Maintenance of a healthy lifestyle:

Differences in the obese and non-obese

BY

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Abstract

The failure to maintain a healthy lifestyle (particularly consuming a healthy diet and engaging in regular physical activity) is a significant contributor to overweight and obesity and the resulting detrimental effects on individual and public health. Using Social Cognitive Theory and the Health Action Process Approach to inform the theoretical framework, this research examined whether maintaining a healthy lifestyle is influenced by different factors in overweight or obese and normal weight groups. Participants were 374 University students, categorized as overweight or obese and normal weight based on BMI determined by self-reported height and weight. They were assessed on measures of healthy eating and physical activity (at three-month intervals, to determine the maintenance of those behaviours over time) and variables predicted to influence those behaviours including: action self-efficacy, outcome expectations, intentions, planning, recovery self-efficacy, facilitators (i.e., consideration of future consequences, perceived social support and perceptions of general health) and impediments (i.e., depression, perceived stress and shame). Structural Equation Modeling was used to determine the fit of the predicted model for the total sample and for the overweight and obese and normal weight subgroups. The results demonstrated that a revised model predicting exercise behaviour (but not healthy diet) was able to adequately explain the data for the overall sample and for the normal weight subsample, but not for the overweight and obese subsample. Outcome expectations about exercise, self-efficacy and planning made important contributions to the prediction of exercise behaviour, but not diet. Implications of these findings will be discussed.

Maintenance of a healthy lifestyle: Differences in the obese and non-obese

Why certain people engage in more health behaviours than others and what motivates and influences them to do so are crucial questions for health. Prevention efforts and health care initiatives are only as useful as the degree to which people consistently apply them in their lives. Accordingly, it is important to make efforts to determine what factors encourage, and what factors may constitute barriers, to maintaining health behaviours.

A critical area on which to presently focus in health-related research is obesity. There has been a recent and dramatic proliferation of overweight and obesity that has resulted in a global "obesity epidemic" both in developed and under-developed countries (World Health Organization [WHO], 2000). Obesity is estimated to affect over 30% of adults (Ogden, Carroll, McDowell & Flegal, 2007) and 16% of children and adolescents (aged 2-19 years old) in the United States (Ogden, Carroll & Flegal, 2008). In Canada, approximately 48% of adults have a Body Mass Index[1] (BMI) of more than 25 and are considered overweight, and 14% have a BMI of 30 or more, and meet the criteria for obesity (Statistics Canada, 2004, 2010). Overall, rates of obesity in North America have doubled in the past 20 years.

Lifestyle factors such as engaging in physical activity and consuming a healthy diet have a large influence on the development of obesity (e.g., Horgen & Brownell, 2002; WHO, 2003; Goran & Weinsier, 2000). That said, many individuals are still not making healthy lifestyle choices. For instance, in Canada, only 50% of the population is physically active and only 40% of the population report eating five or more servings of

[1]BMI refers to weight in kilograms divided by height in meters squared (BMI=kg/m^2); it is a widely used method for determining overweight and obesity (WHO, 2003).

fruits and vegetables a day (Statistics Canada, 2004, 2010). In addition, the amount of fat consumed in a typical diet and the consumption of energy-dense foods (i.e., foods that are highly processed, high in fat and low in nutritional value) has increased in both developed and under-developed countries (WHO, 2003).

These changes in health behaviours have helped to establish obesity as a public health problem, affecting large proportions of the population both physically and economically (WHO, 2000; Grilo, 2006). A higher BMI is associated with numerous negative outcomes: increases in health problems including diabetes, certain types of cancer, degenerative joint disease, the metabolic syndrome,[2] morbidity and all-cause mortality (e.g., WHO, 2000; Pi-Sunyer, 2002); increases in psychological problems such as greater body image disturbance and lower self-esteem (Wardle, Waller & Fox, 2002); and a greater economic burden as global national health budgets devote an increasingly large percentage of spending to obesity and obesity related diseases (WHO, 2000). Given the far-reaching effects of obesity, it is important to develop a better understanding of what variables influence the maintenance of health behaviours.

Maintenance of healthy lifestyle behaviours

Research on healthy lifestyle has focused on two main areas: the initiation and the maintenance of healthy lifestyle behaviours (please see Table 1 for an overview of the research on specific factors that influence the initiation of healthy lifestyle behaviours). In order for health behaviours to be effective in preventing and controlling the "obesity epidemic" it is imperative that they not only be initiated but also maintained over time

[2]The metabolic syndrome is a clustering of risk factors related to cardiovascular disease including insulin resistance, glucose intolerance, dyslipidaemia, hypertension, chronic inflammation, and increased risk for blood clot.

(e.g., Lowe, Miller-Kovach & Phelan, 2001; Volek, VanHeest, & Forsythe, 2005).[3] Maintenance of a healthy diet and physical activity are difficult concepts to define compared to the maintenance of other health behaviours (e.g., breast self-examination, seat-belt use) because it is inaccurate to consider a single episode of intake of unhealthy food, or a failure to exercise on a given day, a lapse in the overall maintenance of those behaviours. Therefore, global concepts of maintenance of a healthy diet and regular physical activity have been favoured, such as the general consistency of those behaviours over time.

A healthy diet should primarily consist of complex carbohydrates, fruits, vegetables, legumes, whole grains, low-fat dairy products, fish, lean meats and poultry and a minimal intake of saturated fat (e.g., American Heart Association, 2006). The exercise component of a healthy lifestyle should include a minimum of 30 minutes of at least moderate-intensity physical activity on most or all days (Blackburn, 2002; Blair & Leermakers, 2002). This amount of activity can decrease the risk of mortality and morbidity and has beneficial effects on health risk factors associated with overweight and obesity (American Heart Association, 2005; WHO, 2003). In addition to structured physical activity, increased lifestyle activity (i.e., making daily choices that contribute to greater energy expenditure) is proposed to be beneficial for weight-loss and weight maintenance (Fabricatore & Wadden, 2006). Further, while also contributing to weight loss, maintaining a healthy lifestyle is a critical part of obesity prevention efforts which are considered easier, less expensive and more effective than treating obesity once it has fully developed (e.g., WHO, 2000).

[3]Although there is debate in the literature about the controllability of weight, the majority of researchers agree that exercise and healthy eating can contribute to weight loss within a certain range and improve overall health.

Despite the importance of maintaining health-related behaviours over time in order to control weight, research has generally found abysmal maintenance rates of physical activity and healthy eating following weight-loss interventions. For instance, a review of longitudinal weight-loss studies has shown that lifestyle interventions generally result in maintenance of less than 5kg of weight-loss over two to four years (Douketis, Macie, Thabane & Williamson, 2005). In addition, global trends toward an increasing prevalence of overweight and obesity suggest that those of normal weight may also be failing to adhere to dietary and exercise guidelines (e.g., WHO, 2003). In fact, adherence to professional health advice is reportedly low for all behaviours that require some degree of discretionary action or self-administration (Becker, 1990). Further, maintenance rates tend to be lower when the changes required are complex, long in duration, require significant changes in lifestyle, are inconvenient or expensive (Becker & Maiman, 1981). Currently, not enough is known about the variables that influence the maintenance of healthy lifestyle behaviours and how to maximize them to increase public health (Lang & Froelicher, 2006).

Theoretical models used to predict health behaviours

Several theoretical models have previously been used to predict various health behaviours and they provide a good starting point for identifying variables that may predict the maintenance of the health behaviours most closely related to obesity prevention (i.e., physical activity and healthy eating). Models that have had considerable success in predicting the initiation of numerous health behaviours include Social Cognitive Theory and the Health Action Process Approach. A brief review of the

components of those models, and the findings in the literature on predicting the initiation of healthy lifestyle behaviours using those models, is provided below.

Social Cognitive Theory.

Social Cognitive Theory (SCT) is a psychosocial approach used to understand and predict behaviour (Bandura, 1977; Bandura, 1986). According to SCT, behaviour is the result of interactions among personal factors, environmental factors, and the behaviour itself (Bandura, 1991; Bandura, 1997). SCT is based on several core determinants including perceived self-efficacy about one's ability to exert control over health-related behaviours, outcome expectations about the anticipated costs and benefits of engaging in various health-related behaviours, the goals that individuals set for themselves regarding their health and the perceived facilitators and impediments to realizing their health-related goals (Bandura, 2004).

Research studies that have looked at the effects of the SCT model variables (Anderson, Winett, Wojcik & Williams, 2010; Anderson, Winett, Wojcik, Winett, & Bowden, 2001; Fuemmeler, Masse & Yaroch, 2006; Dilorio, McCarty & Denzmore, 2006; Hallam & Petosa, 2004; Lewis, Forsyth, Pinto, Bock, Roberts & Marcus, 2006; Linde, Rothman, Baldwin & Jeffrey, 2006; Netz & Raviv, 2004; Spink & Nickel, 2010; Steptoe, Perkins-Porras, Rink, Hilton & Cappuccio, 2004) have found that self-efficacy (Netz & Raviv, 2004; Lewis et al., 2006; Linde et al., 2006; Spink & Nickel, 2010) and outcome expectations (Hallam & Petosa, 2004) are useful predictors of various health-related behaviours (Anderson et al., 2010; Anderson et al., 2001; Dilorio et al., 2006; Fuemmeler et al., 2006; Steptoe et al., 2004). Studies have typically focused on investigating particular variables in the SCT model as opposed to the model as a whole.

However, a recent study investigated all of the components of SCT and found that self-efficacy and self-regulation mediated the treatment effects on physical activity and healthy eating; participants who received the treatment intervention engaged in more goal setting, planning[4] and self-monitoring, compared to those who did not participate in the intervention, which lead to a greater frequency of healthy diet and exercise behaviours (Anderson et al., 2010). They also found that when physical activity was the outcome variable, that more social support around engaging in exercise increased self-efficacy, contributing to greater outcome expectations about exercise and more physical activity behaviour. This study demonstrated the utility of the entire SCT model in predicting health behaviours and identified the role of specific variables as mediators.

Previous research has also found differences in certain SCT variables between individuals in different weight classes. For instance, individuals who are overweight or obese have reported more impediments and fewer facilitators to engaging in health behaviours, contributing to less engagement in health behaviours (e.g., Deforche, De Bourdeaudhuij & Tanghe, 2006; see Table 1). Another notable finding is that shame related to one's body may act as an impediment to engaging in health behaviours (e.g., Burk & Carol, 1996) and has been identified as being more pronounced in those who are overweight and obese compared to those of normal weight (e.g., Van Vlierberghe & Braet, 2007).

[4]Although they have not explicitly tested planning, their description of self-regulation "(i.e. anticipating and planning for barriers to change, e.g. walking at the mall in bad weather, bringing fruit for a snack when healthy alternatives are not available at the work-place)," describes aspects of the planning variable described in the HAPA model (Anderson et al., 2010, p. 23)

The Health Action Process Approach (HAPA).

