A thesis submitted to the University of Birmingham for the degree of

DOCTOR OF CLINICAL PSYCHOLOGY

(CLIN.PSY.D)

Volume I

Research Component

MICHELLE ANN SANDIFORD

School of Psychology

Department of Clinical Psychology

University of Birmingham

June 2008

Table of Contents – Volume I

Main Paper: Implicit and Explicit Attitudes of Young People with Type 1 Diabetes Towards High-Fat and High-Sugar Foods

Appendices to Volume I

Literature Review

Main paper

Figures and tables

Literature Review

Main Paper

Acknowledgements

I would firstly like to thank all of the young people who took part in this study. I also truly appreciate the interest of their parents and teachers, without whom this project would not have being possible.

I am grateful also to the staff teams at each of the participating diabetes clinics. Particularly Dr Michael Plunkett, Professor Timothy Barrett, Hazel (dietician), Lesley Jordan and Lesley Porter. Thank you for your support and kind assistance during the arduous recruitment and ethics procedure.

Dr Gary Law and Dr Arie Nouwen – I am most grateful to both of you for your time and guidance with this thesis. Thank you for generously sharing your knowledge and for your constructive criticism throughout.

My family - You have supported me throughout every stage of my education. You have always taught me the benefits of hard work and perseverance. I owe so much to you all. Thank you for your love, guidance, support.

Finally and above all, I thank God for guiding me though every step of this research and for giving me the strength to complete it.

Overview

This thesis is submitted in partial fulfilment of the requirements for the degree of Doctor of Clinical Psychology (Clin. Psy. D.) at the School of Psychology, University of Birmingham. It is presented in two volumes. These comprise a research component (Volume I) and a clinical component (Volume II).

Volume I consists of a literature review and an empirical paper; each with a focus on type 1 diabetes. The literature review aims to determine the usefulness of the current health behaviour models for understanding the factors influencing the dietary self-care behaviours of individuals with type 1 diabetes. It critiques evidence from 17 papers published from 1985 to 2007 which use the Health Belief Model, Social Cognitive Theory, the Transtheoretical Model and the Theory of Planned Behaviour/Theory of Reasoned Action. The evidence is discussed in terms of methodological and conceptual strengths and limitations. The Self-efficacy components and cost / benefits components of several of the above models were the most consistent predictors of dietary self-care. Limitations of the models/theories in terms of their lack of emphasis on developmental, emotional and socio-cultural factors pertinent to dietary behaviour were discussed. Suggestions were made regarding the implications for healthcare workers and future research. This review was prepared for submission to the British Journal of Health Psychology.

The empirical paper investigated the implicit and explicit attitudes of young people with diabetes towards the fat content and sugar content of foods. It asked whether their attitudes differed to those of young people without type 1 diabetes. This paper

also explored whether the food attitudes of young people with diabetes are related to their healthy eating behaviours. Implicit attitudes were explored using the Implicit Attitudes Test (Greenwald, McGhee & Schwartz, 1998) and explicit attitudes were elicited using questionnaires. Thirty young people with type 1 diabetes and 22 without diabetes were recruited. Results showed that the implicit measures were not able to distinguish between the attitudes of young people with and without diabetes, however the explicit measures were able to. Nonetheless, the implicit association test was able to highlight differences in the effect of priming on food attitude across groups. The IAT also highlighted an association between implicit attitudes and healthy eating behaviours. Limitations of these findings as well as their theoretical and clinical implications were discussed. This paper was prepared in a style suitable for submission to the American Psychological Association journal of Abnormal Psychology. However, for ease of reading, the author has placed tables and figures within the text (rather than at the end of the text).

Volume II of the thesis comprises five Clinical Practice Reports (CPRs) which were completed and assessed during the Clin.Psy.D training. The final CPR (CPR 5) was an assessed oral presentation. An abstract of this presentation is provided. A separate CPR was conducted during each of the core clinical placements and during the specialty placement. CPRs were based on the following clinical specialties: *Learning Disabilities* (Formulating the case of a 65 year-old Learning Disabled Lady with Anxiety from a Cognitive and Psychodynamic Perspective; Identifying the Provision Needs of Intellectually Disabled Service-Users Attending a Relationship Group); *Adult*: (Assessment of a 36-year-old Man with Major Depression with Psychotic Symptoms); *Child & Adolescent Mental Health*: (Application of Cognitive-

Behavioural Therapy to the Treatment of a 15-Year-Old Girl with Needle Phobia) and *Paediatrics*: (CBT for 11-year old Type 1 Diabetic Girl with Procedural Anxiety). All identifying details were changed in these CPRs to ensure anonymity and confidentiality.

How Useful are Current Health Behaviour Models/Theories for Understanding the Factors Contributing to Dietary Self-care in Type 1 Diabetes?

By

Michelle Ann Sandiford

School of Psychology

Department of Clinical Psychology

University of Birmingham

List of Abbreviations

HBM- Health Belief model

EHBM – extended health belief model

SCT- Social cognitive Theory

TTM- Transtheoretical Model

TRA- Theory of Reasoned Action

TPB- Theory of Planned Behaviour

CS - cross sectional

LNG- longitudinal

Abstract

This review explores the degree to which health behaviour models/theories can assist in the understanding of dietary self-care behaviours among individuals with type 1 diabetes. Research utilizing four health behaviour models/theories (The Health Belief Model, Theory of Planned Behaviour/Reasoned Action, Social Cognitive Theory and the Transtheoretical Model) between 1985 and 2007 were reviewed. The components of self-efficacy and costs / benefits evaluation were found to be consistent in their ability to predict dietary self-care across paradigms. Methodological limitations such as weak predictor/outcome scale reliability, non-random sampling and cross-sectional designs, restricted the external validity of the findings. Conceptually, the models/theories were found to be limited regarding their appreciation of the role of cultural, emotional and developmental factors in dietary self-care. It was recommended that interventions geared towards improving self-efficacy and emotional well-being (whilst addressing socio-cultural factors), might be useful when working with dietary self-care in diabetes. Future research should aim to build on the limitations of current models/theories.

Type 1 diabetes is a chronic disease affecting approximately 200,000 people in England (Diabetes UK, 2004). It occurs when insulin producing cells in the pancreas are destroyed by the body's own defense system (NICE, 2004). The illness prevents the production of insulin, which regulates blood glucose levels. This contrasts with type 2 diabetes, in which the body is no longer sensitive to its insulin production or produces insulin in very small/inadequate amounts. The treatment of type 1 diabetes requires a complex daily self-care regimen involving diet, exercise, glucose measurements and insulin injections. Failure to adequately manage this regimen can lead to reversible short-term health consequences (e.g., hypoglycemia/hyperglycemia symptoms) and serious long-term irreversible complications (e.g., kidney disease, cardio-vascular disease and blindness). Achieving good levels of dietary self-care is a fundamental component of positive health outcomes in diabetes (Wysocki, Grecco & Buckloh, 2003).

Dietary Self-Care

Peyrot et al. (2005) categorised the components of the diabetes self-care regimen into two areas: (i) those that impact upon lifestyle (e.g., diet and exercise) and (ii) those that have little or no impact on lifestyle (e.g., glucose checking and insulin injections). Peyrot et al.'s study revealed that individuals with diabetes were consistently less likely to perform well in aspects of their self-care regimen such as *diet* or *exercise* which impacted heavily upon their lifestlye. These findings supported earlier studies (Glasgow & Anderson, 1999; Toljamo & Hentinen, 2001), which highlighted diet as a challenging area of self-care. Indeed, the conflict often experienced between demands of dietary regimen and socio-cultural roles often has a detrimental impact on quality of life (Sato, Suzukamo, Miyashita & Kazuma 2004), particularly in relation to the

lack of flexibility and freedom afforded by the diabetes diet (Bradley & Speight, 2002).

The National Service Framework for Diabetes (Department of Health, 2001) highlights good self-management as being of paramount importance for the prevention of secondary complications. It is well documented that certain nutritional components consumed in excess, can have detrimental implications for individuals with and without diabetes. However, individuals with diabetes are at greater risk of developing certain chronic conditions, such as cardiovascular disease (Soedamah-Muthu et al, 2006). Such risk highlights the importance of understanding and managing the factors that influence dietary self-care behaviours in diabetes.

Health Behaviour

Dietary self-care is one of several 'health behaviours'. These are "behaviour[s] that an individual believes may affect their physical health" (Sutton, 2004; p.94). Health behaviours typically exist as dichotomies, commonly described as positive/preventative (e.g., a healthy balanced diet) or negative (e.g., a high-fat diet) according to the implications they have for the individual's health. Accordingly, adequate dietary self-care would be described as a 'positive' / 'preventative' health behaviour as it is an action taken to encourage or preserve health (Kulbok & Baldwin, 1992).

Health Behaviour Models & Theories

According to Attribution Theory, individuals attempt to ascribe *causes* to events in their lives such as illness (Heider, 1958). The *causes* that they select will largely

influence their behavioral response to that illness (Wallston, 1997). Weiner (1972) highlights three causal dimensions which are used by individuals to make sense of events: i) *locus* (whether the event is caused by internal/external factors) ii) *controllability* (whether it can be controlled by the individual or not) and iii) *stability* (the likelihood the event will remain stable or change). Two of these dimensions, locus and controllability, form the basis of Expectancy-Value Theory. According to this theory, behaviour is guided by (a) the expectation that it will result in a given consequence and by (b) the perceived value/benefits of that consequence/outcome (Bandura, 1992; Rotter, 1954). Individuals are viewed as *active learners* and previous experience provides one with either positive/negative expectations of future outcomes. It thus follows that if one expects that they will be able to exhibit behaviours effectively to achieve a positive outcome, then they will be more likely to exhibit that behaviour (Wallston, 1997). This assumption forms the basis of several *health behaviour models/theories* which have been constructed to explain the adoption of health behaviours by individuals (Peyrot & Rubin, 2007). Several models and theories are currently being utilized within clinical health research; each using unique terminology to define mediating factors for health behaviour. This review will explore the factors underlying dietary self-care behaviours among individuals with type 1 diabetes by examining the findings of health behaviour models. With an enhanced understanding of such factors, healthcare professionals will be better equipped to assess and intervene to assist patients in the adoption of health promoting behaviours.

In selecting the health behaviour models/theories for this review, several factors were taken into consideration such as (a) the evidence supporting models/theories and (b)

the extent to which they had been used in the literature. A review of health behaviour literature by Glanz, Lewis & Rimmer (1997) found that the most frequently utilized models in health behaviour/health education research were the Health Belief Model (HBM), the Theory of Reasoned Action/Theory of Planned Behaviour (TRA/TPA), Social Cognitive Theory (SCT) and The Transtheoretical Model (TTM). These findings were based on a review of general health behaviour models from 1992 to 1994 in health and behavioural science. Based on these findings, subsequent researchers have used the above four models/theories to structure their discussions (e.g., Noar & Zimmerman, 2005; Redding et al., 2000). Each of the above four models/theories also have support for their ability to predict health protective behaviours. For example, meta-analyses and experimental studies have indicated that the HBM (e.g., Mirotznik, Feldman & Stein, 1995); the TRA/TPB (e.g., Hagger, Chatzisarantis & Biddle, 2002), SCT (Conn, 1998) and the TTM (e.g., Ficke & Farris, 2005; Marshall & Biddle, 2001) have predictive validity for health protective behaviours (Noar et al., 2005). The following models shall thus be reviewed in terms of their relevance to dietary self-care in diabetes: i) Health Belief Model, ii) Theory of Reasoned Action / Theory of Planned Behaviour, iii) Social Cognitive Theory and iv) the Transtheoretical Model. The literature was searched with an emphasis placed on papers which aimed to predict or explain dietary self-care in type 1 diabetes using the framework of any of the above four models/theories.

Data Selection and Search Strategy

Four databases were searched for studies predicting dietary behaviours among individuals with type 1 diabetes using a health behaviour model from 1985 to 2007. These were the British Nursing Index (BRNI), EMBASE (EMEZ), Ovid

MEDLINE(R) (MEDF, MED2) and PsycINFO (PSYF). Of these, the BRNI had the latest inception (1985). For correspondence across databases, this was marked as the cut-off year for searches. The search terms used were derived from the names of each health behaviour model; and from key constructs within each health behaviour model, combined with 'type 1 diabetes' and 'diet[ary] health behaviours and self-care/self-management' (see appendix 2 for full list of search terms).

Study Selection

The search was limited to research on human beings and English language journals, using both child and or adult populations. This initial search, based on article title and abstract information, yielded a total of 176 papers. The inclusion criteria for this review was that i) papers should have been published between 1985 and 2007, ii) have aims which focus on the prediction of dietary self-care behaviour using health behaviour models/theories and iii) have type 1 populations or mixed type 1 & 2. The exclusion criteria were as follows: i) intervention or treatment studies, ii) research in which diabetes was co-morbid with other pathology iii) unpublished studies, iv) qualitative studies and v) studies with exclusively type 2 populations.

Results

Of the 176 papers retrieved from the databases, a total of 22 papers fitting the above criteria were selected for this review. On closer inspection, 8 were dropped due to being treatment based, qualitative or focused on type 2 diabetes. Three more papers fitting the criteria were acquired through cross-referencing. This process yielded a final total of 17 research articles (see table 1).

Table 1.

Summary of Studies Included in the Review

Study Reference	Theory or Model	Age, diabetes Type & ethnicity	Design/ n	Self-Care Measures (reliability of diet scales)	Variance of dietary self-care predicted
Aalto et al (1997)	Extended HBM	Aged 15-39, 40-64 Type 1; ethnicity not stated	CS /423	The Diabetes Management Questionnaire (no psychometric data provided)	Variance 14% (diet). High self-efficacy and internal locus of control, the more likely the perceived benefits of dietary self-care
Bond et al (1992)	HBM (Rosenstock, 1974)	11-19; Type 1; 91% White	CS/56	*DRCQ*[9], *DSCQ*[1] *and Child & Parent Compliance Telephone interviews* (self-care)	Variance 26% (eating and glucose frequency)
Brownlee-Duffeck et al (1987)	HBM (Becker et al 1975)	13-26 & 27-64; Type 1; 98% White-US	CS/142	DRAQ[2] (α=.79); DKMSQ[3] (α=75-78)	52% overall self-care (younger) and 41% (older) predicted
Charron-Prochownik et al (1993)	HBM	6-9 years plus one parent; Type 1; 92% White	CS/50	The Diabetes Management Questionnaire (no psychometric data provided)*	21% overall self-care owing to self-efficacy
Gillibrand et al (2006)	Extended HBM	16-25; Type 1, ethnicity not stated	CS/118	SDSCA[2] (no psychometric data provided)	12.4% dietary self-care. Social support strongly associated with self-care(<.001)
Hurley et al (1992)	SCT (self-efficacy only)	18-73, Type 1 and 2, ethnicity not stated	Lng/142	Diabetes Self-Care Scale (no psychometrics provided)	33% of overall self-care 30 days later
Iannotti et al (2006)	SCT (self-efficacy, outcome expectations)	10-16 (and parents); Type 1; 79.2% white	CS/168	Diabetes Self-Management for parents and children Profile (α for conventional diet=.57 for children and .60 for parents. Flexible diet=.73 for children and .79 for parents)*.	All 3 outcome measures accounted for 12-19% of overall self-care
Johnston-Brooks et al (2002)	SCT (Self-efficacy component only)	18-35; Type 1; 88% White	Lng/88	SDSCA[2] (α=.65, 3 month test-retest: r=.53)	42% of dietary behaviours concurrently and 7% less longitudinally

[Continued]

Table 1 Continued

Study Reference	Theory or Model	Age, diabetes Type & ethnicity	Design/n	Self-Care Measures (reliability of diet scales)	Variance of dietary self-care predicted
Kavanagh et al (1993)	SCT (self-efficacy only)	32-82; Type 1 and 2, ethnicity not stated	Lng/63	Adherence Questionnaire (test-retest: r=.44)	Self-efficacy 36% variance in dietary self-care 2 months later
McCaul et al (1987)	SCT	12-65; Type 1 and 2 (tested for difference – non-significant effects), 100% White	Lng/107	DSCQ[1], 24 hour dietary recall, food exchanges (prescribed-consumed), 5 pt Likert scale, (reliability of diet measures not stated)	*Expectancies* composite (composed of self-efficacy, outcomes and automatic thoughts) predicted 12% dietary self-care for both populations; 12% of dietary self-care concurrently and 5% prospectively (6 months later). Dietary knowledge predicted 5% of diet concurrently.
Patino et al (2005)	HBM (Janz et al, 1984)	11-16, Type 1, 67.6% Hispanic, 32% Black	CS/ 74	Self-care inventory (child α=.61 and parent α=.74)*	No association between HBM and self-care
Senecal et al (2000)	SCT	20-70; Type 1 and 2; ethnicity not stated	CS/638	SDSCA[2] (α=.71)	Self-efficacy has higher path coefficient (.54) than autonomous regulation (.21) to dietary self-care
Shenkel (1985)	TRA	12+years (no other information); Type 1; ethnicity not stated	CS/41	24 hour dietary recall (no psychometric data provided)	Subjective norm predicts 13 % of variance in dietary self-care
Syrjala (2004)	TRA	16-72, Type 1, ethnicity not stated	CS/149	Diabetes Adherence Measure (no psychometric data provided)	*Self-efficacy* predicts 65% of dietary self-care and *intention* predicts 14%
Wallston et al (2007)	SCT	M=54.2 (SD=12.95) 14.3 were type 1; 62% White, 33% Black	CS/196	SDSCA[2] (α=.40 on diet scales)	*Self-efficacy explained 6% of general diet self-care and 1% of specific diet self-care*
Wdowick et al (2001)	Expanded HBM	M=24.4years (SD=7.4), Type 1; 83% White, 4% Black, 6% Hispanic	CS/83	Self-developed scales (no psychometric data provided)	No association between the Expanded HBM constructs and dietary behaviour
Williams et al (2002)	SCT (Self-efficacy, outcome expectancies and social support)	22-86; Type 1 and 2; ethnicity not stated	Lng/94	SDSCA[2] (no psychometric data provided)	Self-efficacy mediates effects of social support on self-care. Self-efficacy predicted 22% of diet for 7 day questionnaire and 26% for 8 week questionnaire. Outcome expectancies did not correlate.

Diabetes Regimen Compliance Questionnaire°; Diabetes Regimen Adherence Questionnaire†; Diabetes Self-care Activities Summary (McCaul, Glasgow & Schafer, 1987)[1]; Summary of Diabetes Self-Care Activities (Toobert & Glasgow, 1994)[2]; Diabetes Knowledge and Management Skills[3] Overall score for self-care given (combined score for all regimen areas).

This review shall examine the literature addressing the following four areas:

1. What do health behaviour models/theories tell us about the factors that contribute to dietary self-care among individuals with type 1 diabetes?
2. Can these models/theories account for the social, affective and developmental factors affecting dietary behaviours?
3. What are the implications for clinical practice?
4. Suggestions for future research

Factors Contributing to the Dietary Self-care of Individuals with Type 1 Diabetes: An Exploration of Health Behaviour Models/Theories

Health Belief Model

The Health Belief Model (HBM) predicts the likelihood of a health behaviour being adopted. It is moderated by two factors: (i) readiness to act and (ii) the perceived feasibility of action & effectiveness of action (Maiman & Becker, 1974). The original model (Rosenstock, 1974) was formulated to predict the likelihood of preventative health behaviours. Maiman et al. (1974) modified this with the inclusion of 'cues to action' to predict medical self-care behaviours. According to this model, the decision to adopt appropriate [dietary self-care] behaviours is determined by the individual's perception of threat (*susceptibility* and *severity*) to the consequences of poor self-care, together with their evaluation of the *benefits* and *barriers/costs* of executing the required health behaviours. Internal or external *cues to action* (e.g., bodily symptoms or social/media information), together with demographic and psychosocial factors, are postulated to influence health behaviour. In an attempt to increase its predictive validity several conceptual additions have been made to this model: most notably (a) 'self-efficacy' (Rosenstock, Strecher & Becker, 1988), (b) 'outcome expectancies', 'intention', 'subjective norm', 'emotional response',

'value of action' & 'situational factors' (Burns, 1992) and then (c), 'social support', 'health value' and 'locus of control' (Aalto et al., 1997). The full model, including all components, is shown in Figure 1.

Review of HBM Literature

A total of 4 papers utilized the original version of the HBM to explore self-care. Two additional studies utilized the extended HBM and one used the expanded version. In each study, the HBM was assessed using self-report questionnaires. However, these questionnaires varied across studies due to modifications of the HBM (e.g. HBM to EHBM) and according to the age group under study. The reader is urged to bear this in mind as papers are reviewed.

Using the original HBM, Brownlee-Duffeck, Peterson, Simonds, Goldstein, Kilo & Hoette (1987) examined the ability of the HBM to predict general self-care among adolescents and adults with type 1 diabetes when the effects of age and knowledge were controlled. Among the younger sample (see table 1), multiple regressions revealed that the only component significantly associated ($p<.0001$) with self-care was *perceived cost* (predicting 25% of the variance in self-care). For the older group, perceived *benefits* explained 26% whilst susceptibility explained just 2%. In contrast to the former study, Bond, Aiken & Sommerville (1992) focused *exclusively* on an adolescent population and found no support for the evaluative components of the HBM (e.g. susceptibility/severity and costs/benefits). However, *cues to action* was able to predict 26% of 'frequency of eating and glucose testing'. In contrast, Charron-Prochownik, Becker, Brown, Liang, Bennett (1993) and Patino, Sanchez, Eidson & Delamater (2005) each found no association between the HBM components and self-care.

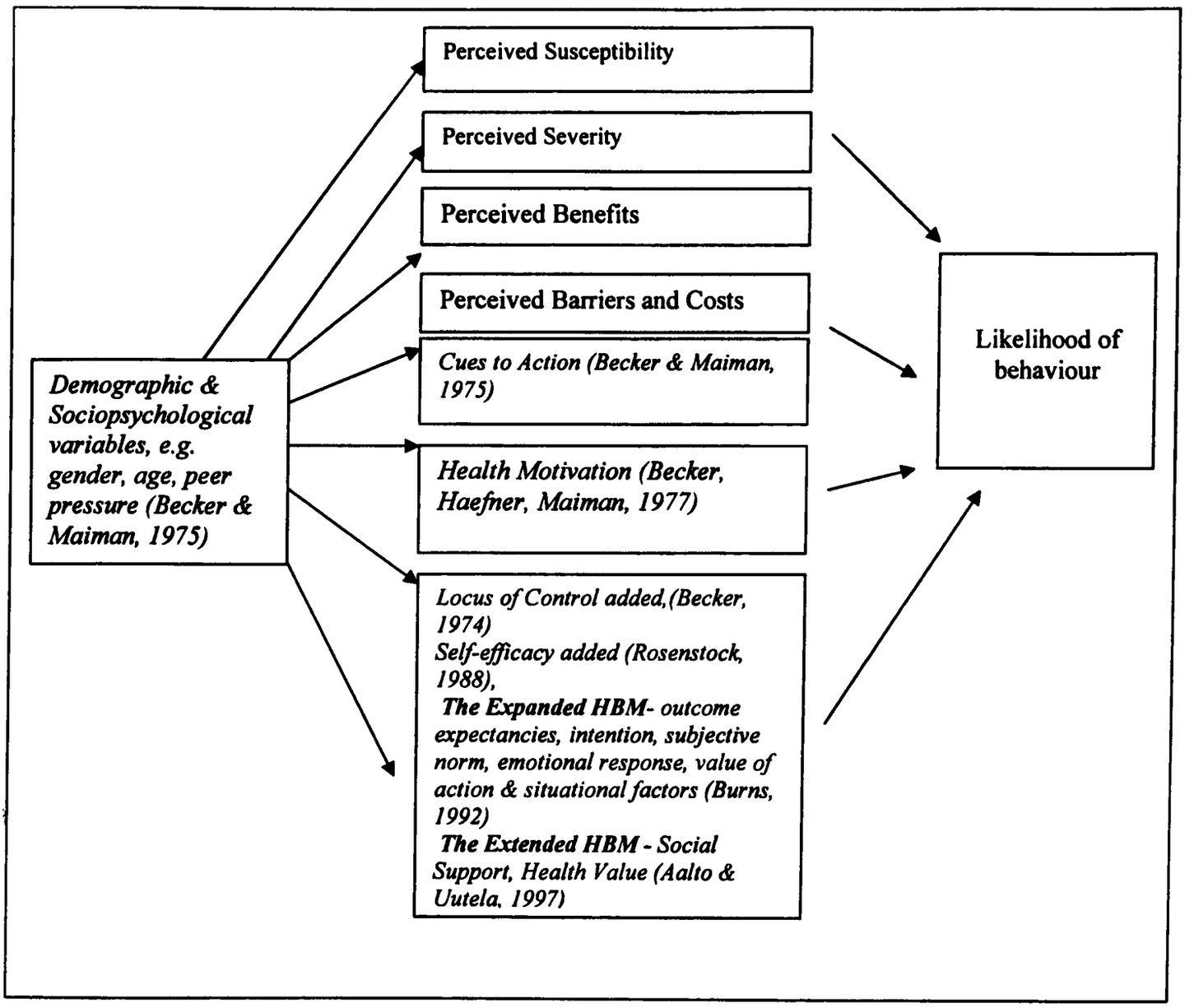


Figure 1. The Health Belief Model (Including Extended & Expanded HBM Components)

The only significant findings using the early versions of the HBM were from Brownlee-Duffeck et al. (1987) and Bond et al. (1992). Although both of these studies are cross-sectional (thereby preventing their prediction of cause and effect), a limitation of Bond et al.'s study is the low internal consistency for one of the statistically significant predictor variables (cues to action; alpha = .31). Consequently, one must question the reliability of their findings. Moreover, as each of these study samples were over 90% White-American, the generalisability of their findings becomes questionable. In relation to this, as Patino et al.'s (2005) exclusively ethnic minority sample found no support for the HBM, it could be argued that the applicability of the HBM to non-White-European groups is limited (Steers, Elliot, Nemiro, Ditman & Oskamp, 1996). It is unlikely that the relatively smaller sample sizes within both Charron-Prochownick et al. (1993) and Patino et al. (2003) resulted in more false negative statistical results compared to Brownlee-Duffeck et al. (1987). This is because a similarly small sample was recruited by Bond et al. (1992); achieving significant outcomes.

