC1)	m5
Action control-2(AC2)	m13
Action control-3(AC3)	m12
Action control-4(AC4)	m11
Action control-5(AC5)	m10
Action control-6(AC6)	m9
Intention1(IN1)	m8
Intention2(IN2)	other2
Intention3(IN3)	other6
Unobserved	other4
Action Control	Other1
Action Plan	e12
Physical Activity Behaviour	e11
Intention	e10
Maintenance Self Efficacy	m1

e/m= error; other=other factors

Cases were subjected to both univariate and multivariate screening to test for the normality of the data for each variable observed before fitting the model. The means and standard deviations for all the measures within Model 3B are displayed (Table 4.17). All the measures were subjected to skewness test and based on the recommended ±2 range for normal distribution. Measures of

physical activity behaviour were normally distributed. Measures of intention were all negatively skewed. All measures of action plan and perceived behavioural control and subjective norm were normally distributed, while action control measures were negatively skewed except for action control-2 and 5. Maintenance self efficacy measures appeared to be negatively skewed. Attitude measures were all negatively skewed except for attitude-1 which appeared to be normally distributed. On the overall data violated normality assumption based on skewness. Kurtosis also indicated that all measures were outside the ±2 range for normal distribution except for subjective norm-2 and 3 action plan-3 and PBC-2 and 3.

Table 4.17 **Measurement Level Descriptive Statistics, Univariate and Multivariate Normality (MODEL 3 B; n= 230)**

Variable	min	max	mean	s.d	skew	c.r.	kurtosis	c.r.
ME1	2.000	7.000	6.63	.870	-3.728	-23.081	15.910	49.252
ME2	1.000	7.000	6.51	1.010	-2.791	-17.278	8.784	27.191
ME3	2.000	7.000	6.72	.755	-3.261	-20.191	12.015	37.195
SN1	118.000	294.000	248.98	51.129	-.736	-4.556	-.779	-2.411
SN2	110.000	294.000	258.01	49.926	-1.146	-7.098	.034	.104
SN3	103.000	294.000	258.48	50.246	-1.139	-7.050	.026	.081
IN1	4.000	7.000	6.74	.628	-2.706	-16.752	7.261	22.479
IN2	1.000	7.000	6.75	.665	-4.214	-26.092	25.878	80.111
IN3	2.000	7.000	6.79	.563	-4.279	-26.494	26.275	81.339
PA3	4.000	8.000	6.83	.707	-.938	-5.809	1.671	5.174
PA2	3.000	8.000	6.59	.984	-1.056	-6.540	1.019	3.154
PA1	1.000	8.000	5.33	2.420	-.825	-5.105	-.854	-2.644
AP4	1.000	7.000	6.04	1.669	-1.708	-10.576	1.582	4.898
AP3	1.000	7.000	5.95	1.641	-1.404	-8.690	.639	1.979
AP2	1.000	7.000	5.92	1.687	-1.446	-8.954	.841	2.603
AP1	1.000	7.000	5.94	1.689	-1.556	-9.634	1.086	3.362
AC1	2.000	7.000	6.50	1.010	-2.678	-16.579	7.522	23.287
AC2	1.000	7.000	6.10	1.548	-1.923	-11.907	2.844	8.805
AC3	1.000	7.000	6.21	1.558	-2.251	-13.939	4.147	12.837
AC4	1.000	7.000	6.41	1.236	-2.692	-16.669	7.111	22.012
AC5	3.000	7.000	6.43	1.033	-1.895	-11.734	2.791	8.641
AC6	1.000	7.000	6.31	1.217	-2.079	-12.869	4.029	12.472
PC1	1.000	49.000	22.10	16.850	.500	3.098	-1.345	-4.164
PC2	1.000	49.000	16.03	14.671	1.266	7.836	.121	.374
PC3	1.000	49.000	16.27	14.884	1.298	8.034	.066	.203
A1	56.000	245.000	248.98	51.129	-1.170	-7.247	1.070	3.311
A2	58.000	245.000	221.89	34.755	-2.063	-12.774	5.613	17.375
A3	53.000	245.000	219.60	32.503	-2.023	-12.522	7.103	21.990
Multivariate							466.742	86.349

Item level measurements were performed due to the difference in the measurement scales. The model was recursive with a *df*=363. Standardized regression weights for the endogenous variables are displayed in the measurement model (Appendix 1.8). Items defining attitude, subjective norm, perceived behavioural control, intention, action plan, action control, maintenance self efficacy and dietary behaviour had varied regression weights. The squared multiple correlation indicated that predictors of subscales across measurements (Appendix 1.8). Correlations between variables in the model were high and positive. Modification indices suggested specifying relationships among items within and between the scales, which suggest multicollinearity.

The goodness of fit statistics were statistically non-significant at the .05 level (χ^2 = 710, *df* = 341, *p* = .15, χ^2/df = 2.082). The relative chi-square was under the recommended 3:1 range indicating acceptable fit after significant modification indices were uncorrelated. Other fit indices {*TLI* = .97*; CFI* =.98*; RMSEA* (90CI) = .05(.001, .058} also demonstrated a good model fit. Hoelter's critical N values suggest that the model would have been accepted at the .05 significance level with 123 cases and the upper limit of *N* for the .01 significance level is 177. No Modification Index was above the customary cutoff value of 4.00. Because the data violated the normality assumption, bootstrapped chi-square values were also calculated and the model fits better in 200 bootstrapped samples. The Bollen-Stine *p* = 0.15 provided further reassurance about the model fit. Based on the goodness of fit statistics an attempt was made to advance the *planned behaviour maintenance and control theory* using structural model (Figure 4.11). Standardized regression weights (Figure 4.11) indicates that attitude was a better predictor of intention (β=0.55, *p*<0.001, *n*=230), followed subjective norm (β=0.41, *p*<0.01, *n*=230).

Perceived behavioural control insignificantly predicted (β=-0.05, p>0.05, n=230) intention. Intention predicted maintenance self efficacy (β=0.25, p<0.05, n=230) and accounted for 100 percent of the variance. Intention also predicted action control (β=.75, p<0.001, n=230) and when combined with maintenance self efficacy accounted for 99 percent of the variance of action control. Intention also predicted action plan (β=0.82, p<0.001, n=230) and when combined with maintenance self efficacy accounted for 95 percent of the variance of action plan. Maintenance self efficacy predicted action plan (β=.16, p<0.05, n=230) and action control (β=1.00, p<0.001, n=230). Both action plan (β=-.44, p>0.05, n=230) and action control (β=.56, p<0.001, n=230) only accounted for 99 percent of the variance on physical activity behaviour.

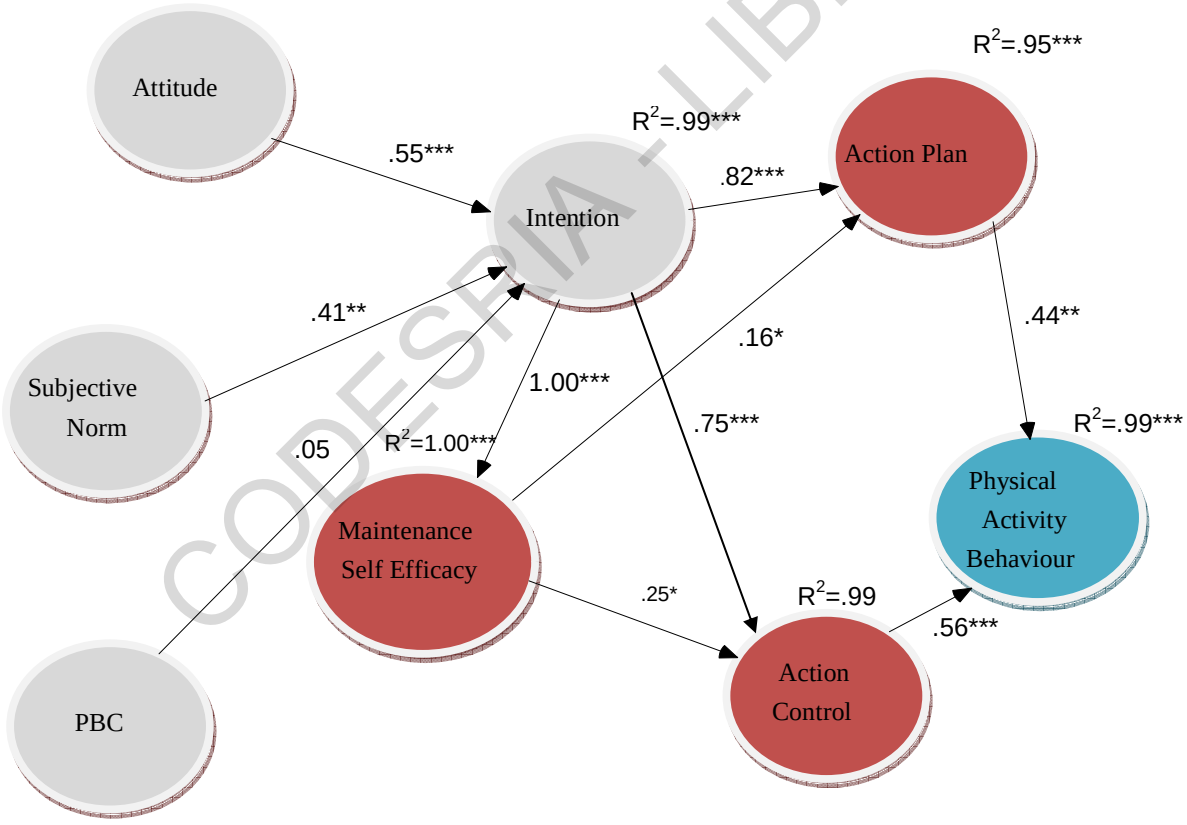

Figure 4.11 Planned behaviour maintenance and control structural model applied to physical activity behaviour (Model 3B)

4.3.3 Overall Assessment of Models

Having subjected all the specified models into goodness of fit tests, it was necessary to compare the absolute fitness of the newly developed versions with the models specified based on the concepts of the Traditional Theory of Planned Behaviour within dietary and physical activity behaviour domains.

Table 4.18 **Comparing of Different Model Series Based on Absolute Fitness Tests**

Model Category	**Test of Absolute Fitness**	
	Relative Chi-square (χ^2/df)	**CMIN (χ^2)**
Dietary behaviour domain		
Model A: Theory of planned behaviour	2.90	0.02*
Model 1A: Planned behaviour knowledge theory	2.12 [c]	.070 [c]
Model 2A: Planned behaviour health belief model	2.47 [c]	.019*
Model 3A: Planned behavour maintenance and control theory	2.98	.025 [c]
Physical activity behaviour domain		
Model B: Theory of planned behaviour	2.53	.061
Model 1B: Planned behaviour knowledge theory	11.12	.000**
Model 2B: Planned behaviour health belief model	2.30	.060
Model 3B: Planned behaviour health belief model	2.08 [c]	.150 [c]

c = Superior model to the original TPB model * α=0.05** α=0.01

Table 4.18 shows measures of absolute fitness for each model specified. It appeared that all the newly generated models were superior to the traditional Theory of Planned Behaviour based on relative chi-square tests and CMIN. This scenario cut across both dietary and physical activity behaviour domain except for Model 1B which appeared to be inferior to the original theory within physical activity behaviour domain. This implied that additional moderators and mediators included in the traditional theory of planned behaviour made significant positive improvement on the model.

4.3.4 Intervening Variables and Control Mechanisms

The relationship between the main variables specified in the four structural equation models could be influenced by other factors not considered during this study. These factors are expressed as "other" in the measurement models. The influences of these factors were taken care off during model identification. The four models (Appendix 4.17) were fully identified (recursive in nature except for model 1b) and the intervening factor categories ranged from "other 1" to "other 6". "Other 1" controlled all additional that may have influenced intention; "other 2" controlled additional factors that may have influenced behaviour; "other 3" controlled additional factors that may have influenced knowledge; "other 4" controlled additional factors that may have influenced maintenance self efficacy; "other 5" controlled additional factors that may have influenced action plan and "other 6" controlled additional factors that may have influenced action control. The p-values <0.01 indicated that critical ratios for the variance estimates for all "other" factors were not obtained by chance except for "other 3" (p>0.05) within dietary behaviour, "other 1" (p>0.05) , "other 4" (p>0.05) and "other 5" (p>0.05) within physical activity behaviour. It implies that for the "other" factors whose p-values were <0.01, the variance estimates were significantly different from zero indicating potential influence on the main corresponding dependent variables in the models.

5.0 CHAPTER FIVE: DISCUSSION

This chapter discusses the results obtained during this study. The discussions are organized by objectives and integrated. The chapter first discusses the questionnaires and integrates both qualitative and quantitative results. Dietary and physical activity survey results are also discussed following the principles of integrated approach. The chapter also discusses results with support from previous studies. Finally, the chapter dwells on the other factors which the study did ignored but could be necessary factors affecting the entire relationships.

5.1 Questionnaires Design, Reliability and Validity

This study has described the process of developing two questionnaires used during the quantitative phase of the study. The two questionnaires included dietary practice and physical activity questionnaires. Since there were no standard questionnaires designed for this nature of study, it was necessary to develop new questionnaires based on the results obtained during the qualitative phase, for both dietary and physical activity behaviours. This process was in congruent with the Ajzen's, (1991) suggestions that any questionnaire intended for the development of a new theory within a population should draw its content from the qualitative results obtained using either focus group discussions, interview schedules or open ended questions. In addition, structural equation modeling also require that validity and reliability variables being included in the model need to be reported after data collection to give an assurance on the model.

5.1.1 Design of Dietary Practice Questionnaire

The design of the dietary practice questionnaire was guided by the concepts drawn from the TPB model (specific objective 1) as well as those stated in specific objectives (objective 2, 3 and 4). Sub-categories defined as measures of the concepts were drawn from responses obtained during the qualitative phase and were identified for each concept and translated into variables. Dietary behaviour had three measurement items (Appendix 2.1). Direct attitude as a main concept had three sub-categories (attitude-1, 2 and 3; Appendix 2.2), each with five measurement items. Direct subjective norm had three sub-categories (subjective norm-1, 2 and 3; Appendix 2.4), each with six measurement items. Direct control belief had three measurement items (Appendix 2.6). Dietary knowledge targeted three measurement items; each tested using five statement form questions (Appendix 2.9). Additional concepts included perceived susceptibility, perceived severity, perceived benefits and cues to action; each had three measurement items (Appendix 2.8). Other measures included intention (three measurement items; Appendix 2.10), action plan (four measurement items), action control (six measurement items) and maintenance self efficacy (three measurement items) (Appendix 1.11). Scaling of measurement items adopted a likert scale invented by Rensis Likert in 1931 and meant to be used by researchers who attempt to quantify constructs which are not directly measurable (Gliem & Gliem, 2003). This design adopted multi-item scaling system based on the principle that the concepts identified for theoretical building could not be measured perfectly by a single item. Using multi-item measures instead of a single item for measuring psychological attributes results into positive outcomes (Nunnally & Bernstein 1994; McIver & Carmines, 1981; and Spector, 1992). Single items have considerable random measurement error which means they are unreliable and error averages out when individual scores are summed to obtain a total score (Nunnally & Bernstein, 1994). Again an individual

item can only categorize people into a relatively small number of groups but cannot discriminate among fine degrees of an attribute. For example, with a dichotomously scored item one can only distinguish between two levels of the attribute, i.e. they lack precision (Spector, 1992). Finally, individual items lack scope and quite often a single item cannot fully represent a complex theoretical concept or any specific attribute for that matter (McIver & Carmines, 1981). However, to prepare for the final items intended to be fitted into Structural Equation Modelling and in order to reduce and value the number of items measuring attitude, subjective norm and perceived behaviour control indirect measurement items for the three concepts as suggested by Fishbein & Ajzen (1975) and Ajzen (1991) was adopted. This is an integrative approach for upgrading scale continuity beyond the likert scale. Measurement items for attitude and subjective norm were weighed by their corresponding evaluation items (Appendix 2.3) and motivation to comply (Appendix 2.5), respectively and sum total obtained for each category. Measurement items for perceived behavioural control were only weighed by the corresponding control beliefs. This process reduced the measurement items for attitude, subjective norm and perceived behavioural control into three (Appendix 4.3).

5.1.2 Reliability of Dietary Practice Questionnaire

All the items measuring the main concepts on the dietary practice questionnaire were subjected to reliability tests using Cronbach's alpha reliability coefficient. Based on George & Mallery (2003) rules of thumb, most items measuring the main concepts in the questionnaire always met the set acceptable criteria except for a few measurement cases. During pre-testing (n=44, Appendix 4.1), measurement items for each subjective norm category, perceived behavioural control, perceived severity, perceived benefits, action plan, action control and maintenance self

efficacy registered acceptable level of Cronbach's alpha (α>.7). Measurement items for dietary behaviour and attitude-2, registered unacceptable reliability (α=.312 and .278 respectively) worth rejecting. However, rejecting the measurement items for dietary behaviour was not justified given the fact that the behaviour categories were considered independently. In addition, the sample size (n=44) was still quite small to make a conclusive judgement on the two concepts. Measurement items for attitude-1, attitude-3 and cues to action registered questionable reliability. This implied that the items did not achieve the recommended minimally acceptable reliability coefficient, but appeared to have a higher measurement potential with increased sample size. Measurement items for dietary intention, perceived susceptibility, and dietary knowledge registered poor reliability coefficients. However, these coefficients were still above average (α>.5) also indicating a higher measurement potential with increased sample size. After the main survey (n=237, Appendix 4.1), measurement items for attitude-1, attitude-3, all the subjective norm category, perceived behavioural control, perceived severity, perceived benefits, cues to action, action plan, action control and maintenance self efficacy registered acceptable level of Cronbach's alpha (α>.7). Measurement items for dietary behaviour, registered unacceptable reliability (α=.387) worth rejecting. Measurement items for perceived susceptibility registered poor reliability. This implied that the items did not achieve the recommended minimally acceptable reliability coefficient even with increased sample size. Measurement items for dietary intention and dietary knowledge registered poor and unacceptable reliability coefficients respective. However, the coefficient for dietary intention was still above average (α>.5) indicating a higher measurement potential with increased sample size. This was not the case with dietary knowledge. Based on George & Mallery (2003) criteria only measurement items for dietary behaviour were unacceptable otherwise the questionnaire appeared to be above

average. The indirect measures of attitude, subjective norm and perceived behavioural control also registered above average coefficients (Appendix 4.3). The recommended cut-off for reliability coefficients in social science is α>.7 for more stringent criteria or α>.6 for more lenient criteria and particularly for exploratory research (Bonett, 2002; Raykov, 1998) but, even with this lenient criteria (α>.6) some measurement items still did not meet the acceptability cut-off (Appendix 4.1).

5.1.3 Validity of Dietary Practice Questionnaire

A measure may be reliable but not valid and at the same time it cannot be valid without being reliable (Armor, 1974). Dietary questionnaire was subjected to construct validation to test is it measured what it intended to measure. *Discriminant validity* using exploratory factor method was used to determine factor loading for measurement items of the main concepts within dietary practice questionnaire. This was necessary especially to drop items that cross loaded into more than one factor from further analysis (Appendix 4.1). Most concepts had their measurements loading into one factor with communalities for each item greater than 0.5. Only two items did not meet this criteria, for example, attitude-2 item on "makes you become overweight" (communality=0.35) and perceived behavioural control-3 (communality=0.064). The dietary practice questionnaire was generally acceptable based on factor analysis criteria used. Most concepts had their measurements loading into one factor with communalities for each item greater than 0.5. Only two items did not meet this criteria, for example, attitude-2 item on "makes you become overweight" (communality=0.35) and perceived behavioural control-3 (communality=0.064). The measurement items for the indirect attitude, subjective norm and perceived behavioural control also loaded in one factor with communalities greater than 0.05,

except for perceived behavioural control-3 (Appendix 4.4). The dietary practice questionnaire was generally acceptable based on factor analysis criteria recommended by Kaiser's criterion (Lance, at al., 2006). Correlation coefficients fluctuate from sample to sample, more so in small samples than in large samples. Factor analysis is also dependent on sample size and many suggestions about sample size necessary for factor analysis provide varied contributions, but in general over 300 cases are suggested with communalities after extraction above 0.5 (Field, 2005). However, this questionnaire was acceptable having confirmed adequacy of sample size (*n=237*) using Kaiser-Meyer-Olkin and Bartlett's test of sphericity.