The Health Action Process Approach (HAPA) model expands on other models[5] used to predict health behaviours to include postintentional factors (Lippke, Ziegelmann & Schwarzer, 2004; Luszczynska & Schwarzer, 2003; Sniehotta, Scholz & Schwarzer, 2005). According to the HAPA model, there is a distinction between preintentional motivational processes that contribute to the intention to complete a behaviour and postintentional volitional processes that contribute to the execution of the behaviour. The preintentional phase of the HAPA model closely mirrors the process outlined by SCT whereby certain factors (i.e., outcome expectations, action self-efficacy, facilitators and impediments) contribute to the formation of an intention to execute a behaviour.

According to the HAPA model, after the preintentional phase, individuals enter into a postintentional phase during which the planning of behaviours affects the relationship between intentions and the outcome behaviour; intentions contribute to the formation of specific plans which in turn affect behaviour (overview in Sheeran, Milne, Webb & Gollwitzer, 2005). The rationale for this sequence of events is that individuals are more likely to engage in a behaviour if they have developed specific strategies and plans to complete a task (i.e., mental simulation of where, when and how the behaviour will be implemented). Further, the mental simulation used in planning is suggested to be helpful in forming cues for action that are triggered when subsequent situational cues are encountered.

The HAPA model also distinguishes between two types of self-efficacy: action self-efficacy and recovery self-efficacy. Action self-efficacy relates to an individual's confidence to act before they engage in the behaviour (i.e., the self-efficacy described in

[5]Namely, SCT and volitional theory (Heckhausen, 1991).

SCT), while recovery self-efficacy refers to how an individual copes with failure and recovers from setbacks (Schwarzer, Luszczynska, Ziegelmann, Scholz, & Lippke, 2008).[6] The distinction between the different types of self-efficacy in the HAPA model has been useful in predicting health behaviours such as exercise (Rodgers, Hall, Blanchard, McAuley & Munroe, 2002; Rodgers & Sullivan, 2001; Scholz, Sniehotta & Schwarzer, 2005), breast self-examination (Luszczynska & Schwarzer, 2003), dietary behaviours (Schwarzer & Renner, 2000) and dental flossing (Schüz, Sniehotta & Schwarzer, 2007). Further, research using the HAPA model has demonstrated that individuals who engage in more planning of health behaviours are more likely to actually engage in those health behaviours (e.g., Rodgers et al., 2002; Schwarzer & Renner, 2000; Sheeran et al., 2005). This model has been useful in examining behaviours following an intervention to address a problem or health concern (e.g., cardiac rehabilitation patients) but has not yet been widely applied to the prediction of health behaviours in individuals who have not received an intervention.

Research on the maintenance of health-related behaviours

What becomes evident when exploring the existing literature on the maintenance of healthy diet and physical activity is that there is a considerable amount to learn about the influences on these health behaviours. For instance, what is the underlying process that motivates people to engage in activities that are good for their health? And what variables are most useful for explaining this process? It is a laudable goal to develop a better understanding of some of the variables contributing to greater maintenance of

[6]Although there is a temporal sequence specified for the two types of self-efficacy (i.e., action self-efficacy → pre-intentional; recovery self-efficacy → post-intentional), the functional difference between the two types of self-efficacy is stressed over the temporal sequence. The phase-specific types of self-efficacy can exist at the same time but are purported to operate differently.

obesity related health behaviours because, if we are able to determine what variables are most influential on physical activity and healthy eating, we may be able to manipulate those factors to reduce the rates of obesity. This would have positive outcomes in terms of personal health factors and the impact on health care systems.

The existing research findings provide support for the predictive ability of the SCT and the HAPA models, but this research is not specifically in the context of the maintenance of obesity-related health behaviours, nor does it comprehensively assess two leading models. This information provides a useful starting point for research on the maintenance of health behaviours; however, the variables that influence the initiation of behaviour change may be different than those that influence the maintenance of those behaviours over time (Conner, 2008).

Research specific to the maintenance of health behaviours related to obesity has typically been conducted in two contexts: following a formal intervention for weight loss or following a medical event. There does not appear to be any literature on the maintenance of healthy diet and physical activity that is not preceded by a formal intervention (i.e., "naturally occurring" health behaviours) nor does there appear to be any research investigating maintenance behaviours in a University sample. Below is a summary of the existing literature on the maintenance of health behaviours following either a formal intervention for weight loss or a medical antecedent. See Table 2 for an overview.

Factors contributing to greater maintenance of healthy diet and physical activity following a formal weight-loss intervention include high levels of satisfaction with weight loss (Rothman, 2000), high degrees of self-efficacy (Riebe et al., 2005), spending

more time participating in physical activity following the intervention (Kruger, Blanck & Gillespie, 2006; Wing & Phelan, 2005), more self-monitoring behaviours (e.g., daily weighing), regular weight-control practices (e.g., planning meals, keeping track of calories and fat, measuring food), fewer dietary barriers (e.g., diet/health foods not as satisfying), fewer exercise barriers (e.g., too tired to exercise) (Kruger et al., 2006; Riebe et al., 2005), lower levels of depression, less perceived loss of control over eating (Wing & Phelan, 2005) and a medical trigger for initial weight loss (e.g., a doctor telling the individual to lose weight, a family member having a heart attack).

Maintenance of physical activity has also been studied independently following formal interventions for weight loss (Marcus et al., 2000).[7] Individuals who fail to maintain physical activity programs report more aversive consequences from regular exercise (e.g., injury) than those who are successful (Ewart, 1990). In addition, supervised follow-up sessions, participation in less structured exercise groups (e.g., exercising at home as opposed to attending a supervised group), seeking out social support and rewarding target behaviours were predictive of maintenance of physical activity (Fabricatore & Wadden, 2006; Dunn Marcus, Kampert, Garcia, Kohl & Blair, 1999).

Another common context for research on maintenance of health behaviours related to obesity is following a medical event, typically a cardiac incident. Studies have showed that a large proportion of individuals return to their previously established lifestyle habits in the year following a medical impetus for lifestyle change, even if the

[7]Individuals who have always engaged in physical activity, and are currently engaging in physical activity, are considered successful maintainers. There do not appear to be any large scale studies that have examined rates of successful maintenance of physical activity in those who have not participated in a formal intervention.

event was a serious cardiac incident (e.g., Burke & Dunbar-Jacob, 1995). Factors associated with a greater degree of maintenance in this population include knowledge and understanding of what to do to implement the regimen, high self-efficacy, high levels of social support, fewer perceived barriers to implementing the regimen, higher ratings of the severity of the health condition and higher ratings of the benefits of changing their behaviour (Lynch et al., 2000).

Facilitators and impediments

Several specific facilitators (i.e., consideration of future consequences, perceived social support and perceptions of general health) and impediments (i.e., depression, perceived stress and shame) were investigated in the present study based on a review of the literature related to positive health practices. In the literature on the *adoption* of healthy lifestyle behaviours, depression (e.g., Yarcheski, Malon, Yarcheski & Cannella, 2004) perceived stress (e.g., Cannella & Scoloveno, 2003) and shame (e.g., Deforche et al., 2006; Van Vlierberghe & Braet, 2007; Burk & Carol, 1996) have been negatively correlated with engagement in health practices, while consideration of future consequences (e.g., Yarcheski et al., 2004; Cannella & Scoloveno, 2003), perceived social support (e.g., Anderson et al., 2010; Anderson et al., 2006; Yarcheski et al., 2004; Cannella & Scoloveno, 2003; Park & Gaffey, 2007) and positive perceptions of general health (Yarcheski et al., 2004) have been positively correlated with engagement in a healthy lifestyle. See Table 1 for a general overview of these studies.

The limited information available on the *maintenance* of healthy lifestyle also provides some support for these variables. Specifically, social support (Marcus et al., 2000; Dunn et al., 1999) is positively correlated with the maintenance of health behaviours, while depression (Wing & Phelan, 2005) and perceived stress (King et al.,

1997) are negatively correlated with maintenance of health behaviours. See Table 2 for an overview.

Expected differences in study variables

Based on a review of the literature, it was expected that the hypothesized model would fit the data differently in the normal weight group compared to the overweight and obese group. Supporting this expectation, previous research has uncovered relationships between several of the variables in the study and weight. For instance, differences have been observed between individuals who are overweight or obese compared to those of normal weight in terms of barriers to engaging in health behaviours (e.g., Deforche et al., 2006; Riebe et al., 2005; Kruger et al., 2006; Burke & Dunbar-Jacob, 1995; Marcus et al., 2000; Grunberg & Lord, 1990), facilitators to engaging in health behaviours (e.g., Lynch et al., 2000; Kruger et al., 2006; Dunn et al., 1999), self-efficacy (e.g., Riebe et al., 2005), levels of depression (Wing & Phelan, 2005), social support (Marcus et al., 2000; King et al., 1997; Dunn et al., 1999) and perceived stress (King et al., 1997). These variables have been identified as useful in predicting the maintenance of various health behaviours. See Table 2 for an overview. The relationships between these variables and weight in previous research suggest that they may also be useful in differentiating individuals in the weight groups in the present study in terms of their maintenance of health behaviours.

Summary and description of the present study

This research project investigated what factors predict the maintenance of a healthy diet and regular physical activity and whether those factors are different for individuals of normal weight compared to the overweight and obese. The obesity research literature clearly indicates that the rates of overweight and obesity are increasing at an

exponential rate, having dire consequences on individual and public health outcomes. Further, research supports the effectiveness of a healthy diet and regular physical activity as key activities in fighting the rise in rates of obesity by producing weight-loss and preventing weight-gain. However, research on promoting the maintenance of a healthy diet and regular physical activity is still in its infancy.

It is unclear at this point whether different factors influence the maintenance of healthy diet and regular physical activity compared to the initiation of behaviour change (which is the context in which those variables are most often studied) and whether there are differences in those variables for individuals that are of normal weight compared to those who are overweight or obese. Given that research supports the effectiveness of a healthy lifestyle in counteracting the proliferation and effects of obesity, it stands to reason that there should be differences between individuals in different weight classes related to their engagement in healthy lifestyle activities. The present research addressed the following questions: 1. What are the factors that influence the maintenance of a healthy lifestyle? 2. Do the same factors influence these health behaviours for individuals who are overweight or obese compared to those of normal weight?