The Expanded HBM (Wdowick, Kendall, Harris & Auld, 2001) was unable to find any significant associations between dietary self-care among a population of young people. This may be due to the internal consistency of two items within the Expanded HBM scale being below α=.60 (cut-off for many social scientists for adequacy; Barker, Pistrang & Elliot, 2002). Also, the small sample size (N = 86) may have increased the risk of type 2 errors. Furthermore, the long length of their Expanded HBM scale (118 items) may have induced fatigue and response bias amongst participants (Anastasi, 1976), thereby affecting the reliability of their results.

In contrast, Aalto and Uutela (1997) and Gillibrand and Stevenson (2006) utilized the Extended HBM and a much larger sample and shorter scales. Using multiple regression and path analysis, Aalto and Uutela's model was able to explain 14% of the variance in dietary self-care within an adult population. In a similar study with adolescents, Gillibrand & Stevenson (2006) found that the

model predicted 12.4% dietary self-care with adolescents. *Social support* was found to be highly correlated to self-care behaviours ($p<.001$). This has been shown elsewhere to be an important factor in youth self-care (e.g., Skinner & Hampson, 1998). However, social support was still indirectly influenced by perceived high risk, high internal locus of control and by benefits outweighing costs (supporting Brownlee-Duffeck et al., 1987).

Compared to the research regarding the more traditional versions of the HBM using multiple regression for data analysis, Aalto et al. (1997) and Gillibrand et al.'s (2006) use of path analysis is valuable as it provides insights into the interaction between different variables in the prediction of self-care. Nonetheless, the appropriateness of such a technique is questionable as both papers comment on the lack of a priori hypothesis surrounding the nature of relationships between EHBM variables and self-care. Indeed, path analysis is only recommended for confirmation; when exploratory relationships between variables have already been established (Hawkes & Holm, 1989).

Conclusive Comments: HBM Literature

One can conclude that several factors (such as unreliable HBM/self-care scales and inappropriate statistical analyses) weaken the ability of the health belief models to promote an understanding of factors contributing to dietary self-care. Additionally, the heavy reliance on retrospective self-report measures alone increases the risk of social desirability effects. This in combination with the inaccuracy of retrospection, affects the reliability of outcome measures (Coolican, 1994). There was some level of consistency in the prediction of self-care by *benefits*. Nevertheless, the findings of Brownlee-Duffeck et al. (1987) may be the most useful because they predicted the greatest amount of variance in dietary self-care, used appropriate statistical methods and controlled for potential confounding factors (e.g., age and knowledge). Still, its contribution is limited by its focus on 'overall self-care' (i.e., diet+exercise+insulin administration etc) rather than on dietary self-care alone. As Hentinen & Kingas (1992) note, self-care in one regimen area cannnot predict

self-care in another. Thus, the validity of combining self-care measures in this way is debatable. One of the most significant limitations of the HBM, is the lack of clear proposed relationships between it variables (Weinstein et al., 1998). This prevents one from ascertaining how its components interact to predict dietary behaviour. Nonetheless, the EHBM research has provided the first steps towards proposing directional relationships between HBM components.

Theory of Reasoned Action /Theory of Planned Behaviour

The Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975) attempts to link attitudes to behaviours. The individual's behavioural intention (or motivation to act) is determined by two factors: (i) their attitude towards the health behaviour and (ii) the subjective norm (see Figure 2). One's attitude towards performing particular health behaviours can be positive or negative, determined by outcome expectancies, and by whether the behaviour is viewed as positive or negative in its own right. *Subjective norms* influence behavioural intention by introducing the variable of *social pressure* to perform the action (e.g., '*do others want me to do it?*').

The Theory of Planned Behaviour (TPB; Ajzen, 1988) extends the TRA by postulating that factors other than the strength of a behavioural intention can cause specific health behaviour. In the TPB, intention alone is insufficient to account for behaviour. Additional factors such as barriers and resources (internal and external) may influence whether the behaviour is exhibited (Schwarzer, 1992). To account for the limitations of intention, a third construct: *perceived behavioural control*, is utilized. Perceived behavioural control consists of internal factors (e.g. one's skills, abilities & emotions) and external factors (e.g. independence and number of opportunities) that can influence behavioural intention. Perceived behavioral control can bypass behavioural intention to predict some behaviours. As Schwarzer (1999) highlights, this tends to occur in cases where the individual has little or no control over the behaviour.

Review of TRA literature

Two studies have examined how far the TRA can predict dietary self-care in type 1 diabetes. The first of these (Shenkel, Rogers, Perfetto & Levin, 1985), investigated its predictive utility with individuals aged 12 and over. Multiple regression analysis revealed that the subjective norm component was only a significant predictor of dietary behavioural intention, but not actual behaviour. Thus, if individuals believed that their significant others expected high levels of dietary self-care; they would have greater intention to exhibit good levels of dietary self-care. Nevertheless, the variance explained by the social norm was quite low (12%).

Syrjala, Ylostalo, Niskanen & Knuutillia (2004) examined the predictive utility of the TRA, but only as part of a secondary research aim (within a *dental care* study). They utilized only the construct of *intention* alongside other psychological characteristics (e.g., self-efficacy & self-esteem) to predict self-care. Results indicated that *Diabetes Self-care Intention* explained 14% of the variance in diabetes self-care whereas the supplementary factor of self-efficacy explained 65%.

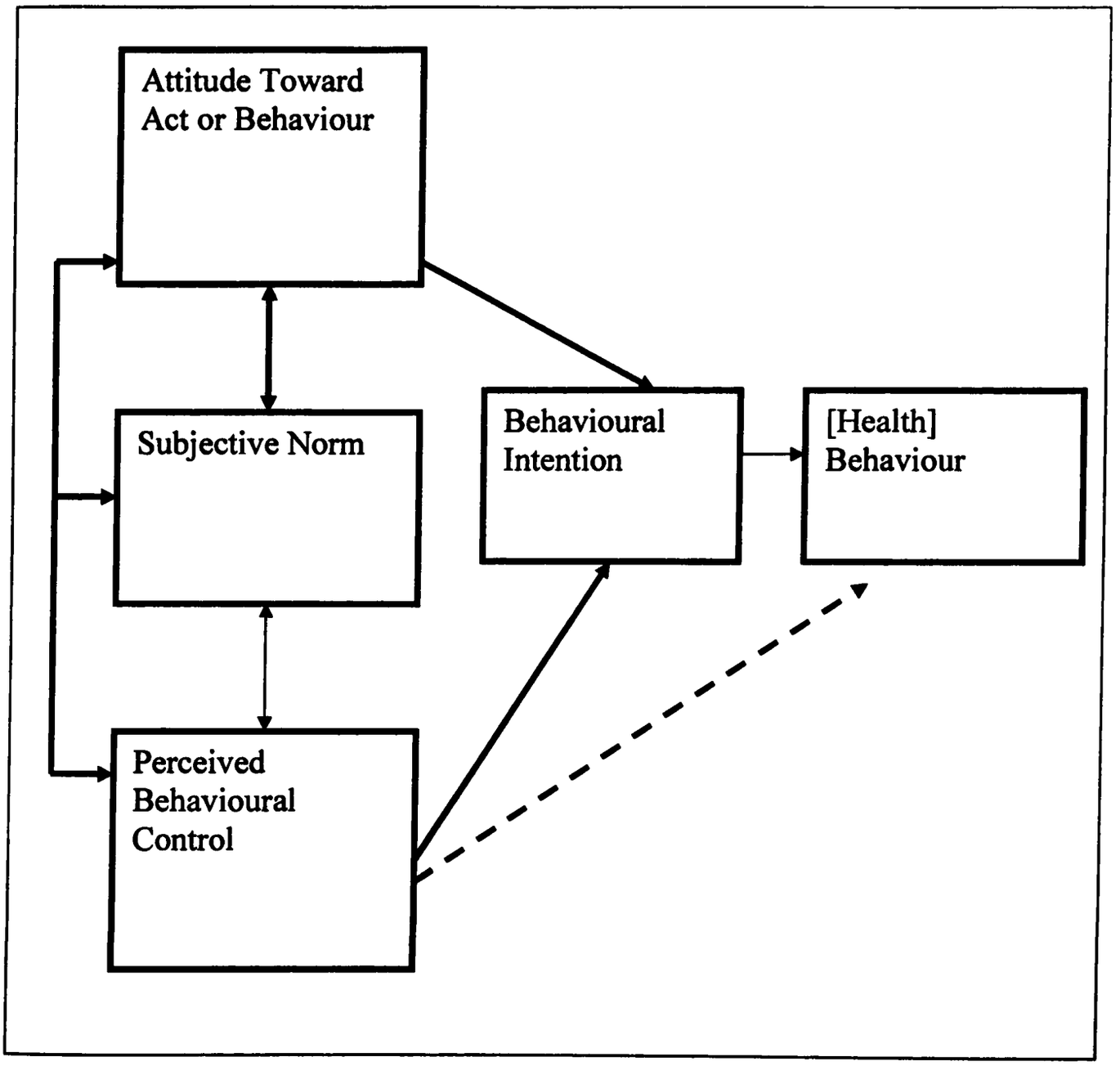


Figure 2: The Theory of Planned Behaviour (Based on Ajzen, 1991)

Conclusive Comments on TRA Literature

Comparing the two TRA studies, Shenkel et al.'s (1985) research provides a more valid evaluation of the predictive utility of the TRA, as it utilizes each of its components (subjective norm, attitudes etc). However, unlike Syrajala et al. (2004) Shenkel et al. (1985) do not include any psychometric information about their measures of the components of the TRA or dietary self-care. In the absence of psychometric data, one can only consider the validity and reliability of their data collection techniques with caution. Moreover, Shenkel et al.'s sample is also imprecisely described (see Table 1), limiting the reliability of the outcome data drawn from this paper. In contrast, Syrajala et al.'s (2004) relative transparency and greater sample size make it the more reliable study.

Nonetheless, there are two factors concerning the above studies which require caution. First, the validity of the outcome measures of both studies is threatened by a design anomaly. As Syrjala et al. (2004) noted, the recommended method of measuring health behaviour within the TRA is *prospectively* (Ajzen & Fishbein, 1980). However, each of the reviewed studies either measured this retrospectively or simultaneously. Second, this model was not designed to predict behaviour (but *behavioral intention*), consequently, its ability to predict actual dietary behaviour may be limited (Sheeran, 2002).

The Transtheoretical Model

The Transtheoretical Model (TTM; Prochaska & DiClemente, 1983; Prochaska & Velicer, 1997) aims to explain how detrimental behaviours are modified to more positive behaviours using the concept of "readiness to change" (Fava, Velicer & Prochaska, 1995). The model would suggest that behavioural change towards dietary self-care involves progression through five *stages of change/readiness: (i) precontemplation* (feeling unmotivated with no objective to change); *(ii)*

contemplation (being aware of the costs/benefits of change and intending to change within near future; *(iii) preparation* (intending to change behaviour within the next month); *(iv) action:* change has occurred within the last 6 months and (v) *maintenance* (behaviour change has been initiated and maintained for six months or more).

Movement through these stages of change (see Figure 3), is driven by three factors: (i) 'processes of change' (these are cognitive and behavioural coping processes such as advice-seeking); (ii) 'decisional-balance': where the individual evaluates the pros and cons of exhibiting health protective behaviour and (iii) 'situational self-efficacy' (the level of confidence that the individual has to be able to exhibit the protective behaviour in challenging situations). Different levels of *decisional-balance* and *self-efficacy* exist at each stage of change, with higher stages having greater self-efficacy, support and perceived benefit for exhibiting the required behaviour (Greene, Rossi, Rossi, Velicer, Fava & Prochaska, 1999). No studies were identified that explored the predictive utility of TTM components in the prediction of dietary self-care behaviours.

Conclusive Comments: TTM Literature

There is currently a paucity of research in this area, however the model has some potential strengths and weaknesses which might be useful to consider before research ensues. A major conceptual strength of the TTM (in contrast to the HBM and TRA/TPB) is that it accounts for *volition* (i.e. the *preparation, execution* and *maintenance* of dietary behaviour), rather than simply *behavioural intention.* However, there may still be an intrinsic limitation to this model. Povey, Conner, Sparks, James & Shepherd (1999) argue that the temporal divisions used to distinguish between the stages of change in the TTM (see Figure 3) may be more suited to describing

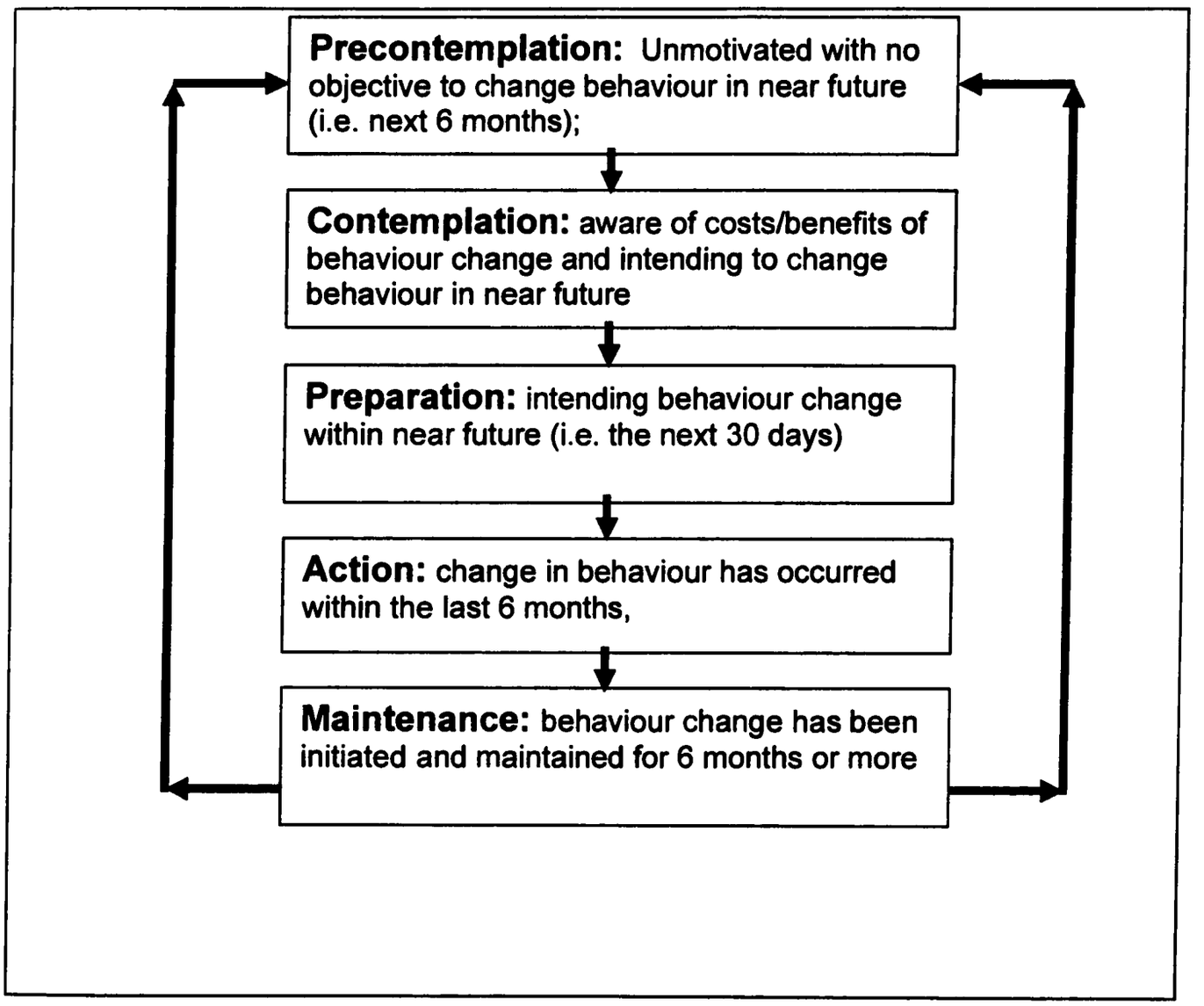


Figure 3: The Transtheoretical Model (Based on Munro, Lewin, Swart, Volmink, 2007)

addictive behaviours (for which the TTM was originally constructed). Addictive behaviours are less complex than dietary behaviours and can thus be more accurately quantified (Povey et al., 1999). Consequently, the construct validity of the TTM model for diet is uncertain.

Social Cognitive Theory

Social Cognitive Theory (SCT), attempts to explain how and why certain behaviours are initiated and maintained. Its predecessor (Social Learning Theory) posits that the *environment*, the *individual* and *behaviour* interact bidirectionally through the process of 'reciprocal determinism'. Therefore, one can affect change on oneself and one's environment and vice-versa (Bandura, 1989). SCT proposes that behaviour is influenced by five self-regulatory processes: (i*) self-efficacy* expectancies (the self-evaluation of one's capability to behave in a certain manner); (ii) *outcome expectancies* (*situational:* the consequences that will occur without personal action and *individual:* how effective one's actions will be and their likely consequences); (iii) *knowledge* about health risks and (iv) by their evaluation of the *benefits* and specific likely outcomes of engaging in that behaviour. An individual's adoption of approved dietary health behaviours is also made more likely by (v) the relative ratio of *perceived facilitators* to *barriers*. The concepts of self-efficacy and outcome expectancies (see Figure 4 below) are integral to the initiation and maintenance of health behaviours (Bandura, 1997).

Thus, dietary self-care behaviours are more likely to be exhibited if the individual (a) is confident about their ability to exhibit the recommended dietary behaviour, (b) feels in control of outcomes and (c) perceives that there are few barriers to achieving the required dietary behaviour (Bandura, 2004).

Review of the Literature: SCT

Four longitudinal studies and five cross-sectional studies explored the association between the SCT and dietary self-care. To commence with the longitudinal studies, McCaul, Glasgow & Shafer (1987) examined the association between four of the SCT's components (outcome expectancies, social support, knowledge & self-efficacy) and the self-care behaviours of adolescents and adults with type 1 diabetes. The predictor and self-care measures each had good test-retest reliabilities. Participants were re-tested on all variables after 2 months and 6 months. Self-care was found to be positively associated with self-efficacy for all participants. It was also positively associated with outcome expectancies and diabetes knowledge for adults. Stepwise multiple regressions revealed that the *expectancies* composite (composed of self-efficacy, outcomes and automatic thoughts) was the strongest predictor of dietary self-care for both populations. It explained 12% of dietary self-care concurrently and 5% prospectively. Dietary knowledge also predicted 5% of adherence concurrently. A strength of this model is its use of multimodal methods for assessing self-care (see Table 1). This increases the reliability of its outcome data.

Similarly, Johnston-Brooks et al. (2002) utilized multimodal methods to examine the predictive utility of self-efficacy longitudinally. Concurrently, self-efficacy predicted 41% of behaviours and longitudinally, the predictive utility of self-efficacy only decreased by 7%. This reduction may however have been due to the below adequate stability of the dietary scale (see Table 1). Nevertheless, using a larger sample size (N = 142), Hurley et al. (1992) provide further support for Brooks et al's observation, with self-efficacy explaining 33% its variance after 30 days.

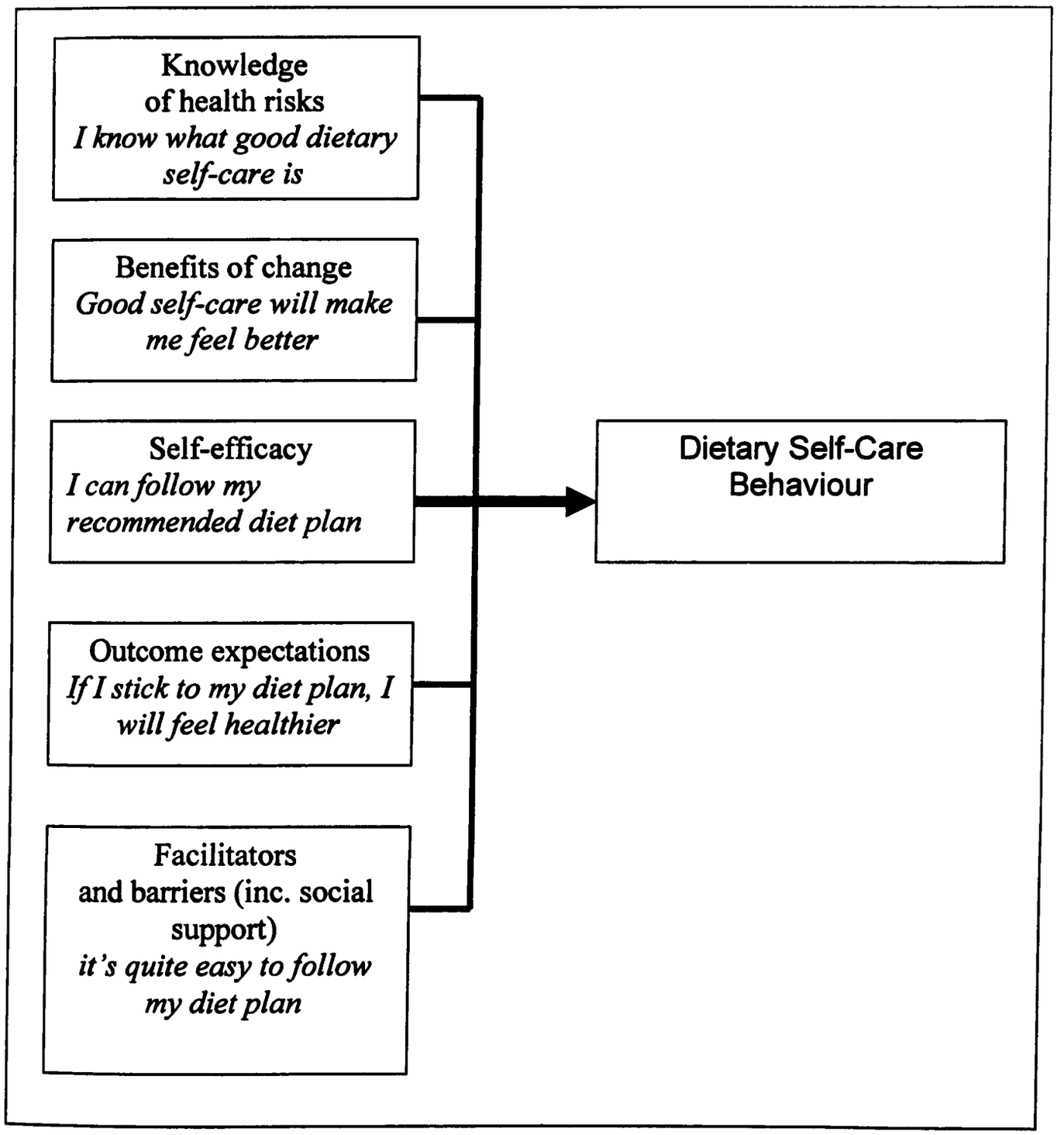


Figure 4: Social Cognitive Theory: Based on Munro, Lewin, Swat &. Volmink (2007)

Also using multiple regression analysis, Kavanagh, Gooley and wilson (1993) found similar results with their adult sample, self-efficacy predicted 36% of dietary self-care two months later. In contrast to McCaul et al. (1987) and Johnston-Brooks et al. (2002), the validity of Kavanagh et al (1993) findings is threatened by the use of two longitudinal observation points rather than three (Barker et al., 2002). Nonetheless, although both Kavanagh et al. (1993) and McCaul et al. (1987) note adequate levels of test-retest reliability, some are as low as r =.44 over two months for dietary self-care (Kavanagh et al.) and r =.36 (skills) and r =.42 (diet knowledge) over two and six months respectively in McCaul et al. 1997). Consequently, suitability of these measures for longitudinal study is debatable.