5.1.4 Design of Physical Activity Questionnaire

The design of the physical activity questionnaire just like dietary practice questionnaire was guided by the main concepts drawn from the TPB model (specific objective 1) and specific objectives (objective 2, 3 and 4). Sub-categories defined as measures of the concepts were drawn from the results obtained during the qualitative phase. Sub-categories were identified for each concept and translated into variables. Physical activity behaviour had three measurement items (Appendix 3.1). Direct attitude as a main concept had three sub-categories (attitude-1, 2 and 3; Appendix 3.2), each with five measurement items. Direct subjective norm had three sub-categories (subjective norm-1, 2 and 3; Appendix 3.4), each with six measurement items. Direct control belief had three measurement items (Appendix 3.6). Physical Activity knowledge targeted three measurement items; each tested using five statement form questions (Appendix 3.9). Additional concepts included perceived susceptibility, perceived severity, perceived benefits and cues to action; each had three measurement items (Appendix 3.8). Other measures included intention (three measurement items; Appendix 3.10), action plan (four measurement

items), action control (six measurement items) and maintenance self efficacy (three measurement items) (Appendix 3.11). Scaling of measurement items adopted a likert scale proposed by Gliem & Gliem, (2003). This design involved use of multi-item scaling system because the concepts identified for theoretical building could not be measured perfectly by a single item. Using multi-item measures instead of a single item for measuring psychological attributes are already discussed under the design of dietary practice questionnaire (Nunnally & Bernstein, 1994; McIver and Carmines, 1981; Spector, 1992; section 5.1.1). However, to prepare for the final items intended to be fitted into Structural Equation Modelling and in order to reduce and value the number of items measuring attitude, subjective norm and perceived behaviour control indirect measurement items for the three concepts as suggested by Fishbein & Ajzen (1975) and Ajzen (1991) was adopted. Measurement items for attitude and subjective norm were weighed by their corresponding evaluation items (Appendix 3.3) and motivation to comply (Appendix 3.5), respectively and sum total obtained for each category. Measurement items for perceived behavioural control were only weighed by the corresponding control beliefs. This process reduced the measurement items for attitude, subjective norm and perceived behavioural control into three (Appendix 4.7).

5.1.5 Reliability of physical activity questionnaire

All the items measuring the main concepts on the dietary practice questionnaire were subjected to reliability tests using Cronbach's alpha reliability coefficient. Based on rules of thumb, most items measuring the main concepts in the questionnaire met the set acceptable criteria except for a few measurement cases (George and Mallery, 2003). During pre-testing (n=45, Appendix 4.5), measurement items for each subjective norm category, physical activity intention, perceived

severity, action plan, action control and maintenance self efficacy registered acceptable level of Cronbach's alpha (α>.7). Measurement items for physical activity behaviour and perceived benefits, registered unacceptable reliability (α=.271 and .480 respectively) worth rejecting. However, measurement items for physical activity behaviour were not rejected given the fact that the behaviour categories were considered independently and the sample size (n=45) was inadequate to make a conclusive judgement on the two concepts. Measurement items for attitude-2, perceived behavioural control and physical activity knowledge registered questionable reliability. Measurement items for attitude-3, perceived susceptibility and cues to action registered poor reliability. This implied that the items did not achieve the recommended minimally acceptable reliability coefficient, but appeared to have a higher measurement potential with increased sample size. However, these coefficients that were still above average (α>.5) indicated a higher measurement potential with increased sample size. After the main survey (n=230, Appendix 4.5), measurement items for attitude-1, all the subjective norm categories, perceived behavioural control, perceived severity, action plan, action control and maintenance self efficacy registered acceptable level of Cronbach's alpha (α>.7). Measurement items for attitude-2, perceived susceptibility, cues to action and physical activity knowledge registered questionable reliability. Measurement items for physical activity behaviour, registered poor reliability (α=.510). Measurement items for perceived benefits registered unacceptable reliability (α=.380) worth rejecting. This implied that the items measuring perceived benefits did not achieve the recommended minimally acceptable reliability coefficient even with increased sample size. Based on George & Mallery (2003) criteria all measurement items for physical activity questionnaire appeared to be above average except for perceived benefits. The indirect measures of attitude, subjective norm and perceived behavioural control also registered above

average coefficients (Appendix 4.7). The recommended cut-off for reliability coefficients in social science is α>.7 for more stringent criteria or α>.6 for more lenient criteria and particularly for exploratory research (Bonett, 2002; Raykov, 1998) but, even with this lenient criteria (α>.6) some measurement items still did not meet the acceptability cut-off (Appendix 4.5). However, the indirect measures for attitude, subjective norm and perceived behaviour control registered acceptable reliability after the main survey (*n*=230; Appendix 4.7).

5.1.6 Validity of Physical Activity Questionnaire

Discriminant validity using exploratory factor method was used to determine factor loading for measurement items of the main concepts within physical activity questionnaire. This was necessary especially to drop items that cross loaded into more than one factor from further analysis (Appendix 4.6). Most concepts had their measurements loading into one factor with communalities for each item greater than 0.5. Only four items did not meet this criteria, for example, attitude-1 item on "makes you become overweight" (communality=0.421), attitude-2 item on "reduces weight" (communality=0.400), attitude-3 items on "reduces weight" (communality=0.406) and cues to action-3 (communality=0.402). The measurement items for the indirect attitude, subjective norm and perceived behavioural control also loaded in one factor with communalities greater than 0.05. The physical activity questionnaire was generally acceptable based on factor analysis criteria recommended by Kaiser's criterion (Lance, at al., 2006). It is important to note that correlation coefficients fluctuate from sample to sample, more so in small samples than in large samples making reliability of factor analysis to be dependent on sample size. Field (2005) suggests over 300 cases with communalities after extraction above 0.5 for a factor to be accepted. However, this questionnaire was generally acceptable having confirmed adequacy of sample size using Kaiser-Meyer-Olkin and Bartlett's test of sphericity.

5.2 Predictive power of the Theory of Planned Behaviour and New versions within Dietary and Physical Activity Behaviour

This section provides evidence of the applicability of the Theory of Planned Behaviour and new versions in understanding dietary and physical activity behaviours among Type II diabetic patients. The section integrates both qualitative and quantitative results (Cresswell, 2009) and compares these results within dietary and physical activity behaviour domains for cross validation purposes. The section discusses the theory building process both in dietary behaviour and physical activity behaviour following a school of thought that a theory may be applicable in a specific behaviour domain but fails to apply in a different behaviour. The initial discussions focuses on the traditional Theory of Planned Behaviour (Ajzen, 1991) then on a series of newly emerging theories developed during this study.

5.2.1 Predictive Power of the Theory of Planned Behaviour in Predicting Dietary and Physical Activity Behaviours among Type II Diabetics

During this study there was no direct objective set to investigate the role played by the original Theory of Planned Behaviour in predicting dietary and physical activity behaviours. However, this theory laid the foundation upon which the six specific objectives were set. The study used the key concepts identified by Ajzen (1991) including attitude, subjective norm, perceived behavioural control and intention, which were all linked up to dietary and physical activities behaviour each at a time. This research sought to identify the motivational factors underlying dietary and physical activity behaviour in a sample of Type II diabetic patients. This section of the study was performed because there was need to develop superior models that include patients' perspectives in the health promotion and health education and the original model was

the beginning point. It was found that Type II diabetic patients held fairly favourable attitudes toward dietary and physical activity behaviour, perceived positive social pressure to do so and poorly felt in control of the two behaviours. The prediction power of each of these factors to intention varied significantly for both dietary and physical activity behaviours (Figure 4.5; Figure 4.9). Attitude was the most powerful determinant of intention (dietary behaviour, β=0.79, p<0.01; physical activity behaviour, β=0.56, p<0.01), subjective norm/social pressure (dietary behaviour, β=0.33, p<0.05; physical activity behaviour, β=0.38, p<0.05), while perceived behavioural control (dietary behaviour, β=-0.02, p>0.05; physical activity behaviour, β=0.06, p>0.05) insignificantly predicted intention indicating less control over behaviour (dietary behaviour, β=0.01, p>0.05; physical activity behaviour, β=0.02, p>0.05). Intention highly predicted both dietary and physical activity behaviours (dietary behaviour, β=-0.99, p<0.001; physical activity behaviour, β=0.98, p<0.001).

High prediction power of intention is consisted with the finding of other authors where a person's intention to perform a particular behaviour was both the immediate determinant and the single best predictor of that behaviour (Sutton, 1997). An intention to perform behaviour is influenced by attitudes towards the action, including the individual's positive or negative beliefs and evaluations of the outcome of the behaviour (Ajzen, 1980). It is also influenced by subjective norms, including the perceived expectations of important others (e.g. family or work colleagues) with regard to a person's behaviour; and the motivation for a person to comply with others' wishes (Ajzen, 1991). Behavioural intention, it is contended, and then results in action (Fishbein & Ajzen, 1975). The authors argue that other variables besides those described above can only influence the behaviour if such variables influence attitudes or subjective norms. There was very

little difference in prediction patterns between dietary and physical activity behaviour, except for the slight changes on the prediction power. The three factors explained 100 percent of the variability of intention when other factors including demographic characteristics were held constant and this was excellent. Nested models for each behaviour domain (Model A & B) fitted the data acceptably well based on the recommended fit indices.

This research has highlighted the relative importance of the TPB constructs upon behavioural intention and subsequent behaviour. These relationships should be considered when designing educational programs to promote dietary practice and physical activity among diabetic patients. For instance, in order to increase Type II diabetic patients' motivation/intention to follow recommended diet and engage in adequate physical activity or reduce sedentary lifestyle, their attitude is the most important followed by subjective norm or social pressure and then perceived behavioural control. In the behaviour model, both intentions had a strong prediction for both dietary and physical activity behaviours calling for both a motivational and a structural educational approach (Luzzi & Spencer, 2008). Furthermore, because perceived control was not statistically a strong predictor intention, its effect might reflect lack of confidence in patience ability to follow recommended diet, increase physical activity levels or reduce sedentary lifestyle and might call for reduction in structural barriers as a focus for intervention.

5.2.2 Influence of Perceived Knowledge as a Pre-Intention Mediator between Attitude, Subjective Norm, Perceived Behavioural Control and Intention within the TPB Model applied to Dietary and Physical Activity Behaviours

Knowledge was proposed to be a powerful mediator between the underlying TPB concepts (attitude, subjective norm and perceived behavioural control) and intention. Based on this proposition a new theory was advanced and labeled *planned behaviour knowledge theory* (PBK). This study attempted to fit a model based on this theoretical postulation and revealed contrasting results within dietary and physical activity behaviours. The proposed model only fitted acceptably well within dietary behaviour {χ^2 = 256.7, *df* = 121, *p* = .07, χ^2/df = 2.12*; TLI* = .95*; CFI* =.93*; RMSEA* (90CI) = .075(.003, .077)} but not in physical activity behaviour {χ^2 = 1256.7, *df* = 113, *p* = .00, χ^2/df = 11.12*; TLI* = .47*; CFI* =.56*; RMSEA (90CI)* = .108(.22, .24)}, therefore theoretical advancement was made just within dietary behaviour. Fitness comparisons between the planned behaviour knowledge theory and the traditional Theory of Planned Behaviour revealed that the new theory was superior within dietary behaviour (PBK: χ^2/df = 2.12*;* p=0.07 against TPB: χ^2/df = 2.53, p=0.02) but inferior within physical activity behaviour (PBK: χ^2/df = 11.12; p=0.00 against TPB: χ^2/df = 2.9, p=0.061). The study revealed that attitude (β=0.65, p<0.01) was the best predictor of knowledge and in descending order followed by subjective norm (β=0.45, p<0.05), while perceived behavioural control (β=-0.02, p>0.01) only had a small impact on knowledge (Figure 4.6) within dietary behaviour model (Model 1A). The measurement results within physical activity behaviour model (Model 1B) did not mean anything after the model was rejected. Fishbein and Ajzen (1975) argued that variables besides attitude and subjective norm could only influence behaviour if they influence attitude and subjective

norm. Although this argument seemed to be true at the time of this theoretical advancement, the situation so far changed when the perceived behavioural control was added as a direct predictor of intention and behaviour (Ajzen, 1991). This study has demonstrated that knowledge is a direct predictor of intention and that attitude, subjective norm and perceived behavioural control predict knowledge. However, this was only the case when the model was applied to dietary behaviour.

The level of a patient's knowledge may affect his/her information and decision-making behaviour (Brucks, 1985; Park, *et al.,* 1994). Two knowledge constructs are evidence in patient's behaviour *ibid.* The first one is objective knowledge: accurate information about the dietary and physical activity behaviour stored in the long term memory. The second one is subjective knowledge: people's perceptions of what or how much they know about dietary and physical behaviour. Although subjective and objective knowledge appeared to have been related in this study, they were distinct in two aspects (Brucks, 1985; Alba & Hutchinson, 1987). First, when patients do not accurately perceive how much or how little they actually know, subjective knowledge may over or under estimate one's actual dietary and physical activity knowledge. Second, measures of subjective knowledge can indicate self-confidence levels as well as knowledge levels. That is, subjective knowledge can be thought of as including an individual's degree of confidence in his/her knowledge, while objective knowledge only refer to what an individual actually knows (Chiou, 1998). Attitude of Type II diabetic patients may play a major role on the knowledge about dietary and physical activity behaviours. Negative attitude on the positive outcome of dietary or physical activity behaviour may interfere with the correct knowledge of a patient and subsequently decision making. Subjective norm or social pressure

may also enhance or interfere with the objective knowledge. The pressure from significant others (doctor/clinical officer/spouse/siblings/friend/children/neighbor) may impact heavily of the knowledge of a patient. As discussed in the previous section, one component of perceived behavioural control in the Theory of Planned Behaviour reflects a person's self-confidence in the ability to conduct the behaviour through control of barriers. If a person has strong subjective dietary and physical activity knowledge, s/he will have higher confidence in the ability to follow appropriate dietary and physical activity behaviour. His/her attitude toward the act already shows this confidence. The attitude toward the behaviour can overshadow the effect of perceived behavioural control. Therefore, the effect of perceived behavioural control on behavioural intention will be weaker when patients have high subjective dietary and physical activity knowledge (Chiou, 1998).

5.2.3 Moderating Influence of Perceived Susceptibility, Perceived Severity, Perceived Benefits and Cues to Action in Predicting Intention Construct within the TPB Model applied to Dietary and Physical Activity Behaviours

Four concepts borrowed from the traditional health belief model (Bandura, 1997) were purposively chosen to be included in the original Theory of Planned Behaviour (Ajzen, 1991) in order to build a new behaviour model for the Type II diabetics. This included perceived susceptibility, perceived severity, perceived benefits and cues to action. These concepts were incorporated into the TPB model to advance a new theory labeled *planned behaviour health belief theory* (PBHB). The model fitted well for both dietary { χ^2= 743.47, *df* = 301, *p* = .019, χ^2/df = 2.47*; TLI* = .90*; CFI* =.91*; RMSEA* (90CI) = .079(.031, .14)} and physical activity behaviours { χ^2 = 705, *df* = 306, *p* = *.06*, χ^2/df = 2.3*; TLI* = .95*; CFI* =.96*;* RMSEA (90CI) =

.080(.021, .07)} based on the common fit indices used in Structural Equation Modelling . Fitness comparisons (based on relative chi-squares and p-values) between the planned behaviour health belief theory and the traditional Theory of Planned Behaviour revealed that the new theory was superior within dietary behaviour (PBHB: χ^2/df = 2.47*;* p=0.19 against TPB: χ^2/df = 2.9, p=0.02) and physical activity behaviour (PBHB: χ^2/df = 2.3*;* p=0.06 against TPB: χ^2/df = 2.9, p=0.061). This study has revealed that there is need to add health belief concepts into the original Theory of Planned Behaviour in order to close the pre-intention gap. It is evident (Figure 4.7 and 4.10) that in addition to attitude and subjective norm and perceived behavioural control health belief concepts performed fairly well as predictors of intention within dietary and physical activity behaviours. However, the percentage of intention accounted for by the four concepts was not quite significant within dietary behaviour. The situation was different within physical activity behaviour where perceived benefits and attitude emerged as the best predictors of intention. The Health Belief Model relates largely to the cognitive factors predisposing a person to health behaviour, concluding with a belief in one's self-efficacy for the behaviour. The model leaves much still to be explained by factors enabling and reinforcing one's behaviour, and these factors become increasingly important when the model is used to explain and predict more complex lifestyle behaviours that needs to be maintained over a lifetime. A systematic, quantitative review of studies that had applied the Health Belief Model among adults into the late 1980s found it lacking in consistent predictive power for many kinds of health behaviour, probably because its scope is limited to predisposing factors (Harrison *et al.*, 1992). One study that specifically compared its predictive power with other models found that it accounted for a smaller proportion of the variance in diet, exercise, and smoking behaviours than did the theory of reasoned action, Theory of Planned Behaviour (Mullen *et al.*, 1987). This study

recommended the inclusion of some key concepts into the more superior Theory of Planned Behaviour to generate a hybrid model for dietary and physical activity promotion among Type II diabetics.

The relationship between *perceived susceptibility* and health related behaviour is well researched (Kershaw *et al.,* 2003) but puts more emphasis on the direct link with health behaviour. However, in this study we examined perceived susceptibility as an indirect determinant of dietary or physical activity behaviours. Perceived susceptibility focused on how the Type II diabetic patients' view the risks related to dietary and physical activity practices and explained up to 3 percent of the variance in dietary intention and 8 percent of the variance in physical activity intention. In both behaviour domains, Type II diabetic patients always had intention whenever they perceived themselves to be at high risk. Perceived susceptibility is one of the motivator for people to adopt healthier behaviours. When perceived risk is high, individuals tend adopt healthier behaviours to decrease the risk. This is what prompts men who have sex with men to be vaccinated against hepatitis B (de Wit *et al.,* 2005) and to use condoms in an effort to decrease susceptibility to HIV infection (Belcher *et al.,* 2005). It is logical to argue that when Type II diabetics believe, they are at risk to worse outcomes of their condition; they are more likely to follow recommended diet and engage in appropriate physical activity. On the on the contrary, when the patients believe that they are not at risk at all or minor risk, they tend to resort to unhealthy dietary practice and sedentary lifestyle. Among people whose parents had or have the Type II diabetes, the perception of risk of developing the condition was predictive of more heath-enhancing behaviours. Most important, they are more likely than others to engage in

behaviours to control their weight (Forsyth & Goetsch, 1997), since weight is a known risk factor to Type II diabetes.

The construct of *perceived severity* also referred to as perceived seriousness in some studies also showed elements of accountability for Type II diabetics' dietary and physical activity intentions. It appeared that perceived severity positively accounted for 2 percent of the variance in dietary intention and negative 3 percent of the variance in physical activity intention. Either way perceived severity predicted intention. This study revealed that while the perception of severity of a disease is often based on medical information or knowledge, it may also come from beliefs a patient has about the difficulties a disease would create or the effects it would have on his or her life in general (McCormic-Brown, 1999). For example, some Type II diabetics view their condition as relatively minor ailment during initial stages. When they are diagnosed with the condition, they simply walk to the clinic get medication and get better. However, when their conditions worsen, they realize the seriousness of the disease and seek serious medical help. Negative variance on physical activity intention probably indicates that the Type II diabetics involved during this study viewed increased activity levels as a behaviour that could probably worsen their condition and they would prefer to lead sedentary life.

The construct of *perceived benefits* focused on the patients' opinions on the value or usefulness of a new behaviour in decreasing the risk of developing severe conditions of Type II diabetes. Perceived benefits performed better than other concepts in the planned behaviour health belief model. This was evident for both dietary and physical activity behaviours. The construct explained 7 percent of the variance in dietary intention and 74 percent of the variance in physical

activity intention. This implies that Type II diabetics tend to develop high intentions to follow recommended diet or engage in adequate physical activity when they realize the benefits of healthy eating and physically active life. Perceived benefit plays a greater role in the adoption of secondary prevention behaviours. For example, it is known that the earlier breast cancer is found, the greater the chance of survival. It is also true that a breast self exam (BSE), when done regularly can be effective means of early detection. However, not all women do BSE regularly. They have to believe there is a benefit in adopting this behaviour. This scenario was discovered among black women in America (Graham, 2002). Similarly in this study Type II diabetics must know there are benefits before they make decision to follow recommended diet and engage in adequate physical activity.