SCT and the HAPA models provided the theoretical basis of the study predictions. Given that the SCT and HAPA models have been useful in predicting various health behaviours, the object of this research was to evaluate the utility of a model combining those approaches in predicting the maintenance of health behaviours particularly important in addressing obesity (i.e., engaging in physical activity and consuming a healthy diet). The central components of SCT include (action) self-efficacy, outcome expectations, facilitators, impediments, goals and behaviour (Bandura, 2004). The

theoretical framework of the HAPA model contributes the recovery self-efficacy and planning variables to the design of the present study. See Figure 1 for an overview of the predicted model. Based on the review of the relevant literature, the specific facilitators expected to influence healthy diet and physical activity were consideration of future consequences, social support and perceptions of general health and the impediments that were examined are depression, perceived stress and shame. Participants were also matched by gender so as to be able to evaluate any differences between males and females on the study variables.

The present study is original in several important ways. First, it applied a combination of two well-supported theoretical approaches, the SCT and the HAPA model, to the prediction of health behaviours in individuals who have not received an intervention. Previous applications of the model have typically examined behaviours following an intervention to address a problem or health concern (e.g., cardiac rehabilitation patients, individuals in an addictions rehabilitation program). Second, it examined preventative dietary behaviours. Third, the model that was investigated in the present study examined numerous specific facilitators (i.e., consideration of future consequences, perceived social support and perceptions of general health) and impediments (i.e., depression, perceived stress and shame) that are associated with healthy lifestyle behaviours and obesity. Previous research has looked at these variables in isolation as opposed to looking at their combined influence as facilitators and impediments. Examining specific factors that encourage or impede the maintenance of physical activity and healthy eating (without an antecedent intervention) will contribute to the understanding of overall determinants of health behaviours. Fourth, although the

shame variable has received considerable support as a factor related to engagement in health behaviours (particularly physical activity), it has not been investigated in previous research on the maintenance of health behaviours. Fifth, the present study examined differences in health behaviours between two distinct groups—overweight and obese and normal weight groups—thereby contributing to the understanding of how those groups may differ and how interventions can be tailored to meet the needs of those groups.

Hypotheses

Primary Hypotheses

Hypothesis 1: the SEM model will provide an adequate overall fit to the data in the normal weight group and the overweight or obese group for physical activity.

Hypothesis 2: the SEM model will provide an adequate overall fit to the data in the normal weight group and the overweight or obese group for healthy diet.

Secondary Hypotheses

Hypothesis 3: the factor loading for impediments will be greater for the overweight and obese group compared to the normal weight group.

Hypothesis 4: the factor loading for facilitators will be greater for the normal weight group compared to the overweight and obese group.

Hypothesis 5: the factor loading for shame onto the impediments factor will be greater for the overweight and obese group relative to the normal weight group.

Hypothesis 6: the factor loading for recovery self-efficacy will be greater for the normal weight group compared to the overweight and obese group.

Hypothesis 7: the factor loading for planning will be greater for the normal weight group compared to the overweight and obese group.

Method

Design

The present study used Structural Equation Modeling (SEM) to determine whether the same factors influence the maintenance of healthy diet and regular physical activity in normal and overweight or obese groups. Two separate SEM procedures were conducted: one to predict eating behaviours and one to predict exercise behaviours. The SEM models included the components of Social Cognitive Theory: (action) self-efficacy, outcome expectations, intentions, facilitators, impediments and behaviour. In addition, the planning and recovery self-efficacy components of the HAPA model were tested. The outcome behaviours were healthy diet and physical activity measured initially and at a three-month follow-up measurement. The Time 1 measures of physical activity and healthy diet acted as covariates in the SEM models predicting Time 2 measures of physical activity and healthy eating so as to incorporate the maintenance of the outcome behaviours in the SEM models. Modeling longitudinal data using the covariances between the unique variances of each indicator measured at different points in time (i.e., in this case, healthy diet and physical activity were measured at two time points) is an established method of accounting for change that avoids the statistical concerns with computing change scores (e.g., Zuroff, Blatt, Sanislow, Bondi & Pilkonis, 1999; Senn, 2006). The covariances take into account that the correlations between indicator variables at Time 1 and Time 2 will be only partly explained by relationships between the other variables at Time 1 and Time 2. Participants also completed a demographic questionnaire.

Participants

Participants were 374 undergraduate introductory psychology students recruited from the University of Manitoba. Group size was selected based on estimates of the number of participants needed to detect a moderate effect size (MacCallum, Browne & Sugawara, 1996). Participants were categorized as overweight or obese and normal weight based on BMI determined by self-reported height and weight. There were 191 participants in the overweight and obese group and 183 participants in the normal weight group. Participants from the overweight and obese group were carefully matched to individuals in the normal weight group based on gender in order to be able to determine if there are any gender differences in the study variables. All participants received written and oral instructions indicating what was required of them, that their participation was voluntary, and that they could discontinue participation without penalty. All participants received course credit for their participation.

Studies on health-related behaviours have been conducted with individuals from a variety of age groups including children, university students and adults from the general population. While there are benefits to using each of the populations, University students were chosen because they are likely in the beginning stages of making autonomous choices about health. In addition, the transition from high school to college is a period often associated with weight gain, particularly in females (Malinauskas, Raedeke, Aeby & Dallas, 2006). It may therefore be a potentially useful point at which to attempt to understand, and subsequently alter, health-related behaviours.

Materials

Dependent variables.

Food Habits Questionnaire (FHQ).

The Food Habits Questionnaire is a 20 item self-report questionnaire that measures food intake habits (Kristal, Shattuck & Holly, 1990). Participants answered a series of questions about typical eating patterns over the past month on a 4-point Likert scale from 1 "Never or Rarely" to 4 "Usually or Always" (see Appendix A). If participants did not eat the food asked about in the question (i.e., if they do not eat meat), they were advised to circle "Not applicable." The questionnaire assessed fat intake by focusing on four food selection behaviours: excluding high-fat ingredients and high-fat cooking methods (i.e., frying or buttering foods), choosing specially manufactured low-fat food products instead of high-fat ones, replacing high-fat foods with low-fat substitutes (i.e., using skim milk), and modifying high-fat foods (i.e., removing the skin from chicken). Internal consistency reliability for the total scale score of the FHQ was α = .73 (Birkett & Boulet, 1995) and α = .83 (Spoon et al., 2002). Test-retest reliability for the total scale across a nine month time span was also good (r = .74). The FHQ also demonstrated adequate concurrent validity as it was significantly correlated with measures of total fat intake (r = .52, p <.01) and total energy intake (r = .43, p <.05) derived from food records.

Stanford 7-day Physical Activity Re-call Scale (PAR).

The Stanford 7-day Physical Activity Re-call Scale (PAR) is a re-call estimate of free-living physical activity (Blair et al., 1985). Participants were asked to report the average number of hours they slept each night for the last week, as well as the average

number of hours spent in moderate, hard, and very hard activity each day during the past week (see Appendix B). One of the great advantages of using the PAR is that it measures various types of physical activities from activities of daily living such as cleaning to sports activities such as jogging. The PAR was first described as an interview; however, there are high correlations between the self-administered re-call, and the interview administered re-call ($r = .83$, $p < .01$), and between the self-administered 7-day re-call and a daily diary of physical activity ($r = .82$, $p < .01$) (Dishman & Steinhardt, 1988). There is also high test-retest reliability for the interview PAR for hard activities ($r = .31$, $p = .021$), and very hard activities ($r = .61$, $p = .0001$) (Sallis et al., 1985). Dishman and Steinhardt (1988) found similar test-retest results for the total score on the self-administered PAR at 3 and 7 weeks: ($r = .58$, $p < .01$; $r = .42$, $p < .01$). They also found that the discriminant validity of the self-administered PAR was supported, as the PAR distinguished between self-defined "trained" and "untrained" groups: (M trained = 279.9, M untrained = 212.6, $p < .01$). Furthermore, the discriminant validity results of the PAR were consistent with results of measured cardiopulmonary fitness (VO_{2max}): (M trained = 56.9, M untrained = 39.9, $p < .01$).

Independent variables.

Beck Depression Inventory-II (BDI-II).

The Beck Depression Inventory-II (BDI-II) is a 21-item self-report questionnaire that assesses a variety of symptoms associated with depression including hopelessness, irritability, guilt and physical symptoms such as fatigue and weight loss (Beck, Steer, & Brown, 1996). Participants were asked to rate the severity of symptoms associated with depression on a scale from 0 to 3 (see Appendix C). The BDI-II is a revised version of the

original scale developed by Beck, Ward, Mendelson, Mock and Erbaugh (1961); the BDI and BDI-II demonstrate strong convergent validity ($r = .93$, $p < .01$) (Dozois, Dobson & Ahnberg, 1998). The BDI-II has also demonstrated good internal consistency reliability (Cronbach's alpha) ($\alpha = .91$, Dozois et al., 1998; $\alpha = .90$, Storch, Roberti & Roth, 2004). The concurrent validity of the BDI-II is supported by positive correlations with the anxiety and depression subscales of the State-Trait Anxiety Inventory-Trait version: STAI-D and STAI-A factor scores (rs = .76 and .69, $p < .001$).

Consideration of Future Consequences Scale (CFCS).

The Consideration of Future Consequences Scale (CFCS) is a 12-item scale measuring the degree to which individuals consider immediate compared to delayed consequences of behaviours (Strathman, Gleicher, Boninger, & Edwards, 1994). Participants rated a series of statements about the importance of immediate and delayed consequences in terms of how characteristic they are of their behaviour on a 5-point Likert scale from 1 "extremely uncharacteristic" to 5 "extremely characteristic" (see Appendix D). Initial validation of the CFCS was conducted on four samples of university students. Internal consistency reliability (Cronbach's alpha) was established for each of the samples and ranged from $\alpha = .80$ to $\alpha = .86$. Test-retest reliability of the CFCS was established for two of the study samples and in both cases the CFCS showed consistency over time: $r = .76$, $p < .001$ and $r = .72$, $p < .001$. Concurrent validity of the CFCS is supported by significant correlations with the Ray and Najman's Deferment of Gratification Scale ($r = .47$, $p < .001$), and the Stanford Time Perspective Inventory ($r = .43$, $p < .001$).

Measure of Intention.

Behavioural intentions were defined as an individual's plan to engage in regular physical activity and consume a healthy diet. Intentions were assessed using a modified version of a measure of intention described in Orbell, Hagger, Brown & Tidy (2006). Participants rated a series of statements about their intentions to engage in regular physical activity and consume a healthy diet on a 6-point Likert scale from 1 "Strongly Disagree" to 6 "Strongly Agree" (see Appendix E). Internal consistency reliability was α = .87. In addition, discriminant validity was demonstrated by the negative correlation of the intentions measure and the Volitional Components Inventory, a measure of volitional control: r = -.10, p < .05 (Orbell & Hagger, 2006).

Medical Outcome Study SF-36v2—General Health Perceptions subscale.