Support for the predictive utility of self-efficacy in dietary self-care is also evident from cross-sectional studies which combined Type 1 and 2 adult populations (Senécal, Nouwen & White, 2000; Wallston, Rothman & Cherrington, 2007; Williams & Bond, 2002). Senécal et al. (2002) examined how the constructs from SCT and self-determination theory (Deci & Ryan, 1985) were associated with dietary self-care and life satisfaction. Internal consistency levels for both self-efficacy and self-care scales were very good ($\alpha > .70$). Structural equation modelling revealed self-efficacy was a significantly stronger predictor of dietary self-care than autonomous self-regulation although they both were highly associated with dietary self-care. A strength of this study was its large sample size, which reduces the chance of false negatives. Nevertheless, studies with smaller sample sizes still provided support. For example, Williams et al. (2002) found self-efficacy explained 22% of the variance in dietary adherence over the last week and 26% over the last 8 weeks. Mediational analysis revealed that self-efficacy mediated the effect of social support on dietary self-care. Apart from McCaul et al. (1987) Williams et al. (2002) was the only paper, which increases the predictive validity of SCT by exploring more than one of its constructs. However,

although the self-report measures in both studies rely on retrospection, the reliance on retrospection in Williams et al. (2002) is far greater (e.g., an 8 week self-report measure). The substantial reliance on memory for this measure threatens its construct validity. Despite these limitations, a later study by Wallson et al. (2007) provided support for previous SCT findings with self-efficacy predicting 6 % of general diet behaviours and 1% specific diet behaviours among adults. The comparatively lower percentage of explained variance from Wallson et al. (2007) might be due to the self-care questionnaires for diet having poor internal consistency (α = .40).

Finally, Iannotti et al. (2006) extended the above findings to child and adolescent populations. Like McCaul et al. (1987) they utilized multimodal methods for collecing self-care information. Moreover, in contrast to Wallston et al. (2007), each of Iannotti et al.'s (2006) measures had adequate levels of internal consistency (α > .60). Iannotti et al found that for older children only, self-efficacy, positive and negative outcome expectancies explained 12-19% of the variance in *overall* diabetes self-care. Outcome expectations moderated the effect of self-efficacy on self-care; with self-care being high when both positive outcome expectations and self-efficacy were high.

Conclusive Comment: SCT Literature

From each of the above studies, it is clear that self-efficacy is able to predict a significant proportion of the variance in dietary self-care. However, the evidence is weaker for the remaining SCT components, e.g. outcome expectancies, knowledge and social support. This may be partly due to issues regarding the reliability and validity of predictor and outcome scales in some of the reviewed studies. Nevertheless, as only McCaul et al. (1987) and Williams et al. (2002) explored multiple components of the SCT, the process of accurately assessing the merit of the theory as a whole is somewhat impeded. Indeed, it has been argued that the broad focus of the SCT might make it difficult to operationalize without segmentation into separate components (Munro et al., 2007). Despite the consistency regarding self-efficacy's predictive utility, it is unable to increase one's understanding regarding the processes mediating the initiation and maintenance of dietary

self-care. It fails to clearly account for the *processes* contributing to the persistence of dietary self-care/prolonged management. SCT research using the Health Action Process Approach (HAPA) model, Schwarzer (1992) may expand our knowledge of dietary self-care behaviours by providing a role for intermediary processes such as *planning* in dietary self-care.

Conclusive Remarks on Reviewed Papers

In summing up the findings from these papers, one must bear in mind their heavy reliance on self-report formats in measuring both predictor (health models) and outcome (health behaviour) variables. The effect of social desirability was not measured or controlled in any of the papers. This brings into question the reliability of the findings. Moreover, since both outcome and predictor measures were not consistently used across studies, the validity of cross-study comparison is threatened. Nonetheless, the Extended HBM and the SCT models consistently highlighted the importance of self-efficacy in dietary self-care. In addition, the importance of evaluating benefits, costs and similar evaluative constructs of dietary self-care was consistently highlighted by the HBM. However, as discussed for each model, factors such as poor scale validity/reliability and limited sample size reduced the credibility of outcomes. Nevertheless, the use of longitudinal designs and mediation analysis in several of the SCT papers provides evidence for causal relationship between model/theory components and dietary self-care.

Nonetheless, as only Aalto et al. (1997) utilized a randomized sample, the generalizability of the remaining findings to diverse populations must be considered with caution. Indeed, the remaining studies, which used non-randomised sampling, may be influenced by selection bias and low internal validity (Barker et al., 2002). Finally, as only two of the papers were able to predict more than 50 percent of the variance in dietary self-care, one can conclude that there may be additional factors contributing to the dietary behaviour of individual with type 1 diabetes.

Health Behaviour Models/Theories' and the Potential Role of Emotion, Development & Socio-Cultural Factors on the Diabetes Diet

The reviewed health behaviour models/theories may have several limitations, which restrict their applicability to the prediction of dietary self-care in diabetes. Some constraints shall now be briefly examined.

Socio-cultural Considerations

The TRA/TPB and the HBM are continuum models. That is, they combine a group of fixed factors into a prediction equation to predict the likelihood of a behaviour occurring (Schwarzer, 2008). A limitation of such models is their implicit assumption that dietary behaviours occur in a uni-directional fashion across individuals (Weinstein et al., 1998). It is unclear how such a uni-directional approach can account for dietary phenomena such as *stop-start* (or yo-yo) dieting (Brownell & Rodin, 1994) or indeed religious fasting. Although the TTM has been criticised for not being a 'true' stage model in the sense that its 'stages' are not discrete and irreversible (Bandura, 2000; Schwarzer, 2008) its conceptualisation of stages of behaviour change and feedback loops, allow greater flexibility than continuum models. They may thus have greater idiosyncratic fit to the health behaviour of a range of diverse populations (Snetselaar, 2003).

The TRA/TPB and the SCT each consider the effects of socio-cultural norms or expectations on decision-making. The TRA/TPB does this through its *subjective norms component* (Romano & Netland, 2007). Similarly, the SCT proposes that health behaviour is regulated by normative influences (Bandura, 1997) in terms of outcome expectancies (i.e. whether the behaviour will attract social approval/sanction). In contrast, although the HBM refers to social and demographic factors, it provides no clear explanation of *how* these modify behaviours. Consequently, the HBM may be

the least useful model/theory for enhancing our understanding of the effect of socio-cultural factors on dietary self-care.

Social interaction is integral to food choice (Pollard, Kirk & Cade, 2002) conveying, for example, group membership, status or individuality. Indeed, it has been demonstrated that individuals make different food choices when in the company of others compared to when eating alone (Brug, Debie, van Assema, and Weijts, 1995). However, none of the reviewed models/theories incorporate such factors into their theorising. Instead, they have a largely individualistic focus which limits the level of understanding that can be achieved regarding the more interpersonal factors underlying dietary self-care in diabetes.

Life-Stage Considerations

Hall, Fong, Epp & Elias (2007) have suggested that the relationship between behavioural intention and actual behaviour might be moderated by *executive functioning* (a set of cognitive functions which control and regulate other functions e.g. planning, attention, organizing and regulating action). As it is known that developmental stage affects executive functioning (Anderson, Jacobs & Anderson, 2008) the fact that many of the reviewed studies failed to control for executive function or examine child and adult groups separately (e.g. Syrjala et al,, 2004 and Shenkel et al., 1985), means that one must consider their conclusions about dietary self-care with caution.

In relation to the above point, the cognitive processes of children may differ to those of adults. That is, children may experience difficulty conceptualising personal risk / long-term ramifications of their behaviour (Patino et al., 2003; Skinner, Hampson, Fife-Schaw, 2002). Consequently, the applicability of models which necessitate the evaluation of risk as a prerequisite for behavioural change (e.g., the HBM, SCT and TTM) in children and adolescents remains questionable.

Finally, factors influencing dietary behaviour among children are likely to be different from those of adolescents. Young children are more likely to be dependent on their parents to make dietary

choices and have contrasting nutritional needs to adolescents (Patton, Dolan & Powers, 2006). In contrast, independence-seeking together with greater insulin sensitivity may place adolescents at higher risk for poor self-care (Linscheid, Budd, Rasnake, 2003; Noller, 1994). Indeed it has been shown that collaborative self-care between parents and adolescents is associated with better self-care (Weibe et al., 2005). In contrast, parental over-involvement results in low self-efficacy and feelings of incompetence among adolescents (Pomerantz & Eaton, 2000). As most of the reviewed models (except the EHBM and SCT) do not consider the impact of developmental trends in social support, one could argue that current models might be more applicable to adult diabetic populations who might have more autonomy.

Emotional Factors

In the psycho-social health behaviour models/theories reviewed, emotional factors are somewhat sacrificed in place of cognitive factors. There has clearly been an implicit assumption that all individuals reason rationally without any emotional components (Munro et al., 2007). However, diabetes is viewed as one of the most psychologically demanding chronic conditions due to the amount of daily self-care expected to be performed by the individual themselves (Ciechanowski et al., 2000; Cox et al., 1992). Indeed, depression and anxiety can be prevalent among diabetic populations (Grigsby et al., 2002; Lloyd, Dyer & Barnet, 2000). Each of these conditions has a negative influence on dietary self-care (e.g. Lin et al., 2004). Indeed, Trafimow et al. (2004) found that affect was able to explain more behaviour (including health behaviours) than rational thought.

Emotional factors are integral to dietary behaviours. In fact, Berridge (1996) highlights the importance of both *affective liking* and *wanting* as motivators of dietary behaviour. Partial support for the importance of emotion in diabetes diet lies in a recent functional Magnetic Resonance Imaging study conducted with type 2 diabetic adults and controls. Among the diabetes group, greater activity was detected in the orbito-frontal cortex (which is associated with motivation and emotion) upon exposure to images of high-fat/restricted food (Chechlacz et al., 2008).

As most of the reviewed models/theories (apart from TTA/TPB and the Expanded HBM) fail to explicitly consider the effect of emotion on dietary behaviour, their validity when applied to diabetes dietary self-care is reduced. To improve their predictive ability and validity, future models/theories must begin to appreciate the significant contribution of emotion to dietary self-care behaviours.

Implications for Clinical Practice

The research studies reviewed were each based on large (often dichotomous) groups of individuals. Consequently, drawing individualistic clinical implications from these findings must be executed tentatively. However, certain trends were identified which might still be useful for healthcare professionals to consider when working with dietary self-care in type 1 diabetes.

Increasing Self-Efficacy

Across models/theories, self-efficacy was consistently shown to be a strong predictor of dietary self-care. The lower the self-efficacy, the poorer the self-care behaviour would be. Thus, self-efficacy should be targeted by healthcare workers to improve dietary self-care. Indeed, the National Service Framework (NSF; Department of Health, 2001) recommends *empowerment* of individuals with diabetes, making them increasingly responsible for their care. This review has highlighted the importance of factors that might mediate the effect of self-efficacy on dietary behaviour (e.g social support; Gillibrand et al., 2006) and autonomous self-regulation/internal motivation (Senécal et al., 2000). In addititon, based on the SCT, Bandura (1997) suggests means by which self-efficacy can be enhanced (e.g. modelling and guided rehearsal). Such strategies can be effective in enhancing the self-efficacy of individuals with diabetes (Ott, Greening, Palardy, Holderby & DeBell, 2000).

Promoting Cognitive Evaluative Processes

In the HBM (Aalto et al., 1997; Brownlee et al.,1987 and Gillibrand et al., 2006) it was found that the more benefits an individual perceived for the adoption of the new behaviour, the more likely they were to adopt the behaviour. In terms of implications for health care, professionals could utilize literature which discusses the dangers of poor dietary self-care. This would work on the principle of threat appraisal and coping appraisal from Protective Motivation Theory (Rogers, 1984). Presentation of such information may encourage clients to evaluate the benefits of adopting better dietary self-care behaviours and assess the severity of the consequences of poor self-care; together with their susceptibility to these consequences. Such techniques have been shown to be effective in increasing an individual's motivation to adapt behaviours to reduce the threat (Milne, Sheeran & Orbell, 2000). However, such methods are most effective when the individual has high self-efficacy (Prentice-Dunn & Rogers, 1986); which has been linked resilliance (rather than being overwhelmed) in the face of fear arousal (Bandura, 1997).

Younger individuals who might not be able to effectively conceptualise the long-term consequences of action/inaction might benefit from focusing instead on the costs/benefits of good self-care (rather than poor self-care). This has been linked to improved diabetes self-care (Palardy et al. 1998).

Assess the Impact of Socio-cultural Factors

This review highlighted the importance of socio-cultural factors in the adoption of dietary self-care behaviours. Thus, in culturally diverse areas, it might be useful for the practitioner to assess how the individual's cultural values influence the adoption of the required dietary self-care behaviour (Elder, Ayala & Harris, 1999). In relation to this, measuring the individual's level of intrinsic/internal motivation might be useful in assessing how likely they are to be led by socio-cultural pressures (Deci & Ryan, 2002). Those with higher intrinsic motivation will be more likely

to adhere to their dietary recommendations (Senécal et al., 2000). Improving dietary self-care whilst simultaneously respecting 'cultural difference' might be achieved through introducing the client to individuals from similar cultural backgrounds who have adequate levels of dietary self-care (Elder et al., 1999).

Promoting Emotional Well-being

Eating behaviours are steeped in emotion. Together with this, depression and anxiety are more prevalent among diabetic populations. A criticism of the current health behaviour models/theories was that they did not consider psychological well-being. Because emotion can have an important impact on dietary self-care, clinicians should routinely assess such factors and where appropriate, recommend psychological interventions. Indeed, the NICE guidelines for diabetes recommend psychological interventions for the improvement of self-care.

Recommendations for Future Research

i. Researchers should measure the psychometric properties of a narrow range of self-care and health behaviour measures and use only these measures in future research to allow ease of comparison across studies. Existing research demonstrates a heavy reliance on retrospective self-report measures. As mentioned, the accuracy of self-reports is questionable, for amongst other reasons *social desirability effects*. If possible, future research should utilize objective measures (e.g. direct observation by significant others). Moreover, a multi-method approach to assessment would encourage more accurate outcomes.

ii. In several of the health behaviour studies, self-care was viewed as a composite score (combining each area of diabetes self-care into a single score). This did not assist the process of understanding dietary self-care. As mentioned earlier, dietary self-care is quite separate to other areas of diabetes self-care. To ascertain more valid and reliable representations of dietary self-care, future researchers are advised to refrain from combining measures of dietary self-care with other self-care areas.

iii. It is recommended that future research in this area analyses the results of children and adults separately. This will enable developmental trends to be clarified. It may also be necessary for separate measures of health behaviour to be developed for children (who may not be able to conceptualize risk / long term consequences) to the same degree as adults. Such cognitive abilities are an integral part of most of the existing health behaviour models/theories. Berg and Upland (2007) recently proposed a model of dyadic coping and appraisal for adult couples experiencing chronic illness. She describes how coping may vary through the couple's lifespan and how a spouse's adjustment can impact upon the patient's

adjustment and vice versa. Due to the intricate nature of the relationship between adolescent with diabetes and their parents in terms of dietary self-care, it might be useful for researchers to explore whether such a model can be applied to the child-parent dyad. This may yield useful insights into the impact of parental involvement on dietary self-care outcomes from childhood to late adolescence.

iv. Finally, few models in this area make reference to *emotion* or *food preference/liking* as factors contributing to dietary self-care. There is evidence to suggest that *liking* and other emotional factors can affect dietary behaviours. It is recommended that future models incorporate emotional factors into their theorising. Possibly then, they will be able to account for more variance in dietary self-care. In relation to this, research is required to investigate the contribution of factors such as *food preference/liking* to the eating behaviours of individuals with type 1 diabetes. Results from studies with related clinical groups is promising (e.g. Chechlacz et al, 2008).

References

Aalto A. M and Uutela A. (1997). Glycemic control, self-care behaviors, and psychosocial factors among insulin treated diabetics: A test of an Extended Health Belief Model. *International Journal of Behavioral Medicine*. 4 (3), 191-214.

Ajzen, I. (1988). *Attitudes, Personality, and Behaviour,* Open University Press, Buckingham.

Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes*, 50 (2),179-211

Ajzen, I. &. Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour.* Englewood Cliffs: Prentice Hall.

Anastasi, A. (1976). *Psychological testing*, 4th ed. New York: Macmillan.

Anderson, R. M. (1985). Is the problem of compliance all in our heads? *Diabetes Educ.* 11, 31-34

Anderson, V., Jacobs, R. &. Anderson, P. (2008). Executive Functions and the Frontal Lobes A Lifespan Perspective. New York. Psychology Press Ltd

Bandura, A. (1989). A social cognitive theory of action. In J. P. Forgas & M. J. Innes (Eds.), *Recent advances in social psychology: An international perspective* (pp. 127-138). North Holland: Elsevier

Bandura, A. (1997). *Self-efficacy. The exercise of control.* New York: W. H. Freeman & Company

Bandura A (2004). Health promotion by social cognitive means. *Health Educ Behav*, 31, 143-164.

Bandura, A. (1992). Exercise of personal agency through the self-efficacy mechanism. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 3-38). Washington, D.C.: Hemisphere.

Bandura, A. (2000). Health promotion from the perspective of social cognitive theory. In P. Norman, C. Abraham. &. M. (Eds) Conner.*Understanding and changing health behaviour: From health beliefs to self-regulation,* (pp. 299-339). Amsterdam: Harwood Academic Publishers

Barker, C., Pistrang, N., & Elliott, R. (2002). *Research methods in clinical psychology: An introduction for students and practitioners* (2nd ed.). Chichester: Wiley.

Becker, M. (1974). The health belief model and personal behavior. Thorofare, NJ: C.B. Slack.

Becker, M. H. &. Maiman, L. A. (1975). Sociobehavioral determinants of compliance with health and medical care recommendations. *Medical Care, 13,* 10-24.

Becker, M. H., Haefner, D. P., & Maiman, L. A. (1977). The health belief model in the prediction of dietary compliance: A field experiment. *Journal of Health and Social Behavior,* 18, 348–366.

Berg, C. A. & Upchurch, R. (2007). A developmental-contextual model of couples coping with chronic illness across the adult life span. *Psychological Bulletin, 133*(6), 920-954.

Berridge, K.C. (1996). Food reward: Brain substrates of wanting and liking. *Neuroscience and Biobehavioral Reviews, 20,* 1-25

Block G, Hartman AM, Dresser C, Carroll MD, Gannon J, Gardner L(1986) A data-based approach to diet questionnaire design and testing. *Am J Epidemiol, 124,* 453–469

Bond, G.G. Aiken, L.S. & Sommerville, S.C (1992). The health belief model and adolescents with insulin dependent diabetes mellitus. *Health Psychology. 11* (3), 190-198

Bradley, C. ,&. Speight J (2002) Patient perceptions of diabetes and diabetes therapy: assessing quality of life. *Diabetes Metab Res Rev, 18,* 264–269

Brownlee-Duffeck, M., Peterson, L. Simmonds, J. F. Goldstein, D. Kilo, C. & Hoette, S. (1987). The role of health beliefs in the regimen adherence and metabolic control of adolescents and adults with diabetes mellitus. *Journal of Consulting & Clinical Psychology. 55* (2), 139-144

Brownell, K.D. &. Rodin, J. (1994). The dieting maelstrom: is it possible and advisable to lose weight? *American Psychologist, 49,* 781–791.

Brug, J. Debie, S. van Assema, P. & Weijts, W. (1995) Psychosocial determinants of fruit and vegetable consumption among adults: results of focus group interviews. *Food Quality and Preference, 6,* 99–107.

Burns, A.C.(1992) The expanded health belief model as a basis for enlightened preventative health care practice ad research. *Journal of Health Care Marketing. 12,* 32-45

Charron-Prochownik, D., Becker, M. H., Brown, M. B., Liang, W. M. & Bennett, S. (1993). Understanding young children's health beliefs and diabetes regimen adherence. *Diabetes Educator, 19* (5), 409-418

Chechlacz, M., Rotshtein, P., Klamer, S., Fritsche, A., Porubska, K, Higgs, S., et al. (2008). Diabetes dietary management alters responses to food pictures in brain regions associated with motivation and emotion: an fMRI study. In Preparation. University of Birmingham, UK

Coolican, H. (1994). *Research Methods and Statistics in Psychology.* London. Hodder & Stoughton

Conn, V.S. (1998). Older women: Social Cognitive theory correlates of health behavior. *Women and Health, 26,* 71-85

Cox, D. J, &. Gonder-Frederick, L. (1992) Major developments in behavioural diabetes research. *J Consult Clin Psychol, 60,* 628-638.

Deci, E. L & Ryan, R. M. (2002). *Handbook of self-determination research.* Rochester: Suffolk

Department of Health (2001). National service framework for diabetes: standards. Retrieved from the Worldwide web on 15th October 2007: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4002951

Diabetes UK (2004) Diabetes in the UK 2004: A report from Diabetes UK October 2004retrieved from the worldwide web on 17 October 2007. http://www.diabetes.org.uk/Documents/Reports/in_the_UK_2004.doc

Elder J. P., Ayala, G. X &. Harris, S. (1999) Theories and intervention approaches. to health-behavior change in primary care. *Am J Prev Med, 17*, 275-284

Fava, J.L., Velicer, W.F. &. Prochaska, J.O., (1995). Applying the transtheoretical model to a representative sample of smokers. *Addictive Behaviors 20,* 189–203

Ficke, D, L., &. Farris, K. B. (2005) Use of the Trans-theoretical model in the medication use process. *Annals Pharmacother*, 39, 1325-30

Fishbein, M., & Ajzen, I. (1975). *Beliefs, Attitude, Intention and Behaviour: An Introduction to Theory and Research.* Philippines: Addison-Wesley Publishing Company.

Franz, M. J., Bantle, J. P., Beebe, C. A., Brunzell, J. D., Chiasson, J. L, Garg, A, et al..(2002) Evidence-based nutrition principles and recommendations for the treatment and prevention of diabetes and related complications. *Diabetes Care. 25* (1), 148-98

Gillibrand, R. &. Stevenson, J. (2006) The extended health belief model applied to the experience of diabetes in young people. *British Journal of Health Psychology, 11* (1), 155-169.

Glanz, K., Lewis, F.M. &. Rimer, B.K. (1997) Linking theory, research and practice. In Glanz, K., Lewis, F.M. &. Rimer, B.K. (eds), *Health Behavior and Health Education: Theory, Research and Practice*, 2nd edn. (pp. 19–35). San Francisco, CA: Jossey-Bass

Glasgow, R.E., &. Anderson, R.M. (1999). In diabetes care, moving from compliance to adherence is not enough. Something entirely different is needed. *Diabetes Care, 22,* 2090-2092.

Greene, G. W., Rossi, S. R., Rossi, J. S., Velicer, W. F., Fava, J. L., & Prochaska, J. O. (1999). Dietary applications of the stages of change model. Journal *of the American Dietetic Association, 99,* 673-678

Grigsby, A. G., Anderson, R. J., Freedland, K. E. &. Clouse, R. E. and Lustma, P. J. (2002). Prevalence of anxiety in adults with diabetes: A systematic review, *J Psychosomatic Res, 53,* 1053–1060

Hagger, M. S., Chatzisarantis, N. L .D. &. Biddle, S. J. H. (2002) A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: predictive validity and the contribution of additional variables. *Journal of Sport and Exercise Psychology, 24,* 3–32.

Hall , P. A., Fong, G. T., Epp, L. J., &. Elias, L. J. (2007) Executive function moderates the intention-behavior link for physical activity and dietary behaviour. *Psychology & Health, 23* (3), 309 - 326

Hawkes, J. M. &. Holm, K. (1989) Causal modeling: A comparison of path analysis and LISREL. *Nursing Res, 38,* 312–314

Heider, F. (1958) *The psychology of interpersonal relations.* New York: Wiley.

Henshaw, L, (2006) Empowerment, diabetes and the National Service Framework: a systematic review. Journal of Diabetes Nursing. Downloaded from the Worldwide Web on 17 January 2008: http://findarticles.com/p/articles/mi_m0MDR/is_4_10/ai_n16689687

Hentinen, M. &. Kingas, H. (1998). Factors associated with the adaptation of parents to a chronically ill child. *Journal of Clinical Nursing, 7,* 316–324

Johnston-Brooks, C. H, Lewis, M. A, Garg, S. (2002) Self-efficacy impacts self-care and HbA1c in young adults with Type I diabetes. *Psychosom Med.64*(1):43-51.

Jones, H, Edwards, L., Vallis, M, Ruggiero, L., Rossi, S., Rossi, J., Greene, G., Kavanagh, D. J., Gooley, S. & Wilson, P. H. (1993). Prediction of Adherence and Control in diabetes. *Journal of Behavioural Medicine, 16*(5), 509-522.

Kulbok, P & Baldwin, J. (1992). From preventive health behavior to health promotion: Advancing a positive construct of health. *Advances in Nursing Science, 14,* 50-64.

Lin, E.L, Katon, W., Von Korff, M., Rutter, C., Simon, G.E, Oliver, M., et al. (2004) Relationship of Depression and Diabetes Self-Care, Medication Adherence, and Preventive Care. *Diabetes Care, 27,* 2154-2160

Linscheid T, Budd K. &. Rasnake L. (2003) Pediatric feeding disorders. *In: Handbook of pediatric psychology.* Roberts M, ed. 3rd. New York: The Guilford Press

Lloyd , C.E., Dyer, P. H. &. Barnett, A. H. (2000) Prevalence of symptoms of depression and anxiety in a diabetes clinic population. *Diabet Med, 17,* 198–202

Maiman, L. A. &. Becker M. H. (1974). The health belief model: Origins and correlates in psychological theory. *Health Educ Monogr 2*, 336-353,

Marshall, S. J. &. Biddle, S. J.H. (2001). The transtheoretical model of behaviour change: A meta analysis of applications to physical activity and exercise. Annals of Behavioral Medicine, *23*(4), 229-246.

McCaul, K.D, Glasgow, R.E & Schafer, L.C (1987) Diabetes regimen behaviours. Predicting Adherence. *Medical Care, 25* (9) 868-881

Mirotznik, J. Feldman, L., & Stein, R. (1995). The health belief model and adherence with a community center-based supervised coronary heart disease exercise program. *Journal of Community Health, 20* (3), 233-247.