Cues to actions are events, people, or even things that move people to change their behaviour. For example, illness of a family member, media reports (Graham, 2002), mass media campaigns, reminder postcards from health care provider or warning labels on a food product. This study focused on three categories of cues to action, including posters and materials, television or radios and weekly education programmes as elements of cues to action. The study has shown that cues to action negatively accounted for 6 percent of the variance in dietary intention and 2 percent of the variance in physical activity intention. The average mean score (μ=4.08±0.16) indicates that most patients were undecided on whether enough materials exist to explain relationship between diet or physical activity and Type II diabetes. To some extent the patients disagreed if TVs and posters were relevant to their conditions. Watching and hearing TV or radio news stories about food borne illness and reading the safe handling instructions on packages of new meat and poultry are cues to action associated with safer food-handling behaviours (Hanson & Benedict,

2002). Similarly having posters and showing patients TV pictures relevant to Type II diabetes are cues to action associated with prevention of severe conditions of the disease.

5.2.4 Mediating Influence of Action Plan, Action Control and Maintenance Self-Efficacy at the Post-Intention Phase within the TPB Model applied to Dietary and Physical Activity Behaviours

Action plan, action control and maintenance self efficacy (Falko *et al.*, 2005) were purposively chosen to close the post intention gap in the original Theory of Planned Behaviour (Ajzen, 1991) with an aim of building a new behaviour model for the Type II diabetics. These concepts were incorporated into the TPB model to advance a new theory labeled *planned behaviour maintenance and control theory* (PBMC). The model fitted well for both dietary {χ^2 = 1004.26, *df* = 337, *p* = .025, χ^2/df = 2.98*; TLI* = .92*; CFI* =.94*; RMSEA* (90CI) = .067(.011, .07) } and physical activity behaviours {χ^2 = 710, *df* = 341, *p* = .15, χ^2/df = 2.082*; TLI* = .97*; CFI* =.98*; RMSEA* (90CI) = .05(.001, .05)}based on the common fit indices used in Structural Equation Modelling. Fitness comparisons (based on relative chi-squares and p-values) between the planned behaviour maintenance and control theory and the traditional Theory of Planned Behaviour revealed that the new theory was superior within dietary behaviour (PBMC: χ^2/df = 2.98*; p*=0.025 against TPB: χ^2/df = 2.9, *p*=0.02) and physical activity behaviour (PBMC: χ^2/df = 2.082*; p*=0.15 against TPB: χ^2/df = 2.9, *p*=0.061). This study has revealed contrasting results on the post-intention processes. Action control, maintenance self efficacy and action control were hypothesized to mediate the relationship between intention and behaviour within dietary and physical activity domains.

As discussed above, the findings indicate the specified model represented the data well for both dietary and physical activity behaviours. However, the mediation process was quite different across the two behaviours under investigation. Within dietary behaviour, maintenance self efficacy and action control significantly mediated the relationship between intention and dietary behaviour. Since intention significantly predicted maintenance self efficacy (β=.71, p<0.001) and action control (β=.45, p<0.01) and that action control also predicted dietary behaviour (β=.25, p<0.05), the two factors appeared to be partial mediators between intention and dietary behaviour. In addition, the link between intention and action control and was also partially mediated by maintenance self efficacy. However, action plan failed to mediate the link between intention and dietary behaviour even though significantly predicted by maintenance self efficacy.

The overall variance of dietary behaviour explained by the immediate determinants (action plan and action control) was 7 percent which is quite small. These conditions were quite different for physical activity behaviour where action plan, action control and maintenance self efficacy fully mediated the relationship between intention and physical activity behaviour. On the overall the immediate determinants (action plan and action control) of physical activity behaviour accounted for 99 percent of the variance in physical activity behaviour. The present study replicates the findings of Falko *et al.,* (2005) and Luszcynska & Schwarzer (2003) although with larger prediction powers for action control and action plan. Action plan as evident in this study is a necessary factor during the post-intentional processes. It indicates that the intended behaviour must be planned, initiated, maintained and restarted when setbacks occur (Falko *et al.,* 2005). By planning dietary and physical activity behavior, Type II diabetics develop a mental representation or picture a suitable future situation ("where" and "when") and behavioural action

("how") which expected to be effecting in fulfilling the behaviour *ibid.* Action plan has been proven to be a powerful predictor of health behaviour in many domains (Abraham *et al.*, 1999; Gollwitzer & Oettingen, 1998). Maintenance self-efficacy (Luszcynska & Schwarzer, 2003) as used in the present study refers to the perceived capability to maintain a newly adopted behaviour, develop routines, and cope with unexpected barriers during the maintenance phase after the behaviour has been initiated and adopted. Prescribed dietary and physical activity recommendations might turn out to be much more difficult to adhere to than expected, but a self-efficacious Type II diabetic responds confidently with better strategies, more effort, and prolonged persistence to overcome such hurdles (Falko *et al.*, 2005).

In addition without active self-regulation, Type II diabetics would not follow recommended diet or engage in adequate physical activity and therefore, efforts undertaken in order to alter their behaviour (Carver & Scheier, 1998) would be required. Self-regulation, awareness of standards and efforts were conceptually referred to as action control indicators which work together as control mechanisms towards a behaviour. In this study action control was seen as the most proximal predictor of behaviour while planning on the other hand is assumed to be partly mediated by action control. Maintenance self efficacy promotes planning (Bandura, 1997) as is evident particularly within physical activity behaviour domain, the situation was a bit different for dietary behaviour.

5.3 Limitations and Challenges

Individual contributions of demographic, cultural and economic factors were not established, other than being controlled during the analysis although there were indications that these factors grouped together significantly varied among subjects. Many studies have indicated that age and gender are powerful predictors of health related behaviour just the same way as psychosocial factors (Johansson & Anderson, 1998; Johansson *et al.*, 1997). The contribution of these two demographic factors may have been established by comparing the models fitness indices across gender and different age categories. However, the sample size could not allow for smaller groupings of participants by gender and age category. Doing this would mean that we deal with a sample size less than 200 for either males or females, the minimum required to accept structural equation model (Loehlin, 1992).

Additional factors which could need attention but left out during this study include economic status and religion. Health related behaviours such as dietary practice and physical activity may be influences by individuals' economic status and cultural practices associated with religion. Measurements of latent variables were made within the specified structural models generated from the Theory of Planned Behaviour and proposed versions. There was also limited Kenyan based literature on the role of behavioural theories in investigating behaviour. This study therefore relied on information from International Journals most of which were conducted in developed world. The study relied on self reported information. Sometimes self-reported information may not always be 100 percent true and might be misleading. However, this limitation was overcome through proper training of research assistants who ensured that they obtained the right and correct information from the participants. Selection of patients was based

on their disease condition and therefore proportionate distribution of the sampled patients by sex was not done. This was therefore disproportionate representation of men and women who participated in the study.

The research process was also faced with several challenges especially during data collection process. It was noted that most Type II diabetic patients were in pain. The patients were concerned of the immediate benefit the study could bring to them. Their general concern was that previously researchers have involved them in the projects without any feedback. This made a few patents to shy away from participating in the study. The length of the questionnaires used during the quantitative phase of the study was not accepted by some patients given that they were in pain. Other challenges included language barrier and limited consultation duration for the patients which made the interview process to be conducted only between 8.30 am to 2.00pm.

6.0 CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

This chapter highlights the key findings of the study. It concludes and recommends actions relevant to the findings. The conclusions are made in line with the objectives and hypothesis within dietary and physical activity behaviours. Recommendations are made for the health professionals, policy makers and researchers who may want to conduct further research in this line of academic discipline.

6.1 Conclusions

This study aimed at testing the efficacy of the Theory of Planned Behaviour and newly developed versions for predicting dietary practice and physical activity behaviour of Type II diabetic patients attending the clinic regularly at Kisii Level-V Hospital in Nyanza Province in Kenya. The conclusions herein are based on the specific objectives achieved after hypotheses were tested. More than 90 percent of items within dietary practice and physical activity questionnaires met the minimum criteria recommended by Field (2005) which requires adequate sample size with communalities after extraction above 0.5 for a factor to be accepted and internal consistency reliability above 0.5 based on George and Mallery's (2003) recommendation. On the basis of reliability and validity outcome of the two questionnaires the researcher made the following conclusions with confidence.

1. The Theory of Planned Behaviour holds among the Type II diabetes and within dietary { χ^2= 223.3, *df* = 77, *p* = .02, χ^2/df = 2.9*; TLI* = .93*; CFI* =.91*; RMSEA (90CI)* = .090(.039, .146)} and physical activity {χ^2= 213, *df* = 84, *p* = .061, χ^2/df = 2.53*; TLI* = .97*; CFI*=.96*; RMSEA* (90CI) = .073(.029, .08)} behaviour domains based on the fit indices used during analysis. However, results indicated that both attitude and subjective norms emerged as the most

powerful predictors of intention to follow recommended diet or engage in adequate physical activity. Perceived behavioural control accounted for some percentage of the variance in intention but not significantly different from zero.

2. Knowledge played a major role in mediating the relationship between attitude, subjective norm and perceived behavioural control and intention and helped in advancing a new theory labeled *planned behaviour knowledge theory.* This also holds among the Type II diabetics and within dietary practice {χ^2= 256.7, *df* = 121, *p* = .07, χ^2/df = 2.12*; TLI* = .95*; CFI* =.93*; RMSEA* (90CI) = .075(.003, .077*)*} domain based on the fit indices used during analysis, but not within physical activity behaviour {χ^2= 1256.7, *df* = 113, *p* = .00, χ^2/df = 11.12*; TLI* = .47*; CFI* =.56*; RMSEA* (90CI) = .108(.22, .24)} and therefore theoretical advancement can only be made within dietary behaviour. The results also revealed that the *planned behaviour knowledge theory* is superior the traditional Theory of Planned Behaviour within dietary behaviour (PBK: χ^2/df= 2.12*; p*=0.07 against TPB: χ^2/df = 2.53, *p*=0.02) but inferior within physical activity behaviour (PBK: χ^2/df = 11.12*; p*=0.00 against TPB: χ^2/df = 2.9, *p*=0.061) based on relative chi-square ratios.
3. Perceived susceptibility, perceived severity, perceived benefits and cues to action moderated the predictive power of attitude and subjective norm and helped in advancement of a new theory labeled *planned behaviour health belief theory*. This theory holds for both dietary {χ^2= 743.47, *df* = 301, *p* = .019, χ^2/df = 2.47*; TLI* = .90*; CFI* =.91*; RMSEA* (90CI) = .079(.031, .14)} and physical activity behaviours {χ^2 = 705, *df* = 306, *p* = .06, χ^2/df = 2.3*; TLI* = .95*; CFI* =.96*; RMSEA* (90CI) = .080(.021, .07)} based on the common fit indices used during analysis. Further results indicates that this new *planned behaviour health belief theory* is superior to the original Theory of Planned Behaviour within dietary (PBHB: χ^2/df =

2.47*; p*=0.19 against TPB: χ^2/df = 2.9, *p*=0.02) and physical activity behaviours (PBHB: χ^2/df = 2.3*; p*=0.06 against TPB: χ^2/df = 2.9, *p*=0.061) based on relative chi-square ratios. Perceived benefits and perceived susceptibility emerged as the most powerful moderators of attitude, subjective norm and perceived behavioural control.

4. Action plan, action control and maintenance self efficacy were key mediators between intention and behaviour and emerged as important factors in building *planned behaviour maintenance and control theory.* This theory also holds among the Type II diabetes and within dietary {χ^2 = 1004.26, *df* = 337, *p* = .025, χ^2/df = 2.98*; TLI* = .92*; CFI* =.94*; RMSEA* (90CI) = .067(.011, .07) } and physical activity behaviours {χ^2 = 710, *df* = 341, *p* = .15, χ^2/df = 2.082*; TLI* = .97*; CFI* =.98*; RMSEA* (90CI) = .05(.001, .05)}based on the common fit indices used during analysis. The planned behaviour maintenance and control theory is inferior to the original Theory of Planned Behaviour within dietary behaviour (PBMC: χ^2/df = 2.98*; p*=0.025 against TPB: χ^2/df = 2.9, *p*=0.02) but superior within physical activity behaviour (PBMC: χ^2/df = 2.082; p=0.15 against TPB: χ^2/df = 2.9, *p*=0.061) based on the relative chi-square ratios.
5. There is evidence of the possibilities of patient related internal and external factors that may influence key concepts identified during this study. The study has shed light on the complexity of the Type II diabetic patients' education. It is evident that healthy dietary and physical activity promotion among Type II diabetics should consider incorporating patients' perspectives. The researcher found that the decisions on whether the Type II diabetics will follow dietary recommendations or engage in adequate physical activity depend on factors related to the patients' themselves.

6. This study has generated new and useful behaviour change theories in addition to original Theory of Planned Behaviour. These theories include planned behaviour knowledge theory, planned behaviour health belief theory and planned behaviour maintenance and control theory. The four theories tested in this study was used to develop an all inclusive conceptual model with a focus on mental related factors that can now be used to motivate Type II diabetes patients to adhere to healthy eating and engage in adequate physical activity across most clinics. This conceptual framework was labeled *mental health tailored communication model*. (Appendix 1.9). The model puts the patients' decision making process on focus and suggest that several mental related factors are key predictors and mediators of the decision making process. This process is strongly linked to intention construct in the model. In this model the pre-intention factors such as attitude, subjective norms, perceived behavioural control, perceived susceptibility, perceived severity, perceived benefits, cues to action and knowledge were the key motivating factors towards patients' decision making process. The post-intention factors including action planning, action control and maintenance self efficacy gave assurance that healthy eating and physical activity involvement will always be executed as required.

6.2 Recommendations

This study has used both subjective and objective methods to confirm the importance of mental health related factors that influence dietary and physical activity behaviours among Type II diabetics. Based on the results the researcher has made one recommendation to the health professionals and policy makers. Recommendations to researchers have also been made in form of suggestions for further research.

6.2.1 Recommendation to the Policy Makers

The newly developed *mental health tailored communication model* (Appendix 1.9) is recommended for nutrition and health educators attending to Type II diabetic patients as a scientific guide to help in designing a practical healthy eating and physical activity promotion manual with a bias on mental related factors. Mental related factors have long been ignored in the current approaches currently being adopted across most diabetic clinics with active dietary and physical activity programmes in Kenya and this is an area where policy makers need to give a serious thought. Even though this model is loaded with many mental related factors that need to be brought on board during implementation process, its adoption requires that a dissemination workshop be held for secondary and tertiary target users which include health professionals, relevant government ministries and policy makers. In this workshop a basic mental health manual would be developed with clear steps on how to use the model. To give a brief summary of how this curriculum would be developed, the researcher focuses on each factors identified.

Attitude: The implementers would be required to identify the beliefs of Type II diabetics with regard to their daily dietary and physical activity practices in order to assess the strength of the beliefs and corresponding value of the beliefs. This would be necessary when organizing classes to improve on the perceived knowledge in order to do away with wrong perceptions. **Subjective norm**: Significant others support groups would be formed to motivate the patents. Instead of the patients coming on their own, they would be encouraged to be accompanied with the preferred significant other for a joint education process concerning healthy diet and adequate physical activity. **Perceived behavioural control**: Assessment of barriers and facilitating factors would be made where patients would be required to own diaries. In these diaries they would be

encouraged list all the factors influencing their daily dietary and physical activity behaviours. The patients would be required to suggest their own solution to barriers and encouraged to take advantage of the facilitating factors. This can be done on a series of visits for regularly enrolled Type II diabetics.

Perceived knowledge: Emphasis should be put on improving the patients' factual knowledge about healthy eating and use of physical activity in managing Type II diabetes. Some knowledge sessions would be organized for significant others. The researcher believe that if the knowledge of significant others is enhanced then they are more likely to positively motivate the patients to adopt healthy eating and engage in adequate physical activity. **Perceived susceptibility/perceived severity/received benefits and cues to action:** These factors would be incorporated by designing audio-visual materials with strong communication messages. The pictures and content of the materials should emphasize on how susceptible the patients' would be or how severe the conditions could be if they fail to adopt healthy eating and get involved in physical activity. In addition, posters or videos would be used to display success stories of patients who have consistently followed healthy dietary and physical activity recommendations. **Intention**: This concept would be used to help patients' set their own goals on how much they could reduce the intake of high calorie food while increasing consumption of fruits and vegetables as well as natural foods. The patients will also be encouraged to commit in writing the level of weekly physical activity they intend to achieve. The educators should follow up on these patients during regular visits.

Action plan: In this case the curriculum manual will emphasize to the educators the need to encourage patients to keep a written plan on when to eat appropriately or get involved in enough physical activity, how to selects the foods or physical activities, where to eat or get involved in physical activity. **Action control:** This will put emphasis on the need for the patients to self monitor their daily dietary intake and physical activity, making sure that they carefully choose what is recommended. It will also encourage patients to do their own assessment of the weekly achievements based on guidelines provided by the health educators. Follow ups would be necessary during the next visits. **Maintenance self efficacy:** Patients will be encourage to keep following recommended diet and engaging in adequate physical activity even when positive outcomes are not forth coming, or when they are in the company of peers and relatives or when they have limited time. Follow ups would be necessary for this factor to be properly implemented.

However, the implementation of this model would require more resources in terms of manpower, serious commitment of health professionals and patients, active consultation with experts including designers and teachers, community support and proper record keeping. The researcher recommends volunteerism concept for this process to be executed. Youths in colleges and fresh graduates in health and other relevant disciplines would be very much willing to be involved in the programme as lay interventionist as this would help them develop good experience for their future career enhancement.

6.2.2 Recommendation to Researchers

1. This study has revealed that alternative models to the original Theory of Planned Behaviour could be specified and fitted using data obtained from Type II diabetics. However, the magnitude of influence of demographic, cultural and economic factors on the relationships among intrinsic psychosocial patients' related factors specifically for this population is not yet clear. Although our approach attempted to lump together the overall influence of these factors by constraining the dependent latent variables, knowing the contribution of each factor could be a significant scholarly contribution.
2. This study could be used by interested scholars as a reference material for gathering more information among patients with specialized disease conditions. The study can be replicated among Type II diabetics in a different setting using the same methodology. The study methodology can also be adopted for other chronic diseases including hypertension, breast cancer, colon cancers, HIV and Aids just to mention but a few.
3. This study did not exhaust all possible mediators and moderators and only selected a few concepts to be put to test. Due to the positive results, additional and alternative intrinsic patient related factors should be included in the traditional Theory of Planned Behaviour to further generate new models. This will ensure no important factor is left out in behaviour change interventions and where possible traditional theories should be merged.
4. This study has generated a useful model that is practical and can be adopted; however, scholarly contribution would be made if another a randomized control study is designed to test the effectiveness of this model as an intervention tool. This would require power analysis for effective assessment.