The SF-36v2 is a generic measure of perceived health used to assess functioning status and well-being (Ware & Sherbourne, 1992; Ware, 1996). There are eight subscales measured by the SF-36. For the present study, only the general health perceptions subscale was used. The subscale score ranges from 0 to 100, with higher scores representing better health. The subscale consists of five questions related to perceptions of overall health. Participants responded to the first question about general health on a 5-point Likert scale from 1 "Excellent" to 5 "Poor." Then, they rated a series of statements about general health on a 5-point Likert scale from 1 "Definitely True" to 5 "Definitely False" (see Appendix F). Internal consistency reliability (Cronbach's alpha) was established for the general health perceptions subscale in several studies: α = .81 (Ware, 1999); α = .81 (Ware & Gandek, 1994); α = .78 (McHorney, Ware, Lu, & Sherbourne, 1994). McHorney, Ware and Raczek (1993) found that the discriminant validity of the

general health perceptions subscale was supported, as it was able to significantly distinguish between groups of individuals with minor medical conditions as compared to serious medical conditions.

Multidimensional Scale of Perceived Social Support (MSPSS).

The Multidimensional Scale of Perceived Social Support (MSPSS) is a 12-item self-report scale used to measure an individual's perception of the adequacy of social support they receive from three sources: family, friends and significant other (Zimet, Dahlem, Zimet, & Farley, 1988). Participants responded to a series of statements regarding their perception of social support received from others on a 7-point Likert scale from 1 "Very strongly disagree" to 7 "Very strongly agree" (see Appendix G). There are three subscales to the MSPSS that address different sources of support (friends, family, and significant other) and they have demonstrated strong independent factorial validity. Internal consistency reliability (Cronbach's alpha) was established for the whole scale (α = .88) and for each of the subscales: family (α = .87), friends (α = .85) and significant other (α = .91). Test-retest reliability of the MSPSS was also established for the whole scale (α = .85) and for each of the subscales: family (α = .85), friends (α = .75) and significant other (α = .72). Concurrent validity of the MSPSS is supported by significant negative correlations with subscales of the Hopkins Symptom Checklist measuring anxiety and depression symptomatology; perceived support from family was negatively related to both depression (r = -.24, p < .01) and anxiety (r = -.18, p < .01); perceived support from friends was negatively related to depression (r = -.24, p < .01); perceived support from a significant other was negatively related to depression (r = -.13, p < .01); further, the scale as a whole was negatively related to depression (r = -.25, p < .01)

(Zimet et al., 1988). Internal consistency reliability was confirmed in a subsequent study for the whole scale (α = .91) and for each of the subscales: family (α = .90), friends (α = .94) and significant other (α = .95) (Dahlem, Zimet, & Walker, 1991). Another study confirmed the factorial validity of the three subscale structure and extended the findings on the internal reliability to other subgroups including pregnant women (total scale α = .92; family, α = .90; friends, α = .94; and significant other, α = .92) adolescents (total scale α = .84; family, α = .81; friends, α = .92; and significant other, α = .83) and pediatric residents (total scale α = .90; family, α = .83; friends, α = .90; and significant other, α = .98) (Zimet, Powell, Farley, Werkman & Berkoff, 1990).

The Objectified Body Consciousness Scale—Body Shame Subscale.

The Objectified Body Consciousness Scale (OBCS) is a 24-item scale with three subscales measuring different aspects of body consciousness (McKinley & Hyde, 1996). The Body Shame subscale is comprised of eight items that assess feelings of shame that a person may feel if they believe their body does not fit society's expectations. Participants responded to each item on a 7-point Likert scale from 1 "Strongly Disagree" to 7 "Strongly Agree" (see Appendix H). Internal consistencies reported for the Body Shame subscale are α = 0.75 (McKinley & Hyde, 1996), α = 0.78 (Greenleaf & McGreer, 2006) and α = 0.79 (Forbes, Jobe & Revak 2006). Concurrent validity of the Body Shame subscale is supported by significant positive correlations between the Body Shame subscale and measures of disordered eating in individuals who are sedentary (β= .398, p = .007) and those who are physically active (β= .252, p = .045) (Greenleaf & McGreer, 2006). Construct validity is supported by the positive correlation of the Body Shame subscale with subscales measuring internalizing emotions on the Sociocultural Attitudes

Toward Appearance Questionnaire-3: Internalization-General Scale ($r = .66$, $p < .001$) and the Internalization-Athletic Scale ($r = .21$, $p < .05$); the modest correlation supports the idea that they are separate constructs.

Outcome Expectations for Exercise Scale (OEE).

The Outcome Expectations for Exercise Scale (OEE) is a brief measure of beliefs a person holds that engaging in physical activity will lead to a desired outcome (Resnick, Zimmerman, Orwig, Furstenberg & Magaziner, 2000). The scale measures both physical and mental benefits that may be derived from physical activity. Participants responded to 9 statements regarding their expectations related to exercise on a 5-point Likert scale from 1 "Strongly disagree" to 5 "Strongly agree" (see Appendix I). Internal consistency of the scale was robust ($\alpha = .89$). Internal consistency in a different sample, of older residents living in a long-term care facility, was also strong ($\alpha = .87$). Concurrent validity of the OEE is supported by significant positive correlations between the OEE and measures of exercise behaviour ($\beta = .39$, $p < .05$). Concurrent validity is also supported by the fact that the OEE is able to detect a significant difference between individuals who exercise regularly and those who do not ($F = 31.3$, $p < .05$, $\beta^2 = .15$). Construct validity is supported by the positive correlation of the OEE with measures of self-efficacy expectations ($r = .66$, $p = < .05$); the modest correlation supports the idea that they are separate constructs. The OEE was also used to measure outcome expectations about healthy eating. The questions from the original OEE remained the same, but the instructions were altered to reflect the focus on healthy eating (see Appendix J).

Perceived Stress Scale (PSS).

The Perceived Stress Scale (PSS) is a 10-item self-report scale used to measure

the degree to which an individual perceives situations in their life to be stressful (Cohen, Kamarck, & Mermelstein, 1983). Participants responded to a series of statements regarding their reactions and perceptions of potentially stressful situations on a 5-point Likert scale from 0 "Never" to 4 "Very Often" (see Appendix K). There are three versions of the PSS, a 14-item scale, a 10-item scale and a 4-item scale. Each of the versions have adequate internal reliability; however, the 10-item scale has the highest internal reliability coefficient (10-item, $\alpha = .78$; 14-item, $\alpha = .75$; 4-item, $\alpha = .60$) (Cohen & Williamson, 1988). Concurrent validity of the PSS (10-item version) is supported by significant positive correlations with other subjective measures of stress including reports of amount of stress experienced in a typical week ($r = .39$, $p < .005$), and the number of life events experienced ($r = .32$, $p < .005$). In addition, the PSS was also associated with the Heath Service Utilization Scale ($r = .22$, $p < .001$). Further, high PSS scores were related to increased dissatisfaction as measured by the Life Satisfaction Scale ($r = .47$, $p < .0001$). Given that the 10-item version has higher internal consistency, and has correlations with other measures that are equivalent to the 14-item version, the authors recommend the use of the 10-item version in future research.

Planning Behaviours.

Physical activity and nutritional planning behaviours were assessed using two self-report scales derived from work by Renner and Schwarzer (2005). The physical activity planning scale is comprised of five items that assess the degree to which an individual has made concrete plans for physical exercise. The item-stem "I already have concrete plans…" is followed by the items such as "when to exercise" (see Appendix L). Similar scales of planning of physical activity have reported strong internal consistency

reliabilities: α = .92, α = .94 (Scholz et al., 2005). The nutritional planning measure is comprised of five items that assess the degree to which an individual has made concrete plans for eating a healthy diet. The item-stem "I already have concrete plans..." is followed by items such as "how to change my nutrition habits." For both scales, participants rated each item on a 4-point Likert scale from 1 "Not at all true" to 4 "Exactly true."

Recovery Self-Efficacy.

Recovery self-efficacy is described as an individual's confidence in their ability to recover from setbacks. For the recovery self-efficacy for physical activity scale, participants were asked to imagine they had taken a break from being physically active and assess their level of confidence about returning to regular physical activity (Scholz et al., 2005). The item-stem "I am confident that I can return to a physically active lifestyle…" is followed by items such as "even if I have relapsed several times" (see Appendix M). The scale is comprised of three items measured on a 4-point Likert scale from 1 "Not at all true" to 4 "Exactly true." Internal consistency for this scale is high: α = .85 and α = .93. For the recovery self-efficacy for nutritional behaviours scale four items measuring confidence in recovering from a setback were used (Renner, Knoll, & Schwarzer, 2000). The item stem "I can manage to stick to healthy food…" was followed by items such as "even if something delicious but unhealthy is served". The scale consists of three items measured on a 4-point Likert scale from 1 "Strongly disagree" to 4 "Strongly agree." Internal consistency for this scale is high: α = .74.

Action self-efficacy: Self-Rated Abilities for Health Practices Scale.

The Self-Rated Abilities for Health Practices Scale is a 28-item self-report

measure of an individual's perception of their ability to implement various health promoting behaviours (Becker, Stuifbergen, Oh & Hall, 1993). Self-efficacy for health behaviours was measured across several domains including physical activity, nutrition, psychological well-being and responsible health practices. Respondents rated how well they are able to perform each health practice on a 5-point scale from 0 "Not at all" to 4 "Completely" (see Appendix N). Individual ratings are summed to yield a total score, with higher scores indicating greater self-efficacy for health practices. Becker et al. assessed the scale in a group of individuals recruited from a county medical association health fair and a group of nursing students. In the health fair sample, internal consistency reliability was computed for the whole scale (α = .94) and for each of the subscales: physical activity (α = .92), nutrition (α = .81), psychological well-being (α = .90) and responsible health practices (α = .86). Similarly, in the nursing students group, internal consistency reliability was computed for the whole scale (α = .94) and for each of the subscales: physical activity (α = .89), nutrition (α = .81), psychological well-being (α = .86) and responsible health practices (α = .88). Two-week test-retest reliability was computed in the nursing student sample for the whole scale (r = .70) and for each of the subscales: physical exercise/activity (r = .69), nutrition (r = .63), psychological well-being (r = .63) and responsible health practices (r = .73). Concurrent validity of the Self-Rated Abilities for Health Practices Scale is supported by significant correlations with other measures of health practices including the Barriers to Health Promotion Scale (r = -.55, $p < .01$) and the Health Promoting Lifestyle Profile (r = .69, $p < .01$).

Demographic Questionnaire.

Participants were also asked to complete a series of demographic variables

including height, weight, ethnicity, current health problems, medications, age, marital status, income, educational background, occupation, a question about who does the cooking in their household and the affordability of eating healthy meals and joining a gym (See Appendix O).