Munro, S. & Lewin, S. Swart, T. & Volmink, J. (2007). A review of health behaviour theories: how useful are these for developing interventions to promote long-term medication adherence for TB and HIV/AIDS? *BMC Public Health, 7*,104

Noar, S. M., & Zimmerman, R. S. (2005). Health behavior theory and cumulative knowledge regarding health behaviors: Are we moving in the right direction? *Health Education Research: Theory & Practice, 20*(3), 275-290

Noller, P. (1994). Relationships with parents in adolescence: Process and outcome. In R. Montemayor,G. R. Adams,& T. P. Gullotta (Eds.), *Personal relationships during adolescence: Advances in adolescent development* (Vol. 6, pp. 37-77). Thousand Oaks, CA: Sage.

Ott, J., Greening, L., Palardy, N., Holderby, A. &. DeBell W.K. (2000). Self-efficacy as a mediator variable for adolescents' adherence to treatment for insulin-dependent diabetes mellitus. *Children's Health Care. 29*, 47-63

Palardy, N, Greening L, Ott J, Holderby A, Atchison J. (1998) Adolescents' health attitudes and adherence to treatment for insulin-dependent diabetes mellitus. *J Dev Behav Pediatr. 19*(1):31-7.

Patino, A. M., Sanchez, J. Eidson, M. & Delamater, A. M (2005). Health beliefs and regimen adherence in minority adolscentes with type 1 diabetes. *Journal of Pediatric Psychology, 30* (6), 503-512

Patton, S. Dolan, L. &. Powers, S. (2007). Dietary Adherence and Associated Glycemic Control in Families of Young Children with Type 1 Diabetes. *Journal of the American Dietetic Association, 107* (1), 46-52

Peyrot, M., Rubin, R.R., Lauritzen, T., Snoek, F. J., Matthews, D. R. &. Skovlund, S.E. (2005) Psychosocial problems and barriers to improved diabetes management: results of the Cross-National Diabetes Attitudes, Wishes and Needs (DAWN) Study. *Diabet Med, 22*:1379 -1385

Peyrot, M. & Rubin, R. R. (2007) Behavioural and psychosocial interventions in diabetes: A conceptual review. *Diabetes Care. 30*(10), 2433-2440

Pollard, J., Kirk, S.F.L. & Cade, J.E. (2002). Factors affecting food choice in relation to fruit and vegetable intake: A review. *Nutrition Research Reviews. 15*, 373-387.

Pomerantz, E. M., & Eaton, M. M. (2000). Developmental differences in children's conceptions of parental control: "They love me, but they make me feel incompetent." *Merrill Palmer Quarterly, 46*, 140–167.

Povey, R., Conner, M., Sparks, P., James, R. &. Shepherd, R. (2000). Application of the Theory of Planned Behaviour to two dietary behaviours: roles of perceived control and self-efficacy. *British Journal of Health Psychology, 5*, 121-139.

Prochaska J. O. &. DiClemente C. C. (1983) Stages and processes of self-change of smoking: toward an integrative model of change. *J Consult Clin Psychol, 51*, 390-5.

Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion, 12*, 38-48.

Redding, C. A., Rossi, J. S., Rossi, S. R., Velicer, W. F., & Prochaska, J. O. (2000). Health Behavior Models. *The International Electronic Journal of Health Education*, 3 (Special Issue), 180-192 http://www.iejhe.siu.edu.

Rogers,R.W. (1984) Changing health-related attitudes and behaviors: the role of preventative health psychology. In J.H. Harvey, J.E. Maddux, R. P. McGlynn. and C. D. Stoltenberg. (eds). Social Perception in Clinical and Counseling Psychology. (Vol. 2. pp. 91-112). Lubbock, TX: Texas Tech University Press.

Romano, J. L. & Netland, J. The application of the theory of reasoned action and planned. *Counseling Psychology Quarterly, 14*, 51-63

Rosenstock, I. (1974). Historical Origins of the Health Belief Model. *Health Education Monographs,* 2 (4), 328-335

Rosenstock, I. M.,. Strecher, V. J. &. Becker, M. H. (1988) Social Learning Theory and the Health Belief Model. *Health Educ Behav, 15*, 175

Rotter, J. B. (1954). *Social learning and clinical psychology.* New York: Prentice-Hall

Sato, E., Suzukamo, Y., Miyashita, M. &. Kazuma, K. (2004). Development of a Diabetes Diet-elated Quality-of-Life Scale. *Diabetes Care, 27,* 1271-1275.

Schwarzer, R. (1992) Self-efficacy in the adoption and maintenance of health behaviors: a critical analysis of theoretical approaches and a new model. In Schwarzer,R. (ed.), *Self-efficacy: Thought Control of Action.* Hemisphere, New York.

Schwarzer, R. (1999). Self-regulatory processes in the adoption and maintenance of health behavior. *Journal of Health Psychology, 4*(2), 115-127.

Schwarzer, R. (2008). Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology: An International Review, 57*, 1–29.

Senecal, C., Nouwen, A. &. White, D. (2000) Motivation and dietary self-care in adults with diabetes: Are self-efficacy and autonomous self-regulation complementary or competing constructs? *Health Psychology. 19* (5), 452-457.

Sheeran, P. (2002). Intention-behaviour relations: A conceptual and empirical review. In M. Hewstone &. W. Stroebe (Eds.), *European Review of Social Psychology.* (Vol. 12, pp. 1-36.): Chichester, UK: John Wiley & Sons.

Shenkel, R. J., Rogers, J. P., Perfetto, G. & Levin, R. A. (1985) Impirtance of "signigicant others" in predicting coperation with diabetic regimen. *International Journal of Psychiatry in Medicine, 15* (2), 149-155

Skinner,T.C. &. Hampson,S.E. (1998). Social support and personal models of diabetes in Relation to self-care and well-being in adolescents with Type I diabetes mellitus *Journal of Adolescence, 21* (6), 703-715

Skinner, T.C., Hampson, S.E., Fife-Schaw, C. (2002). Personality, personal model beliefs, and self-care in adolescents and young adults with Type 1 diabetes *Health Psychology,* 21(1), 61-70

Snetselaar, L. (2003) Stages of Change and Eating Behaviors Issues on categorizing. *Diabetes Care, 26, 1624-1625*

Soedamah-Muthu, S. S, Fuller, J. H., Mulnier, H. E, Raleigh, V. S., Lawrenson, R. A. &. Colhoun HM (2006). 'High Risk of Cardiovascular Disease in Patients with Type 1 Diabetes in the UK. *Diabetes Care 29,* 798-804

Steers, W.N., Elliot, E., Nemiro, J., Ditman, D., & Oskamp, S. (1996). Health beliefs as predictors of HIV-preventive behavior and ethnic differences in prediction. *Journal of Social Psychology, 136* (1), 99-110.

Sutton, S. (2004) Determinants of health-related behaviours: theoretical and methodological issues. In S. Sutton, A. Baum. &. M. Johnston, (eds), *The Sage Handbook of Health Psychology* (pp. 94–126) London, Sage

Syrjälä, A. M, Ylöstalo P, Niskanen M, Knuuttila M. (2004) Relation of different measures of psychological characteristics to oral health habits, diabetes adherence and related clinical variables among diabetic patients. *Eur J Oral Sci, 112*,109-14

Toljamo, M. &. Hentinen, M. (2001). Adherence to Self-care and Social Support. *Journal of Clinical Nursing, 10,* 618-627.

Trafimow, D., Sheeran, P., Lombardo, B., Finlay, K.A., Brown, J., Armitage, C.J., (2004). Affective and cognitive control of persons and behaviors. *British Journal of Social Psychology, 43*, 207-224.

Wallston, K.A. (1997). Perceived control and health behavior. In A. Baum, C. McManus, S. Newman, J. Weinman, and R. West (Eds). Cambridge Handbook of Psychology, *Health and medicine (Vol. 1).* Cambridge, England: Cambridge University Press

Wallston, K.A. Rothman, R. L & Cherrington, A. (2007) Psychometric properties of the perceived diabetes self-management scale (PDSMS) *Journal of Behavioural Medicine, 30*, 5, 395-401

Wdowik, M.J., Kendall,P,A., Harris, M. A. &. Auld, G. (2001).Expanded Health Belief Model Predicts Diabetes Self-Management in College Students. Journal of Nutrition Education, *33*, 17-23,

Weiner, B. (1972). Theories of Motivation: From Mechanism to Cognition, Chicago: Markham.

Weinstein, N.D. (1993). Testing four competing theories of health-protective behavior. *Health Psychology, 12,* 324–333

Weinstein, N. D., Rothman, A. J., & Sutton, S. R. (1998). Stage theories of health behavior: Conceptual and methodological issues. *Health Psychology, 17,* 290–299.

Wiebe, D. J., Berg, C. A., Korbel, C. D., Palmer, D. L., Beveridge, R. M., Upchurch, R., et al. (2005). Children's appraisals of maternal involvement in diabetes care: Enhancing our understanding of quality of life, adherence, and metabolic control across adolescence. *Journal of Pediatric Psychology, 30,* 167–178.

Williams, K.E. & Bond, M. J. (2002) The roles of self-efficacy, outcome expectancies and social support in the self-care of behaviours of diabetics. *Psychology, Health and Medicine, 7* (2), 127-141

Wysocki, T. Greco, P. &. Buckloh, L. (2003) Childhood diabetes in psychological context. In. In: M. Roberts, Editor, *Handbook of Pediatric Psychology* - 3rd ed (pp. 304–320). New York, NY: The Guilford Press

Implicit and Explicit Attitudes of Young People with Type 1 Diabetes Towards High-Fat and High-Sugar Foods

By

Michelle Ann Sandiford

School of Psychology

Department of Clinical Psychology

University of Birmingham

This study examined whether there were differences between the implicit and explicit attitudes of young people with diabetes (n=22) and without diabetes (n=30) towards the fat and sugar content of foods. It also explored whether these attitudes were associated with the healthy eating behaviours of young people with diabetes. The traditional Implicit Association Test (IAT; Greenwald, McGhee & Schwartz, 1998) and the Avoid-Approach IAT (de Houwer, Custers & deClercq, 2006) were respectively used to explore relative implicit *liking* and *wanting* for high-fat foods/high-sugar foods over their low-fat alternatives. Results suggest that priming effects based on novel aspects of foods lead to differences in implicit *wanting* for high-fat foods between groups. Results from the explicit measures suggest that individuals with diabetes are more easily primed by the *palatability* of foods compared to controls. Implicit preferences for high-fat foods were incongruently related to healthy eating. The limitations of this study and its potential impact on clinical practice are discussed.

Type 1 diabetes is the most common form of diabetes amongst young people (NICE, 2004), with an estimated 1 in 700 having the disease (Arslanian, Becker, & Drash, 1994). It is an autoimmune disease in which the body's own insulin producing pancreatic cells are destroyed (NICE, 2004). Consequently, the pancreas is no longer able to produce insulin (which regulates blood-glucose levels). To compensate, glucose levels are managed by following a complex self-care regimen involving diet, insulin injections, exercise and blood-glucose measurements. Inadequate blood-glucose control during adolescence has been linked to lasting harmful effects, irrespective of later improvements in blood-glucose control (Diabetes Complications Control Trial [DCCT], 1993). There is growing evidence detailing the importance of diet in the management of diabetes (Brand-Miller, Hayne, Petocz & Colagiuri, 2003).

Challenges during Adolescence

Young people with diabetes are particularly vulnerable to large variations in blood-glucose due to lowered insulin-sensitivity (Bloch, 1987). They are also more vulnerable to depression, which has been linked to poorer diabetes self-care (Polonsky et al., 1995). Moreover, the independence-seeking behaviours typical of adolescence can be associated with declines in diabetes management (Morris et al., 1997; Stang & Story, 2005). Nevertheless, a young person's increasing confidence in their ability to *successfully* exhibit appropriate self-care (*self-efficacy*) has been associated with better dietary behaviours (Aalato & Uutela, 1997).

Some potentially detrimental eating habits, such as a higher than average intake of fats, have been highlighted within the adolescent population (Helgeson, Viccario, Becker, Escobar & Simeneiro, 2006). This is an alarming finding since young people with diabetes are more susceptible to the development of cardiovascular disease due to, amongst other factors, increased arterial wall thickening (Atabek, Kurtoglu, Pirgon, Baykara, 2006). Furthermore, although adolescents with diabetes tend to consume less sugars than their healthy peers (Helgeson et al., 2006), prolonged

failure to manage glucose effectively is a primary contributor to irreversible secondary physical complications such as kidney disease and blindness (DCCT, 1993).

Minimizing the risk of complications in young people with diabetes is one of the chief principles of the guidance document *Making Every Young Person with Diabetes Matter* (Department of Health, 2007). Central to this theme, the NICE (2004) guidelines for diabetes recommend that professionals should educate young people and their families about the importance of healthy nutrition in the prevention of such risk. In terms of health promotion, this research aims to explore the 'food attitudes' of young people with diabetes. This is an important focal point as past research has shown that food attitudes can directly influence dietary behaviours (Aikman & Crites, 2005).

Food attitudes

Food attitudes are stable evaluations concerning one's liking/disliking for a particular food (Cervellon & Dube, 2002). They can be influenced by *cultural, social* and *affective* factors (Cervellon et al., 2002; Mela 1999, 2001). Indeed, it has been shown that the eating habits of adolescents may be more influenced by their *liking* of particular foods than by how *healthy* they perceive those foods to be (Woodward et al., 1996). However, most health education programs still tend to focus on the healthiness of foods, placing little emphasis on the young person's perceived (dis)liking of the food (Eertmans et al., 2001).

Implicit & Explicit Attitudes

According to the Dual Attitudes Model (Fazio, 1990; Petty, Brinol & DeMarree, 2007), two types of attitude guide behaviour - *explicit attitudes* and *implicit attitudes*. Explicit attitudes guide behaviour through direct and conscious evaluation. They are elicited through self-report measures, which can be influenced by introspection and social desirability effects. In contrast, implicit

attitudes are unconscious and automatic and therefore are less likely to be influenced by introspection or external effects. According to Lamote, Hermans, Baeyens & Eelen (2004) implicit attitudes are usually inferred *indirectly* (e.g., through tasks measuring speed of response to related stimuli).

Previous Food Attitudes Research

Explicit Food Attitudes

First, Lozano, Crites & Aikman (1999) found that explicit attitudes were more positive towards foods when participants were hungry. Additionally, the *time of day* was found to affect the *type* of food craved. For example, if a study was conducted in the early morning, participants would have more favourable attitudes towards foods normally eaten within that temporal context (Aikınan et al., 2005). Next, Urland & Ito (2005) explored how restrained eating (i.e., a restricted diet to avoid weight gain) among female undergraduates affected food attitudes. Overall, participants displayed more ambivalent attitudes towards high-fat and high-sugar foods (e.g., liking a food but not wanting to eat it). Restrained eaters were the most ambivalent about this type of food. They showed less mixed feelings about healthy foods (fruits and vegetables). Finally, Perl, Mandic, Primorac, Klapec & Perl (1998) investigated the food preference of obese and healthy adolescents. They found no preference for high-fat foods among the obese sample, but a preference was observed with the non-obese sample. The authors suggest that societal factors such as the stigma of obesity may have influenced the responses of the obese participants.

The validity of these findings is questionable since they rely solely on one aspect of attitudes (i.e., explicit) omitting a focus upon both explicit and explicit attitudes in accordance with the dual theory of attitudes. Moreover, their reliability is threatened by the susceptibility of explicit measures to external influences (e.g., social desirability effects).

Implicit Food Attitude Measures

Several computer-based implicit paradigms have been utilized to measure food preferences: i) the Implicit Association Test (Greenwald, McGhee & Schwartz, 1998), ii) the Extrinsic Affective Simon Task (*EAST*; De Houwer, 2003); and iii) the Affective Priming Paradigm (*APP*; Fazio, Sanbonmatsu, Powell & Kardes, 1986). A detailed description of each of these paradigms is beyond the scope of this research; the interested reader is directed to the review by Roefs, Werrij, Smulders & Jansen (2006). However, of the above implicit paradigms, the IAT has been shown to have superior reliability and validity (Nosek, Greenwald & Banaji, 2006; Teige, Schnabel, Banse & Asendorph, 2004). The IAT was therefore chosen as the paradigm of choice for this study and is described in more detail below.

The Implicit Association Test

The IAT measures the relative strength of association between two objects and attribute pairs (e.g., *high-fat foods and pleasant words* versus *low-fat foods and unpleasant words*). Each of the four types of such stimuli is presented randomly on a computer screen. The participant then sorts them into their appropriate paired grouping. According to the IAT principle, the sorting of stimuli into a specific paired group will be faster if the object-attribute pairs are well-associated in the mind of the participant (Nosek, Greenwald & Banaji, 2007). Thus in a food IAT, participants who find it easier to group high-fat foods with positive (and low fat with negative) compared to grouping low-fat with positive (and high-fat with negative), would be described as having a more positive attitude towards high-fat foods. The IAT adheres to the principle that attitudes are linkages/associations between objects and evaluations held in memory (Fazio, 1995; Petty, Brinol, DeMarree, 2007).

Implicit Attitudes and Food

Implicit and explicit attitudes towards food have been compared in various populations using several implicit paradigms. Using the IAT, Roefs & Jansen (2002) examined the attitudes of obese

adults towards high-fat foods. It was found that obese individuals displayed a more negative attitude towards high-fat foods when compared to non-obese controls on both implicit and explicit measures. Specifically, they were found to like the taste of high-fat foods but not its fat content. Exploring the attitudes of food restrained (dieters) and unrestrained adults (non-dieters) towards high-fat foods, Fung (2003) found that both restrained and unrestrained eaters had negative implicit and explicit attitudes towards high-fat foods. In a similar vein, Craeynest, Crombez, Haerens & De Bourdeaudhuij (2007) found that both obese and lean children held a more positive attitude towards healthy foods than unhealthy foods.

The above IAT findings each found a positive attitude towards healthier foods among restrained eaters and obese participants. However, such an attitude does not correspond with behaviour in obesity. It is possible, that the 'healthier attitude' of the obese group might reflect a slowed metabolism or reduced appetite as an effect of dieting behaviour within this clinical group (Fricker, Rozen, Melchior and Apfelbaum, 1991). However, as none of the above studies measured the level of food intake among participants, it is difficult to ascertain whether food intake is in fact confounding with the effects of obesity. Such unexpected outcomes might also be due to the words used to form the IAT's group pairings reflecting societal values and bias against high-calorie foods rather than participants' *personal* values per se (Olson & Fazio, 2004).

Berridge (1996) and Finlayson, King &. Blundell (2007) both found evidence to suggest that different areas of the brain are associated with *wanting* and *liking* of food. Thus, there may be two dissociable components of food rewards: (a) *liking* (e.g., palatability) and (b) *wanting* (e.g., motivation or appetite). However, the traditional IAT design only assesses preference/liking for a particular phenomenon. Consequently, researchers (i.e., DeHouwer et al., 2006) have modified the IAT when exploring certain behaviours by substituting attributes such as 'positive' / 'negative' (which relate to *liking*) with terms more related to *wanting* (i.e. 'approach'/'avoid'). De Houwer et al (2006) found that smokers associated with avoidance behaviours rather than approach

behaviours. Their modified *avoid-approach IAT* has not yet been utilized in the study of dietary attitudes. Incorporating the avoid-approach IAT into the current study may permit a broader understanding of implicit food cognitions than has been achieved thus far.

Apart from the IAT, two additional implicit attitude paradigms have provided useful insights into the food attitudes of clinical and non-clinical groups. Firstly, the Affective Priming Paradigm was used by Roefs, Herman, MacLeod, Smulders & Jansen (2005) to examine whether restrained and unrestrained eaters differed in their implicit attitudes towards high-fat palatable foods. Positive and negative words were primed by high-fat/low-fat foods and palatable/unpalatable foods. Responses were faster for both groups when positive words were primed by highly palatable fatty foods and negative words were primed with highly unpalatable foods. Thus, both groups expressed a preference towards highly palatable fatty foods. However, restrained eaters had significantly more craving for these foods. Using the same paradigm, Roefs, Stapert, et al. (2005) found that compared to healthy controls, anorexic patients were less sensitive to the palatability of foods. Additionally, supporting Roefs et al. (2002), obese and healthy control participants displayed a similar preference for low-fat palatable foods over high-fat foods. In a latter study examining obese and lean adult populations, Roefs et al. (2006) found that priming participant's focus of attention on the *healthy attributes* of foods (though listing healthy factors of foods), could prime later automatic preference associations to be based upon *healthiness*. Supporting Loranzo et al. (1999), they also found that induced craving (through restriction) led to the obese group having significantly more craving towards palatable foods (low-fat palatable foods). However, as the authors did not address the confounding variable of Body Mass Index (BMI) and restraint within their obese sample, this study's construct validity is questionable. Thus, the APP identifies that adults with anorexia were less sensitive to foods compared to non-anorexics, and induced food craving can lead obese individuals to crave more low-fat foods compared to their lean peers. In addition to this, induced focus of attention on healthy characteristics of foods was shown to affect later implicit food choice.

Finally, although the Extrinsic Affective Simon Task (EAST) has been criticised for its reduced ability to predict behaviour of distinct groups compared to the IAT (due to its weaker test-retest reliability; de Houwer & de Bruycker, 2007), it nonetheless provides some useful insights into food attitudes. Craeynest et al. (2005) examined the implicit attitudes of obese and lean young people (aged 9-18) towards healthy and unhealthy foods and physical activity using the EAST. Obese children showed greater positive implicit attitudes towards *both* types of foods when compared to lean controls suggesting more positive attitudes to foods in general among obese individuals. No difference was found in explicit attitudes towards healthy/unhealthy foods or physical activity between groups.

The inconsistencies within the above implicit findings may be due to the involvement of differing cognitive processes and differing levels of internal consistency across paradigms (Nosek et al., 2007). Nevertheless, there is some strong evidence to suggest that food attitudes can be influenced by health status and by the degree of one's restraint/craving (Lozano et al., 1999; Roefs et al., 2006). Thus, it is conceivable that the food attitudes of young people with diabetes may differ from those of young people without diabetes due to factors associated with the insulin regimens, dietary regimen and dietary education received by individuals with diabetes.

The dietary restrictions associated with certain insulin regimens have been shown to impact on quality of life (Bott, Ebrahim Hirschberger & Skovlund, 2003). Such restriction could induce a preference for restricted foods (Lepper et al., 1982) and lead to greater consumption of such foods (Fisher & Birch, 1999) when they are compared to their non-restricted peers. In addition, the regular dietary education that young people with diabetes receive (NICE, 2004) might prime them to focus on certain characteristics of food such as calorific content or healthiness compared to their peers.

Bearing the above in mind, the aim of this study is to compare implicit and explicit attitudes of adolescents with type 1 diabetes and non-diabetic controls towards food images. This is an exploratory study as food attitudes is a novel area of investigation within diabetes research. According to the dual model of attitudes, it is plausible that both types of attitude (implicit and explicit) would be related to healthy eating behaviours. Two types of implicit attitudes were examined, namely attitudes associated with 'liking/disliking' (based on the traditional IAT) and those with 'approach/avoidance' *(based on the avoid-approach IAT)*. Images of both *high-fat foods* and *high-sugar* were chosen due to their potential role in the development of secondary health complications. In view of the above discussions, this study predicted that:

1. The implicit and explicit food-attitudes of young people with diabetes will be different to those of young people without diabetes.
2. Both implicit and explicit food attitudes will be related to healthy eating behaviours.

METHOD

Design

A between subjects design was utilized. The three between-subjects factors were: (i) *group* (diabetes vs. healthy control); (ii) *task-order* (explicit measures first versus IAT first counter-balanced) and (iii) *pairing-order* (compatible pairing first or incompatible pairing first). The main dependent variable was the IAT effect (the latency difference when sorting into compatible and incompatible pairings). Three secondary dependent variables (potential correlates to dietary attitude) were included, these were: *dietary self-efficacy*, *motivation* and *self-care*. Using Cohen's (1988) conventions for describing effect sizes, this study required approximately 52 participants to show a large experimental effect (power = 0.80; alpha = 0.05 two-tailed; mixed 2x2x2 ANOVA).

A group of adolescents without diabetes (of similar age and sex to the diabetes group) was used as a control group. This was to clarify whether the food attitudes of young people with diabetes were due to their diabetes alone.

The IAT effect can often be influenced by the order in which the participant completes *compatible* and *incompatible* pairings (Nosek, Greenwald & Banaji, 2005). To reduce this bias, pairing-order was counter-balanced across participants. Similarly, as presentation of the self-report tasks before implicit attitude tasks has been shown to lead to higher correlations between the two types of measure (Hoffman, Gawronski, Geschwendner & Schmitt, 2004), task-order was counter-balanced across participants.

Participants

A total of 52 young people aged 12 to18 years (+/- 4 months) were recruited for this study (see Table 1 for summary of demographics and body mass index). The experimental group consisted of 22 adolescents with type 1 diabetes. They were recruited from two inner-city diabetes clinics and two local schools. A total of 30 young people without diabetes formed the control group. They were recruited from two inner-city secondary schools. An information sheet distributed to participants in both groups discouraged those with conditions affecting their nutritional behaviour (e.g. food allergies or eating disorders) from participating. This was because such disorders could confound with the effect of diabetes. An overall participation rate of approximately 55% was expected from the diabetes group (Riekert & Drotar, 1999), thus purposive sampling was deemed appropriate.