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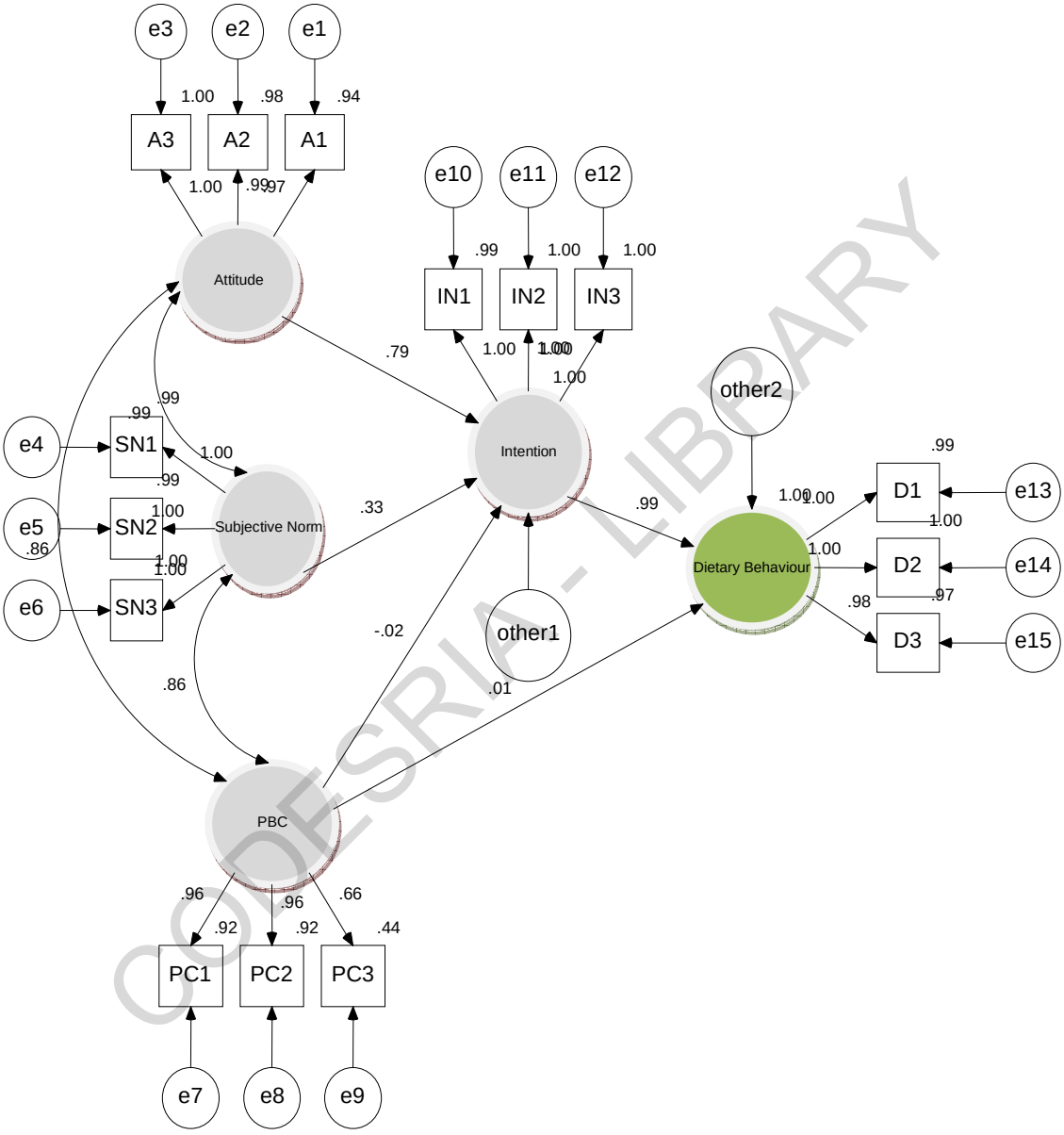
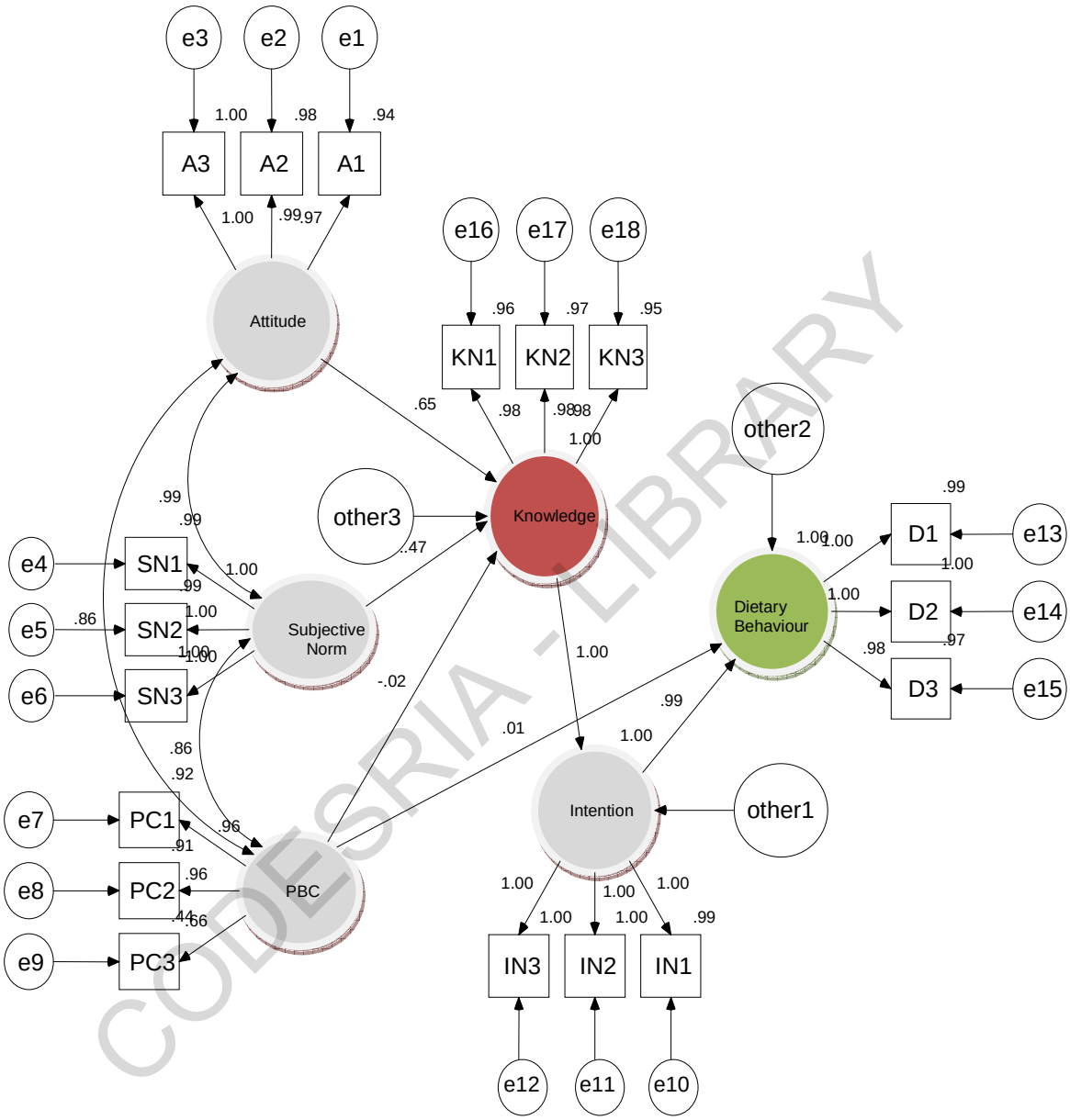
APPENDICES

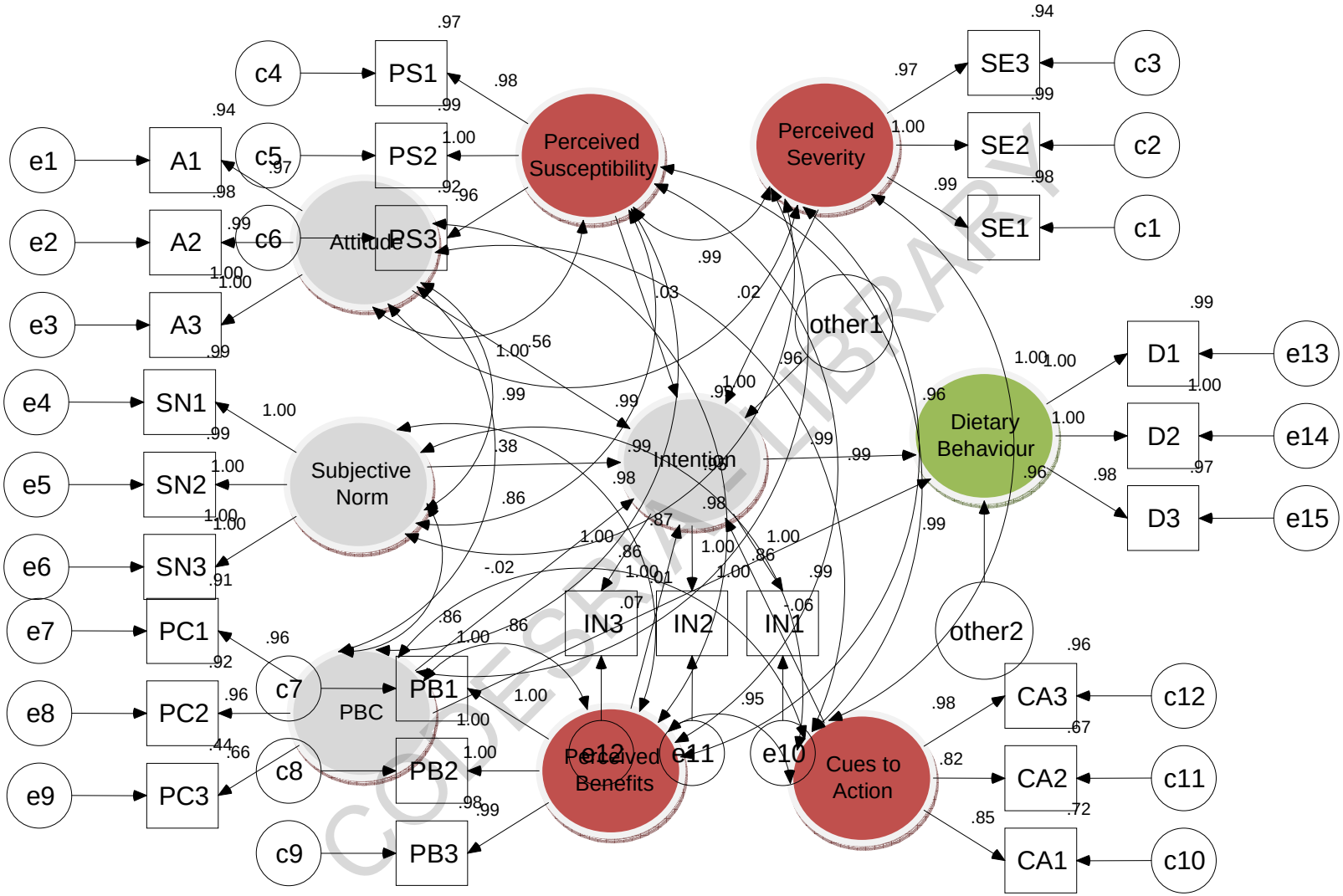
Appendix 1: Models



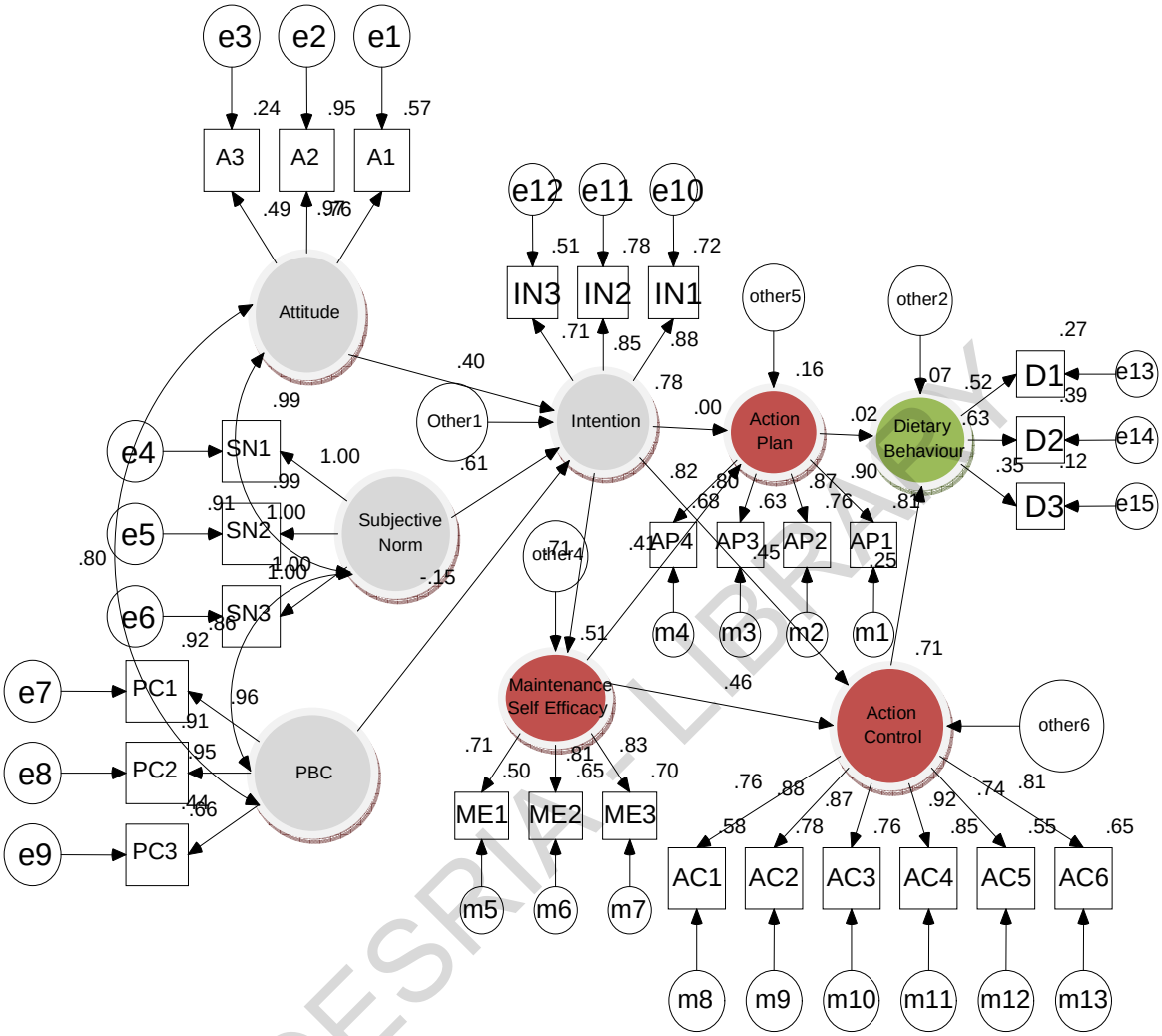
Appendix 1.1 Theory of Planned Behaviour measurement model applied to dietary practice (Model A)



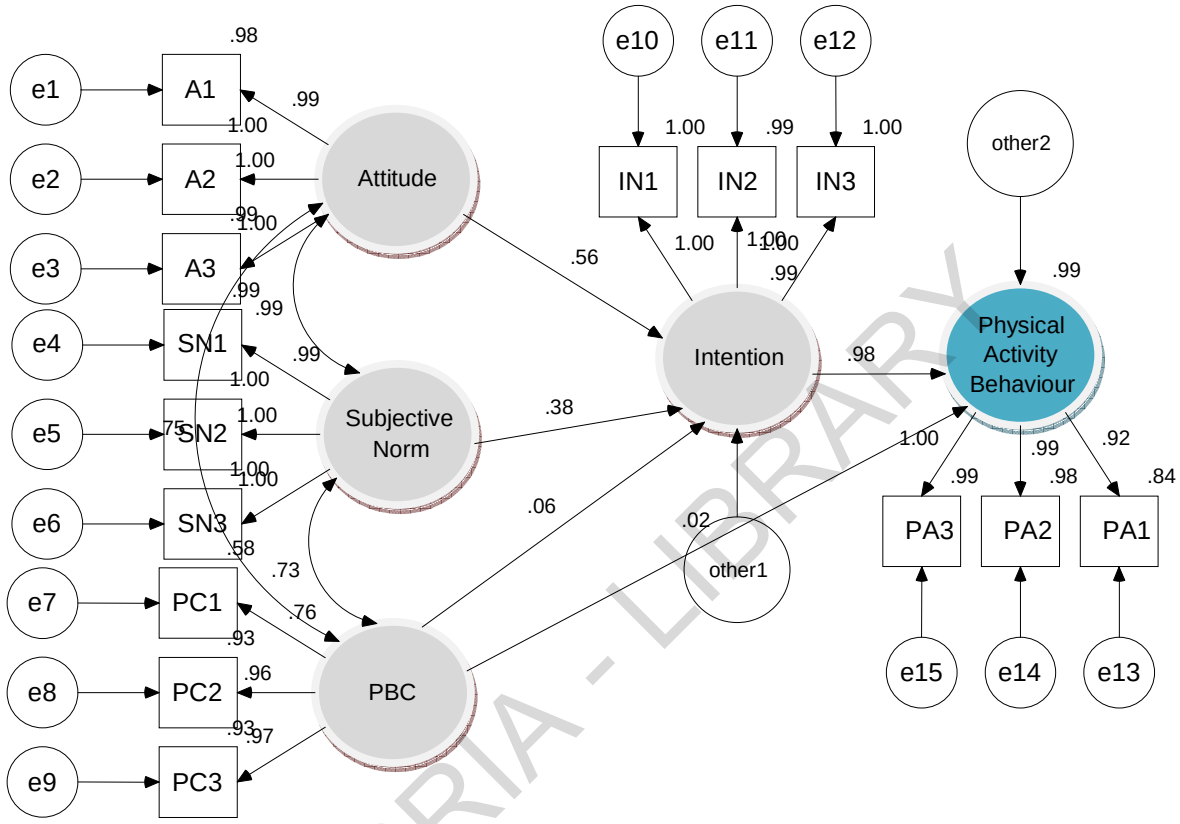
Appendix 1.2 Planned behaviour knowledge measurement model applied to dietary practice (Model 1A)



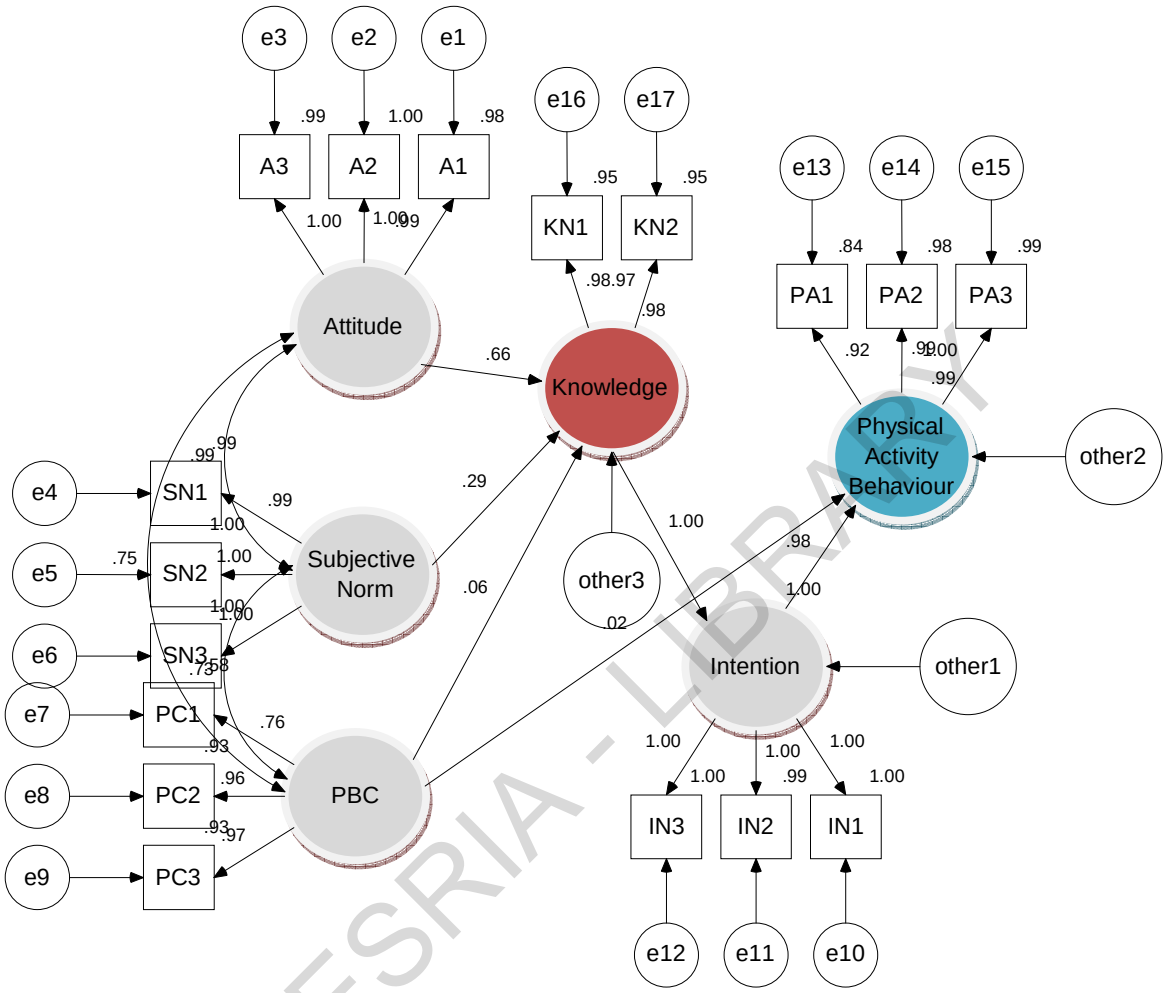
Appendix 1.3 Planned behaviour health belief measurement model applied to dietary practice (Model 2A)