Procedure

Participants responded to a series of questionnaires assessing health-related behaviours and potential influencing variables at an initial testing session and at a second testing session three months later. Various time frames for assessing maintenance of health-related behaviours have been reported in the literature. In the weight maintenance literature, following an intervention, individuals who regain weight tend to do so within the first two months (e.g., Gintner, 1988; Marlatt, 1985; Marlatt, Baer & Quigley, 1995). Similarly, relapses in maintenance of physical activity often occur within the first three months of adopting an exercise regime (e.g., Gintner, 1988; Lee & Owen, 1986). Therefore, a three-month interval was chosen for the present study since it has been established as an appropriate time interval for assessing the stability of eating and exercise behaviours.

The study was advertised as assessing health-related behaviours and all testing took place in large groups. Participants were given a consent form describing the purpose of the study to read and sign prior to the commencement of the study (see Appendix P) and then participants completed all questionnaires: the Self-Rated Abilities for Health Practices Scale, Outcome Expectations measures, the intentions measure, the Beck Depression Inventory-II, Consideration of Future Consequences Scale (CFCS), the Medical Outcome Study SF-36v2—General Health Perceptions subscale, the

Multidimensional Scale of Perceived Social Support (MSPSS), the Perceived Stress Scale (PSS), Objectified Body Consciousness Scale (OBCS) – Body Shame subscale, the recovery self-efficacy measure, the planning measure, the Food Habits Questionnaire (FHQ) and the Stanford 7-day Physical Activity Re-call Scale (PAR). Three months after the initial testing session, participants completed the Food Habits Questionnaire (FHQ) and the Stanford 7-day Physical Activity Re-call Scale (PAR). Participants were also asked to report their height and weight at the second testing session to control for any potential changes in BMI from Time 1 to Time 2.

Participants' BMI was calculated based on self-report of height and weight (kg/m^2). Previous research has demonstrated that self-reported height and weight are fairly accurate, but tend to slightly underestimate actual weight (e.g., Stunkard & Albaum, 1981; White, Masheb & Grilo, 2010). Participants were grouped based on the international body mass index cut-off points for overweight and obesity. Participants with a BMI between 18 and 25 were classified as normal weight and participants with a BMI of 25 or more were categorized as overweight or obese (WHO, 2000). Participants with a BMI of less than 18 were not included in the study because individuals who are considered underweight may have different beliefs about healthy lifestyle than individuals who are of normal weight. Participants from the normal weight group were matched to participants in the overweight and obese group based on gender because men and women may hold different health-related beliefs. Following the completion of the study, participants were given a debriefing form explaining the purpose of the study (See Appendix Q).

Results

Preliminary Screening

Preliminary analyses of the model indicated that it is a viable model. Before testing a model it is necessary to consider sample size and identification of the model. Sample size estimates indicate that to adequately test the model specified there would need to be approximately 200 participants in the two conditions (normal weight and overweight or obese) (Gagné & Hancock, 2006). In addition, for the model to be tested, it must be over-identified (i.e., there can be more than one solution to a model). If more than one unique solution can be generated when a model is analyzed, then the degree of model fit can be meaningfully evaluated (Byrne, 2006). Analysis of the model revealed that it was over-identified, indicating that it is possible to find more than one solution to the model.

The data from all participants were screened for missing data. The total number of missing data points was less than .2% of the full dataset. When there is a small amount of missing data (i.e., <5%), the patterns of missing data are considered inconsequential (Kline, 2005; West, 2001). To enable data from all participants to be included in the model testing procedures, missing values were imputed using an expectation-maximization (EM) imputation algorithm available in SPSS. The EM imputation method was used because it has been found to yield more accurate standard errors than traditional methods for handling missing data (e.g., listwise deletion, pairwise deletion; Savalei & Bentler, 2009).

All data were screened for univariate outliers, defined as responses greater than 3.29 standard deviations from the mean (Tabachnick & Fidell, 2007). There were a total

of 12 outliers in the normal weight group and 6 outliers in the overweight and obese group. These cases were deleted from the sample. Further, two participants in the normal weight group who had BMI scores close to the cutoff for the overweight and obese group at Time 1 (i.e., BMI of 24) had a BMI in the range of the overweight and obese group at Time 2 (i.e., BMI of > 25); given that these participants could not accurately be classified in either group, they were also removed from the sample. After removing these cases, complete data from 183 participants in the normal weight group and 191 participants in the overweight and obese group remained for a total of 374 participants in both groups.

It is recommended that violations of univariate normality are examined and corrected before screening for multivariate normality (Kline, 2005). The recommended criteria for univariate normality are Skewness between -2.0 and 2.0 and Kurtosis between -7.0 and 7.0 (Kline, 2005). All variables were adequately normally distributed according to these criteria. Following the assessment of normality, all variables included in the structural equation model were then screened for multivariate outliers using a regression-based procedure described by Tabachnick and Fidell (2007). Given that there are 12 variables to be included in the regression analysis, the critical chi square value is $\chi^2 = 32.9$ (Tabachnick & Fidell, 2007). Accordingly, multivariate outliers were operationalized as cases with Mahalanobis Distance Values greater than 32.9. There were no multivariate outliers according to these criteria.

A further assumption of SEM procedures is that data are multivariate normal (Kline, 2005). This assumption means that all variables are assumed to be normally distributed, the joint distribution of any two items yield a distribution that is bivariate normal and the scatterplots of any two items are linear and homoscedastic (e.g., Kline,

2005). Addressing issues of univariate and multivariate outliers and univariate normality typically corrects for any issues of multivariate normality (e.g., Kline, 2005; Tabachnick & Fidell, 2007). The descriptive statistics for all variables and the correlations between variables are displayed in Table 4 for the normal weight group and Table 5 for the overweight and obese group. According to Cohen's conventions the majority of correlations are between the small and medium range (Cohen, 1988).

Analysis of the descriptive statistics demonstrated that dividing participants by group revealed some important information about physical activity and healthy eating trends. A higher percentage of individuals in the normal weight group, compared to the overweight and obese group, reported engaging in physical activity and healthy eating behaviours (see Tables 6 and 7). Of the total sample, 60% of participants reported engaging in at least 30 minutes of moderate physical activity on most days of the week.[8] When the sample was subdivided into the normal weight and overweight and obese groups, only 55% of individuals in the overweight and obese group, compared to 64% of individuals in the normal weight group, reported engaging in this amount of physical activity. In terms of healthy eating, only 33% of the total sample reported eating a healthy diet.[9] When divided into subgroups, only 31% of individuals in the overweight and obese group, compared to 36% of individuals in the normal weight group, reported consuming a healthy diet. These figures are consistent with other estimates of engagement in these health behaviours (e.g., Statistics Canada, 2004, 2010; WHO, 2002; Hrabosky, White, Masheb & Grilo, 2007). However, despite the trends suggested by the data, calculations

[8] A healthy amount of physical activity was defined as 30 minutes (or more) on an average of five days per week (or more) on the PAR

[9] A healthy diet was defined as an average score of 2.5 or higher on each question of the FHQ (between "sometimes" and "often"), reflecting higher intake of fruit, vegetable and whole grains and lower fat intake

of a margin of error at 95% resulted in a margin of error of .049 which did not support any statistical differences between groups (Tabachnick & Fidell, 2007).

Measurement Models

Before testing the hypothesized model, measurement models were examined using confirmatory factor analysis (CFA) procedures because evaluating latent factors prior to estimating the hypothesized model is helpful for identifying sources of poor model fit (Kline, 2005). Multiple fit indices (in addition to the Chi-Square statistic used most frequently) were used to evaluate model fit. This approach is recommended because the Chi-Square statistic is significantly influenced by sample size (Hu & Bentler, 1999). Additional fit indices that were examined were the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), Tucker Lewis Index (TLI, also known as the Non-Normed Fit Index [NNFI]), and the Standardized Root Mean Square Residual (SRMR). Values greater than .90 for the CFI and .95 for the NNFI indicate acceptable and good fit. For the RMSEA, values less than .08 indicate a reasonable fit and values less than .05 indicate good fit (Hu & Bentler, 1999). Similarly, for the SRMR, values less than .05 indicate a good fit.

The hypothesized model (see Figure 1) contained two latent variables: facilitators (comprised of social support, consideration of future consequences and general health perceptions) and impediments (comprised of perceived stress, depression and body shame). Model fit for the measurement model was very good: χ^2 (8) = 20.41, $p < .01$, CFI = .97, TLI = .95, SRMR = .03, RMSEA = .06 ($CI_{90\%}$ = .03 - .10). However, factor loadings for the facilitators construct were unacceptably low for two indicators: perceived social support (.25) and consideration of future consequences (.35). The factor loading for

general health perceptions (GHP) was adequate (.76). Consequently, only a single observed variable, GHP, was used as an estimate of facilitators in the structural equation model. All factor loadings for the impediments scale exceeded .60. As a result, all of the observed variables in this latent variable were retained in the examination of the full model.

Structural Models

Structural Equation Modeling procedures were used to examine two versions of the hypothesized model. One version included exercise behaviour as the outcome variable and exercise specific assessments of recovery self-efficacy, planning, and expectations (Hypothesis 1). The second version included eating behaviour as the outcome, with eating specific assessments of recovery self-efficacy, planning, and expectations (Hypothesis 2). In each of the structural models, the first measurement of the healthy eating and exercise variables were used as predictors. The test-retest reliability between the first and second measures of these outcome variables was good in both the overweight and obese and normal weight groups (i.e., overweight and obese: exercise $r = .82$, $p < .001$, healthy eating $r = .68$, $p < .001$; normal weight: exercise $r = .73$, $p < .001$, healthy eating $r = .73$, $p < .001$; see Tables 4 & 5).

Exercise.

The results revealed that the hypothesized model predicting exercise behaviour did not fit the full sample of data well (see Table 8). Therefore, the hypothesized model was modified using post-hoc modification indices. Initially, two pathways were added to the model: recovery self-efficacy was regressed onto intentions and expectations. This model also did not fit the data well. Therefore, two nonsignificant pathways were

removed from the model: the pathway from recovery self-efficacy to exercise behaviour and the pathway from impediments to intentions were removed. Deletion of the pathway from impediments to intentions resulted in all variables included in the model being observed (i.e., no latent variables). This revised model provided a better fit with the observed data, χ^2_{diff} (18) = 144.73, $p < .001$. This second revision of the hypothesized model resulted in an adequate fit with the data according to three of the four fit indices (see Table 8 and Figure 2).