Table 1: Demographic Information of Participants Recruited and Body Mass Index by Group

		Diabetes Group	*Control Group*
Sex:*	Boys (%)	59.1	36.7
	Girls (%)	40.9	63.3
Age**	(M & SD):	14.3 (1.7)	15.0 (2.4)
Age Range		11.9-17.8	11.8-11.9
Ethnicity*** (N [%])			
White British		9 (40.9)	23 (76.7)
White Other		0 (0)	1 (3.3)
Black Caribbean		0 (0)	1 (3.3)
Black African		4 (18.2)	1 (3.3)
Black other		0 (0)	1 (3.3)
Indian		6 (27.3)	0 (0)
Arabic		2 (9.1)	0 (0)
Asian Pakistani		0 (0)	2 (6.7)
Mixed Asian- white		0 (0)	1 (3.3)
Any other ethnic group		1 (4.5)	0 (0)
[White]		9 (27.3)	24(72.7)
[Black and Minority Ethnic (BME)]		13 (68.4)	6(31.6)
Body Mass Index† (kg/m^2)		23.03 kg/m^2 (2.45)	21.70 kg/m^2 (1.58)

* There was no significant difference in the distribution of sex across groups [χ^2=2.59, *df*=1, p>.05]

** *There was no significant difference in the age across groups [F (1, 51) =1.17, p >.05].*

*** *Ethnicity differed significantly across groups, [χ^2=8.36, df = 1, p<.01]. This potential confounding variable was regressed out of the later analysis.*

† *Both mean values were below the cut-off point for obesity (26.35-30 kgs/m^2; Cole, Bellizzi, Flegal & Dietz, 2007). Since 98% of participants failed to meet the obesity cut- off criteria, obesity was not treated as a covariate in the later analysis.*

Measures

Demographics

A questionnaire requesting information about *age, ethnicity, height* and *weight* was completed by participants. Additional information concerning *age at onset of diabetes* and *type* of *insulin regimen* was requested from the diabetes group only.

Implicit Association Test (IAT; Greenwald et al., 1998) *& IAT Stimuli*

The IAT measures the relative strength of association between two object-attribute pairs by recording participants' latencies (in milliseconds) for sorting related object/attribute stimuli into these pairs. Both the traditional IAT and the avoid-approach IAT were used; one for high-fat foods and one for low fat foods (making a total of four five minute IATs). The stimulus materials used in both IATs were presented to the participants on a 1.30GHz colour notebook computer with a QUERTY keyboard, using Inquisit software (Inquisit, 2006). The word stimuli used in the traditional IAT were derived from the Children's Printed Word Database (Masterson, Stuart, Dixon, Lovejoy & Lovejoy, 2003). The traditional IAT used five positive words (*peace, sunny, jolly, bliss* and *laugh)* and five negative words *(awful, angry, hated, toxic* and *stink)* rated by young people aged 16-18 recruited from an inner-city school to ensure face validity.

The word stimuli for the avoid-approach IAT were derived from the MRC Psycholinguistic Database (Wilson, 1988). Five words meaning avoid (*leave, flee, decline, quit* and *refuse) and five meaning approach (come, towards, want, desire* and *crave) were used.* They were rated by the same group of 16-18 year olds for negativity or positivity. The five words chosen were consistently rated as either approach or avoid. Therefore, they had good face validity with the adolescents.

Colour images of high-fat, high-sugar and low-fat/sugar food images were selected from a University of Birmingham Food Picture Database. Selection of 5 high-fat foods (*corn puffs, crisps, cheese, fries* and *peanuts*), 5 high-sugar foods (*jelly dinosaurs, grapes, fruit allsorts, banana* and

fruit-salad) and 5 low-fat/sugar foods (*lettuce, corn, peas, broccoli* and *cucumber*) was based on the categorising criteria of the British Food Standards Agency (see Appendix 4). These foods produced the three food categories used within the traditional and avoid/approach IAT.

Explicit attitudes (Combined Palatability & Healthiness Scale)

A 9-point bi-polar scale (based on Roefs et al., 2002) was administered to all participants to assess their explicit ratings of palatability and healthiness of the colour images of the 15 foods used in the IAT. This computer-based scale rated the palatability and healthiness of foods from -4 (extremely unhealthy/unpalatable) to +4 (extremely healthy/palatable). The scale took approximately 5 minutes to complete.

Healthy Eating

An adapted Version of the Summary of Self-Care Activities Scale (Law, 2002) was used to assess the extent to which the participants followed a healthy diet over a retrospective 7-day period. Scores ranged from 0-4 with the highest scores indicating a healthier diet. The 12-item scale has been adapted from the original Summary of Diabetes Self-Care Activities scale (Toobert and Glasgow, 1994) by modifying the wording of some items to increase face validity with UK participants, and to increase the congruence with current self-care recommendations in the UK. The scale has an internal consistency of $\alpha = .55$ for adolescents with diabetes and $\alpha = .61$ for the control group. This scale took approximately 2 minutes to complete.

Dietary Self-Efficacy Scale (based on Glasgow, Toobert & Hampson, 1996 and Schlundt, Rea, Kline & Pichert, 1994).

This is a 26-item uni-polar scale that assesses the confidence that individuals have to follow their recommended dietary regimen irrespective of the difficulties they might face. Confidence level is rated from 0 (not confident) to 10 (extremely confident). The scale has good internal consistency ($\alpha = .99$ for both the diabetes and control group). It takes less than 5 minutes to complete.

The WHO (Five) Well-Being Index (World Health Organization, 1998)

Psychological well-being was assessed using the WHO-5 Well-Being Index. The scale has 5 items which are scored from 0 (all of the time) to 5 (at no time). The total score can range from 0-25, where zero would indicate 'the worst possible quality of life', and 25 would indicate the 'best possible quality of life'. A score under 13 is indicative of poor well-being. Internal consistency of this scale ranged from 0.84 to 0.9, (Shea, Skovlund, Bech, Kalo, Home, 2003). Criterion validity was established using the DSM-IV (American Psychiatric Association, 1994) depression criteria and was found to be good (r=0.88; Lowe, Spitzer, Grafe, Kroenke, Quenter, Zipfel, Buchholtz, Witte, Herzog, 2004). It takes less than 2 minutes to complete.

Child Depression Inventory; CDI-S (Kovacks, 1992)

The CDI-S is a 10-item screening scale for which the child responds to one of three statements which most closely match their feelings for the last two weeks. Responses to each of the items are scored from 0-2, with higher scores indicating greater severity of that depressive symptom. The CDI has internal consistency levels of .71 to .89. (Carey, Faulstich, Gresham, Ruggerio, Eynart, 1987) and has been normed on English speaking children aged 6 – 17. It takes approximately 2 minutes to complete. See Appendix 8 for all pen and pencil questionnaires.

Procedure

Ethical approval for hospital recruitment was granted by the local NHS research ethics committee and by the research ethics committees of each participating NHS trust. Ethical approval for the non-clinical sample was obtained through the University Of Birmingham School Of Psychology Human Research Ethics Committee (see Appendix 3 for approval letters). Young people with diabetes and their parents/guardians were sent information sheets detailing the study (see Appendix

5). They were asked whether they wished to participate during their diabetes clinic appointment. If interested, they were invited to provide written consent (see consent sheet, Appendix 6). Headteachers of 3 local secondary schools were sent invitation letters and information sheets detailing the study (see Appendix 5). Appropriate young people were then selected by headteachers/teachers and information sheets were sent to their homes. Their participation took place following the receipt of written parent/guardian consent regarding the young person's participation. In both cases, if the young person was above 16, they provided their own consent. Participation took place in a quiet, well-lit room with minimal distraction (either at the young person's family home or at their school). The notebook computer was placed on a flat table with the child seated directly in front of it. The experimenter was seated in an adjacent position.

Before the first IAT task commenced, participants were provided with an anonymous ID code and instructed to complete the demographics form. Following this, their height (in centimetres) and weight (in kilograms) were measured. Participants were then re-seated and instructions for the computer-based IAT task were displayed on the computer screen (see appendix 7 for exact IAT on-screen instructions and structure), after which they were then shown colour images of low-fat/sugar foods and high-fat/sugar foods in the centre of the screen. They were instructed to press the left *('e' key)* if the image was of a low-fat/sugar food, and the right *('i' key)* if it was a high-fat/sugar food. They were asked to respond as quickly as possible to each stimulus (stage1). They were then shown positive and negative words one at a time on the screen. Participants responded to each positive word by pressing the left-key, and each negative word by pressing the right-key (stage 2). The first two stages of the IAT were designed to acquaint them with the stimuli and paired categories.

In the next practice phase, participants sorted each low-fat/sugar food or positive word into the same category, (using the left-key response). Items representing high-fat/sugar foods or negative

words were grouped together (using the right-key response; stage 3). This was followed by the first test trial in which participants sorted forty more word and food images the same way (stage 4).

Then, participants were shown images of high-fat/sugar foods and low-fat/sugar foods. They responded to the high-fat/sugar foods by pressing the left-key and the low-fat/sugar foods by pressing the right-key (stage 5).

In the final practice stage, participants were presented with items representing high-fat/sugar food images and positive words. They had to group them using the same left-key response. Low-fat/sugar food items and negative word items were both placed into the same group using a right-key response (stage 6). This process was then repeated for 40 more test trials (stage 7).

The high-fat foods and high-sugar foods were presented to participants in separate IATs. The procedure for the avoid-approach IAT was exactly the same as above. This was completed after the conventional IAT.

Participants then completed the explicit measure and self-report questionnaires. As mentioned, the order of completion of the explicit/self-report measures and the implicit measures was counterbalanced across participants. Following their participation, participants were verbally debriefed about the aims and hypotheses of the study.

Data Analysis

Data was treated using the conventional algorithm recommended by Greenwald et al. (1998) and Pinter & Greenwald (2004). Fast latencies (≤300ms) were recoded to 300ms and very slow latencies (≥3000ms) to 3000ms. The first and second trial of each test phase was deleted and error latencies were incorporated into the main data. The data was then log-transformed (lg10) to improve estimates of central tendency. IAT effects were calculated by subtracting the log latency

for the *compatible* pairings (high-sugar-positive/approach and low-sugar-negative) from the *incompatible* pairing (high-sugar-negative and low-sugar positive). Outliers in the IAT data were managed by replacing them with the next extreme value in the dataset (Haworth, 1996), this was performed for approximately 2% of the database to achieve parametric assumptions. Implicit data were then analysed across groups using a 3 way ANCOVA. Explicit attitude data were ordinal and skewed. Therefore, non-parametric analyses Mann-Whitney U-tests were used to analyse the difference between groups on each factor.

RESULTS

Comparison of Diabetes and Control Group

One-way ANOVAs with group (diabetes or control) as the independent variable, identified no significant differences between the two groups on depression, healthy eating, age or sex (all *p*s >.11). However, dietary self-efficacy was greater for the diabetes group, $F(1, 50) = 12.01, p = .001$ and well-being was greater for the control group, $F(1, 50) = 6.09, p = .017$. As *time of testing* has been shown to influence food attitudes (Aikman & Crites), differences between the groups (in terms of time of participation) were examined. This showed that the participants in the diabetes group were tested later in the day than participants in the control group, $F(1, 51) = 15.17, p < .001$. These factors (well-being, time of participation and dietary self-efficacy) were therefore used as covariates in the subsequent analyses. As *ethnicity* differed across groups, the effect of this nominal variable on IAT scores was removed by using unstandardized IAT effect residuals.

Comparison of Implicit and Explicit Food Attitudes of Young People With and Without Diabetes

Implicit Attitudes towards Fat Content

Avoid-Approach IAT. A three-way 2 (group: diabetes group vs. control) x 2 (task order: explicit first vs implicit first) x 2 (pairing order: compatible vs incompatible first) ANCOVA

showed no main effect for Group, $F(1,39) = 2.44$, $p = .13$, $\eta_p^2 = .06$ or *task-order* (the administration of either explicit measures or implicit measures first), $F(1, 41) = .32$, $p = .58$, $\eta_p^2 = .01$. However, there was a significant main effect for *pairing-order*, $F(1, 39) = 9.59$, $p = .004$, $\eta_p^2 = 1.97$, such that participants showed evidence of an implicit positive attitude for high-fat foods when *compatible* pairings (e.g., high-fat food and approach words) were presented first ($M = .05$ logms, $SD = .11$) compared to when incompatible pairings (high-fat foods and avoidance) were presented first ($M = -.05$ logms, $SD = .10$). There was also a significant interaction between *group* and *task-order* (i.e. whether the implicit or explicit measures were completed first), $F(1, 39) = 7.92$, $p = .01$, $\eta_p^2 = .17$ (Figure 1). As Figure 1 shows, for the diabetes group the presentation of explicit tasks first resulted in greater preference for high-fat foods on the IAT compared to when implicit tasks were administered first. However, the converse was true for the control group. The presentation of explicit tasks first resulted in a more negative attitude towards high-fat foods compared to when explicit tasks were given first. When the implicit measure was administered first, individuals in the control group demonstrated a more *positive attitude* for high-fat foods than the diabetes group. None of the remaining interactions were significant (*pairing-order* by *group*, $F(1, 39) = .17$, $p = .68$, $\eta_p^2 < .005$; *pairing-order* by *task-order*, $F(1,39) = .03$, $p = .86$, $\eta_p^2 = .001$ and *pairing-order* by *group* by *task-order*, $F(1,39) = .018$, $p = .89$, $\eta_p^2 < .001$).

Traditional IAT. In contrast, using the traditional IAT there were no significant main effects or interactions (all *ps*>.19), indicating that there were no differences in implicit positive or negative attitudes towards high-and low-fat foods across groups.

Implicit Attitudes Towards Sugar Content

Avoid-Approach IAT. There were no significant main effects or interactions (all *ps* > .62) using the approach-avoidance IAT for high-sugar foods. Thus, no support was found for the hypothesis that implicit attitudes towards high-sugar foods would differ across groups.

Traditional IAT. There were no significant main effects for group or task-order (all *ps* >.32). However, there was a non-significant trend for pairing-order, $F(1, 40) = 3.44$, $p = .07$, $\eta_p^2 < .08$. When asked to respond using the same key for high-sugar foods and positive words first (*compatible* pairings) participants were more positive towards high-sugar foods (M =.04 logms, SD=.14) than they were when *incompatible* pairings were presented first (M = -.04 logms, SD =.16). There were no significant interactions for group by pairing-order, pairing-order by task-order and group by task-order (all *ps* > .19).

Moreover, a non-significant trend for the three-way interaction between *group*, *task-order* and *pairing-order* was observed, $F(1, 40) = 3.15$, $p = .08$, $\eta_p^2 = .07$. As can be seen in Figure 2, the order of presentation of the explicit or implicit tasks has no bearing on positive attitudes towards high-sugar foods in the diabetes group if compatible food-attribute pairings were presented first. However, for the control group a converse trend was evident. If they completed the explicit measures first, then encountering *compatible* pairings first on the IAT resulted in positive attitudes towards sugary foods than if *incompatible* pairings were viewed first.

Explicit Attitudes

Healthiness of Foods. The diabetes group's explicit ratings for both high-fat and high-sugar foods did not differ significantly from those of the control group ($U = 287.00$, $N_1 = 22$, $N_2 = 30$, $p = .430$ two tailed and $U = 249.50$, $N_1 = 22$, $N_2 = 30$, $p = .132$ two-tailed respectively). There was a non-significant trend for the ratings of low-sugar foods on healthiness ($U = 240.500$, $N_1 = 22$, $N_2 = 30$, $p = .09$), with the diabetes group rating these foods as more healthy ($M = 18.18$, $SD = 2.89$) than the control group ($M = 16.07$, $SD = 4.01$).

Palatability of Foods. Adolescents in the diabetes group rated high-fat foods as more palatable than those in the control group ($M = 11.32$, $SD = 3.50$ and $M = 7.74$, $SD = 4.83$ respectively

(U =180.50, N_1 = 22, N_2 = 30, *p* =.005). A similar, but non-significant trend was observed for sugary foods (*M* = 12.82, SD = 4.12 and *M* = 9.83, SD=6.28 respectively), *U* = 238.00, N_1 = 22, N_2 = 30, *p*=.087. There was no difference in the ratings of palatability for low-fat/sugar foods across groups (*U* = 330.00, N_1 = 22, N_2 = 30, *p* =1.00).

Associations of Implicit and Explicit Attitudes with Healthy Eating Behaviours

(diabetes group only)

The implicit attitudes of the diabetes group did not differ according to the *type of insulin regimen* (twice daily or multiple daily injections), $p > .11$ or *period since diagnosis*, $p > .05$, for each IAT. Correlations involving implicit attitudes are displayed in table 2, and those for explicit attitudes are displayed in table 3.

Implicit Attitude Correlations with Healthy Eating Behaviours

There was a positive relationship between healthy eating and implicit attitudes towards high-fat foods on the traditional IAT, r (22) =.43, p <.05.

Explicit Attitude Correlations to Healthy Eating Behaviours

There was a positive correlation between ratings of the healthiness of sugary foods and healthy eating but this failed to reach significance, r (22) = .38, p = .08. No significant correlations were found between the remaining explicit attitudes and healthy eating (all *p*s>.23).

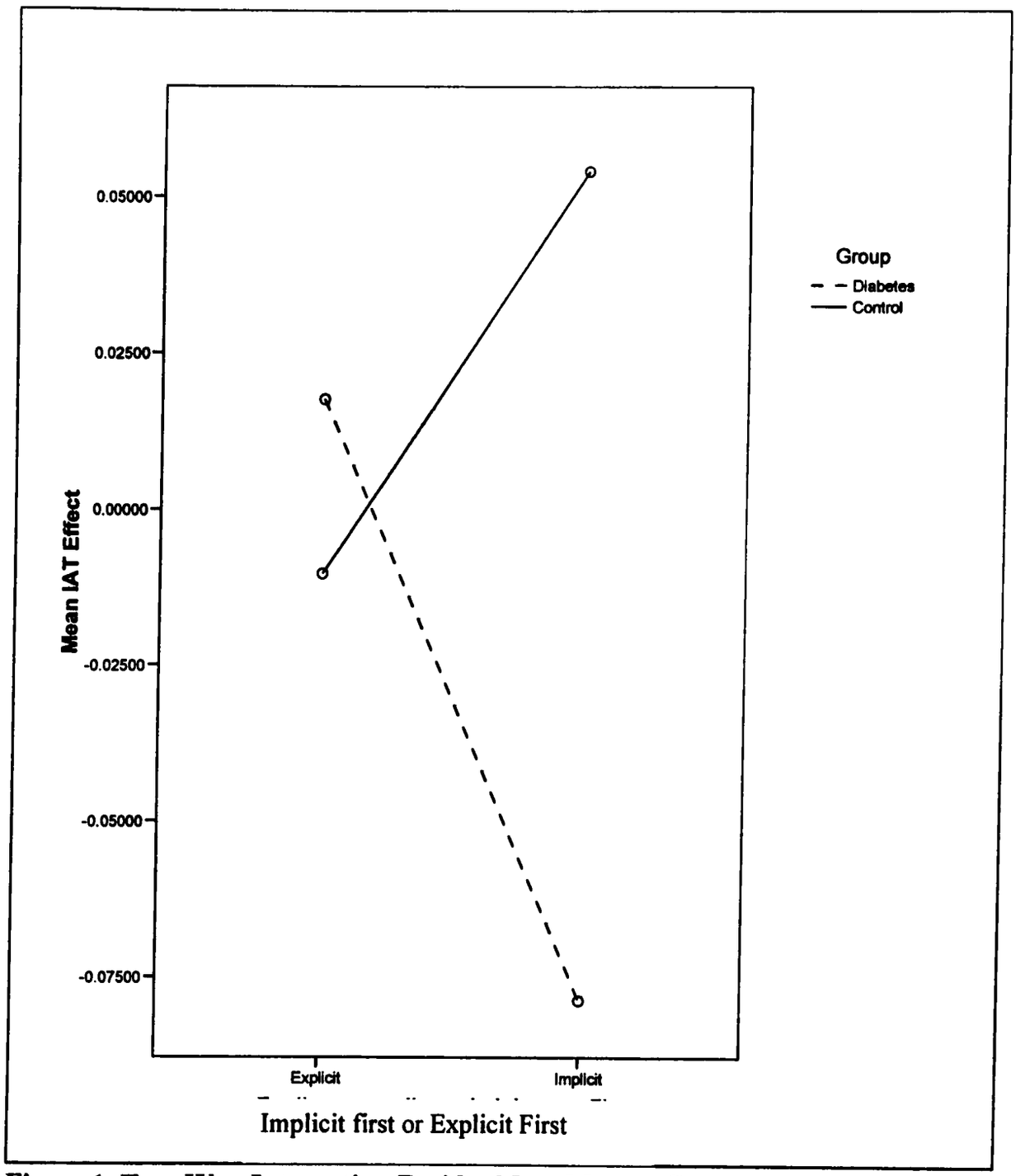


Figure 1. Two-Way Interaction Residual Log Means: Group by Task-Order (Explicit versus Implicit First). Note that a more negative IAT effect represents a greater preference for low-fat foods.

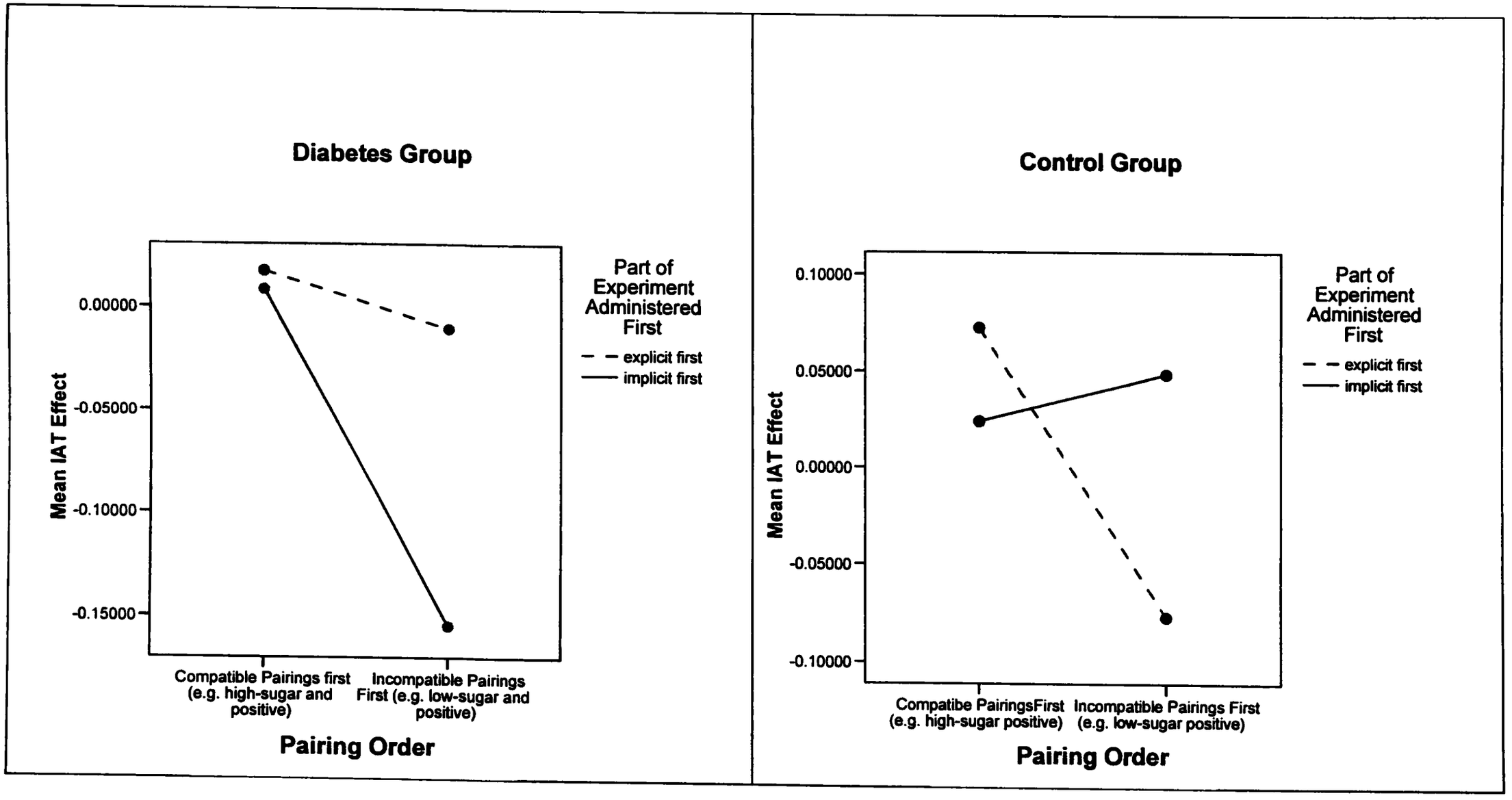


Figure 2. The non-significant interaction trend between Group, Pairing-Order and Task Order

Table 2.