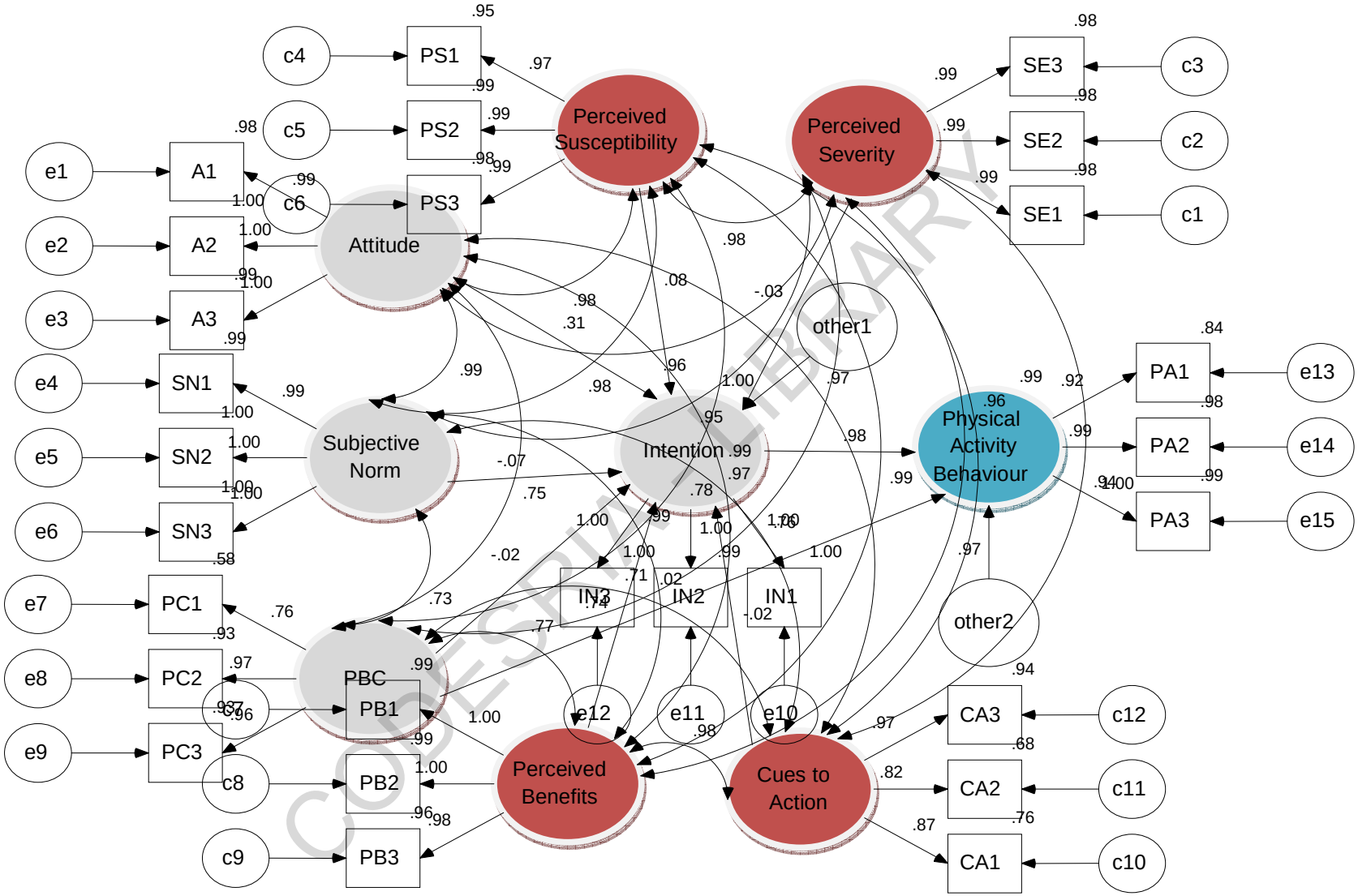
Appendix 1.4 Planned behaviour maintenance and control measurement model applied to dietary practice (Model 3A)



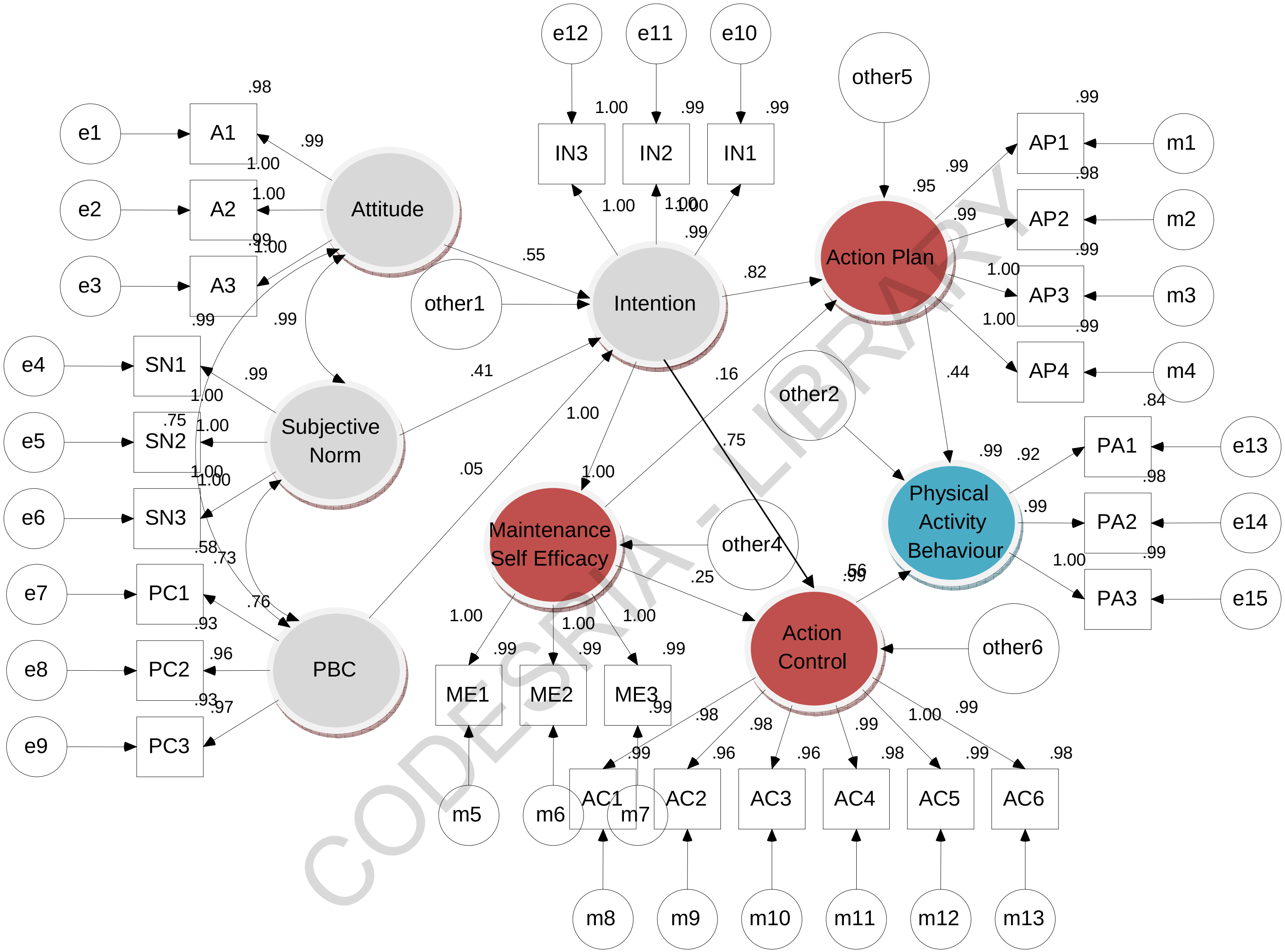
Appendix 1.5 Theory of Planned Behaviour measurement model applied to physical activity behaviour (Model B)



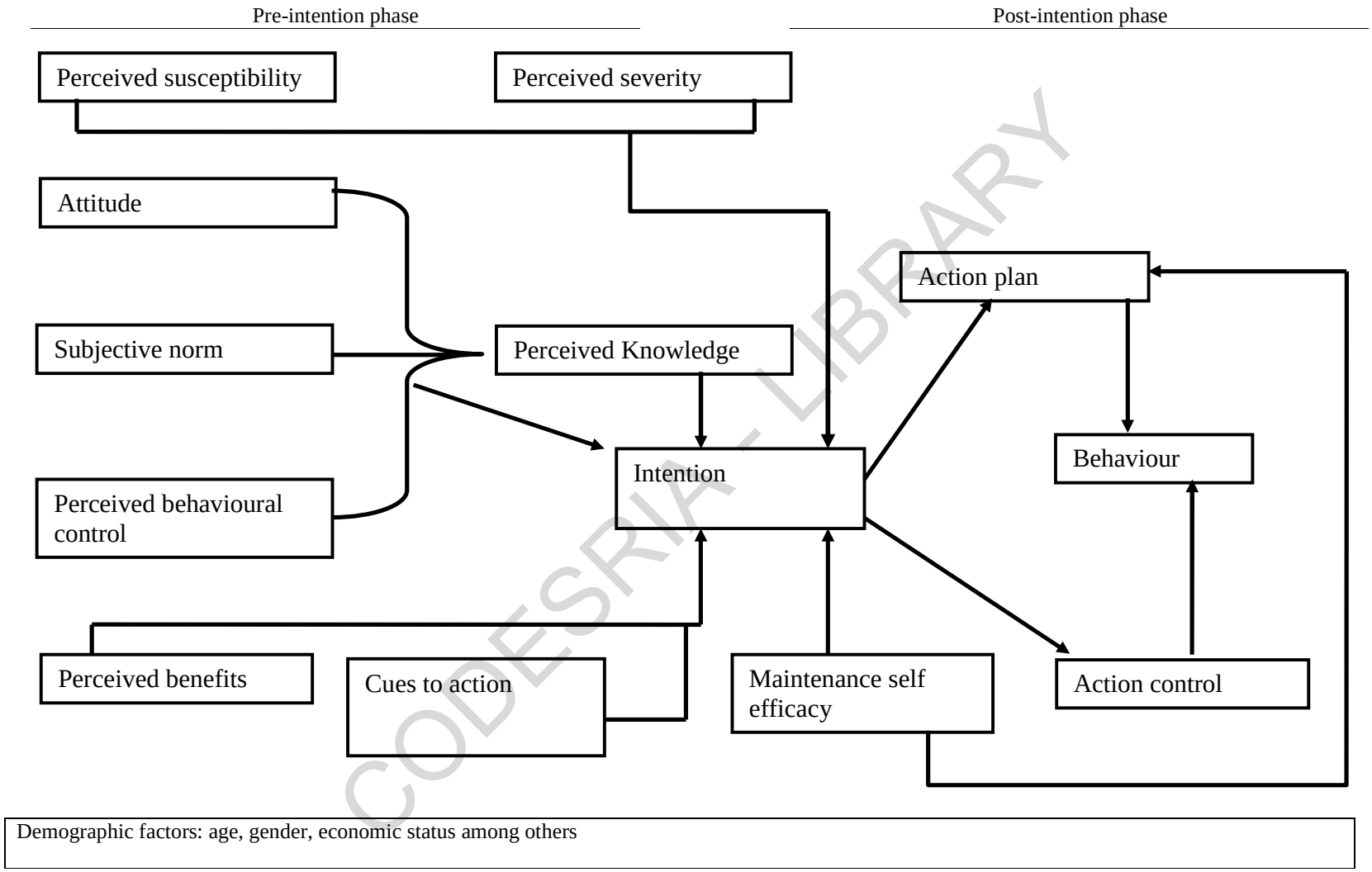
Appendix 1.6 Planned behaviour knowledge measurement model applied to physical activity behaviour (Model 1B)



Appendix 1.7 Planned behaviour health belief measurement model applied to physical activity behaviour (Model 2B)



Appendix 1.8 Planned behaviour maintenance and control measurement model applied to physical activity behaviour (Model 3B)



Appendix 1.9 Mental Health Tailored Communication Model (Omondi, 2010)

Appendix 2: Dietary Practice Questionnaire

Appendix 2.1 Dietary Behaviour Measures

How often (number of times in a week) do you consume food items such as red meat (beef, mutton, goat meat), fried potatoes, ghee, fried chicken, sausages.

Number of times in a week (circle correct answer)

0 1 2 3 4 5 6 7

How often (number of times in a week) do you consume food items such as sweets, sweet non-alcoholic beverages (sodas) and tea with sugar.

Number of times in a week (circle correct answer)

0 1 2 3 4 5 6 7

How often (number of times in a week) do you consume fruits, vegetables, fish and *Omena*, poultry without skin, whole wheat flour, maize flour and unpolished rice grain.

Number of times in a week (circle correct answer)

0 1 2 3 4 5 6 7

Appendix 2.2 Salient Belief Measures for Attitude towards Dietary Practice

Attitude-1 salient belief measures

Consumption of food items rich in fat such as red fatty meat, fried potatoes among others when diabetic *makes you go into a comma*.

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Consumption of food items rich in fat such as red fatty meat, fried potatoes among others when diabetic *makes sugar level go higher than normal range.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Consumption of food items rich in fat such as red fatty meat, fried potatoes among others when diabetic *leads to quick loss of life.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Consumption of food items rich in fat such as red fatty meat, fried potatoes among others when diabetic *makes you vomit.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Consumption of food items rich in fat such as red fatty meat, fried potatoes among others when diabetic *speeds up complications related to your condition.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Attitude-2 salient belief measures

Consumption of food items such as sweets, sweet non-alcoholic beverages (sodas) and tea with sugar when diabetic *makes sugar levels go higher than normal range.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Consumption of food items such as sweets, sweet non-alcoholic beverages (sodas) and tea with sugar when diabetic *makes you use a lot of money in medical bills*.

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Consumption of food items such as sweets, sweet non-alcoholic beverages (sodas) and tea with sugar when diabetic *leads to fatigue.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Consumption of food items such as sweets, sweet non-alcoholic beverages (sodas) and tea with sugar when diabetic *makes you become overweight.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Consumption of food items such as sweets, sweet non-alcoholic beverages (sodas) and tea with sugar when diabetic *leads to quick loss of life.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Attitude-3 salient belief measures

Consumption of fruits and vegetables, fish, poultry without skin, whole wheat flour, maize flour and unpolished rice grain when diabetic *maintains sugar levels within normal range.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Consumption of fruits and vegetables, fish, poultry without skin, whole wheat flour, maize flour and unpolished rice grain when diabetic *prolongs life.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Consumption of fruits and vegetables, fish, poultry without skin, whole wheat flour, maize flour and unpolished rice grain when diabetic *reduces frequency of hospital visits.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Consumption of fruits and vegetables, fish, poultry without skin, whole wheat flour, maize flour and unpolished rice grain when diabetic *improves your health condition.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Consumption of fruits and vegetables, fish, poultry without skin, whole wheat flour, maize flour and unpolished rice grain when diabetic *increases your strength.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Appendix 2.3 Evaluation Measures for Attitude towards Dietary Practice

Going into a comma is						
Extremely good						extremely bad
1	2	3	4	5	6	7
For me make sugar level go higher than normal range is						
Extremely good						extremely bad
1	2	3	4	5	6	7
For me quick loss of life is						
Extremely good						extremely bad
1	2	3	4	5	6	7
For me vomiting is						
Extremely good						extremely bad
1	2	3	4	5	6	7
Increased spending on medical bills is						
Extremely good						extremely bad
1	2	3	4	5	6	7
For me being fatigued is						
Extremely good						extremely bad
1	2	3	4	5	6	7
Increased complications related to diabetes is						
Extremely good						extremely bad
1	2	3	4	5	6	7
For me being overweight is						
Extremely good						extremely bad
1	2	3	4	5	6	7
Maintained sugar level is						
Extremely bad						extremely good
1	2	3	4	5	6	7
Prolonged life is						
Extremely bad						extremely good
1	2	3	4	5	6	7
Reduced frequency of hospital visit is						
Extremely bad						extremely good
1	2	3	4	5	6	7
Improved health condition is						
Extremely bad						extremely good
1	2	3	4	5	6	7
Improved strength is						
Extremely bad						extremely good
1	2	3	4	5	6	7

Appendix 2.4 Normative Belief Measures for Subjective Norm in Relation to Dietary Practice

Subjective Norm-1 normative belief measures

My doctor/nurse/nutritionist think that
I should I should not
1 2 3 4 5 6 7
consume of food items rich in fat such as red fatty meat, fried potatoes among others when diabetic.

My spouse think that
I should I should not
1 2 3 4 5 6 7
consume of food items rich in fat such as red fatty meat, fried potatoes among others when diabetic.

My bother/sister think that
I should I should not
1 2 3 4 5 6 7
consume of food items rich in fat such as red fatty meat, fried potatoes among others when diabetic.

My friend think that
I should I should not
1 2 3 4 5 6 7
consume of food items rich in fat such as red fatty meat, fried potatoes among others when diabetic.

My children think that
I should I should not
1 2 3 4 5 6 7
consume of food items rich in fat such as red fatty meat, fried potatoes among others when diabetic.

My neighbour think that
I should I should not
1 2 3 4 5 6 7
consume of food items rich in fat such as red fatty meat, fried potatoes among others when diabetic.

Subjective Norm-2 normative belief measures

My doctor/nurse/nutritionist think that
I should I should not
1 2 3 4 5 6 7
Consume of food items such as sweets, sweet non-alcoholic beverages (sodas) and tea with sugar when diabetic.

My spouse think that
I should I should not
1 2 3 4 5 6 7
consume of food items such as sweets, sweet non-alcoholic beverages (sodas) and tea with sugar when diabetic.

My brother/sister think that
I should I should not
1 2 3 4 5 6 7
consume of food items such as sweets, sweet non-alcoholic beverages (sodas) and tea with sugar when diabetic.

My friend think that
I should I should not
1 2 3 4 5 6 7
consume of food items such as sweets, sweet non-alcoholic beverages (sodas) and tea with sugar when diabetic.

My children think that
I should I should not
1 2 3 4 5 6 7
consume of food items such as sweets, sweet non-alcoholic beverages (sodas) and tea with sugar when diabetic.

My neighbour think that
I should I should not
1 2 3 4 5 6 7
consume of food items such as sweets, sweet non-alcoholic beverages (sodas) and tea with sugar when diabetic.

Subjective Norm-3 normative belief measures

My doctor/nurse/nutritionist think that
I should I should not
1 2 3 4 5 6 7
consume of fruits and vegetables, fish, poultry without skin, whole wheat flour, maize flour and unpolished rice grain when diabetic.
My spouse think that
I should I should not
1 2 3 4 5 6 7
consume of fruits and vegetables, fish, poultry without skin, whole wheat flour, maize flour and unpolished rice grain when diabetic.

My brother/sister think that
I should I should not
1 2 3 4 5 6 7
consume of fruits and vegetables, fish, poultry without skin, whole wheat flour, maize flour and unpolished rice grain when diabetic.
My friend think that
I should I should not
1 2 3 4 5 6 7
consume of fruits and vegetables, fish, poultry without skin, whole wheat flour, maize flour and unpolished rice grain when diabetic.
My children think that
I should I should not
1 2 3 4 5 6 7
consume of fruits and vegetables, fish, poultry without skin, whole wheat flour, maize flour and unpolished rice grain when diabetic.

My neighbour think that
I should I should not
1 2 3 4 5 6 7
consume of fruits and vegetables, fish, poultry without skin, whole wheat flour, maize flour and unpolished rice grain when diabetic.

Appendix 2.5 Motivation to Comply Measures in Relation to Dietary Practice

Generally speaking how much do you care what the doctor/nurse/nutritionist think you should eat?

Not at all						very much
1	2	3	4	5	6	7

Generally speaking how much do you care what your spouse think you should eat?

Not at all						very much
1	2	3	4	5	6	7

Generally speaking how much do you care what your friend think you should eat?

Not at all						very much
1	2	3	4	5	6	7

Generally speaking how much do you care what your brother/sister think you should eat?