In the revised model, the planning variable influenced the direct pathways between recovery self-efficacy and exercise behaviour and between intentions/goals and exercise behaviour. In order to explicitly assess the indirect pathways in the model, a Monte Carlo method for assessing mediation[10] was used (MacKinnon, Lockwood, & Williams, 2004). This method has been found to yield more accurate results than the widely used Sobel test, particularly in smaller samples (Sobel, 2009). These analyses were conducted with a web-based calculator created by Selig and Preacher (2008), resulting in a confidence interval of the indirect effects. If the confidence interval does not contain zero, then it can be concluded that the intermediate pathways are significant.

The results in Figure 2 demonstrate that planning influenced the relationship between recovery self-efficacy and exercise behaviour (Full Sample: $CI_{95\%}$ = 6.23 – 28.45; normal weight group: $CI_{95\%}$ = 2.01 – 9.18) and between intentions and exercise behaviour (Full Sample: $CI_{95\%}$ = 10.74 – 44.17; normal weight group: $CI_{95\%}$ = 2.26 – 10.05). These results indicate that good intentions to exercise and the ability to recover from a setback in an exercise regime do not directly result in improved rates of

[10]This was not a true test of mediation given that IVs were measured concurrently with Time 1 DVs. This is more accurately called a "half-longitudinal design," but the Monte Carlo method can still be used.

maintenance of exercise behaviour. Rather, they contribute to more planning which then leads to greater maintenance.

The results also demonstrated that intentions affected the relationship between action self-efficacy and planning (Full Sample: $CI_{95\%}$ = .01 - .03; normal weight group: $CI_{95\%}$ = .01 - .03), between outcome expectations and planning (Full Sample: $CI_{95\%}$ = .07 – .15; normal weight group: $CI_{95\%}$ = .04 - .15), and between GHP and planning (Full Sample: $CI_{95\%}$ = .01 - .11; normal weight group: $CI_{95\%}$ = .02 – .11; see Figure 2). These findings indicate that the belief one has about their ability to engage in a behaviour, their positive expectations about the outcome and their general perceptions of their health all contribute to the likelihood that they will form intentions for exercise. In turn, intentions influence planning which influences exercise behaviour.

In addition, recovery self-efficacy affected the relationship between action self-efficacy and planning (Full Sample: $CI_{95\%}$ = .02 - .05; normal weight group: $CI_{95\%}$ = .02 - .06), and between outcome expectations and planning (Full Sample: $CI_{95\%}$ = .04 - .13; normal weight group: $CI_{95\%}$ = .07 - .23). This indicates that the belief that one has the ability to perform a health behaviour and the positive expectations one has about that behaviour are filtered through one's belief that they are capable of recovering from a setback. Furthermore, recovery self-efficacy partially influenced the direct pathway between intentions and exercise behaviour (Full Sample: $CI_{95\%}$ = .02 - .09; normal weight group: $CI_{95\%}$ = .01 - .08). This result indicates that, in addition to the direct effect of intentions on planning, the effect of intentions on planning is also filtered through one's belief that they are capable of recovering from a setback.

The results also showed that gender was significantly correlated with the physical activity variable in the normal weight group (Time 1: r = -.31, p < .001; Time 2: r = -.31, p < .001; see Table 4) and in the overweight and obese group (Time 1: r = -.37, p < .001; Time 2: r = -.40, p < .001; see Table 5). Males were more likely than females to report higher scores on the measure of physical activity.

After fitting and revising the hypothesized model to the full sample, the hypothesized and revised models were then tested in the normal weight and overweight and obese groups separately. Results from these analyses are displayed in Tables 9 and 10. The revised model provided a very good fit with observed data for the normal weight group, but not for the overweight and obese group. The standardized and unstandardized estimates of all pathways in the final model are displayed in Table 11 for the full sample and for the normal weight group.

Given that the model fit was particularly poor for the overweight and obese group, separate analyses by subgroup were conducted to determine if there were significant differences between individuals in the overweight subgroup (N = 160) and those in the obese subgroup (N = 31) that may help explain the results. Independent samples t-tests were conducted to compare the means of all of the study variables by subgroup. There were no significant differences between the subgroups on any of the study variables with the following three exceptions: outcome expectations for exercise (t = 1.91, p = .014), planning for exercise (t = 1.97, p = .019) and planning for healthy eating (t = .873, p = .022). Relative to individuals in the obese subgroup, individuals in the overweight subgroup had significantly greater outcome expectations for exercise and engaged in significantly more planning behaviours, for both exercise and healthy eating, compared to

the obese subgroup. Although there were no significant differences in the means of the majority of study variables between subgroups, the differences that were observed are important to note given that planning behaviours and outcome expectations are variables that made an important contribution to the fit of the overall model (see Figures 2 & 3). Given that the sample of individuals who are obese was small (n = 31), these observed differences between subgroups should be interpreted with caution. That said, these differences are nonetheless important to note as they may have contributed in part to the poor fit of the model in the overweight and obese group.

Eating.

A similar procedure was employed to examine models for the eating variables. The model was tested for the full sample first, followed by the two subsamples of normal weight and overweight and obese participants. The modifications to the models based on post-hoc indices were identical to those described in the exercise models. However, neither the hypothesized nor revised models provided an adequate fit with the observed data (see Table 12). Therefore, an alternative and simplified model was specified (see Figure 3). However, the results of this model did not fit well for the full sample: χ^2 (8) = 120.45, $p < .001$, CFI = .85, TLI = .74, SRMR = .12, RMSEA = .19 ($CI_{90\%}$ = .16 - .2) (see Table 12); normal sample: χ^2 (8) = 49.81, $p < .001$, CFI = .90, TLI = .82, SRMR = .12, RMSEA = .17 ($CI_{90\%}$ = .13 - .22) (see Table 13); or the obese sample: χ^2 (8) = 406.28, $p < .001$, CFI = .38, TLI = .28, SRMR = .22, RMSEA = .36 ($CI_{90\%}$ = .32 - .41) (see Table 14). Figure 3 presents the revised model with standardized estimates from the normal sample. Note that when the model fit is poor results are not reliable, so these estimates should be interpreted with caution.

Although the model predicting healthy eating did not adequately fit the data for the total sample, the normal weight subgroup or the overweight and obese subgroup, some interesting trends in the data can be noted.[11] In the normal weight group, several study variables were significantly correlated with healthy diet, including: gender (females were more likely than males to endorse maintaining a healthy diet), consideration for future consequences, intention, social support, shame (negatively correlated), outcome expectations, planning, recovery self-efficacy and action self-efficacy (see Table 4). In the overweight and obese group, the following variables were significantly associated with healthy diet: gender, intention, general health perceptions, stress, planning, recovery self-efficacy and action self-efficacy (see Table 5).

The internal consistency reliability of the separate weight subgroups was also analyzed to determine if any potential differences would shed light on the difficulty fitting the model to the data. The internal consistency reliability for the FHQ was poor in both the obese subgroup ($\alpha = .59$) and the overweight subgroup ($\alpha = .69$). Given that the internal consistency was equally poor for the two subgroups (i.e., overweight versus obese), it does not appear that differences between the subgroups can explain poor model fit in the combined overweight and obese group.

Secondary Hypotheses

In addition to the two main hypotheses, several secondary hypotheses were also proposed. These secondary hypotheses all related to direct comparisons between factor weights for the normal weight sample compared to the overweight and obese sample. Unfortunately, because the revised model did not fit in the overweight and obese sample,

[11]Any trends in the data observed when an overall model does not fit the data should be interpreted with caution (Kline, 2005).

it was not possible to compare factor weights between these groups. However, what information is available regarding each hypothesis will follow. Hypothesis 3 was that the factor loading for impediments would be greater for the overweight and obese group compared to the normal weight group. The impediments factor did not load onto intentions to engage in behaviour (eating or exercise) as predicted (see Figure 1). Therefore, the variables that comprised the impediments factor were not retained in the model (see Figure 2) making it impossible to compare how they differentially loaded onto intentions in the subgroups.

Hypothesis 4 was that the factor loading for facilitators would be greater for the normal weight group compared to the overweight and obese group. Only one of the three variables proposed to facilitate physical activity and healthy eating (i.e., general health perceptions) sufficiently loaded on the facilitator factor and was retained in the revised model (see Figure 2). Further, it was not possible to compare how the General Health Perceptions variable loaded differentially in the weight subgroups since the model did not fit the data well in the overweight and obese group. However, the correlation between General Health Perceptions and intentions in the normal weight group ($r = .33$, $p < .001$; see Table 4) and the overweight and obese group ($r = .30$, $p < .001$; see Table 5) were very similar and significant.

Hypothesis 5 was that the factor loading for shame onto the impediments factor would be greater for the overweight and obese group relative to the normal weight group. Although it was not possible to explicitly test for any differences in factor loadings because none of the variables proposed to act as impediments loaded sufficiently on the intentions variable as predicted (see Figure 1), the correlation between shame and

intentions (the variable on which impediments was predicted to load—see Figure 2) in the normal weight group (r = -.02, *NS*; see Table 4) and the overweight and obese group (r = -.11, *NS*; see Table 5) were of similar magnitude and not significant. In the present study the shame variable was not significantly associated with the maintenance of exercise (or dietary) behaviour. Although this is not what was expected, this finding suggests that while shame may be an important variable for determining when a person may initially engage in exercise behaviour, it may not be a significant predictor of whether a person will maintain this behaviour over time.

Hypothesis 6 was that the factor loading for recovery self-efficacy would be greater for the normal weight group compared to the overweight and obese group. Again, it was not possible to explicitly test this hypothesis because factor loadings for the overweight and obese group could not be evaluated since the revised model did not adequately fit the data (Kline, 2005). However, the correlations between recovery self-efficacy and planning in the normal weight group (r = .68, p < .001; see Table 4) and in the overweight and obese group (r = .59, p < .001; see Table 5) suggest that there is a similarly strong relationship between recovery self-efficacy and planning in both groups when predicting the physical activity outcome variable,[12] which does not support the hypothesis. Similarly, when predicting food as the outcome variable, the correlations between recovery self-efficacy and planning in the normal weight group (r = .65, p < .001; see Table 4) and in the overweight and obese group (r = .66, p < .001; see Table 5) were strong and significant. These findings suggest that there is a strong relationship

[12]There were separate variables to measure recovery self-efficacy with regard to physical activity and food, see Appendix M.

between the belief that one can recover from a setback and planning behaviour when predicting both physical activity and eating.

Hypothesis 7 was that the factor loading for planning would be greater for the normal weight group compared to the overweight and obese group. This hypothesis could not be tested by statistically comparing factor loadings due to the model not adequately fitting in the overweight and obese group (Kline, 2005); however, the correlations between planning and physical activity in the normal weight group (T1 $r = .28$, $p < .001$; T2 $r = .27$, $p < .001$; see Table 4) and in the overweight and obese group (T1 $r = .18$, *NS*; T2 $r = .17$, *NS;* see Table 5) suggest that the relationship between planning and physical activity may be stronger in the normal weight group compared to the overweight and obese group, providing partial support for this hypothesis. A similar pattern was evident between groups when healthy eating was the outcome variable (normal weight group: T1 $r = .37$, $p < .001$; T2 $r = .48$, $p < .001$; see Table 4; overweight and obese group: T1 $r = .22$, $p < .01$; T2 $r = .14$, *NS;* see Table 5).