Correlations Between IAT and Healthy Eating (diabetes group)

Variables	2	3	4	5
1. High-Fat Avoid IAT	.22	60**	.66**	.07
2. High-Sugar Avoid	-	.16	.33	-.03
3. High-Fat Tradition al IAT		-	.43*	.43*
4. High-Sugar Tradition al IAT			-	-.03
5. Healthy eating				-

*$p < 0.05$; **$p < 0.01$

Table 3

Correlations Between Explicit Attitudes and Healthy Eating (diabetes group)

Variables	2	3	4	5	6	7
1. Healthiness of fatty foods	.13	.33	.17	-.12	-.01	.03
2. Tastiness of fatty foods	-	.29	.41	33	.21	.19
3. Healthiness of Sugary foods		-	-.13	.15	-.01	.38
4. Tastiness of Sugary Foods			-	.29	.16	-.13
5. Healthiness of Low fat/sugar foods	.			-	.61**	.08
6. Tastiness of Low fat/sugar foods					-	-.23
7. Healthy Eating				.		-

*$p < 0.05$; **$p < 0.01$

DISCUSSION

This study aimed to explore whether the food attitudes of young people with diabetes differed from those of young people without diabetes. It also aimed to determine whether the food attitudes of individuals with diabetes were associated with healthy eating behaviours. The first hypothesis, which predicted a difference between the food attitudes of young people with and without diabetes, was not supported by any of the four IATs. Thus, the two groups did not differ in their *liking* (traditional IAT) or their *wanting* (avoid-approach IAT) for high-fat/high-sugar foods. However, there was a significant *group by task-order* effect using the avoid-approach IAT for fat content. Therefore, implicit attitude differences between the two groups depended upon the order in which participants completed implicit/explicit tasks. When the diabetes group were given the implicit tasks first, they displayed more *avoidance* attitudes towards high-fat foods compared to controls. However, if they completed the explicit measures first, they appeared to have more relative *wanting* for high-fat foods than controls. Nosek, Greenwald and Banaji (2005) have suggested that such order-effects can be stronger if the attitude is novel, unstable or ambivalent. However, attitudes towards high-fat foods have been shown to elicit some level of ambivalence from participants (Urland & Ito 2005; Roefs et al., 2002). For example, Roefs et al (2002) suggest that obese individuals may like the taste of high-fat foods and yet (for health reasons) dislike its fat content. Moreover, ambivalence can lead to attitude instability (Eagly & Chaiken, 1993).

It is noteworthy that all of the self-report measures focused upon adhering to a healthy diet (except the explicit attitude measure which focused upon the *healthiness* and

palatability of foods). In this climate of 'healthiness', completion of the explicit attitude measure might have resulted in *food palatability* becoming the most salient food attribute for young people with diabetes. This may be because their diabetes education has ordinarily primed them towards preferring healthy foods (hence their healthier implicit attitudes in the absence of priming). To illustrate, the governmental document *Making Every Young Person with Diabetes Matter* (Department of Health, 2007) emphasises the importance of professionals encouraging young people to make *'healthier food and lifestyle choices'* (p.45). In contrast, the control group (who may have less exposure to health education), appear to have been more easily primed by the extensive *health* focus.

Moreover (supporting Ernst & Epstein, 2002), the diabetes group's exposure to frequent nutritional health education may have somewhat habituated them to the healthiness component of foods in this study. They might be more inclined than controls to respond to food components perceived by them to be more *novel* (i.e. palatability). Indeed, such habituation can be simulated without direct consumption of foods e.g. by visual food cues (Temple, Giacomelli, Roemmich and Epstein, 2007). This argument extends Roefs (2006) findings that an initial focus on one food attribute (e.g. *healthiness*) could shape later implicit attitudes, by suggesting a role for the *novelty* of that food attribute.

Hypothesis one was supported for explicit ratings. The diabetes group rated high-fat foods as more palatable than controls (a similar but non-significant trend was observed for sugary foods). They also rated low-sugar/fat foods as being healthier compared to controls. There were no other significant differences between the

explicit ratings of each group. These findings support the argument regarding a focus upon *novel* food factors such as palatability within the diabetes group. They also suggest that explicit attitude measures may be more sensitive than implicit measures to the differences between the food attitudes of young people with diabetes and their non-diabetic peers.

Hypothesis two which predicted that implicit and explicit attitudes would be related to healthy eating behaviours was only supported for implicit attitudes towards the fat content of foods using the traditional IAT. More positive implicit attitudes towards high-fat foods relative to low-fat foods were associated with better reported healthy eating. The finding that only the *traditional* IAT was able to find a relationship between attitude and behaviour, suggests that food *liking* is more associated with eating behaviours than food *wanting*. This fails to provide support for the argument of Zeng and Berthoud (2008), that *liking* is closer to sensory processes whereas *wanting* is more related to eating behaviour.

This incongruent association of greater liking for high-fat foods with healthy eating behaviours could be evidence of factors in addition to 'food-liking' influencing food choice (Eertmans, Baeyens and Van den Bergh, 2001); for example *parental influence* (Woodward et al, 1996). Fishbein and Ajzen (1975) suggest that behaviour may be a function of both *social norms* (i.e. the behavioural expectations of significant others and one's desire to adhere to these norms) and *attitude* (one's evaluation of the proposed behaviour). Moreover, Shenkel (1985) found evidence to suggest that the expectations of others could even predict dietary self-care over and above the influence of the individual with diabetes' idiosyncratic attitude. In support of this

argument Hebert, Clemow, Pbert, Ockene and Ockene (1995) and Brener, Billy and Grady (2003) noted that young people under-reported eating behaviours when completing frequency-based self-report measures. This trend was particularly pertinent when reporting socially undesirable/ health risk behaviours such as consuming high-fat foods (Herbert et al, 1995). It is therefore suggested that one reason for the inconsistent trends in self-reported dietary self-care within this study might be the adolescents' need for social approval. They may not have wanted their implicit liking for high-fat foods to have been reflected in their self-report of eating habits as this is a health-risk/undesirable behaviour. Indeed, it is possible that the researcher/parents' presence when the diabetes group completed the questionnaires, led to an under-reporting of health risk behaviours due to fear of embarrassment (Aquilino, 1994; Brener et al, 2003).

Alternatively, such inconsistent findings may highlight a constraint within the IAT paradigm. It does not allow attitudes towards single foods to be measured. Rather, only the *relative strength of association* between two pairs of food and affective attributes can be measured (de Houwer, 2003). As such, in the case of hypothesis two, one learns that the association between high-fat-*positive* and low-fat-*negative* is more closely associated with greater healthy eating than the high-fat-*negative* and low-fat-*positive* association. Research into blood donor behaviour (Cacioppo & Gardner, 1993) has found that as long as one's attitude towards donation was highly positive, simultaneously holding negative attitudes towards the same phenomena did not affect behavioural intention. In a similar vein, it could be that holding strongly positive attitude towards high-fat foods does not necessarily mean high fat foods will be consumed. Indeed, Urland et al (2005) found that although restrained eaters liked

high-fat/sugar foods, they were negative about its fat content. Arguably then, it could be the interaction between positive and negative attitudes which ultimately dictates the self-care behaviour of young people with diabetes. However, since one is unable to simultaneously examine both positive and negative attitudes towards a food type using the IAT, the presence of such a relationship cannot be substantiated. It might therefore be fruitful for future researchers to examine the food attitudes of individuals with diabetes using both positive and negative scales. Alternative (but currently psychometrically weaker) implicit priming tasks such as the EAST may allow this.

One final possibility for the results of hypothesis two, is that the positive association between liking for high-fat foods and healthy eating behaviours reflect one's *cravings* for high-fat foods. As Hill (2000) noted, craving for a food is not necessarily associated with a higher intake of that food. Dieters tend to experience more craving than non-dieters (Fedoroff, Polivy, & Herman, 1997). It is argued that the eating behaviour of diabetics may resemble that of dieters. Dieting has been defined by Polivy and Herman (1991) as "the act of replacing internally regulated (hunger-driven) eating with planned, cognitively determined, diet-approved eating, or dietary restraint" (p.97). Therefore, although the young people with diabetes in this study show evidence of having similar nutritional intakes to their non-diabetic peers, their diet may still utilize more *planned and recommended eating strategies* than their peers. This may be due to their frequent clinic visits and the professional promotion of healthy food choices (Department of Health, 2007). A possible factor in their ability to maintain good eating behaviours (despite their cravings), is their level of self-efficacy (see Appendix 9) which was a mean of 193/270 or 71%. Such high self-

efficacy has been linked to good dietary self-care among young people with diabetes in several studies (Aalto & Uutela, 1997 and Iannotti et al., 2006).

Limitations and Future Research

There are several methodological limitations within this research which may have impacted upon the reliability of the results obtained. Firstly, as mentioned, the self-report measures used may have been affected by social desirability effects. Young people might be more susceptible to wanting to respond in 'acceptable' ways (Eyesenck, Easting and Eysenck, 1970). To more thoroughly control for such factors, a social desirability questionnaire such as the *Revised Lie Scale* (Corulla, 1990) could have been utilized.

Secondly, and in relation to the above, the inadequate levels of internal consistency for the healthy eating measure ($\alpha = .55$) may have impacted on the reliability of some of the outcomes of this study. The scale's heavy reliance on retrospection may have affected the reliability of outcome data. It is thus recommended that future research utilizes simultaneous data collection methods such as mealtime diaries or objective measures of healthy eating.

Thirdly, the age of the pilot sample used to assess the face validity of the explicit attitude measure (16-18 years), only matched the older experimental and control participants. Consequently, the face validity of this measure with the younger participants must be considered with caution.

Fourth, individuals who are on twice daily injections tend to have less dietary freedom than those who have multiple daily injections (Bott et al, 2003). The effect of the type of insulin regimen on implicit or explicit attitudes was not explored within this study. This was because (with only three individuals using twice daily injections) there were insufficient participants available for a reliable comparison. Nonetheless, preliminary analyses revealed that there was no difference between the results of participants using either type of insulin regimen. However, with such small samples statistical comparisons may lack the required power to detect meaningful differences between the two groups. To establish whether insulin regimen type has an effect on food attitudes, future research should compare the two groups using larger samples.

Despite counterbalancing task order and the order of compatible / incompatible pairings, order effects still emerged within this study. Such results are common place within IAT studies (Greenwald et al, 2007), and unless related to the hypothesis, they were not emphasised within this study. Nevertheless, the emergence of such order effects makes one question the construct validity of the IAT with this clinical group.

Another limitation within this study was that the effect of ethnicity and age on food attitudes was not investigated. It has been demonstrated that ethnicity can have a significant impact on food choice (Sheikh and Thomas, 1994) as can age group (Cooke and Wardle, 2005). However, the direct study of the effect of ethnicity within this study was impeded by ethnicity confounding with clinical group status. That is, a large number of the young people with diabetes were also from ethnic minority groups whereas the converse was true for the control group. Bearing this in mind, efforts were made to drastically reduce the influence of ethnicity on IAT performance

by regressing out its effects. Nonetheless, bearing in mind its potential impact on food choice, it might be of interest for future studies to examine the effects of ethnicity on food attitudes within a diabetic population.

Although the two groups within this study did not differ statistically with regard to age, there still exist may be developmental differences *within* groups that may have influenced the results obtained. This may in part be due to the broad range of ages sampled within this study (11-18; early to late adolescence). Since it has been suggested that younger children may have different nutritional needs/ behaviours compared to older children (Patton, Dolan & Powers, 2006), the effect of age on food attitude among diabetic adolescents may be a useful area of interest for future studies.

Finally, the cross-sectional nature of this study means that no causal relationships can be established between attitude and behaviour. Moreover, a larger sample of both young people with diabetes and controls would have enabled structural equation modelling techniques to have been used to explore differences between the two groups in terms of variance in healthy eating behaviours and attitudes. The current design and small sample size limits the generalizability of these findings. Future research should therefore attempt to study the food attitudes of individuals with diabetes longitudinally and with larger samples.

Clinical & Theoretical Implications

When primed by both hedonic and health attributes of food, young people with diabetes express more implicit *wanting* for high-fat foods compared to their non-diabetic peers (who are ordinarily exposed to less healthy eating education).

Currently, the NICE (2004) guidelines emphasise diabetes education with a focus upon *healthy* nutrition alone with no comment on *palatability* etc. Such a health focus may instil a sense of novelty in other aspects of food such as palatability, particularly when children encounter food product marketing through the media. It might therefore be useful for healthcare workers to remain aware of this tendency in their practice when working with young people with diabetes. Indeed, such novelty for the hedonic aspects of foods may result in cravings for certain foods. However, cravings do not necessarily induce increased food intake. Self-efficacy for managing one's diet irrespective of barriers may be a factor which enables young people with diabetes to resist their craving. Thus, health professionals could encourage increases in self-efficacy through role-play and guided rehearsal of dietary regimen behaviours (Ott, Greening, Palardy, Holderby and DeBell, 2000).

Clinicians and researchers alike, should consider the implications of administering self-report questionnaires to young people with diabetes in the presence of their parents / influential others. Moreover, they must also bear in mind the effect of their own presence when administering the questionnaire. Literature suggests that young people are more open with self-reporting sensitive information when they feel that they are not being observed or judged by others Aquilino, 1994; Brener et al, 2003). Less *under-reporting* of health risk behaviours may occur when the adolescent is provided with the questionnaire to complete at their own time and place of choosing. Moreover, assurances of confidentiality may assist in reducing their anxieties.

Finally, when attempting to elicit the unique attitudes of individuals with diabetes, this study has highlighted that explicit attitudes may be a more useful technique than

the use of implicit attitudes. This was the only attitude measure which was able to distinguish between the two groups independently. Nevertheless, the two types of IAT design (traditional and avoid-approach), may still be useful for understanding different factors (e.g. priming and craving) that influence the food attitudes of young people with diabetes.

Final Comment

Implicit attitudes of young people with diabetes do not differ to their non-diabetic peers. However, their explicit attitudes differ significantly. Food-attribute priming seems to have a differential impact on the implicit food *wanting* (rather than *liking*) of young people with diabetes compared to non-diabetic controls. Although the implicit attitudes of adolescents with diabetes are associated with healthy eating behaviours, this relationship is somewhat contradictory. This may be due to limitations of the implicit association test or cravings for high-fat foods being reflected within the implicit attitudes of these young people. Clearly, the traditional and avoid-approach IAT are both useful in understanding the implicit food attitudes of young people with diabetes. However, the avoid-approach IAT may be more useful for eliciting the effects of food priming on implicit cognitions.

References

Aalto A. M, & Uutela A. (1997). Glycemic control, self-care behaviors, and psychosocial factors among insulin treated diabetics: A test of an Extended Health Belief Model. *International Journal of Behavioral Medicine*. 4 (3), 191-214.

Aikman, S.N. & Crites, S.L., Jr. (2005). Hash browns for breakfast, baked potatoes for dinner: Changes in food attitudes based on motivation and context. *European Journal of Social Psychology*, 35, 181-198.

Aquilino, W. (1994). Interview mode effects in surveys of drug and alcohol use. *Public Opinion Quarterly,* 58, 210-240.

Arslanian, S., Becker, D., Drash, A. (1994). Diabetes mellitus in the child and adolescent. In M. S. Kappy, R. M. Blizzard, C. J. Migeon (Eds). *The Diagnosis and Treatment of Endocrine Disorders in Childhood and Adolescence.* (pp 961–1026) Springfield, IL: Charles C. Thomas

Atabek, M. E., Kurtoglu, S., Pirgon, O. &. Baykara, M. (2006). Arterial wall thickening and stiffening in children and adolescents with type 1 diabetes. *Diabetes Res Clin Pract*. 74, 33-40.

Bandura, A. (1992). Exercise of personal agency through the self-efficacy mechanism. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 3-38). Washington, D.C: Hemisphere.

Banse, R., Seise, J., & Zerbes, N. (2001). Implicit attitudes toward homosexuality: Reliability, validity, and controllability of the IAT. *Zeitschrift fur Experimentelle Psychologie*, 48, 145-160.

Berridge, K.C. (1996). Food reward: Brain substrates of wanting and liking. *Neuroscience and Biobehavioral Reviews*, 20, 1-25

Bott U., Ebrahim S., Hirschberger, S. & Skovlund, S. E. (2003). Effect of the rapid-acting insulin analogue insulin aspart on quality of life and treatment satisfaction in patients with Type 1 diabetes. *Diabetic Medicine*, 20 (8), 626-634

Brand-Miller, J., Hayne, S., Petocz, P. &. Colagiuri, S. (2003). Low-glycemic index diets in the management of diabetes: a meta-analysis of randomized controlled trials. *Diabetes Care*, 26, 2261-2267.

Brener, N. D., Billy, J. O., & Grady, W. R. (2003). Assessment of factors affecting the validity of self-reported health-risk behavior among adolescents: Evidence from the scientific literature. *Journal of Adolescent Health*, 33, 436–457

Brug, J., Lechner, L. and De Vries, H. (1995). Psychosocial determinants of fruit and vegetable consumption. *Appetite,* 25, 285-296

Brunel, F. F., Tietje, B. C., & Greenwald, A. G. (2004). Is the Implicit Association Test a valid and valuable measure of implicit consumer social cognition. *Journal of Consumer Psychology*, 14, 385–404

Cacioppo, J. T. & Gardner, W. L. (1993). What underlies medical donor attitudes and Behaviour? *Health Psychology*. 12 (4), 269-271.

Carey, M. P, Faulstich, M.E., Gresham, F. M., Ruggerio, L. &. Eynart, P. (1987). Children's Depression Inventory: construct and discriminant validity across clinical and non-referred (control) populations. *Journal of Consulting Clinical Psychology*. 55, 755–61

Cervellon, M.C., & Dube, L. (2002). Assessing the cross-cultural applicability of affective and cognitive components of attitude. *Journal of Cross-Cultural Psychology*, 33, 346-357.

Cole, T. J. and Bellizzi, M.C. and Flegal, K.M. and Dietz, W.H. (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. *British Medical Journal,* 320 (7244), 1240-1243

Cooke, L. J. & Wardle, J. (2005). Age and gender differences in children's food preferences. *British Journal of Nutrition*, 93, 741-6

Corulla, W. J. (1990). A revised version of the psychoticism scale for children. *Personality and Individual Differences,* 11, 65-76.

Craeynest, M., Crombez, G., Houwer, J. D., Deforche, B., Tanghe, A. & Bourdeaudhuij, I. D. (2005). Explicit and implicit attitudes towards food and physical activity in childhood obesity. *Behaviour Research and Therapy*, 43 (9), 1111-1120

Croll, J. K., Neumark-Sztainer, D., & Story, M. (2001). Healthy eating: What does it mean to adolescents? *Journal of Nutrition Education*, 33 (4), 193-198.

Crowne, D. P. and Marlowe D. (1964). *The Approval Motive*. John Wiley, New York.

de Houwer, J. (2003). The extrinsic affective Simon task. *Experimental Psychology,* 50 (2), 77-85.

Deci, E. L., & Ryan, R. M. (2002). *Handbook of self-determination research.* Rochester, NY: University of Rochester Press.

de Houwer, J., Custers, R., de Clercq, A (2006). Do smokers have a negative implicit attitude toward smoking? *Cognition and Emotion*, 20, 1274-1284

de Houwer, J., & De Bruycker, E. (2007). The Implicit Association Test outperforms the Extrinsic Affective Simon Task as a measure of inter-individual differences in attitudes. *British Journal of Social Psychology*, 46 (2), 401-421.

Department of Health (2007). *Making Every Young Person with Diabetes Matter*, Retrieved from the world wide web in February 2008: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_073674

Department of Health and Department for Education and Skills (2004). National Service Framework for Children, Young People and Maternity Services. Retrieved from the world wide web in February 2008: www.dh.gov.uk/assetRoot/04/09/05/52/04090552.pdf

de Wit, M, Pouwer F., Gemke R.J., Delemarre-van de Waal H.A, Snoek F.J. (2007). Validation of the WHO-5 Well-Being Index in adolescents with type 1 diabetes. *Diabetes Care*. 30 (8) 2003-2006.

Eagly, A. H. & Chaiken, S. (1993). *The psychology of attitudes*. Fort Worth, TX: Harcourt Brace Jovanovich.

Eertmans, A., Baeyens, F., & Van den Bergh, O. (2001). Food likes and their relative importance in human eating behavior: Review and preliminary suggestions for health

promotion. *Health Education Research, 16,* 101-114.

Ernst M. M, Epstein L. H (2002). Habituation of responding for food in humans, *Appetite, 38*, 224-234.

Eysenck, H. J., Easting, G., & Eysenck, S. B. G. (1970). Personality measurement in children: A dimensional approach. *The Journal of Special Education, 4*, 261-268.

Fazio, R. H., Sanbonmatsu, D. M., Powell, M. C., & Kardes, F. R. (1986). On the automatic activation of attitudes. *Journal of Personality and Social Psychology, 54*, 297-327.

Fazio, R. H. (1990). Multiple processes by which attitudes guide behaviour: The MODE as an integrative framework. In M. P. Zanna (Ed). Advances in *Experimental Social Psychology* (vol 23, pp75-109). New York. Academic Press

Fazio, R. H. (1995). Attitudes as object–evaluation associations: Determinants, consequences, and correlates of attitude accessibility. In R. E. Petty &. J. A. Krosnick (Eds.), *Attitude strength: Antecedents and consequences* (pp. 247–283). Hillsdale, NJ: Erlbaum.

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

Fishbein, M. and Azjen, I. (1975). *Belief, attitude, intention, and behaviour: An introduction to theory and research.* Reading, Massachusetts: Addison-Wesley

Fricker, J., Rozen, R., Melchior, J. C. & Apfelbaum, M. (1991). Energy-metabolism adaptation in obese adults on a very-low-calorie diet. *Am J Clin Nutr. 53* (4), 826-30

Finlayson, G., King, N. & Blundell J.E.(2007). Is it possible to dissociate 'liking' and 'wanting' for foods in humans? A novel experimental procedure. *Physiology and Behaviour, 90*, 36-42.

Fisher, J. O. and Birch, L.L. (1999). Restricting access to foods and children's eating. *Appetite, 32*, 405–419

Fung, D. (2003). Implicit and explicit attitudes toward high-gat foods in restrained and unrestrained eaters, *Health Institute Journal of Psychology (i)* Retrieved from the world-wide web on June 3 2006 from: http://www2.help.edu.my /departments/psychology/hijop/index.php

Glasgow, R. E. Toobert, D. L, & Hampson, S. E. (1996). Effects of a brief, office-based intervention to facilitate diabetes dietary self-management. *Diabetes Care, 19*, 835-842

Greenwald, A. G., & Nosek, B. A. (2001). Health of the Implicit Association Test at age 3. Zeitschrift für Implicit Association Test 34. *Experimentelle Psychologie, 48,* 85-93.

Greening, L., Stoppelbein L, Moll G, Palardy N, Hocking M. (2004). Intrinsic motivation and glycemic control in adolescents with Type I diabetes. *Diabetes Care, 27*, 15-17

Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review, 102* (1), 4-27.

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The Implicit Association Test. *Journal of Personality and Social Psychology, 74*, 1464–1480.

Hebert, J. R., Clemow, L. Pbert, L., Ockene, I. S. & Ockene, J. K. (1995). Social desirability bias in dietary self-report may compromise the validity of dietary intake measures *Int J Epidemiol, 24* (2), 389-98

Helgeson, V. S., Viccaro, L., Becker, D., Escobar, O., & Siminerio, L. (2006). Diet of Adolescents With and Without Diabetes. *Diabetes Care*. 29, 982-987

Hill, A. J.(2007). The psychology of food craving. *Symposium on 'Molecular mechanisms and psychology of food intake' Proceedings of the Nutrition Society, 66* (2), 277-285,

Hofmann, W., Gawronski, B., Gschwendner, T., Le, H., & Schmitt, M. (2005). A meta-analysis on the correlation between the Implicit Association Test and explicit self-report measures. *Personality and Social Psychology Bulletin, 31*, 10, 1369-1385

Horwath, C. C. (1999). Applying the transtheoretical model to eating behaviour change: Challenges and Opportunities. *Nutrition Research Reviews. 12,* 281-317.

Iannotti, R.J., Schneider, S., Nansel, T.R., Haynie, D.L., Plotnick, L.P., Clark, L.M., Sobel, D.O, & Simons-Morton, B. (2006). Self-efficacy, outcome expectations, and diabetes self-management in adolescents with type 1 diabetes. *Journal of Developmental and Behavioral Pediatrics, 27,* 98-105.

Inquisit 2.0.60616 [Computer software]. (2006). Seattle, WA: Millisecond Software.

Kershnar, A. K., Daniels S. R., Imperatore, G,. Palla, S., Petitti, D., Pettitt, D., et al. (2006). Lipid abnormalities are prevalent in youth with type 1 and type 2 diabetes: the SEARCH for Diabetes in Youth Study. *J Pediatr, 149,* 314 -319

Kovacs, M. (1992). *Children's Depression Inventory manual.* North Tonawanda, NY: Multi-Health Systems.

Lamote, S., Hermans, D., Baeyens, F., & Eelen, P. (2004). An exploration of affective priming as an indirect measure of food attitudes. *Appetite, 42,* 279–286.

Law, G. U., Kelly, T. P., Huey, D. & Summerbell, C. (2002). Self-management and well-being in adolescents with diabetes mellitus: Do illness representations play a regulatory role. *Journal of Adolescent Health, 31,* 381-385.

Lepper, M.R., Sagotsky, G., Dafoe, J.L. and Greene, D., 1982. Consequences of superfluous social constraints: effects on young children's social inferences and subsequent intrinsic interest. *Journal of Personality and Social Psychology, 42*, 51–65

Lowe, B., Spitzer, R.L., Grafe, K. Kroenke, K., Quenter, A., Zipfel, S., et al. (2004). Comparative validity of three screening questionnaires for DSM-IV depressive disorders and physicians' diagnoses, *J. Affect. Disord, 78*, 131–140.