Not at all						very much
1	2	3	4	5	6	7

Generally speaking how much do you care what your child think you should eat?

Not at all						very much
1	2	3	4	5	6	7

Generally speaking how much do you care what your neighbour think you should eat?

Not at all						very much
1	2	3	4	5	6	7

Appendix 2.6 Control Belief Measures for Perceived Behavioural Control In Relation to Dietary Practice

How often do you encounter factors that prevent you from reducing consumption of food items rich in fat such as red meat, fried potatoes among others?

Very rarely						Very frequently
1	2	3	4	5	6	7

How often do you encounter factors that prevent you from reducing consumption of food items with high sugar content such as sweets, sweet non-alcoholic beverages (sodas), among others?

Very rarely						Very frequently
1	2	3	4	5	6	7

How often do you encounter factors that prevent you from increasing consumption of plenty of fruits and vegetables, fish, poultry without skin, whole wheat flour, maize flour and unpolished rice grain?

Very rarely						Very frequently
1	2	3	4	5	6	7

Appendix 2.7 Control Power Measures for Perceived Behavioural Control in Relation to Dietary Practice

To what extent do you control factors that prevent you from reducing consumption of food items rich in fat such as red meat, fried potatoes among others?

Not at all very much

1 2 3 4 5 6 7

To what extent do you control factors that prevent you from reducing consumption of food items with high sugar content such as sweets, sweet non-alcoholic beverages (sodas), among others?

Not at all very much

1 2 3 4 5 6 7

To what extent do you control factors that prevent you from increasing consumption of plenty of fruits and vegetables, fish, poultry without skin, whole wheat flour, maize flour and unpolished rice grain?

Not at all very much

1 2 3 4 5 6 7

Appendix 2.8 Health Belief Concept Measures in Relation to Dietary Practice

Perceived susceptibility measures

Failure to reduce intake of diet rich in fats increases the chances of experiencing elevated blood sugar levels (hyperglycemia), blurred vision and loss of strength.

Totally disagree Totally agree

1 2 3 4 5 6 7

Failure to reduce intake of foods with high sugar content increases the chances of experiencing elevated blood sugar levels (hyperglycemia), blurred vision and loss of strength.

Totally disagree Totally agree

1 2 3 4 5 6 7

Failure to increase intake of fruits and vegetables increases your chances of experiencing elevated blood sugar levels (hyperglycemia), blurred vision and loss of strength.

Totally disagree Totally agree

1 2 3 4 5 6 7

Perceived severity measures

If I don't reduce intake of diet rich in fats I risk being amputated, going into a comma and suffering from skin irritation.

Totally disagree Totally agree

1 2 3 4 5 6 7

If I don't reduce intake of foods with high sugar content I risk being amputated, going into a comma and suffering from skin irritation.

Totally disagree Totally agree

1 2 3 4 5 6 7

If I don't increase intake of fruits and vegetables I risk being amputated, going into a comma and suffering from skin irritation.

Totally disagree Totally agree
1 2 3 4 5 6 7

Perceived benefit measures

Adhering to the recommended diet consistently maintains blood sugar level within normal range.

Totally disagree Totally agree
1 2 3 4 5 6 7

If I follow the recommended diet strictly I will be strong and able to work productively.

Totally disagree Totally agree
1 2 3 4 5 6 7

If I follow the recommended diet strictly I will avoid complications associated with elevated blood sugar such as blurred vision and amputation.

Totally disagree Totally agree
1 2 3 4 5 6 7

Cues to action measures

There are enough reading materials (booklets, magazine among others) explaining the relationship between diet and Type II diabetes in this clinic.

Totally disagree Totally agree
1 2 3 4 5 6 7

There are enough visual materials (posters, television among others) put strategically to educate diabetic patients on which foods to eat and which ones to avoid.

Totally disagree Totally agree
1 2 3 4 5 6 7

The clinic periodically organizes diabetic education day where patients are taught about which foods they should take and which ones they need to avoid.

Totally disagree Totally agree
1 2 3 4 5 6 7

Appendix 2.9 Dietary Knowledge Measures

Knowledge 1: Fat intake

Statement	True	False	Answer
Reducing fat intake lowers the chances of developing Type II diabetes by half	T	F	T
Plant proteins such as peas, nuts, beans, green gram, are the sources of dangerous fats	T	F	F
People who are diabetic are not suppose to consume fats at all	T	F	F
In order to reduce fat intake when diabetic it is advisable to consume more beef and less fish.	T	F	F
People who are extremely fat have equal risk to diabetes as those who are normal in weight	T	F	T
Total Score			5

Knowledge 1: Sugar intake

Statement	True	False	Answer
Individuals who are diabetic should take sugar just like normal people	T	F	F
Complex sugars (e.g. starch) are good for diabetic people compared to simple sugars (e.g. glucose).	T	F	T
A diabetic individual should not take any amount of sugar at all times	T	F	F
Sugar is the main cause of Type II diabetes	T	F	F
It is preferable for diabetes individuals to consume fruit sugar rather than table sugar	T	F	T
Total Score			5

Knowledge 3: Recommended diet intake

Statement	True	False	Answer
People who are diabetic should eat more than three meals a day in small quantities	T	F	T
White bread is preferable to brown bread in diabetic management.	T	F	F
Consumption of fruits and vegetable daily is not good for your condition	T	F	F
A diabetic person should consider eating more beef and goat meat than eating more beans and peas	T	F	F
A diabetic person should not take sugar at all times	T	F	F
Total Score			5

Appendix 2.10 Dietary Intention Measures

Intend to reduce the intake of foods including red meat, fried potatoes among others by half.

Not at all						very much
1	2	3	4	5	6	7

I intend to reduce the intake of plenty of food items with such as sweets, sweet non-alcoholic beverages (sodas), among others by half.

Not at all						very much
1	2	3	4	5	6	7

I intend to Increase the consumption of fruits and vegetables, fish, poultry without skin, whole wheat flour, maize flour and unpolished rice grain by half.

Not at all						very much
1	2	3	4	5	6	7

Appendix 2.11 Post-Intention Mediator Measures in Relation to Dietary Practice

Action plan measures

I have made a detailed plan on when to eat the recommended meals.

Totally disagree					Totally agree	
1	2	3	4	5	6	7

I have made a detailed plan on where to eat the meals.

Totally disagree					Totally agree	
1	2	3	4	5	6	7

I have made a detailed plan on how to select the meals.

Totally disagree					Totally agree	
1	2	3	4	5	6	7

I have made a detailed plan on how often to consume the meals.

Totally disagree					Totally agree	
1	2	3	4	5	6	7

Action control measures

During the last four weeks, I have constantly monitored myself whether I consume the recommended diet frequently.

Totally disagree					Totally agree	
1	2	3	4	5	6	7

During the last four weeks, I have watched carefully that I did eat the diet as recommended by the health care provider.

Totally disagree					Totally agree	
1	2	3	4	5	6	7

During the last four weeks, I have had my recommended diet intention often in mind.

Totally disagree					Totally agree	
1	2	3	4	5	6	7

During the last four weeks, I have always been aware of my recommended diet.

Totally disagree						Totally agree
1	2	3	4	5	6	7

During the last four weeks, I have really tried to consume recommended diet regularly.

Totally disagree						Totally agree
1	2	3	4	5	6	7

During the last four weeks, I have tried my best to eat in accordance to my recommended guidelines.

Totally disagree						Totally agree
1	2	3	4	5	6	7

Maintenance self efficacy measures

I am confident to stay on recommended diet regularly on a long-term basis even if I cannot see any positive changes immediately.

Totally disagree						Totally agree
1	2	3	4	5	6	7

I am confident to stay on recommended diet regularly on a long-term basis even if I am together with friends and relatives who are not following the same diet.

Totally disagree						Totally agree
1	2	3	4	5	6	7

I am confident to stay on the recommended diet regularly on a long-term basis even if the foods are limited and expensive to acquire.

Totally disagree						Totally agree
1	2	3	4	5	6	7

Appendix 3: Physical Activity Questionnaire

Appendix 3.1 Physical Activity Behaviour Measures

How often (number of times in a week) do you engage in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week.

Number of times in a week (circle correct answer)

0 1 2 3 4 5 6 7

How often (number of times in a week) do you engage in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week.

Number of times in a week (circle correct answer)

0 1 2 3 4 5 6 7

How often (number of times in a week) do you sit down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week.

Number of times in a week (circle correct answer)

0 1 2 3 4 5 6 7

Appendix 3.2 Salient Belief Measures for Attitude towards Physical Activity

Attitude-1 salient belief measures

Sitting down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week *raises blood sugar level.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Sitting down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week *interfere with blood flow.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Sitting down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week *increases accumulation of fluids in the body.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Sitting down watching television, sleeping, talking to friends, and receiving money in a shop for a whole day among others in a week *reduces physical fitness.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Sitting down watching television, sleeping, talking to friends, and receiving money in a shop for a whole day among others in a week *makes you become overweight.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Attitude-2 salient belief measures

Engaging in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week *lowers blood sugar level.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Engaging in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week *maintains blood flow.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Engaging in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week *improves physical fitness.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Engaging in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week *reduces weight.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Engaging in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week *prevents accumulation of fluids in the body.*

Attitude-3 salient belief measures

Engaging in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week *lowers blood sugar level.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Engaging in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week *maintains blood flow*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Engaging in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week *improves physical fitness.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Engaging in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week *reduces weight.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Engaging in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week *prevents accumulation of fluids in the body.*

Extremely unlikely extremely likely

1 2 3 4 5 6 7

Appendix 3.3 Evaluation Measures for Attitude towards Physical Activity

For me raised blood sugar level is
Extremely good extremely bad
1 2 3 4 5 6 7

For me blood flow interference is
Extremely good extremely bad
1 2 3 4 5 6 7

For me accumulation of fluids in the body is
Extremely good extremely bad
1 2 3 4 5 6 7

For me reduced physical fitness is
Extremely good extremely bad
1 2 3 4 5 6 7

For me overweight is
Extremely good extremely bad

Appendix 3.4 Normative Belief Measures for Subjective Norm in Relation to Physical Activity Behaviour

Subjective Norm-1 normative belief measures

My doctor/nurse/nutritionist think that
I should I should not
1 2 3 4 5 6 7
sit down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week

My spouse think that
I should I should not
1 2 3 4 5 6 7
sit down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week.

My bother/sister think that
I should I should not
1 2 3 4 5 6 7
sit down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week.

My friend think that
I should I should not
1 2 3 4 5 6 7
sit down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week.

My children think that
I should I should not
1 2 3 4 5 6 7
sit down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among

others in a week

My neighbour think that
I should I should not
1 2 3 4 5 6 7
sit down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week

Subjective Norm-2 normative belief measures

My doctor/nurse/nutritionist think that
I should I should not
1 2 3 4 5 6 7
engage in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others.

My spouse think that
I should I should not
1 2 3 4 5 6 7
engage in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others.

My brother/sister think that
I should I should not
1 2 3 4 5 6 7
engage in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others.

My friend think that
I should I should not
1 2 3 4 5 6 7
engage in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others.

My children think that
I should I should not
1 2 3 4 5 6 7
engage in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others.

My neighbour think that
I should I should not
1 2 3 4 5 6 7
engage in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others.

Subjective Norm-3 normative belief measures

My doctor/nurse/nutritionist think that
I should I should not
1 2 3 4 5 6 7
engage in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week

My spouse think that

I should I should not
1 2 3 4 5 6 7
engage in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week.

My brother/sister think that
I should I should not
1 2 3 4 5 6 7
engage in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week.
.
My friend think that
I should I should not
1 2 3 4 5 6 7
engage in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week.
.
My children think that
I should I should not
1 2 3 4 5 6 7
engage in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week.
.

My neighbour think that
I should I should not
1 2 3 4 5 6 7
engage in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week.

Appendix 3.5 Motivation to Comply Measures In Relation to Physical Activity Behaviour

Generally speaking how much do you care what kinds of physical activity the doctor/nurse/nutritionist think you should/should not engage?
Not at all very much
1 2 3 4 5 6 7

Generally speaking how much do you care what kinds of physical activity your spouse think you should/should not engage?
Not at all very much
1 2 3 4 5 6 7

Generally speaking how much do you care what kinds of physical activity your friend think you should/should not engage?
Not at all very much
1 2 3 4 5 6 7

Generally speaking how much do you care what kinds of physical activity your brother/sister think you should/should not engage?
Not at all very much
1 2 3 4 5 6 7

Generally speaking how much do you care what kinds of physical activity your child think you should/should

not engage?
Not at all very much
1 2 3 4 5 6 7

Generally speaking how much do you care what kinds of physical activity your neighbour think you should/should not engage?
Not at all very much
1 2 3 4 5 6 7

Appendix 3.6 Control Belief Measures For Perceived Behavioural Control In Relation To Physical Activity

How often do you encounter factors that prevent you from reducing time spend sitting down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week.?
Very rarely Very frequently
1 2 3 4 5 6 7

How often do you encounter factors that prevent you from engaging in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week?
Very rarely Very frequently
1 2 3 4 5 6 7

How often do you encounter factors that prevent you from engaging in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week?
Very rarely Very frequently
1 2 3 4 5 6 7

Appendix 3.7 Control Power Measures for Perceived Behavioural Control in Relation to Dietary Practice

To what extent do you control factors that prevent you from reducing time spend sitting down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week.?
Not at all very much
1 2 3 4 5 6 7

To what extent do you control factors that prevent you from engaging in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week?
Not at all very much
1 2 3 4 5 6 7

To what extent do you control factors that prevent you from engaging in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week?
Not at all very much
1 2 3 4 5 6 7

Appendix 3.8 Health Belief Concept Measures in Relation to Physical Activity

Perceived susceptibility measures

Failure to engage in moderate activities for at least 30 minutes daily and consistently increases the chances of experiencing elevated blood sugar levels (hyperglycemia), blurred vision and loss of strength.

Totally disagree						Totally agree
1	2	3	4	5	6	7

Failure to engage in walking for at least 60 minutes daily and consistently increases your chances of experiencing elevated blood sugar levels (hyperglycemia), blurred vision and loss of strength.

Totally disagree						Totally agree
1	2	3	4	5	6	7

Spending a whole day sitting while reading/talking to friends/watching television among others increases your chances of experiencing elevated blood sugar levels (hyperglycemia), blurred vision and loss of strength.

Totally disagree						Totally agree
1	2	3	4	5	6	7

Perceived severity measures

If I don't engage in moderate activities for at least 30 minutes daily and consistently I risk being amputated, going into a comma and suffering from skin irritation.

Totally disagree						Totally agree
1	2	3	4	5	6	7

If I don't engage in walking for at least 60 minutes daily and consistently I risk being amputated, going into a comma and suffering from skin irritation.

Totally disagree						Totally agree
1	2	3	4	5	6	7

If I spend a whole day sitting while reading/talking to friends/watching television among others throughout the week I risk being amputated, going into a comma and suffering from skin irritation.

Totally disagree						Totally agree
1	2	3	4	5	6	7

Perceived benefit measures

Engaging in adequate physical activity maintains blood sugar level within normal range.

Totally disagree						Totally agree
1	2	3	4	5	6	7

If I engage in adequate physical activity consistently I will be strong and able to work productively.

Totally disagree						Totally agree
1	2	3	4	5	6	7

If I engage in adequate physical activity consistently I will avoid complications associated with elevated blood sugar such as blurred vision and amputation

Totally disagree						Totally agree
1	2	3	4	5	6	7

Cues to action measures

There are enough reading materials (booklets, magazine among others) explaining the relationship between physical activity and Type II diabetes in this clinic

Totally disagree						Totally agree
1	2	3	4	5	6	7

There are enough visual materials (posters, television among others) put strategically to educate diabetic patients on type and intensity of physical activities to be involved.

Totally disagree						Totally agree
1	2	3	4	5	6	7

The clinic periodically organizes diabetic education day where patients are taught about which physical activities to be involved and which ones to avoid.

Totally disagree						Totally agree
1	2	3	4	5	6	7

Appendix 3.9 Physical Activity Knowledge Measures

Knowledge-1: Light-High level physical activity

Statement	True	False	Answer
Doing heavy activity for at least 20 minutes a day for 3 days a week is adequate for diabetes management but not recommended	T	F	T
Moderate physical activity should be done for at least 20 minutes a day for three of more days a week to manage diabetes effectively	T	F	F
Physical activity is only meant for diabetic persons who are overweight	T	F	F
Domestic works such as gardening, washing and cooking are not examples of physical effective a diabetic person should be involved	T	F	F
Walking for at least 60 minutes a day for three or more days a week lowers the risks associated with diabetes	T	F	T
Total Score			5

Knowledge-2: Sedentary lifestyle

Statement	True	False	Answer
Washing/cooking while sited down every day is example of sedentary lifestyle.	T	F	T
A diabetic person is not supposed to sit down watching TV or listening to radio	T	F	F
Leading sedentary life decreases the risks associated with diabetes	T	F	F
Only those who do not consistently get involved in high level physical activity are normally overweight	T	F	F
Sedentary lifestyle is only recommended for diabetic persons who have reached the final stage of the condition	T	F	F
Total Score			5

Appendix 3.10 Physical Activity Intention Measures

I intend to Increase/maintain my level of participating in moderate physical activity including jogging, digging to/at 30minutes or more daily by half in the next one month.

Not at all very much

1 2 3 4 5 6 7

I intend to Increase/maintain light activities including daily walking, washing, cooking among others to/at 60minutes daily by half in the next one month.

Not at all very much

1 2 3 4 5 6 7

I intend to decrease time spend watching television, sleeping, talking to friends, receiving money in a shop for a whole day by half in the next one month.

Not at all very much

1 2 3 4 5 6 7

Appendix 3.11 Post-Intention Mediator Measures in Relation to Physical Activity Practice

Action plan measures

I have made a detailed plan on when to when to engage in adequate physical activity.

Totally disagree Totally agree

1 2 3 4 5 6 7

I have made a detailed plan on where to engage in adequate physical activity.

Totally disagree Totally agree

1 2 3 4 5 6 7

I have made a detailed plan on how to select the type of physical activity.

Totally disagree Totally agree

1 2 3 4 5 6 7

I have made a detailed plan on how often to engage in adequate physical activity.

Totally disagree Totally agree

1 2 3 4 5 6 7

Action control measures

During the last four weeks, I have constantly monitored myself whether I participate in adequate physical activity frequently.

Totally disagree Totally agree

1 2 3 4 5 6 7

During the last four weeks, I have watched carefully that I did participate in physical activity as recommended by the health care provider.

Totally disagree Totally agree

1 2 3 4 5 6 7

During the last four weeks, I have had my physical activity intention often in mind.