Power analyses

Post hoc power analyses were conducted using an inferential approach to assessment of fit that employs the root mean square error of approximation (RMSEA; Steiger & Lind, 1980). This approach employs confidence intervals around the measure of fit instead of a point estimate of fit[13] and uses general conventions related to model fit (i.e., values less than .05 are considered indicative of a close fit, values between .05-.08 are considered a fair fit and values between .08-.10 indicate a poor fit; Browne & Mels,

[13]A test that considers confidence intervals is considered more useful since a test of exact fit will result in the rejection of a good model when N is large and does not take into account the imprecision in the estimate (MacCallum, Browne & Sugarwara, 1996).

1990). Given that a perfect fit of a model in a population is considered unlikely, Browne and Cudeck (1993) recommend testing a null hypothesis of close fit of a model instead of a model of perfect fit (i.e., H_o: $\varepsilon_o \leq .05$ instead of H_o: $\varepsilon_o = 0$). When a model of close fit is tested, a value greater than the value selected for the null hypothesis is selected to test as the alternative hypothesis (typically, $\varepsilon_a \leq .08$[14]) and represents the degree to which the model is considered incorrect in the population. This test asks the question: if the fit of the model is mediocre (i.e., $\varepsilon_a \leq .08$) and we test the hypothesis that the fit is close (i.e., $\varepsilon_o \leq .05$), what is the likelihood of rejecting the null hypothesis?

Using this inferential framework, power analyses were conducted on the revised SEM model when exercise was the outcome variable in the full sample ($N = 374$, $df = 12$), the normal weight sample ($N = 183$, $df = 12$) and the overweight and obese sample ($N = 191$, $df = 12$), and for the full sample when healthy diet was the outcome variable ($N = 374$, $df = 12$), where power was defined as the area under the true distribution of the test statistic beyond the critical value (i.e., $\pi = Pr(x^2_{d\lambda a} \geq x^2_c)$.[15] Testing the hypothesis of close fit, the power of the test (i.e., the probability of rejecting H_o: $\varepsilon_o \leq .05$) was approximately .44 in the full sample predicting physical activity, .27 in the normal sample predicting physical activity, .30 in the overweight and obese sample predicting physical activity and .44 in the full sample predicting eating behaviours (See Tables 8, 9, 10 and 12, respectively). According to the post power analyses, the models were substantially underpowered; this suggests that there may not have been sufficient power in the study to accurately predict maintenance of health behaviours. Although the sample size in this

[14]Although the values of ε_o and ε_a are somewhat arbitrary, they are used because they represent "interesting and meaningful questions for power analysis" (MacCallum, Browne & Sugarwara, 1996, p. 139)
[15]Power calculation can also be derived from Gnambs (2010)

study was comparable or larger than the majority of other studies looking at the maintenance of health behaviours (e.g., see Riebe et al., 2005; King et al., 1997), the results of the post hoc power analysis suggests that future investigations in this area should aim for very large sample sizes.

Discussion

This study applied a combination of two well-supported theoretical approaches, Social Cognitive Theory (SCT) and the Health Action Process Approach (HAPA), to the prediction of preventative health behaviours. In contrast to previous applications of the models which have typically examined health behaviours following an intervention to address a problem or health concern (e.g., in cardiac rehabilitation patients or individuals in an addictions rehabilitation program), preventative maintenance behaviours were investigated in this study (i.e., in a university sample that did not participate in a formal intervention). The investigation of preventative dietary behaviours (which have not previously received much research attention) and physical activity were both part of the study paradigm. Additionally, in contrast to most studies investigating SCT that have only looked at particular aspects of the model, the entire SCT model was assessed in a carefully matched design.

Maintenance of Exercise Behaviour

Consistent with other research, greater outcome expectations, self-efficacy, specific goals, and planning for exercise predicted the maintenance of physical activity over a 3-month time span (e.g., Sheeran et al., 2005; Scholz, Sniehotta & Schwarzer, 2005). The present results also support the importance of distinguishing between the two types of self-efficacy (i.e., action self-efficacy and recovery self-efficacy), as outlined in

the HAPA model (see, for example, Schwarzer et al., 2008) and confirms similar findings in previous research affirming the independent roles of the two types of self-efficacy (e.g., Rodgers et al., 2002; Rodgers & Sullivan, 2001; Scholz et al., 2005; Schwarzer & Renner, 2000; Schüz et al., 2007).

The results of the present study also diverge from results obtained in previous studies. While outcome expectations for exercise had a significant effect on maintenance of physical activity in the present study (as predicted by the theoretical model), other research has not found this effect (e.g., Anderson et al., 2010; Anderson et al., 2006). Further, although recovery self-efficacy has been proposed to have a direct effect on exercise outcome behaviour (e.g., Schwarzer & Renner, 2000), the present study found that recovery self-efficacy did not have a negative effect on the maintenance of physical activity if there was sufficient planning (see Figure 2). It appears that planning may be an important intermediate variable between recovery self-efficacy and maintenance of physical activity and may overshadow the direct effect of recovery self-efficacy on physical activity.

None of the specific impediments to engaging in health behaviours (i.e., perceived stress, depression, shame) and only one of the specific facilitators (i.e., only general health perceptions, not consideration of future consequences or social support) predicted maintenance of health behaviors. These results are surprising because, in the literature on the *adoption* of healthy lifestyle behaviours, depression (e.g., Yarcheski, Malon, Yarcheski & Cannella, 2004) perceived stress (e.g., Cannella & Scoloveno, 2003) and shame (e.g., Deforche et al., 2006; Van Vlierberghe & Braet, 2007; Burk & Carol, 1996) have been negatively correlated with engagement in health practices, while consideration of future consequences (e.g., Yarcheski et al., 2004; Cannella & Scoloveno, 2003), perceived social support (e.g., Anderson et al., 2010; Anderson et al., 2006; Yarcheski et

al., 2004; Cannella & Scoloveno, 2003; Park & Gaffey, 2007) and positive perceptions of general health (Yarcheski et al., 2004) have been positively correlated with engagement in a healthy lifestyle (see Table 1). Very few of the variables in the facilitators and impediments factors were significantly correlated with healthy diet or physical activity in this study (see Tables 4 & 5). This divergence from findings in the literature on the *adoption* of health behaviours suggests that the variables that influence the *maintenance* of health behaviours may be different.

Unlike previous studies that have found an interaction effect with age (i.e., that older adults have lower levels of self-efficacy for exercise and fewer positive outcome expectations about exercise: e.g., Netz & Raviv, 2004; Wilcox & Storandt, 1996), the present study did not find any differences in levels of the variables in the study based on age. That said, this study was conducted with University students and the mean age of participants was 18 years of age. Although there was some variability in age in the sample, it was likely not variable enough to detect any significant differences based on age.

Differences between weight groups

After testing the revised model of exercise behaviour on the full sample (i.e., on the overweight and obese and normal weight groups combined), the revised model was then tested on each of the subgroups separately. The results demonstrated that the revised model was a good fit to the data for the normal weight group (see Table 9) but did not adequately fit the data for the overweight and obese group (see Table 10). Study results showed that factors that predict maintenance of health behaviours in a normal weight group may be distinct from the factors that predict maintenance of health behaviours in an overweight and obese group, meaning that these two groups may be qualitatively

different. Alternatively, there may be common factors that predict maintenance of health behaviors in these two groups, but these variables were not studied. If the former is true, this suggests that more research is needed with individuals who are overweight and obese to develop a better understanding of the factors that contribute to the maintenance of health behaviours in this specific population. If the latter is true, then other variables that might influence the maintenance of health behaviours would need to be explored (e.g., physical discomfort, the complexity of the health regimen—see Table 2).

The results also showed that, for individuals in the normal weight group, there were intercorrelations between several of the study variables related to taking action to improve health (i.e., recovery self-efficacy, planning [for exercise and healthy eating], action self-efficacy, outcome expectations [for exercise and healthy eating]). These intercorrelations between measures of one's ability to have an impact on health suggest that individuals who are able to maintain a healthy weight may have more internal locus of control for health behaviours compared to those who are overweight or obese.

Locus of control has been investigated in previous research studies with no clear consensus about its effect on health behaviours. For instance, some studies have found positive correlations between internal locus of control and regular physical activity (e.g., Duffy, 1997; Norman, Bennett, Smith, & Murphy, 1997), while other studies have found no relationship (e.g., Callaghan, 1998; Laffrey & Isenburg, 1983; Rabinowitz, Melamed, Weisburg, Tal, & Ribak, 1992). Similarly, there have been mixed results in the research on the relationship between internal locus of control and healthy diet (e.g., Bennett, Moore, Smith, Murphy, & Smith, 1994; Duffy, 1997; Schank & Lawrence, 1993). Although research has suggested that evaluating the level of internal locus of control can

serve to clarify the influence on health behaviours (i.e., that higher levels of internal locus of control are associated with more health behaviours: Steptoe & Wardle, 2001), there is considerable disagreement in the literature about the effect of locus of control on health behaviours. It appears that more research is needed to clarify the role of locus of control before any conclusions about its effect on health behaviours related to obesity can be drawn.

Model for healthy diet

Unfortunately, neither the initial model, nor the revised model, adequately fit the data when the eating variable was the outcome measure and efforts to find an adequate fit using reestimation and respecification procedures were unsuccessful (see Table 12). This finding could mean that the variables in the model are not adequate predictors of the maintenance of healthy eating behaviours. However, this finding may also indicate that the measure used to assess healthy eating behaviour was not sufficiently reliable. The internal consistency reliability of this measure was low in our sample (alpha = .70 in the normal weight sample; alpha = .65 in the overweight and obese sample) meaning that it may not be a good measure of healthy eating (adequate internal consistency of a measure is considered to be alpha = .80 and above; e.g., Henson, 2001). Low internal consistency of a measurement tool is problematic because if the variables in the predicted (or revised) model are related to the construct of healthy eating, then a poor measure of healthy eating could obscure the relationship between the variables and the construct of healthy eating. Although cumbersome to complete and score, it may be preferable to use food journals instead of self-report questionnaires to assess diet given the problems with the internal consistency reliability of these measures.