Lozano, D. I., Crites, S. L., & Aikman, S. N. (1999). Changes in food attitudes as a function of hunger. *Appetite, 32*, 207–218.

Lucas, F. &. Bellisle, F. (1987). The measurement of food preference in humans: Do taste-and-spit tests predict consumption? *Physiol. Behav, 39*, 739– 43

Masterson, J., Stuart, M., Dixon, M., Lovejoy, D. & Lovejoy, S. (2003). The Children's Printed Word Database. Retrieved July, 2006 from the World Wide Web: http://www.essex.ac.uk/psychology/cpwd/

Mela, D.J. (1999). Food choice and intake: the human factor. *Proc Nutr Soc, 58*, 513-521

Mela, D. J. (2001). Determinants of Food Choice: Relationships with Obesity and Weight Control. *Obesity Research, 9*, 249-255

Morris, A. D, Boyle, D. I. R., McMahon, A. D., Greene, S. A., MacDonald, T. M. and Newton, R. W. (1997). Adherence to insulin treatment, glycaemic control, and ketoacidosis in insulin dependent diabetes mellitus. *Lancet, 350*, 1505-1510.

NICE (2004). *Type 1 diabetes in children and young people: Full guideline.* http://www.nice.org.uk/guidance/index.jsp?action=download&o=29394

Nosek, B. A., & Banaji, M. R. (2001). The go/no-go association task. *Social Cognition, 19* (6), 625-666.

Nosek, B. A., Greenwald, A. G., & Banaji, M. R. (2007). The Implicit Association Test at age 7: A methodological and conceptual review. In J. A. Bargh (Ed.), *Automatic Processes in Social Thinking and Behavior*. (pp. 265-292). Psychology Press.

Nosek, B. A., Greenwald, A. G., & Banaji, M. R. (2005). Understanding and using the Implicit Association Test: II. Method variables and construct validity. *Personality and Social Psychology Bulletin, 31*, 166-180.

Nouwen, A., Law, G.U., Hussain, S., McGovern, S., & Gibbons, H. *Comparison of the role of self-efficacy and illness representations in relation to Dietary self-care and diabetes distress in adolescents with type 1 diabetes.* Unpublished document. University of Birmingham, UK.

Ott, J., Greening, L., Palardy, N., Holderby, A., & De-Bell, W. K. (2000). Self-efficacy as a mediator variable for adolescents' adherence to treatment for insulin-dependent diabetes mellitus. *Children's Health Care, 29,* 47–63.

Patton, S. Dolan, L. &. Powers, S. (2007). Dietary Adherence and Associated Glycemic Control in Families of Young Children with Type 1 Diabetes. *Journal of the American Dietetic Association. 107* (1), 46-52

Pelchat, M. L., Johnson,A., Chan,R., Valdez, J. &. Ragland, D. (2004). Images of desire: food-craving activation during fMRI, *NeuroImage, 23* (4), 1486-1493.

Perugini, M. (2005). Predictive models of implicit and explicit attitudes. *British Journal of Social Psychology, 44, 29-45*

Perl, M. A., Mandic, M. L, Primorac, I., Klapec, T., & Perl, A. (1998). Adolescent acceptane of different food by obesity status and by sex. *Physiology and Behaviour, 65, 241-245*

Petty, R. E., Briñol, P., & DeMarree, K. G. (2007). The Meta–Cognitive Model (MCM) of Attitudes: Implications for Attitude Measurement, Change, and Strength. *Social Cognition, 25* (5), 657-686

Polivy, J. & Herman, C.P. (1991). Good and bad dieters: Self-perception and reaction to a dietary challenge. *International Journal of Eating Disorders*, 10, 91-99.

Polonsky, W., Anderson, B., Lohrer, P., Welch, G., Jacobson, A., Aponte, J. & Schwartz C. (1995). Assessment of diabetes-related distress. *Diabetes Care , 18,* 754–760.

Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion, 12*, 38-48.

Reid, G. J., Dubow, E. F. & Carey, T. C. (1995). Developmental and situational differences in coping among children and adolescents with diabetes. *Journal of Applied Developmental Psychology, 16* (4), 529-554

Riekert, K. A. & Drotar, D. (1999). Who participates in research on adherence to treatment in insulin-dependent diabetes mellitus? Implications and recommendations for research. *Journal of Pediatric Psychology, 24,* 253-258.

Roefs, A. & Jansen, A. (2002). Implicit and Explicit Attitudes towards High Fat foods in obesity. *Journal of Abnormal Psychology, 111*, 517-521

Roefs, A., Herman, C.P., MacLeod, C.M., Smulders, F.T.Y., & Jansen, A. (2005). At first sight: how do restrained eaters respond to high-fat palatable foods? *Appetite, 44*, 103-114.

Roefs, A., Quaedackers, L., Werrij, M. Q., Wolters, G., Havermans, R., Nederkoorn, C., et al. (2006). The environment influences whether high-fat foods are associated with palatable or with unhealthy. *Behaviour Research and Therapy, 44*, 715-736.

Roefs, A., Stapert, D., Isabella, L. A. S., Wolters, G., Wojciechowski, F., & Jansen, A. (2005). Early associations with food in anorexia nervosa patients and obese people assessed in the affective priming paradigm, *Eating Behaviors, 6*, 151-163.

Roefs, A., Werrij, M., Smulders, F. T. Y., & Jansen, A. (2006). The value of indirect measures for assessing food preferences in abnormal eating. *Journal of Consumer Protection and Food Safety, 1*, 180-186.

Rossi, S.R., Reed, G. Green, G. W., Rossi, J.S., Prochaska, J. O. & Velicer, W. F. (1994). Cross validation of a decisional balance measure for dietary fat reduction. *Paper presented at the 14th annual convention of the Society for Behavioural Medicine*, Boston, MA.

Schlundt, D.G., Rea, M.R., Kline, S.S., & Pichert, J.W. (1994). Situational obstacles to dietary adherence for adults with diabetes. *J Am Diet Assoc, 94*, 874-879.

Sheikh, N. and Thomas. J. (1994). Factors influencing food choice among ethnic minority adolescents. *Nutrition & Food Science, 5*, 29-35

Shenkel, R., Rogers R., Perfetto G. and Levin R. A. Importance of 'Significant Others' in predicting cooperation with diabetic regime. *Int. J. Psychiat. Med, 15* (2) 149-155

Senecal, C., Nouwen, A. &. White, D. (2000). Motivation and Dietary Self-Care in adults with diabetes: Are self-efficacy and autonomous self-regulation complementary or competing constructs? *Health Psychology, 19* (5), 452-457.

Senécal, C., Guay, F., Austin, S., & Nouwen, A. (2006). *Construction et validation de l'échelle de motivation à suivre son plan alimentaire auprès d'adolescents diabétiques de type I.* Manuscrit en préparation, Université Laval, Québec, Canada

Snoek, F. J., Pouwer, F., Welch, G. W. & Polonsky, W. H. (2000). Diabetes-related emotional distress in Dutch and U.S. diabetic patients: Cross-cultural validity of the problem areas in diabetes scale. *Diabetes Care, 23* (9), 1305-1309.

Soedamah-Muthu, S. S., Fuller, J.H, Mulnier, H.E., Raleigh, V.S, Lawrenson, R. A. & Colhoun, H. M. (2006). High Risk of Cardiovascular Disease in Patients with Type 1 Diabetes in the U.K. A cohort study using the General Practice Research Database. *Diabetes Care, 29* (4), 798-804.

Stang, J. &. Story, M. (2005). *Guidelines for Adolescent Nutrition Services.* Retrieved March 2008 from the world wide web: http://www.epi.umn.edu/let/pubs/adol_book.shtm

The Diabetes Control and Complications Trial Research Group. (1993). The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med, 329*, 977-986

Temple, J. L., Giacomelli, A. M., Roemmich, J. N., & Epstein, L. H. (2007). Television watching increases motivated responding for food and energy intake in children. *American Journal of Clinical Nutrition, 85* (2), 355-361

Toobert, D. and R. Glasgow (1994). Assessing diabetes self-management: The summary of diabetes self-care activities questionnaire. In C. Bradley (Ed) *Handbook of Psychology and Diabetes (*pp.351–375). Reading, England, Harwood Academic,

Urland, G.R., & Ito, T.A. (2005). Having your cake and hating it too: Ambivalent food attitudes are associated with dietary restraint. *Basic and Applied Social Psychology, 24* (4), 353-360

Welch, G., Rose G., & Ernst, D. (2006). Lifestyle and Behavior. Motivational Interviewing and Diabetes: What Is It, How Is It Used, and Does It Work? *Diabetes Spectrum, 19,* 5–11

Wiers R.W., VanWoerden, N., Smulders, F.T.Y., & De Jong, P.J. (2002). Implicit and explicit alcohol-related cognitions in heavy and light drinkers. *Journal of Abnormal Psychology, 111*, 648–658.

Williams, K.E & Bond, M. J. (2002). The roles of self-efficacy, outcome expectancies and social support in the self-care of behaviours of diabetics. *Psychology, Health and Medicine*, *7* (2), 127-141

Wilson, M.D. (1988). The MRC Psycholinguistic Database: Machine Readable Dictionary, Version 2. *Behavioural Research Methods, Instruments and Computers*, *20* (1), 6-11.

Woodward, D. R, Boon, J, A., Cumming, F. J., Ball, P. J., Williams, H. M. & Hornsby, H. (1996). Adolescents' reported usage of selected foods in relation to their perceptions. *Appetite*, 27 (2), 109-117

Wysocki, T., Harris, M. S., Buchloh, L. M., Mertlich, D., Sobel Lochrie, A., Taylor, A., et al. (2006). Effects of behavioral family systems therapy for diabetes on adolescents' family relationships, treatment adherence, and metabolic control. *J Pediatr Psychol, 31*, 928-938.

Zheng, H. and. Berthoud, H. R. (2008). Neural Systems Controlling the Drive to Eat: Mind Versus Metabolism. *Physiology, 23*, 75-83

Appendix 1: Public Domain Briefing Paper

Implicit and Explicit Attitudes of Young People with Type 1 Diabetes Towards High-Fat and High-Sugar Foods

Michelle Sandiford

Outline

The study aimed to investigate whether there was a difference between the hidden attitudes (implicit attitudes) and conscious self-reported (explicit attitudes) of young people with and without type 1 diabetes. It also looked for associations between these attitudes and the healthy eating behaviours of young people. Explicit attitudes measures (questionnaires) were more successful than implicit measures in distinguishing between the food attitudes of young people with diabetes and those without diabetes. The automatic attitudes of the young people with diabetes were related to their healthy eating behaviours.

Background Information

Type 1 diabetes is the most common form of diabetes amongst young people with an estimated 1 in 700 having the disease. It is an autoimmune disease in which the body's own insulin producing pancreatic cells are destroyed. Diabetes is managed by following a complex self-care regimen involving diet, insulin injections, exercise and blood-glucose measurements. There is growing evidence detailing the importance of diet in the management of diabetes.

Poorly controlled diabetes can result in both reversible (hypo/hyperglycemia) and long term irreversible (cardiovascular disease, kidney damage, nerve damage) physical health complications. It is vitally important for adolescents with diabetes to manage their diabetes well, as their management during this period can have lifelong effects on health. Adolescents are more at risk of poor management because physiological changes and their desire to be independent.

Both explicit attitudes and implicit attitudes have been previously measured to understand the eating behaviours of different groups of people (e.g. those with

anorexia, obesity etc). It was often clear that individuals with different health conditions had different attitudes towards foods when compared to healthy peers. However, no studies have yet investigated the food attitudes of young people with diabetes.

The Study

30 young people with type 1 diabetes and 22 without diabetes aged 12-18 were recruited. Young people with diabetes were recruited from two inner-city UK hospitals and local schools. All children without diabetes were recruited from local schools. Young people participated if they were free from any condition which would affect their eating behaviours (e.g. a food allergy or eating disorder).

What was measured?

The explicit (conscious) attitudes of the participants were measured by asking them to complete questionnaires about the tastiness and healthiness of foods. They were also asked about their healthy eating behaviours. Implicit (hidden) attitudes were measured using a reaction time task called the Implicit Association Test (Greenwald, McGhee & Schwartz, 1998). This measured how much they associated fatty foods with good thing and low fat foods with bad things. In the same way, it was used to find out what their attitudes towards sugary foods were.

What did the young people have to do?

After consent was sought from the young person (and parents for some) they completed the demographics sheet which asked about age, ethnicity, height and weight. They then completed questionnaires to measure mood, confidence and eating habits. These were given so that the researcher could make sure that young people across each group were similar as possible; only then could they be compared fairly. They then completed the implicit association test and the self-report measures.

What was found?

No difference was found between the implicit (hidden) attitudes of young people with diabetes and those without diabetes. However, questionnaires (explicit measures) found that the diabetes group liked more fatty foods. They also rated low-fat and low sugar foods as more healthy compared to the non-diabetes group. Due to their everyday focus on the healthy aspects of foods, and their frequent diabetes education, young people with diabetes were more easily influenced by relatively novel information regarding the 'tastiness' of foods. Questionnaire based techniques for measuring attitudes (explicit attitudes) were not linked to the healthy eating behaviours of any of the young people. Evidence was found to suggest that craving for high-fat foods among young people with diabetes was associated with their eating behaviours. However, it was unlikely that this craving directly led to greater consumption of high-fat foods.

What do the findings tell us?

These findings indicate that using questionnaires (rather than implicit measures) might be the best way to find differences between the attitudes of young people with and without diabetes. Healthcare workers should be aware of the sensitivity of young people with diabetes to information related to the palatability of foods. So much information may be placed on their "healthy food choices" that when factors related to the 'tastiness' of foods are presented, they may be more likely to develop cravings towards those foods. These cravings may not necessarily lead to the consumption of craved foods. However, increasing the dietary self-care confidence of individuals with diabetes may increase their ability to withstand cravings without 'giving in'.

What needs to be done next?

Researchers should explore the effect of the type of insulin regimen (twice daily injections or multiple daily injections) on the food attitudes of young people with diabetes. This could not be done within the current research because of the small sample size. The current findings would gain strength if they were replicated using a larger number of participants in the future. Also, use of a longitudinal design to investigate the relationship between food attitudes and healthy eating behaviours

would enable us to find out whether there are causal relationships between the two phenomena. Future studies could employ methods of ascertaining the accuracy of the responses of participants on the questionnaires. In relation to this, the use of a more reliable method of obtaining information about healthy eating behaviours could be used in the future, e.g. diaries.

Where can I find more detailed information?

Information related to this thesis is available from:

Michelle Sandiford (Clinical Psychologist in Training)

School of Psychology, Department of Clinical Psychology, University of Birmingham

B15 2TT. 0121 414 7576

Information about the current guidelines for diabetes is available from:

Department of Health (2007). *Making Every Young Person with Diabetes Matter*, http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_073674

or

NICE (2004). *Type 1 diabetes in children and young people: Full guideline.* http://www.nice.org.uk/guidance/index.jsp?action=download&o=29394

References

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The Implicit Association Test. *Journal of Personality and Social Psychology*, 74, 1464–1480.

Appendix 2: Literature Search Terms

Literature Review Search Terms

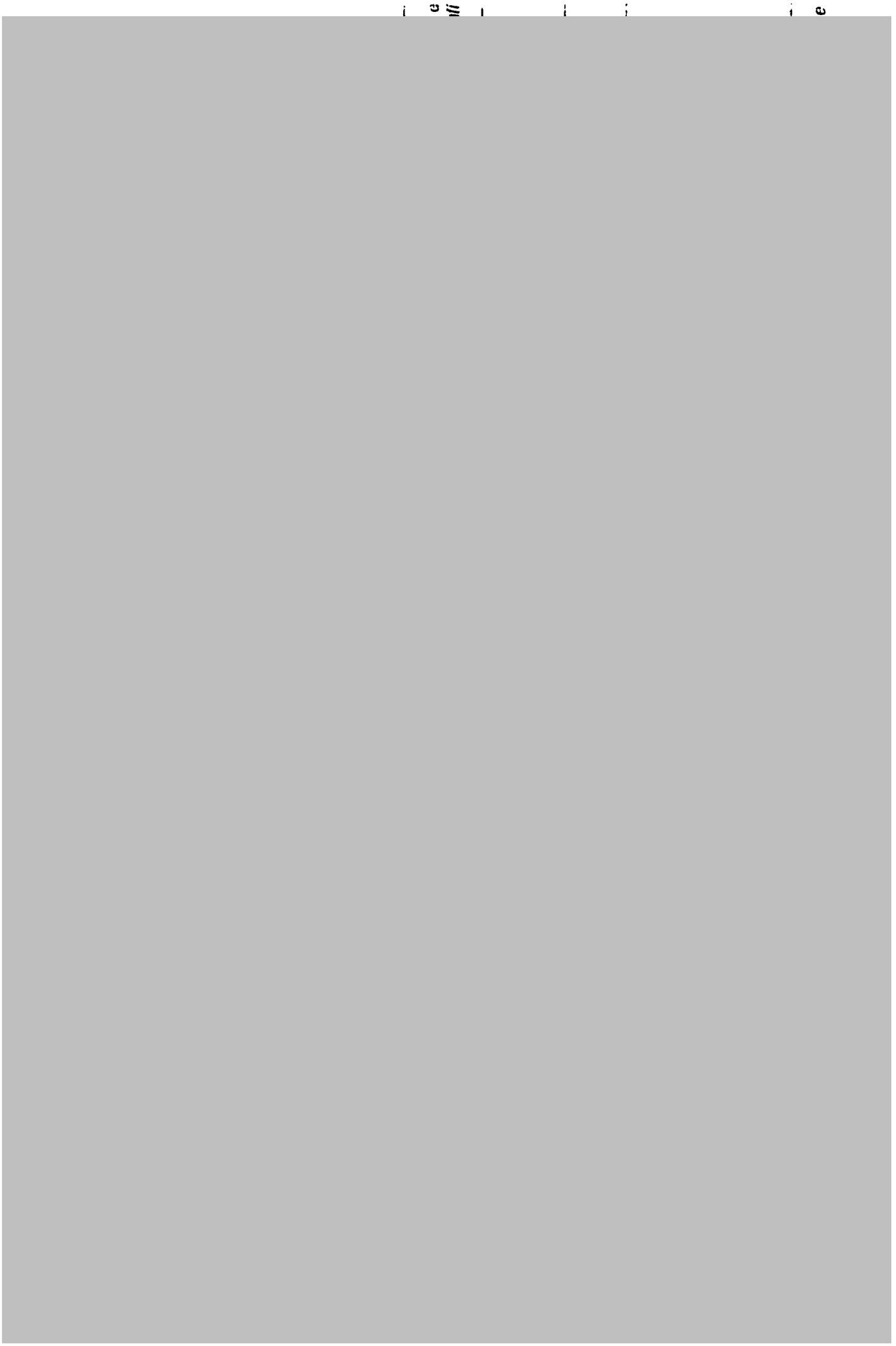
Specifically, each database was searched using the following terms in the title, abstract or heading words: *type 1 diabetes, insulin dependent diabetes mellitus, iddm, juvenille diabetes, Social Cognitive Theory, outcome expectancies, self-efficacy, diet[ary] , Theory of Planned Behaviour, Theory of Reasoned Action, behavioral intention, perceived behavioural control, subjective norms, Health Belief Model, health beliefs, barriers, self-care, stages of change, transtheoretical model, processes of change, situational* self-efficacy, decisional balance, *health behaviour, illness behaviour, health behaviour models, illness behavior models, compliance, adherence, self-management, self-care* (alternative US spellings were used in searches alongside UK spellings).

Appendix 3: Letters Granting MRAC, University ethics and R& D approval

BIRMINGHAM

School of Psychology

[redacted]



DO NOT SCAN

Invitation for Parents

Dear Parent

Your child's consultant _____ has asked me to contact you to invite your child to participate in some research. This research is interested in the eating habits of young people with diabetes It will be taking place at their diabetes clinic in collaboration with the University of Birmingham.

Your child's participation is completely voluntary, and non-participation will have no bearing on their treatment at the diabetes clinic. Please find enclosed two information sheets – one for you and one for your son/daughter. This sheet explains the research and includes the contact details of the researcher (just in case you have any questions).

At their next appointment, your consultant will ask you and your son/daughter whether you would like to participate in this research. If you do, you and your child will be asked to sign a consent form. The research will only take about 30 minutes to complete. You can speak to the researcher to arrange for the research to take place at your home or your child's school.

Please feel free to contact me if you have any questions using the contact details at the end of the information sheet.

Yours sincerely

Michelle Sandiford
Clinical Psychologist in Training
Department of Clinical Psychology
University of Birmingham

DO NOT SCAN

Appendix 6: Consent sheets

CONSENT FORM FOR YOUNG PEOPLE AGED 17-18
(to be completed by the young person)

The Attitudes of Young People with Diabetes Towards Healthy and Unhealthy Foods

---

Please read the statements below and circle either YES or NO:

Have you read about or heard about this project?	Yes/No
Has somebody else explained this project to you?	Yes/No
Do you understand what this project is about?	Yes/No
Have you asked all the questions you want?	Yes/No
Have you had your questions answered in a way you understand?	Yes/No
Do you understand it's OK to stop taking part at any time?	Yes/No
Are you happy to take part?	Yes/No

If any answers are 'no' or you **don't** want to take part, **don't** sign your name!

If you **do** want to take part, please write your name and today's date

Print Name _____

Signature _____

Date _____

Phone No. (Required) _____

The person who explained this project to you needs to sign too:

Print Name _____

Sign _____

Date _____

Thank you for your help.

CONSENT FORM FOR YOUNG PEOPLE UNDER 17 YEARS OLD
(to be completed by the young person and their parent/guardian)

The Attitudes of Young People with Diabetes Towards Healthy and Unhealthy Foods

---

Young person (or if unable a parent on their behalf) to circle all they agree with please:

Have you read about or heard about this project? Yes/No

Has somebody else explained this project to you? Yes/No

Do you understand what this project is about? Yes/No

Have you asked all the questions you want? Yes/No

Have you had your questions answered in a way you understand? Yes/No

Do you understand it's OK to stop taking part at any time? Yes/No

Are you happy to take part? Yes/No

If any answers are 'no' or you **don't** want to take part, **don't** sign your name!

If you **do** want to take part, please write your name and today's date

Your name _____

Date _____

Your parent or guardian must write their name here too if they are happy for you to do the project

Print Name _____

Sign _____

Date _____

The person who explained this project to you needs to sign too:

Print Name _____

Sign _____

Date _____

Thank you for your help.

Appendix 7: IAT instructions and structure

Table 1: Procedural stages of the high-fat IAT (counter-balanced order; based on Greenwald et al, 2007)

BLOCK	**NO. OF TRIALS**	**ITEMS ASSIGNED TO LEFT KEY RESPONSE**	**ITEMS ASSIGNED TO RIGHT KEY RESPONSE**
S1 PRACTICE	*20*	*High-fat foods*	*Low-fat/sugar foods*
S2 PRACTICE	*20*	*Positive words*	*Negative words*
S3 PRACTICE	*20*	*High-fat foods + positive words*	*Low-fat/sugar foods + negative words*
S4 TEST	*40*	*High-fat foods + positive words*	*Low-fat foods + negative words*
S5 *PRACTICE*	*40*	*Low-fat/sugar foods*	*High-fat foods*
S6 PRACTICE	*20*	*Low-fat/sugar foods + positive words*	*High-fat foods + negative words*
S7 TEST	*40*	*Low-fat/sugar foods + positive words*	*High-fat foods + negative words*

IAT Item instructions (Re-worded for Young People)

Block 1

"Put your middle fingers on the E and I keys of your keyboard. Pictures or words will appear one after the other in the middle of the screen. When a picture or word belongs to a category on the left, press the E key; when the item belongs to a category on the right, press the I key. Each picture or word belongs to only one category. If you make a mistake, an X will appear. Fix the error by pressing the other key.

GO AS FAST AS YOU CAN while making as few mistakes as possible. This task will take about 5 minutes to complete."

Block 2

"See above, the categories have changed. The pictures or words for sorting have changed as well. The rules, however, are the same.

When a picture or word belongs to a category on the left, press the E key; when a picture of word belongs to a category on the right, press the I key. Each pictures or word belongs to only one category. An X will appear after an error - fix the error by pressing the other key. GO AS FAST AS YOU CAN."

Block 3

"See above, the four categories you saw separately now appear together. Remember, each picture or word belongs to only one group. For example, if the categories High-fat and Positive appears on the top left hand side, you would press the E key for pictures of high-fat foods and positive words. You would press the I key for Low-fat pictures and Negative words.

The green labels may help to identify the appropriate category. Use the E and I keys to categorize pictures and words into four groups left and right, and correct errors by hitting the other key."

Block 4

"Sort the same four categories again. Remember to go as fast as you can while making as few mistakes as possible.

The green and white category labels at the top corners of the screen may help you to identify the appropriate category. Use the E and I keys to sort pictures and words into the group on the left or on the right. Correct any errors by hitting the other key."

Block 5

"Notice above, there are only two categories and they have switched positions. The category that was previously on the left is now on the right, and the category that was on the right is now on the left. Practice this new sorting pattern.

Use the E and I keys to sort pictures and words into the group on the left side or on the right side. Correct any errors by hitting the other key."