Totally disagree Totally agree

1 2 3 4 5 6 7

During the last four weeks, I have always been aware of my recommended physical activities.
Totally disagree Totally agree
1 2 3 4 5 6 7

During the last four weeks, I have really tried to engage in adequate physical activity regularly.
Totally disagree Totally agree
1 2 3 4 5 6 7

During the last four weeks, I have tried my best to do physical activities in accordance to my recommended guidelines
Totally disagree Totally agree
1 2 3 4 5 6 7

Maintenance self efficacy measures

I am confident to engage in adequate physical activity regularly on a long-term basis even if I cannot see any positive changes immediately.
Totally disagree Totally agree
1 2 3 4 5 6 7

I am confident to engage in adequate physical activity regularly on a long-term basis even if I am together with friends and relatives who are not performing the same physical activities.
Totally disagree Totally agree
1 2 3 4 5 6 7

I am confident to engage in adequate physical activity regularly on a long-term basis even if time is a limiting factor.
Totally disagree Totally agree
1 2 3 4 5 6 7

Appendix 4: Result Related Tables

Appendix 4.1 Reliability Test for Dietary Questionnaire

Concepts measurement	Number of items	Cronbach's alpha (pre-test, n=44)	Cronbach's alpha (main survey, n=237)
Dietary behaviour measures	3	0.312	0.387
Attitude			
Salient belief measures (Attitude-1)	5	0.664	0.748
Salient belief measures (Attitude-2)	5	0.278	0.539
Salient belief measures (Attitude-3)	5	0.647	0.704
Subjective norm			
Normative belief measures (Subjective norm-1)	6	0.896	0.822
Normative belief measures (Subjective norm-2)	6	0.842	0.874
Normative belief measures (Subjective norm-3)	6	0.837	0.820
Perceived Behavioural Control			
Control belief strength measures	3	0.718	0.723
Dietary intention	3	0.553	0.587
Pre-intention moderators			
Perceived susceptibility	3	0.508	0.514
Perceived severity	3	0.799	0.688
Perceived benefits	3	0.978	0.844
Cues to action	3	0.662	0.713
Dietary knowledge	3	0.519	0.411
Post-intention mediators			
Action plan	4	0.913	0.906
Action control	6	0.846	0.869
Maintenance self efficacy	3	0.822	0.727

Appendix 4.2 Rotated Components Matrix for Dietary Questionnaire

Scales (n=237)	Components (Factors)			
	1	2	3	4
Dietary behaviour measures				
Frequency of consuming high fat diet (Diet class-1)	.723			
Frequency of consuming high sugar diet (Diet class-2)	.785			
Frequency of consuming recommended diet (Diet class-3)	.575			
Average communalinity	0.694			
percent Variance explained	48.94			
Attitude				
Attitude-1				
Consuming class 1 foods make you go into a comma	.649			
Consuming class 1 foods makes sugar levels go higher than normal	.773			
Consuming class 1 foods leads to quick loss of life	.805			
Consuming class 1 foods leads makes you vomit	.641			
Consumer class 1 foods speeds up complications related to your condition	.725			
Average communalinity	0.719			
Percent Variance explained	52.1			
Attitude-2				
Consuming class 2 foods makes sugar level go higher than normal range	.720	-.442		
Consuming class 2 foods makes you use a lot of money in medical bills	.646	-.517		
Consuming class 2 foods leads to fatigue	.722	.112		
Consuming class 2 foods makes you become overweight	.350	.686		
Consuming class 2 foods leads to quick loss of life	.672	.493		
Average communalinity	0.622	0.066		
Percent Variance explained	40.63	23.77		
Attitude-3				
Consuming class 3 foods maintains sugar level within normal range	.745	-.395		
Consuming class 3 foods prolongs life	.818	-.380		
Consuming class 3 foods reduces frequency of hospital visit	.825	-.039		
Consuming class 3 foods improves your health condition	.604	.574		
Consuming class 3 foods increases your strength	.372	.782		
Average communalinity	0.673	0.11		
Percent Variance explained	48.17	24.85		
Subjective norm				
Subjective norm-1				

My doctor/nurse/nutritionist think that I should/should not consume class 1 foods	.545	
My spouse think that I should/should not consume class 1 foods	.680	
My brother/sister think that I should/should not consume class 1 foods	.852	
My friend think I should/should not consume class 1 foods	.812	
My children think I should/should not consume class 1 foods	.827	
My neighbour think that I should/should not consume class 1 foods	.738	
Average communalinity	0.74	
Percent Variance explained	56.24	
Subjective norm-2		
My doctor/nurse/nutritionist think that I should/should not consume class 2 foods	.716	
My spouse think that I should/should not consume class 2 foods	.739	
My brother/sister think that I should/should not consume class 2 foods	.889	
My friend think I should/should not consume class 2 foods	.840	
My children think I should/should not consume class 2 foods	.769	
My neighbour think that I should/should not consume class 2 foods	.754	
Average communalinity	0.785	
Percent Variance explained	61.93	
Subjective norm 3		
My doctor/nurse/nutritionist think that I should/should not consume class 2 foods	.510	
My spouse think that I should/should not consume class 2 foods	.641	
My brother/sister think that I should/should not consume class 2 foods	.810	
My friend think I should/should not consume class 2 foods	.832	
My children think I should/should not consume class 2 foods	.809	
My neighbour think that I should/should not consume class 2 foods	.728	
Average communalinity	0.722	
Percent Variance explained	53.44	
Perceived behavioural control		
Control belief strength		
How often do you encounter factors that prevent you from reducing consumption of class 1 foods? (PBC-1)	.944	.039
How often do you encounter factors that prevent you from reducing consumption of class 2 foods? (PBC-2)	.940	-.107
How often do you encounter factors that prevent you from increasing consumption of class 3 foods(PBC-3)	.064	.997
Average communalinity	0.65	0.31
Percent Variance explained	59.28	33.56
Pre-intention moderators		
Perceived susceptibility		
Failure to reduce intake of class 1 foods increases the chances of experiencing elevated blood sugar levels, blurred vision and loss of strength (*Perceived susceptibility-1)*	.720	
Failure to reduce intake of class 2 foods increases the chances of experiencing elevated blood sugar levels, blurred vision and loss of strength (*Perceived susceptibility-2)*	.744	
Failure to increase intake of class 3 foods increases the chances of experiencing elevated blood sugar levels, blurred vision and loss of strength (*Perceived susceptibility-3)*	.732	
Average communalinity	0.732	

Percent Variance explained	53.58
Perceived severity	
If I don't reduce intake of class 1 foods, I risk being amputated, going into a comma and suffering from skin irritation (*Perceived severity-1)*	.839
If I don't reduce intake of class 2 foods, I risk being amputated, going into a comma and suffering from skin irritation (*Perceived severity-2)*	.871
If I don't increase intake of class 3 foods, I risk being amputated, going into a comma and suffering from skin irritation (*Perceived severity-3)*	.697
Average communalinity	0.80
Percent Variance explained	64.93
Perceived benefits	
Adhering to the recommended diet consistently maintains blood sugar level within normal range	.939
If I follow the recommended diet strictly, I will be strong and able to work productively (*Perceived benefits-1)*	.927
If I follow recommended diet strictly, I will avoid complications associated with elevated blood sugar such as blurred vision and amputation (*Perceived benefits-2)*	.797
Adhering to the recommended diet consistently maintains blood sugar level within normal range (*Perceived benefits-3)*	.939
Average communalinity	0.90
Percent Variance explained	79.23
Cues to action	
There are enough reading materials (booklets, magazines among others) explaining the relationship between diet and Type II diabetes in this clinic (*Cues to action-1)*	.869
There are enough visual materials (posters, television among others) put strategically to educate diabetic patients on which foods to eat and which ones to avoid (*Cues to action-2)*	.839
The clinic periodically organizes diabetic education day where patients are taught about which foods they should take and which ones they need to avoid (*Cues to action-3)*	.669
Average communalinity	0.79
Percent Variance explained	63.54
Dietary Knowledge	
Knowledge on fat intake *(Knowledge-1)*	.572
Knowledge on sugar intake *(Knowledge-2)*	.653
Knowledge on recommended diet intake *(Knowledge-3)*	.797
Average communalinity	0.674
Percent Variance explained	46.33
Dietary intention	
I intend to reduce the intake of class1 foods by half within one month *(Intention-1)*	.768
I intend to reduce the intake of class2 foods by half within one month *(Intention-2)*	.835
I intend to increase the intake of class3 foods by half within one month *(Intention-3)*	.626
Average communalinity	0.76
Percent Variance explained	55.93
Post-intention mediators	

Action plan	
I have made a detailed plan on when to eat the recommended meals (*Action plan-1)*	.909
I have made a detailed plan on where to eat the meals (*Action plan-2)*	.893
I have made a detailed plan on how to select the meals (*Action plan-3)*	.862
I have made a detailed plan on how often to consume the meals (*Action plan-4)*	.872
Average communalinity	0.80
Percent Variance explained	78.21
Action control	
During the last four weeks, I have constantly monitored myself whether I consume the recommended diet consistently (*Action control-1)*	.730
During the last four weeks, I have watched carefully that I did take the diet as recommended by the health provider (*Action control-2)*	.858
During the last four weeks I have had my recommended diet intentions in mind (*Action control-3)*	.813
During the last four weeks, I have always been aware of my recommended diet (*Action control-4)*	.880
During the last four weeks, I have really tried to consume recommended diet regularly (*Action control-5)*	.704
During the last four weeks, I have tried my best to eat in accordance to my recommended guidelines (*Action control-6)*	.770
Average communalinity	0.79
Percent Variance explained	63.2
Maintenance self efficacy	
I am confident to stay on recommended diet regularly on a long-term basis even if I cannot see any positive changes immediately (*Self efficacy-1)*	.758
I am confident to stay on recommended diet regularly on a long-term basis even if I am together with friends and relatives who are not following the same diet (*Self efficacy-2)*	.830
I am confident to stay on recommended diet regularly on a long-term basis even if I foods are limited and expensive to acquire (*Self efficacy-3)*	.857
Average communalinity	0.82
Percent Variance explained	66.56

Appendix 4.3 Reliability Test for Indirect Measures of Attitude, Subjective Norm and Perceived Behavioural Control towards Dietary Practice

Concepts measurement	Number of items	Cronbach's alpha (pre-test, n=44)	Cronbach's alpha (main survey, n=237)
Indirect attitude	3	0.554	0.57
Indirect subjective norm	3	0.960	0.94
Perceived Behavioural Control	3	0.630	0.59

Appendix 4.4 Rotated Components Matrix for Indirect Measures Generated from Dietary Questionnaire

Scales (n=237)	Components (Factors)			
	1	2	3	4
Indirect attitude				
Attitude-1	.767			
Attitude-2	.805			
Attitude-3	.514			
Average communalinity	0.70			
Percent Variance explained	50.01			
Indirect subjective norm				
Subjective norm-1	.948			
Subjective norm-2	.943			
Subjective norm-3	.958			
Average communalinity	0.95			
Percent Variance explained	90.08			
Indirect perceived behavioural control				
Perceived behavioural control 1 (PBC-1)	.939			
Perceived behavioural control 2 (PBC-2)	.928			
Perceived behavioural control 3 (PBC-3)	.195			
Average communalinity	0.69			
Percent Variance explained	59.35			

Appendix 4.5 Reliability test for Physical Activity Questionnaire

Concepts measurement	Number of items	Cronbach's alpha (pre-test, n=44)	Cronbach's alpha (main survey, n=230)
Physical activity behaviour measures	3	0.271	0.51
Attitude			
Salient belief measures (Attitude-1)	5	0.770	0.720
Salient belief measures (Attitude-2)	5	0.669	0.660
Salient belief measures (Attitude-3)	5	0.550	0.510
Subjective norm			
Normative belief measures (Subjective norm-1)	6	0.912	0.866
Normative belief measures (Subjective norm-2)	6	0.811	0.898
Normative belief measures (Subjective norm-3)	6	0.843	0.903
Perceived Behavioural Control			
Control belief strength measures	3	0.687	0.796
Physical activity intention	3	0.735	0.670
Pre-intention moderators			
Perceived susceptibility	3	0.516	0.658
Perceived severity	3	0.725	0.895
Perceived benefits	3	0.480	0.380
Cues to action	3	0.533	0.615
Physical activity knowledge	3	0.615	.590
Post-intention mediators			
Action plan	4	0.961	0.955
Action control	6	0.763	0.859
Maintenance self efficacy	3	0.755	0.818

Appendix 4.6 Rotated Components Matrix for Physical Activity Questionnaire

Scales (n=230)	Components (Factors)		
	1	2	3
Physical activity behaviour measures			
Frequency of engaging in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week (Activity class-2).	.599		
Frequency of engaging in at least 1 hour of light physical activities such as washing, normal walking, cooking, sweeping, watering flours, among others in a week (Activity class-3).	.731		
Frequency of sitting down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week (Activity class-1).	.679		
Average communalinity	0.67		
Percent Variance explained	45.15		
Attitude			
Attitude-1			
Sitting down watching television, sleeping, talking to friends, and receiving money in a shop for a whole day among others in a week raises blood sugar level.	.783		
Sitting down watching television, sleeping, talking to friends, and receiving money in a shop for a whole day among others in a week interfere with blood flow.	.837		
Sitting down watching television, sleeping, talking to friends, receiving money in a shop for a whole day among others in a week increases accumulation of fluids in the body.	.613		
Sitting down watching television, sleeping, talking to friends, and receiving money in a shop for a whole day among others in a week reduces physical fitness.	.726		
Sitting down watching television, sleeping, talking to friends, and receiving money in a shop for a whole day among others in a week makes you become overweight.	.421		
Average communalinity	0.68		
Percent Variance explained	47.89		
Attitude-2			
Engaging in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week lowers blood sugar level.	.828		
Engaging in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week maintains blood flow.	.713		
Engaging in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week improves physical fitness.	.760		
Engaging in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week reduces weight.	.400		
Engaging in at least 30 minutes of moderate to heavy physical activities such as cycling, jogging, digging, gardening among others in a week prevents accumulation of fluids in the body.	.698		
Average communalinity	0.68		
Percent Variance explained	48.39		
Attitude-3			

Engaging in at least 1 hour of light physical activities such as washing, normal walking, and cooking, sweeping, watering flours, among others in a week lowers blood sugar level.	.131	.826
Engaging in at least 1 hour of light physical activities such as washing, normal walking, and cooking, sweeping, watering flours, among others in a week maintains blood flow	.875	-.223
Engaging in at least 1 hour of light physical activities such as washing, normal walking, and cooking, sweeping, watering flours, among others in a week improves physical fitness.	.764	-.265
Engaging in at least 1 hour of light physical activities such as washing, normal walking, and cooking, sweeping, watering flours, among others in a week reduces weight.	.406	.676
Engaging in at least 1 hour of light physical activities such as washing, normal walking, and cooking, sweeping, watering flours, among others in a week prevents accumulation of fluids in the body.	.754	.020
Average communalinity	0.62	0.21
Percent Variance explained	48.01	25.20
Subjective norm		
Subjective norm-1		
My doctor/nurse/nutritionist think that I should/should not engage in class 1 activities	.600	
My spouse think that I should/should not engage in class 1 activities	.823	
My brother/sister think that I should/should not engage in class 1 activities	.851	
My friend think I should/should not engage in class 1 activities	.924	
My children think I should/should not engage in class 1 activities	.682	
My neighbour think that I should/should not engage in class 1 activities	.802	
Average communalinity	0.78	
Percent Variance explained	62.10	
Subjective norm-2		
My doctor/nurse/nutritionist think I should/should not engage in class 2 activities	.710	
My spouse think that I should/should not engage in class 2 activities	.845	
My brother/sister think I should/should not engage in class 2 activities	.911	
My friend think I should/should not engage in class 2 activities	.886	
My children think I should/should not engage in class 2 activities	.866	
My neighbour think I should/should not engage in class 2 activities	.735	
Average communalinity	0.83	
Percent Variance explained	68.72	
Subjective norm-3		
My doctor/nurse/nutritionist think I should/should not engage in class 3 activities	.745	
My spouse think I should/should not engage in class 3 activities	.876	
My brother/sister think I should/should not engage in class 3 activities	.940	
My friend think I should/should not engage in class 3 activities	.849	
My children think I should/should not engage in class 3 activities	.932	
My neighbour think I should/should not engage in class 3 activities	.721	
Average communalinity	0.84	
Percent Variance explained	71.9	
Perceived behavioural control		
Control belief strength		

How often do you encounter factors that prevent you from reducing time spent in class 1 activities? (PBC-1)	.705
How often do you encounter factors that prevent you from increasing time spent in doing class 2 activities? (PBC-2)	.919
How often do you encounter factors that prevent you from increasing time spent in doing class 3 activities? (PBC-3)	.905
Average communalinity	0.84
Percent Variance explained	72.2
Pre-intention moderators	
Perceived susceptibility	
Failure to engage in moderate activities for at least 30 minutes daily and consistently increases the chances of experiencing elevated blood sugar levels (hyperglycemia), blurred vision and loss of strength. (*Perceived susceptibility-2)*	.866
Failure to engage in walking for at least 60 minutes daily and consistently increases your chances of experiencing elevated blood sugar levels (hyperglycemia), blurred vision and loss of strength. (*Perceived susceptibility-3)*	.859
Spending a whole day sitting while reading/talking to friends/watching television among others increases your chances of experiencing elevated blood sugar levels (hyperglycemia), blurred vision and loss of strength. (*Perceived susceptibility-1)*	.624
Average communalinity	0.79
Percent Variance explained	62.62
Perceived severity	
If I don't engage in moderate activities for at least 30 minutes daily and consistently I risk being amputated, going into a comma and suffering from skin irritation. (*Perceived severity-2)*	.918
If I don't engage in walking for at least 60 minutes daily and consistently I risk being amputated, going into a comma and suffering from skin irritation. (*Perceived severity-3)*	.902
If I spend a whole day sitting while reading/talking to friends/watching television among others throughout the week I risk being amputated, going into a comma and suffering from skin irritation. (*Perceived severity-1)*	.909
Average communalinity	0.91
Percent Variance explained	82.7
Perceived benefits	
Engaging in adequate physical activity maintains blood sugar level within normal range. *(Perceived benefits-1)*	.939
Engaging in adequate physical activity consistently I will be strong and able to work productively. *(Perceived benefits-2)*	.927
Engaging in adequate physical activity consistently I will avoid complications associated with elevated blood sugar such as blurred vision and amputation. *(Perceived benefits-3)*	.797
Average communalinity	0.89
Percent Variance explained	50.40
Cues to action	
There are enough reading materials (booklets, magazine among others) explaining the relationship between physical activity and Type II diabetes in this clinic. *(Cues to action-1)*	.890
There are enough visual materials (posters, television among others) put strategically to educate diabetic patients on type and intensity of physical activities to be involved. *(Cues to action-2)*	.877
The clinic periodically organizes diabetic education day where patients are taught about which physical activities to be involved and which ones to avoid. *(Cues to action-3)*	.402
Average communalinity	0.72
Percent Variance explained	57.49
Physical Knowledge	
Knowledge 1 (phase 3): Physical activity levels *(Knowledge-1)*	.710

Knowledge 2 (phase 3): Sedentary Activity*(Cues to action-2)*	.710
Average communalinity	0.71
Percent Variance explained	50.48
Dietary intention	
I intend to Increase/maintain my level of participating in moderate physical activity including jogging, digging to/at 30minutes or more daily by half in the next one month. (Intention-2)	.728
I intend to Increase/maintain light activities including daily walking, washing, cooking among others to/at 60minutes daily by half in the next one month. (Intention-3)	.802
I intend to decrease time spend watching television, sleeping, talking to friends, receiving money in a shop for a whole day by half in the next one month. (Intention-1)	.805
Average communalinity	0.78
Percent Variance explained	60.71
Post-intention mediators	
Action plan	
I have made a detailed plan on when to when to engage in adequate physical activity (*Action plan-1)*	.945
I have made a detailed plan on where to engage in adequate physical activity (*Action plan-2)*	.911
I have made a detailed plan on how to select the type of physical activity (*Action plan-3)*	.946
I have made a detailed plan on how often to engage in adequate physical activity (*Action plan-4)*	.954
Average communalinity	0.94
Percent Variance explained	88.21
Action control	
During the last four weeks, I have constantly monitored myself whether I participate in adequate physical activity frequently. *(Action control-1)*	.716
During the last four weeks, I have watched carefully that I did participate in physical activity as recommended by the health care provider. *(Action control-2)*	.820
During the last four weeks, I have had my physical activity intention often in mind *(Action control-3)*	.794
During the last four weeks, I have always been aware of my recommended physical activities. *(Action control-4)*	.799
During the last four weeks, I have really tried to engage in adequate physical activity regularly *(Action control-5)*	.796
During the last four weeks, I have tried my best to do physical activities in accordance to my recommended guidelines *(Action control-6)*	.707
Average communalinity	0.77
Percent Variance explained	59.78
Maintenance self efficacy	
I am confident to engage in adequate physical activity regularly on a long-term basis even if I cannot see any positive changes immediately. (*Self efficacy-1)*	.851
I am confident to engage in adequate physical activity regularly on a long-term basis even if I am together with friends and relatives who are not performing the same physical activities. (*Self efficacy-2)*	.942
I am confident to engage in adequate physical activity regularly on a long-term basis even if time is a limiting factor (*Self efficacy-3)*	.769
Average communalinity	0.85
Percent Variance explained	73.44

Appendix 4.7 Reliability Test for Indirect Measures of Attitude, Subjective Norm and Perceived Behavioural Control towards Physical Activity Behaviour

Concepts measurement	Number of items	Cronbach's alpha (pre-test, n=45)	Cronbach's alpha (main survey, n=230)
Indirect attitude	3	0.842	0.870
Indirect subjective norm	3	0.989	0.970
Perceived Behavioural Control	3	0.550	0.740

Appendix 4.8 Rotated Components Matrix for Indirect Measures Generated from Physical Activity Questionnaire

Scales (n=230)	Components (Factors)			
	1	2	3	4
Indirect attitude				
Attitude-1	.869			
Attitude-2	.943			
Attitude-3	.882			
Average communalinity	0.90			
Percent Variance explained	80.7			
Indirect subjective norm				
Subjective norm-1	.936			
Subjective norm-2	.980			
Subjective norm-3	.985			
Average communalinity	0.97			
Percent Variance explained	93.6			
Indirect perceived behavioural control				
Perceived behavioural control 1 (PBC-1)	.587			
Perceived behavioural control 2 (PBC-2)	.927			
Perceived behavioural control 3 (PBC-3)	.930			
Average communalinity	0.81			
Percent Variance explained	68.96			

Appendix 4.9 Variance Estimates for other Factors Intervening on the Relationships between Variables Specified in the Models

Dietary behaviour

Model	*Variables*	*Estimate*	*S.E*	*C.R*	*P-Value*
Model a	Other1	.097	.031	3.076	.002
	Other 2	.157	.035	4.528	***
Model 1a	Other 1	.095	.030	3.200	***
	Other 2	.156	.035	4.508	***
	Other 3	.008	.012	.664	.507
Model 2a	Other 1	.070	.029	2.458	.014
	Other 2	.141	.033	4.238	***
Model 3a	Other 1	.157	.064	2.465	.014
	Other 2	.031	.011	2.952	.003
	Other 4	.241	.045	5.352	***
	Other 5	3.306	.422	7.833	***
	Other 6	.263	.049	5.416	***

Physical activity behaviour

Model	*Variables*	*Estimate*	*S.E*	*C.R*	*P-Value*
Model b	Other1	.645	.072	8.917	***
	Other 2	.199	.043	4.622	***
Model1b	Other 1	-.096	.057	-1.698	.089
	Other 2	.185	.041	4.470	***
	Other 3	.248	.031	7.899	***
Model2b	Other 1	.080	.027	2.939	.003
	Other 2	.197	.042	4.707	***
Model 3b	Other 1	.500	.058	8.651	***
	Other 2	.306	.062	4.901	***
	Other 4	.009	.009	.990	.322
	Other 5	-.739	1.475	-.501	.616
	Other 6	.147	.056	2.641	.008

*** Significant at α=0.001

Appendix 5: Focus Group Discussion Guides

Personal Characteristics and General Information
Age _____
When were you born_____

Sex (1) Male ☐ (0) Female ☐

Level of Formal Education (1) Never ☐ (2) Primary ☐ (3) Secondary ☐ (4) Tertiary ☐

(5) University ☐

Are you diabetic? (1) Yes ☐ (0) No ☐
When did you discover that you are diabetic? _____

Is there any of your family member who also suffer from diabetes? (1) Yes ☐ (0) No ☐
For how long have you been attending this clinic? _____

Have you been attending the clinic regularly on monthly basis? (1) Yes ☐ (0) No ☐
Who normally attends to you more frequently during the clinic sessions?

Doctor/clinical officer ☐ (2) Nurse ☐ (3) Nutritionist ☐ (4) Nurse and Nutritionist ☐ (5) No idea about the cadre ☐

Appendix 5.1 Dietary Behaviour (Questions guide for the facilitator)

Salient beliefs related to attitude	What examples of foods have you always been told to eat by your doctor/nurse/nutritionist due to your diabetic condition? Which foods are you currently taking in your everyday life in relation to the doctor/nurse/nutritionist advice? For the foods which you have been advised to eat, what are your beliefs about eating them in relation to your diabetes condition? (Probe for positive and negative beliefs) What examples of foods have you always been told to avoid eating by your doctor/nurse/nutritionist due to your diabetic condition? Which foods are you currently avoiding in your everyday life in relation to the doctor/nurse/nutritionist advice? For the foods which you have been advised not to eat, what are your beliefs about eating them in relation to your diabetes condition? (Probe for positive and negative beliefs)
Salient beliefs on subjective norms	Who among the people important in your life can influence you to eat the foods recommended due to your condition? (List all of them) Who among the people important in your life can influence you not to eat the foods to be avoided due to your condition? (List all of them)
Salient beliefs on perceived behavioural control	What are some of the factors that facilitate your effort to eat recommended diet due to your diabetic condition? What are some of the barriers towards eating the foods recommended to you due to your diabetic condition? What are some of the factors that facilitate your attempt to avoid eating foods you are

	advised to avoid in your everyday life due to your diabetic condition? What are some of the factors that hinder your attempt to avoid eating foods you are advised to avoid in your everyday life due to your diabetic condition?
Perceived Knowledge	What do you think about consuming high fat, high sugar, fruits, vegetables and natural foods?
Perceived susceptibility	Tell me to what level are you susceptible/vulnerable to the repercussions of Type II diabetes if you fail to consistently follow dietary recommendations or if you continue with inappropriate diet?
Perceived Severity	What are some of the injuries you may face if you fail to follow appropriate diet? Discuss traumatizing outcomes.
Perceived benefits	What are some to the benefits associated with adhering to recommended diet?
Cues to action	Are there some materials or process or an action that motivates you on strict following of appropriate dietary intake?
Intention	What is your intention with regards to consuming high fat diet, high sugar diet and recommended diet?
Action control	What have you been doing to follow recommended dietary practices: *Constant self monitoring of appropriate diet?* *Keeping diet intentions in mind?* *Trying hard to follow appropriate diet?*
Action planning	Do you always have a plan: *When to eat take eat recommended diet?* *Where to take this diet?* *How to select the meals?*
Maintenance self efficacy	Tell me about the extent to which you can stay on recommended diet despite challenging circumstances?

Appendix 5.2 Physical Activity Behaviour (Questions guide for the facilitator)

Salient beliefs related to attitude	What examples of physical activity have you always been told to engage in by your doctor/nurse/nutritionist due to your diabetic condition? What examples of physical activities are you currently engaging in your everyday life? For the physical activity which you have been advised to engage in, what are your beliefs about doing them in relation to your diabetes condition? (Probe for positive and negative beliefs) What examples of physical activity have you always been told to avoid engaging in by your doctor/nurse/nutritionist due to your diabetic condition? What examples of physical activities are you currently not engaging in your everyday life?

	For the physical activity which you have been advised not to engage in, what are your beliefs about not doing them in relation to your diabetes condition? (Probe for disadvantages)
Salient beliefs subjective norms	Who among the people important in your life can influence you to engage in recommended physical activity for your diabetic condition? (List all of them) Who among the people important in your life can influence you not to engage in the physical activity to be avoided due to your diabetic condition? (List all of them)
Salient beliefs on perceived behavioural control	What are some of the factors that facilitate your engagement in recommended physical activity for your diabetic condition? What are some of the barriers towards engaging in recommended physical activity for your diabetic condition? What are some of the factors that facilitate your avoidance of non-recommended physical activities for your diabetic condition? What are some of the factors that hinder your attempt to avoid non-recommended physical activities for your diabetic condition?
Perceived Knowledge	What do you think about participating in physical activity of light to heavy intensity or leading sedentary life when you are diabetic?
Perceived susceptibility	Tell me to what level are you susceptible/vulnerable to the repercussions of Type II diabetes if you fail to engage in adequate exercise or manual activities?
Perceived Severity	What are some of the injuries you may face if you fail to engage in adequate physical activity? Discuss traumatizing outcomes.
Perceived benefits	What are some to the benefits associated with adhering to adequate physical activity?
Cues to action	Are there some materials or process or an action that motivates to engage on in adequate physical activity?
Intention	What is your intention with regards to consuming participating in adequate physical activity and reducing sedentary lifestyle?
Action control	What have you been doing to engage in adequate exercise manual work: *Constant self monitoring of appropriate physical activity?* *Keeping physical activity intentions in mind?* *Trying hard to engage in appropriate physical activity?*
Action planning	Do you always have a plan: *When to engage in exercise or manual work?* *Where to do the exercise or manual work?* *How to select the type of exercise?*
Maintenance self efficacy	Tell me about the extent to which you can stay on exercising or manual work despite challenging circumstances?

Appendix 6: Informed Consents

Appendix 6.1 FGD Consent Form

Sub-Title of Research: Investigation of salient beliefs related to Attitudes, Subjective Norms and Perceived behavioural Control; intention; perceived susceptibility, perceived severity, perceived benefits and cues to action; action plan, action control and maintenance self efficacy within dietary practice/physical activity domains among Type II diabetics.

Investigator: Omondi Okeyo David: (Programme being fulfilled is Doctor of Philosophy in Community Nutrition)

Before agreeing to participate in this research, it is important that you read the following explanation of this study. This statement describes the purpose, procedures, benefits, risks, discomforts, and precautions of the program. Also described are the alternative procedures available to you, as well as your right to withdraw from the study at any time.

Explanation of Procedures You are being asked to participate in a research project to investigate the attitudes, subjective norms and perceived behavioural control within dietary practice and physical activity domains. The approach of the research is through the use of two questionnaires. You will complete the first questionnaire that contains approximately 7 questions that will make us know you better today; this should take about 10 minutes. Afterwards, we shall discuss the rest of the questions for about 1 hour.

Risks and Discomforts You will not be at physical or psychological risk and should experience no discomfort resulting from answering the questionnaires or discussing the key issues highlighted by the questions.

Benefits There are no direct benefits by participating in this project. However, this research is expected to yield knowledge about salient beliefs related to Attitudes, Subjective Norms and Perceived behavioural Control; intention; perceived susceptibility, perceived severity, perceived benefits and cues to action; action plan, action control and maintenance self efficacy within dietary practice/physical activity domains. This will be used to better educate Type II diabetic patients .

Confidentiality All information gathered from the study will remain confidential. Your identity as a participant will not be disclosed to any unauthorized persons; only the researchers and when necessary Maseno University School of Graduate Studies Board (the committee that approved this research project) will have access to the research materials, which will be kept in a locked drawer. Any references to your identity that would compromise your anonymity will be removed or disguised prior to the preparation of the research reports and publications.

Withdrawal without Prejudice Participation in this study is voluntary; refusal to participate will involve no penalty. You are free to withdraw consent and discontinue participation in this project at any time without prejudice from the health facility.

Costs and/or Payments to Subject for Participation in Research There will be no costs for participating in the research. Also, you will not be paid to participate in this research project.

Payment for Research Related Injuries Although there are no risks of injury involved with this study, the researcher has made no provision for monetary compensation in the event of injury resulting from the research. In the event of such injury, the researcher will provide assistance in locating and accessing appropriate health care services. The cost of health care services is the responsibility of the participant.

Alternative Procedures If a person chooses not to participate, an alternative procedure is not necessary.

Questions Any questions concerning the research project and/or in the case of injury (whether physical or psychological) due to the project, participants can call Mr. David Okeyo Questions regarding rights as a person in this research project should be directed to Dr. Mitei (chairman, research and ethics committee of New Nyanza Provincial General Hospital), the one who authorized this research on behalf of the committee.

Agreement
This agreement states that you have received a copy of this informed consent. Your signature below indicates that you agree to participate in this study.

Subject name (printed)_____Signature of Subject_____Date_____

Signature of Researcher /Research Assistant _____ Date _____

Appendix 6.2 Dietary Practice Survey Consent Form

Sub-Title of Research: The Influence of selected mediators and moderators of the relationship between psychosocial factors and dietary practice among Type II diabetics in Kisii Hospital Kenya.

Investigator: Omondi Okeyo David: (Programme being fulfilled is Doctor of Philosophy in Community Nutrition)

Before agreeing to participate in this research, it is important that you read the following explanation of this study. This statement describes the purpose, procedures, benefits, risks, discomforts, and precautions of the program. Also described are the alternative procedures available to you, as well as your right to withdraw from the study at any time.

Explanation of Procedures You are being asked to participate in a research project to investigate the attitudes, subjective norms and perceived behavioural control within dietary practice domain and how they relate with patients intentions to consume food. It also focuses on how certain factors relate with these key factors. The approach of the research is through the use of one questionnaire with approximately 101 questions. The questionnaire will be administered by a research assistant who will tell you his/her name and will take approximately 1 hour.

Risks and Discomforts You will not be at physical or psychological risk and should experience no discomfort resulting from answering the questions or discussing the key issues highlighted by the questions.

Benefits There are no direct benefits by participating in this project. However, this research is expected to yield knowledge about salient beliefs related to attitude, subjective norm, perceived behavioural control and other factors within dietary domain. This will be used to better educate Type II diabetic patients .

Confidentiality All information gathered from the study will remain confidential. Your identity as a participant will not be disclosed to any unauthorized persons; only the researchers and when necessary Maseno University School of Graduate Studies Board (the committee that approved this research project) will have access to the research materials, which will be kept in a locked drawer. Any references to your identity that would compromise your anonymity will be removed or disguised prior to the preparation of the research reports and publications.

Withdrawal without Prejudice Participation in this study is voluntary; refusal to participate will involve no penalty. You are free to withdraw consent and discontinue participation in this project at any time without prejudice from the health facility.

Costs and/or Payments to Subject for Participation in Research There will be no costs for participating in the research. Also, you will not be paid to participate in this research project.

Payment for Research Related Injuries Although there are no risks of injury involved with this study, the researcher has made no provision for monetary compensation in the event of injury resulting from the research. In the event of

such injury, the researcher will provide assistance in locating and accessing appropriate health care services. The cost of health care services is the responsibility of the participant.

Alternative Procedures If a person chooses not to participate, an alternative procedure is not necessary.

Questions Any questions concerning the research project and/or in the case of injury (whether physical or psychological) due to the project, participants can call Mr. David Okeyo. Questions regarding rights as a person in this research project should be directed to Dr. Mitei (chairman, research and ethics committee of New Nyanza Provincial General Hospital), the one who authorized this research on behalf of the committee.

Agreement This agreement states that you have received a copy of this informed consent. Your signature below indicates that you agree to participate in this study.

Subject name (printed)_____Signature of Subject_____Date_____

Signature of Researcher /Research Assistant _____ Date _____

Appendix 6.3 Physical Activity Survey Consent Form

Sub-Title of Research: The Influence of selected mediators and moderators of the relationship between psychosocial factors and physical activity among Type II diabetics in Kisii Hospital Kenya.

Investigator: Omondi Okeyo David: (Programme being fulfilled is Doctor of Philosophy in Community Nutrition)

Before agreeing to participate in this research, it is important that you read the following explanation of this study. This statement describes the purpose, procedures, benefits, risks, discomforts, and precautions of the program. Also described are the alternative procedures available to you, as well as your right to withdraw from the study at any time.

Explanation of Procedures You are being asked to participate in a research project to investigate the attitudes, subjective norms and perceived behavioural control within physical activity domain and how they relate with patients intentions to consume food. It also focuses on how certain factors relate with these key factors. The approach of the research is through the use of one questionnaire with approximately 99 questions. The questionnaire will be administered by a research assistant who will tell you his/her name and will take approximately 1 hour.

Risks and Discomforts You will not be at physical or psychological risk and should experience no discomfort resulting from answering the questions or discussing the key issues highlighted by the questions.

Benefits There are no direct benefits by participating in this project. However, this research is expected to yield knowledge about salient beliefs related to attitude, subjective norm, perceived behavioural control and other factors within dietary domain. This will be used to better educate Type II diabetic patients .

Confidentiality All information gathered from the study will remain confidential. Your identity as a participant will not be disclosed to any unauthorized persons; only the researchers and when necessary Maseno University School of Graduate Studies Board (the committee that approved this research project) will have access to the research materials, which will be kept in a locked drawer. Any references to your identity that would compromise your anonymity will be removed or disguised prior to the preparation of the research reports and publications.

Withdrawal without Prejudice Participation in this study is voluntary; refusal to participate will involve no penalty. You are free to withdraw consent and discontinue participation in this project at any time without prejudice from the health facility.

Costs and/or Payments to Subject for Participation in Research There will be no costs for participating in the research. Also, you will not be paid to participate in this research project.

Payment for Research Related Injuries
Although there are no risks of injury involved with this study, the researcher has made no provision for monetary compensation in the event of injury resulting from the research. In the event of such injury, the researcher will provide assistance in locating and accessing appropriate health care services. The cost of health care services is the responsibility of the participant.

Alternative Procedures If a person chooses not to participate, an alternative procedure is not necessary.

Questions Any questions concerning the research project and/or in the case of injury (whether physical or psychological) due to the project, participants can call Mr. David Okeyo Questions regarding rights as a person in this research project should be directed to Dr. Mitei (chairman, research and ethics committee of New Nyanza Provincial General Hospital), the one who authorized this research on behalf of the committee.

Agreement This agreement states that you have received a copy of this informed consent. Your signature below indicates that you agree to participate in this study.

Subject name (printed)_____Signature of Subject_____Date_____

Signature of Researcher /Research Assistant _____ Date _____

Appendix 7: National Research Permit

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telegrams: "SCIENCETECH", Nairobi
Telephone: 254-20-241331, 241349,
254-20- 311761, 241376,
Fax: 254-20- 213215

When replying please quote

P. O. Box 30623 –00100
NAIROBI- KENYA

REF: NCST/13/001/C/717

3rd February 2009

Mr. David O. OKeyo
School of Public Health & Community Development
Maseno University
Private Bag
MASENO

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on, ***'The Influence of Selected Moderators and Mediators of the Relationship between Psychosocial Factors, Physical Activity and Dietary Practices of Type 2 Diabetics'***

I am pleased to inform you that you have been authorized to carry out research in Kisumu and Kisii Districts for a period ending 31st December 2010.

You are advised to report to the Director of New Nyanza General Hospital and Kisii District Hospital before embarking on your research.

On completion of your research, you are expected to submit two copies of your research report to this office.

for **SAID S. HUSSEIN**
FOR: EXECUTIVE SECRETARY

Copy to:

The Director
New Nyanza General Hospital
Kisumu

The Director
Kisii District Hospital
Kisumu

Appendix 8: Provisional Ethics Clearance

MINISTRY OF HEALTH

Telegrams: "MEDICAL", Kisumu
Telephone: 057-2020801/2020803/2020321
Fax: 057-2024337
E-mail: medsupt@africaonline.co.ke
When replying please quote

NYANZA PROVINCIAL GENERAL HOSPI
P.O. BOX 849 - 40100
KISUMU

Ref. No. NPGH-ERC/02/09 Date 16th March, 2009

Mr. David Omondi Okeyo.

Dear Okeyo,

RESEARCH PROPOSAL: "THE INFLUENCE OF SELECTED MODERATORS AND MEDIATORS OF THE RELATIONSHIP BETWEEN PSYCHOSOCIAL FACTORS, PHYSICAL ACTIVITY AND DIETARY PRACTICES OF TYPE 2 DIABETICS."

This is to inform you that the Nyanza Provincial General Hospital Ethics and Research Committee has reviewed and **approved** your above cited research proposal for the period 18th March 2009 to 18th May 2009.

You will be required to request for a renewal of the approval if you intend to continue with the study beyond the deadline given.

On behalf of the committee, I wish you fruitful research and look forward to receiving a summary of the research findings upon completion of the study.

Yours sincerely,

DR. MITEI P K.
DIRECTOR RESEARCH AND TRAINING.
c.c. The Head, Department of Medicine.
NO in charge, out patient department.
Nurse in charge diabetic clinic.

Appendix 9: Institutional Ethics Approval

MINISTRY OF MEDICAL SERVICES

Telegrams: "MEDICAL", Kisumu
Telephone: 057-2020801/2020803/2020321
Fax: 057-2024337
E-mail:
medsupt@africaonline.co.ke
When replying please quote

NYANZA PROVINCIAL GENERAL HOSPITAL
P.O. BOX 849
KISUMU

GEN 2A/VOL II/80

Ref. No.....

29th June 2009

Date .....

Mr. David Omondi Okeyo

Dear Mr. Okeyo

RE: CHANGE OF RESEARCH PERIOD

Your letter dated 22nd June 2009 refers. This is to inform you that your request for change of research period for your study entitled **"The influence of selected moderators and mediators of the relationship between psychosocial factors, physical activity and dietary practices of type 2 diabetics"** has been granted.

Please note that your study should begin from 8th July 2009 and end on 8th September 2009.

Please be advised that there will be no further extension of the period of your study, so you should strive to complete your data collection within the specified period.

Sincerely

Dr. Mitei Paul
DIRECTOR RESEARCH & TRAINING
NPGH – KISUMU.

C.c. Medical Superintendent - Kisii Level 5 Hospital
HOD - Department of Medicine
Nursing Officer Incharge - OPD
Nurse Incharge - Diabetic Clinic