Block 6

"See above, the four categories now appear together in new pairings. Remember, each item belongs to only one group.

The green and white category labels at the top corners of the screen may help you to identify the appropriate category. Use the E and I keys to sort pictures or words into the group on the left or on the right. Correct any errors by hitting the other key."

Block 7

"Sort the same four categories again. Remember to go as fast as you can while making as few mistakes as possible.

The green and white category labels at the top corners of the screen may help you to identify the appropriate category. Use the E and I keys to categorize pictures or words into the group on the left or on the right. Correct any errors by hitting the other key."

Results Information

Below is a summary of your average response time for sorting the different food pictures and words into pairs.

Pairing 1 average time %> milliseconds
Pairing 2:average time %> milliseconds

Did you respond much more quickly on one of the pairings than the other? If so, that pairing may reflect your attitudes about those kinds of foods.

Thank you for your participation. Please press 'Continue' to end the test.

Appendix 8: Questionnaires

Healthy Eating Questionnaire

The questions below ask about your dietary habits and health eating during the past 7 days. If you were ill during the past 7 days, please think back to the last 7 days that you were not ill. Please answer the questions as honestly and accurately as you can.

How often did you follow a healthy balanced diet over the last 7 days?

Always	Usually	Sometimes	Rarely	Never
☐	☐	☐	☐	☐

During the past week, how many of your meals included high fibre food, such as fresh fruits, fresh vegetables, and peas, bran?

None of the them	A few of the them	Some of the them	Most of the them	All of the them
☐	☐	☐	☐	☐

During the past week, how many of your meals included high fat foods, such as butter, ice cream, oil, nuts and seeds, mayonnaise, fried food, salad dressing, crisps, pies, pizzas and sausages?

None of the them	A few of the them	Some of the them	Most of the them	All of the them
☐	☐	☐	☐	☐

During the past week, how many of your meals included sweets and desserts, such as pastries, cake, jam, soft drinks (not diet), chocolate and cream biscuits?

None of the them	A few of the them	Some of the them	Most of the them	All of the them
☐	☐	☐	☐	☐

Over the last week, how often did you exercise?

None of the time	A little of the time	Some of the time	Most of the time	All of the time
☐	☐	☐	☐	☐

On how many of the last 7 days did you exercise for at least 20 minutes ?

0	1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐	☐

On how many of the last 7 days did you exercise on top of what you do at school?

0	1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐	☐

Diabetes kids only:

On how many of the last 7 days (that you were not ill) did you did you test your glucose (blood sugar) level ?

0	1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐	☐

Over the last 7 days how many of the glucose (blood sugar) tests recommended by your doctor did you actually do (covering all meals and pre bed) ?

None of the them	A few of the them	Some of the them	Most of the them	All of the them
☐	☐	☐	☐	☐

How many of your recommended insulin injections / medication did you take in the last 7 days that you were supposed to ?

All of them	Most of them	Some of them	None of them
☐	☐	☐	☐

How many of your recommended insulin injections / medication did you have at the time you were supposed to ?

All of them	Most of them	Some of them	None of them
☐	☐	☐	☐

Participant Code _____

ABOUT ME

Consent Sheet

We would like to thank you for taking the time to participate in this research. This is a questionnaire pack which has been designed to investigate the attitudes of young people towards food.

You are free to stop at any time and all of your answers will be anonymous (you will not be named in the research). You can delete or change any answers and all information will be kept confidential unless your responses indicate that you require some assistance from a healthcare professional in the diabetes team. If you feel uncomfortable answering any question, simply leave it out and move on. If you would like to see a summary of the research findings, you can request from your clinic consultant.

Please complete the following:

1. Are you... *[please tick one]*
   1. Male 2. Female

2. Date of Birth (dd/mm/yyyy – for example 03/12/1992) __ _/_____/_____

3. How old were you when you became a diabetic?_____years old

4. Ethnicity (please tick as appropriate):

White British

1. British

2. Irish

3. Any other White background

Asian or Asian British

7. Indian

8. Bangladeshi

9. Pakistani

10. Any other Asian Background

Other Ethnic Group

15. Chinese
16. Any other Ethnic group

Black or Black British

4. Caribbean

5. African

6. Any other Black background

Mixed

11. White & Black Caribbean

12. White & Black African

13. White & Asian

14. Any other Mixed background

Height & Weight.

Weight_____ Height_____ Insulin Type____ __

Dietary Self-Efficacy Scale
Following my dietary plan for diabetes

Sometimes its hard to following my dietary plan for diabetes, this happens in lots of situations. Some of these situations are listed in this questionnaire. We would like to know how confident you are that you will be able to regularly follow your dietary plan in these situations.

Using the scale below, please indicate how confident you are in your ability to follow your dietary plan on a regular basis by writing a number between 0 and 10 on the line provided. If the statement does not apply to your situation, please write N/A.

☺☺ Example: Going to the cinema with my friends. Confidence = 2

When I go to the cinema with my friends they buy lots of foods that are high in calories and sugar. I feel like buying the same foods. In that situation I am not very confident that I would not buy those foods.

If I always stick to my diabetes diet when I go with friends to the cinema

Confidence = 10.

Confidence Scale

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately certain can do					Certain can do

CONFIDENCE (0-10)

1. When watching television _____
2. When feeling tired or bored _____
3. When alone at home _____
4. When feeling wound up or worried _____
5. When seeing friends eating the 'wrong' or sugary foods _____
6. When I am upset _____
7. When eating out _____

0	1	2	3	4	5	6	7	8	9	10
Not at all confident					Moderately confident					Totally confident

8. When feeling annoyed or angry _____

CONFIDENCE (0-10)

9. When very hungry _____
10. When feeling sad _____
11. When celebrating with others _____
12. When offered the 'wrong' foods e.g. chocolate, sweets, biscuits _____
13. When the 'wrong' (sugary) foods are available at home _____
14. When it is difficult to get hold of the foods I should eat for my diabetes (fruit, vegetables, etc.) _____
15. When on the way to or from school
16. When ill _____
17. When going out with friends _____
18. When on holiday _____
19. At parties, when the 'wrong' (sugary or fatty) foods are offered to me _____
20. When I am in a hurry _____
21. When preparing my own meal _____
22. When faced with appealing foods that are sugary or fatty in a supermarket or vending machines _____
23. When my life doesn't go to plan _____
24. When I need to eat (snacks, regular meals) even though others are not eating _____
25. When feeling well _____
26. When I want more variety in my diet _____
27. When craving for high calorie foods _____

CDI-S

Kids sometimes have different feelings and ideas.

This form lists the feelings and ideas in groups. From each group of tree sentences, pick one sentence that describes you best for the past two weeks. After you pick a sentence from the first group, go on to the next group.

There is no right or wrong answer. Just pock the sentence that best describes the way you have been recently. Put an X in the box next to your answer.

Here is an example of how this form works. Try it. Put a mark next to the sentence that describes you best.

Example:

☐I read books all the time
☐I read books once in a while
☐I never read books

Remember, pick out the sentences that describe you best in the PAST TWO WEEKS

Item 1
☐I am sad once in a while
☐I am sad many times
☐I am sad all the time

Item 2
☐Nothing will ever work out for me
☐I am not sure if things will work out for me
☐Things will work out for me

Item 3
☐I do most things ok.
☐I do many things wrong
☐I do everything wrong

Item 4
☐I hate myself
☐I do not like myself
☐I like myself

Item 5
☐I feel like crying every day
☐I feel like crying many days
☐I feel like crying once in a while

Item 6
☐Things bother me all the time
☐Things bother me many times
☐Things bother me once in a while

Item 7
☐I look ok
☐There are some bad things about my looks
☐I look ugly

Item 8
☐I do not feel alone
☐I feel alone many times
☐I feel alone all the time

Item 9
☐I have plenty of friends
☐I have some friends but I wish I had more
☐I do not have any friends

Item 10
☐Nobody really loves me
☐I am not sure if anybody loves me
☐I am sure that somebody loves me

Based on Kovacks (1992).

(Five) Well-Being Index (1998 version)

Please indicate for each of the five statements which is closest to how you have been feeling over the last two weeks.

Notice that higher numbers mean better well-being.

Example: If you have felt cheerful and in good spirits more than half of the time during the last two weeks, put a tick in
the box with the number 3 in the upper right corner.

Over the last two weeks

5. All of the time	4. Most of the time	3 More than half of the time	2. Less than half of the time	1. Some of the time At no time	0. At no time

1 I have felt cheerful and in good spirits

5 4 3 2 1 0

2 I have felt calm and relaxed

5 4 3 2 1 0

3 I have felt active and vigorous

5 4 3 2 1 0

4 I woke up feeling fresh and rested

5 4 3 2 1 0

5 My daily life has been filled with things that interest me

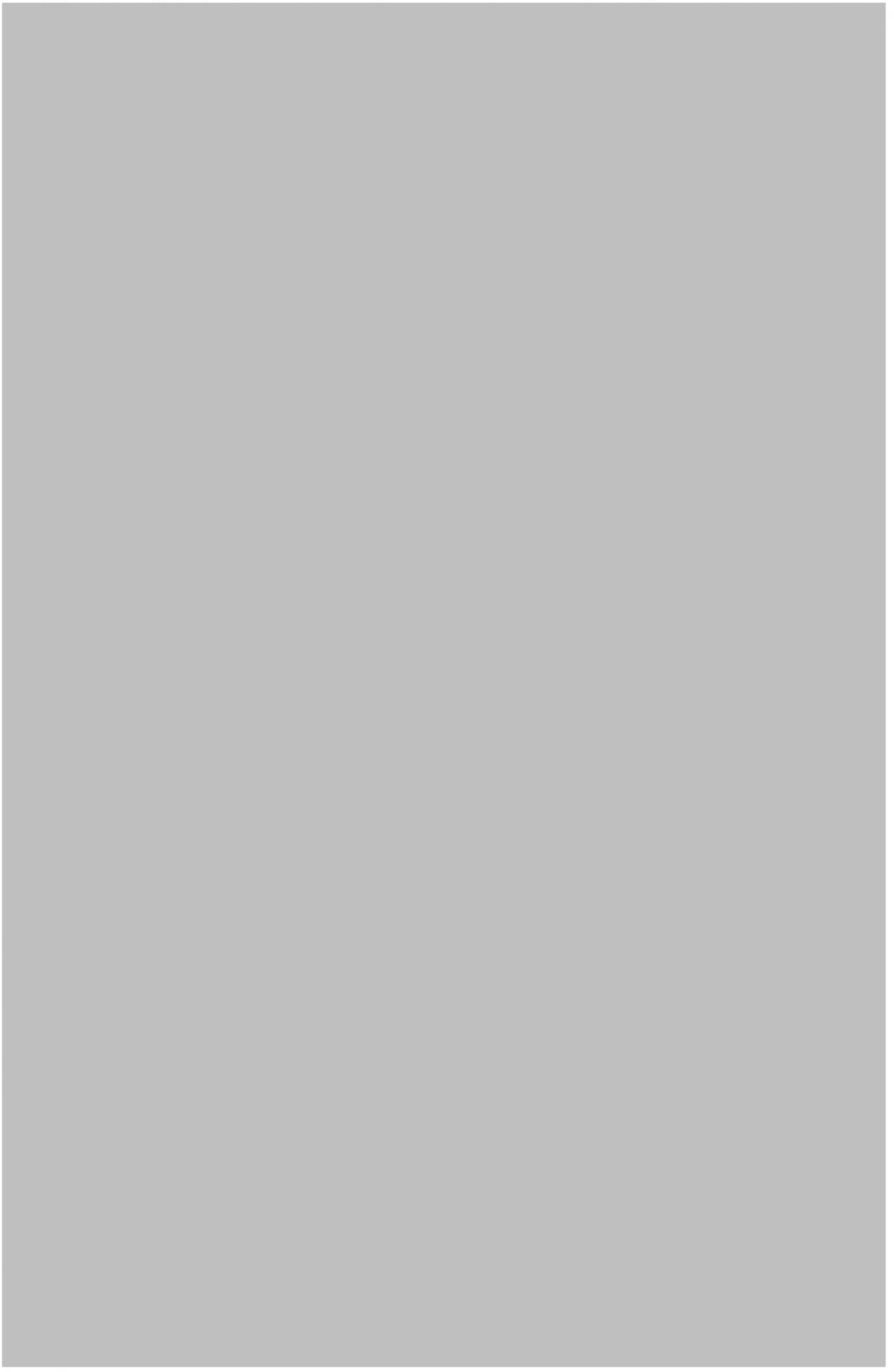
5 4 3 2 1 0

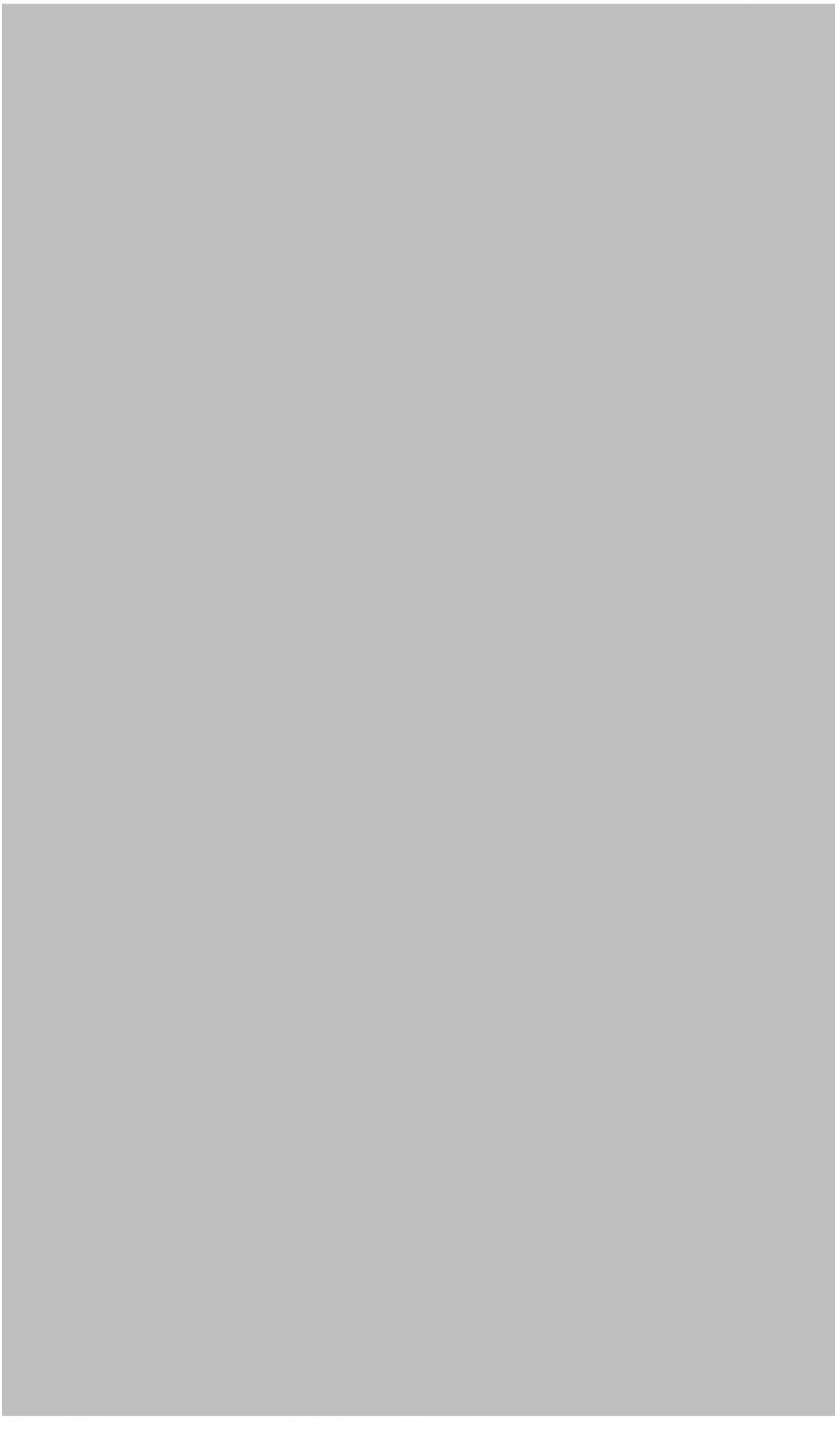
Scoring:

The raw score is calculated by totalling the figures of the five answers. The raw score ranges from 0 to 25, 0 representing
worst possible and 25 representing best possible quality of life.

To obtain a percentage score ranging from 0 to 100, the raw score is multiplied by 4. A percentage score of 0 represents
worst possible, whereas a score of 100 represents best possible quality of life.

Explicit Food Attitude Measure

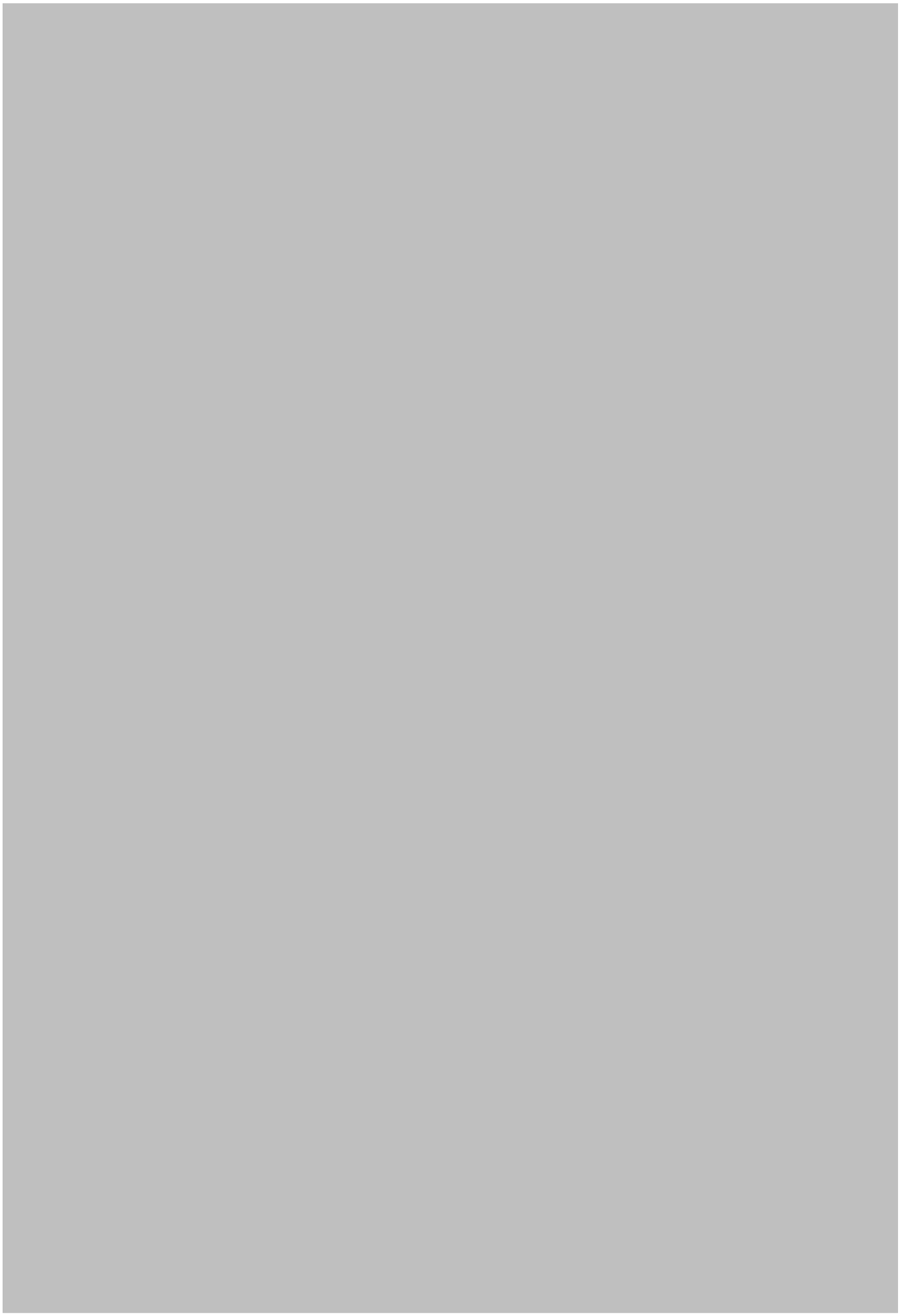




Appendix 9: Comparison between Groups on Health and Mood Variables

Healthy Eating	*Diabetic*	22	60.19	12.92	25.00 - 87.50
	Non-diabetic	30	62.92	12.49	25.00 - 81.25
Self-efficacy (healthy-eating)	*Diabetic*	21	193.17	52.29	72 - 270
	Non-diabetic	30	150.77	35.19	81 - 270
Well-being	*Diabetic*	22	62.00	16.27	32 - 84
	Non-diabetic	30	72.53	14.39	40 - 92
Depression	*Diabetic*	22	1.59	2.36	0 - 8
	Non-diabetic	30	2.37	1.67	0 - 7
Body Mass Index	*Diabetic*	19	23.02	2.45	18.81 - 29.39
	Non-diabetic	30	21.69	1.58	17.90 - 25.53

Appendix 10: Instructions to authors



Online Materi

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

- Download Permissions Alert Form (PDF: 46KB)

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

- Down Disclosure of Interests Form (PDF: 58KB)

[redacted]

- Download Publication Rights (Copyright Transfer) Form (PDF: 48KB)

[redacted]

[redacted]

[redacted]

[redacted]

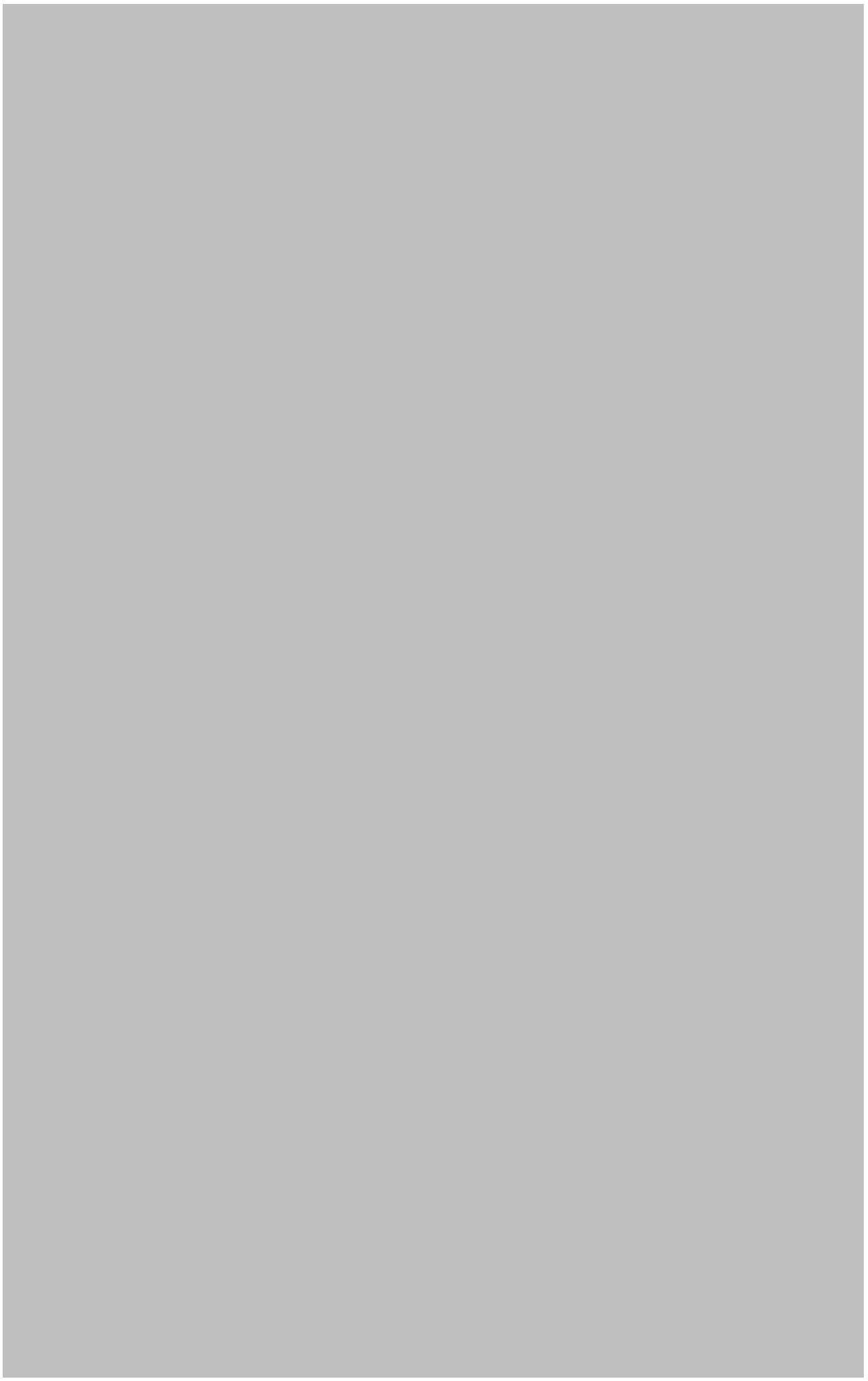
[redacted]

[redacted]

[redacted]

http://bjhp.edmgr.com.

[redacted]



Code of Conduct, Ethical Principles and