In contrast to previous research, the SEM model that used the SCT and HAPA variables was not an accurate predictor of healthy eating behaviours. While previous research has found that outcome expectations (e.g., Anderson et al. 2001; Fuemmeler et al., 2006; Steptoe et al., 2004), self-efficacy (e.g., Anderson et al., 2010; Anderson et al., 2001; Linde et al., 2006; Schwarzer & Renner, 2000) and planning (Schwarzer & Renner, 2000) are able to accurately predict healthy eating behaviour, this was not found in the present study. A possible explanation for this difference is the way in which healthy diet was assessed. For instance, in the Anderson et al. (2000) study, they used two different measures of healthy diet as the outcome variable: a self-report questionnaire and an analysis of food shopping receipts (to determine percent kcal from fat, fiber g/1000kcal and servings of fruit and vegetables/1000 kcal). This method of assessing diet that does not rely on self-report may have provided a more accurate assessment of dietary intake. Further, using multiple measures to assess healthy diet likely resulted in a more accurate measure of the construct, which in turn has more power to detect the relationship between predictor variables and the outcome variable.

Potential implications for clinical practice

This research has several potential implications for clinical practice. The significant relationship between outcome expectations and maintenance of physical activity suggests that a better understanding of the benefits of exercise may potentially be useful for encouraging individuals to engage in physical activity. It may therefore be important to highlight the known physical, psychological and emotional benefits to exercise in efforts to prevent obesity (as opposed to only focusing on the health risks associated with overweight and obesity). Further, the results demonstrated that when

individuals have more positive feelings about their overall health, this contributes to a greater likelihood of investing further energy in their health by engaging in exercise. Therefore, encouraging more positive thoughts about overall health (e.g., helping people to recognize their strengths, putting health problems in context of overall wellness, informing the public about realistic expectations for health at different ages) will tend to lead to more healthy behaviours. Given that explicit goals for exercise and planning related to those exercise goals (e.g., where, when and with whom) were correlated with maintenance of health behaviours, it may be important to place an emphasis on helping people to make their intentions regarding exercise clear (e.g., by publicly declaring intentions to exercise), and to make specific plans related to exercise, in programs addressing obesity (e.g., a weekly exercise engagement). Action self-efficacy (i.e., the belief that one has sufficient knowledge and skills and the ability to self-regulate) and recovery self-efficacy (i.e., the belief that one can recover from a setback) were also related to maintenance of physical activity. Consequently, it is important to attempt to bolster an individual's beliefs that they can engage in behaviours that benefit their health and that they have the ability to return to an exercise regimen after a perceived setback.

The results also demonstrated some interesting results related to the gender of participants in the study. Females in the study (in both the normal weight and overweight and obese groups) were significantly more likely to have higher scores on the measure of healthy eating than males, whereas males in both weight groups were significantly more likely to report engaging in more physical activity than females, both at Time 1 and at Time 2. These findings suggest that in terms of maintenance of health behaviours, females are currently more focused on strategies related to diet whereas men are more

focused on strategies related to exercise. These findings are consistent with the broader research literature on body image and media exposure which suggests that men are more exposed to and influenced by messages related to fitness (e.g., men's fitness magazines) whereas women are more influenced by messages related to thinness (e.g., Morry & Staska, 2001; Davis, Dionne & Lazarus, 1996). In terms of intervention efforts to improve the maintenance of health behaviours, it may be most useful to attempt to use media outlets currently most influential for each gender (i.e., magazines or television shows with gender-specific audiences) to increase the behaviours that are currently not the focus for the gender subgroups (i.e., encourage healthier eating in males and more physical activity in females). One way to do this would be to tailor interventions to improve health to meet these gender specific needs (e.g., develop public education campaigns about healthy eating that employ "macho" language to be aired during sporting events; develop group physical activity motivational programs in female dominated professions).

Strengths

The present study differs from previous research in several important ways. First, it applied the HAPA model to preventative behaviours in individuals who have not received a formal intervention. This is important because the majority of previous research has been conducted following a formal intervention and very little is known about naturally occurring health behaviours. Another strength of the present research is the scales used to assess the various factors in the HAPA model were more reliable compared to previous research (e.g., outcome expectations measured using a single item, Scholz, Keller, & Perren, 2009). Using more than one item to measure a construct

increases the likelihood of accurately assessing that construct. The present study also added to the research literature by examining preventative dietary behaviours which have received a dearth of attention in the research literature. There were data fitting problems in the model predicting healthy eating that precluded answering some of the hypotheses of the study. However, continued research in this area will lead to increased clarity about factors that influence this important preventative health behaviour.

A comprehensive assessment of specific facilitators and impediments that have predicted initiation of dietary and exercise behaviours was conducted to determine if the same factors predicted maintenance. The variables that have been shown in the literature to predict initiation of health behaviours did not predict the maintenance of health behaviours in this study. Despite there being moderate intercorrelations between the variables in the proposed latent factors (see Tables 4 & 5), the latent factors were not included in the revised model (with the exception of the general health perceptions variable; see Figure 2). These results could indicate that the variables that have accurately predicted engagement in health behaviours may be different than those that accurately predict the maintenance of those behaviours. Alternatively, these results could indicate that these variables were not predictive of the maintenance of health behaviours when examining the particular theoretical and structural models used. Although not consistent with what the literature has previously predicted with regard to initiation of health behaviours, the findings of the present study (that the same facilitators and impediments do not accurately predict the maintenance of health behaviours in this sample) provide important information that may eventually lead to a better understanding of the specific

variables that may in fact contribute to the maintenance of exercise and healthy eating behaviours.

The present study also examined differences in health behaviours between two distinct groups (i.e., overweight and obese and normal weight groups) and found that the revised model, which included the outcome expectations, general health perceptions, intentions/goals, planning, action self-efficacy and recovery self-efficacy variables, fit the data well for the normal weight group but not for the overweight and obese group. This is one of the first studies to compare individuals in different weight groups in terms of their maintenance of health behaviours. This study provided information about the potential difficulty with applying the SCT and HAPA models to individuals who are overweight or obese and suggested that the weight groups may be distinct in terms of what variables influence the maintenance of health behaviours.

Limitations

A limitation of the present study is that the scale used to measure healthy eating habits (the Food Habits Questionnaire, FHQ; Kristal et al., 1990) had low internal consistency reliability in this sample. There are very few measurement tools that adequately assess healthy eating habits. The self-report measures related to healthy eating often provide a very narrow look at healthy eating (e.g., consuming a low-fat diet, caloric intake). More comprehensive measures that consider the quality and quantity of various foods, such as dietary journals, are often considered too cumbersome and time-consuming to reasonably use in many research studies, especially when there are a large number of participants (e.g., Burke & Dunbar-Jacob, 1995). The use of multiple measures to increase the accuracy of dietary data has been suggested (e.g., Newell, Girgis, Sanson-

Fischer & Savolainen, 1999); however, there is little consensus on the best way to use multiple measures during analysis (Anderson et al., 2001). There is a need for more accurate ways of measuring dietary data.

Use of an undergraduate population, with a limited age range, may have limited the ability to generalize study findings. This population was used in part because it was easily accessible and in part because this group is at the beginning stages of making autonomous choices about health. A population-based study would provide a broader look at exercise and diet. Despite selecting the variables which have been shown to be important in past research on the initiation of health behaviors, failure of the impediment and facilitator variables to load on their respective factors impacted negatively upon the ability to test the study models.

The use of retrospective self-report measures, requiring accurate recall of healthy eating and physical activity, was a further limitation. Also, a self-report measure of physical activity (the Stanford 7-day Physical Activity Recall Scale) was used even though accelerometer technology is available. While this more sophisticated measurement method is more expensive and cumbersome, it would potentially provide a clearer picture of the physical activity outcome behaviour.

Although participants were asked about whether they can afford to eat a healthy diet and go to the gym, more specific questions about socioeconomic status may provide further information about economic barriers to maintaining health behaviours in the present sample since previous research has demonstrated a positive correlation between socioeconomic status and health (e.g., Adler, Marmot, McEwen & Stewart, 1999). Other

practical issues that were not measured (e.g., available time for exercising or cooking) may also have affected the results.

Lastly, the measurement of the dependent variables at only two time points did not allow for a true assessment of mediation effects and any impact that the time of measurement may have had on the dependent variables (e.g., temporal relationship to start of semester or exam timetable).

Future research on health behaviours

The results of the present study suggest several areas to explore in future research. The results demonstrated that recovery self-efficacy (i.e., the ability to resume healthy activities after a setback) is particularly important for the maintenance of health behaviours. Accordingly, future research should aim to identify ways to maximize recovery self-efficacy (e.g., encourage specific planning for how to resume health activities) and how to better educate the public about the typical trajectory of change (i.e., that change often involves multiple setbacks).

Further, it is important that future research studies attempt to develop measures that accurately and efficiently measure healthy eating or alternatively take a qualitative approach to measurement. As more interventions are developed to assist those who are overweight and obese to make healthier choices, it is imperative to accurately assess eating habits. In quantitative studies, if better scales of nutritional intake are developed, it would be useful to test the model again to determine if the model is a better fit when the outcome measure is a more internally consistent measure of healthy eating. Given that consumption of a healthy diet is considered one of the main elements in obesity

prevention, it will be important to develop a better understanding of factors that predict this behaviour.

Given that environmental causes, such as the consumption of energy dense foods, increased portion sizes and the lack of physical activity, are considered the main causes related to the increase in rates of obesity (e.g., WHO, 2000), ways to encourage healthy lifestyle choices will continue to be the focus of numerous research studies. However, in addition to efforts at reducing obesity on an individual level, researchers in the field argue that larger scale, systemic changes need to be made in order to improve the environment as it relates to health. Public health strategies (e.g., healthy eating and physical activity initiatives in schools, incentives for cycling or walking to work) and changing the legal framework related to obesity (e.g., enacting legislation requiring state-funded health care in the United States to cover obesity treatment, increased taxes on energy-dense foods) are shifting the focus of obesity prevention from an individual level to a societal level (e.g., Dietz, Benken & Hunter, 2009; Ries, 2008). Public health and legal efforts to address the obesity epidemic may lead to a change in the social expectations around health behaviours may support and bolster public health interventions (Dietz, et al., 2009; Gostin, 2007) as they have with other public health concerns such as smoking (e.g., Wolfson, 2001). Whether it takes an individual or public health perspective, research that attempts to understand healthy lifestyle choices will continue to play an important role in obesity treatment and prevention efforts (WHO, 2000).

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Table 1.
*Factors that contribute to the **adoption** of healthy diet and physical activity*

Study authors and population	**Factors that contribute to adoption of health behaviours**
Yarcheski, Mahon, Yarcheski and Cannella (2004) Meta-analysis of studies using mostly convenience samples	loneliness (r = -.48), social support (r = .40), perceived health status (r = .37), self-efficacy (r = -.32), and future time perspective (r = -.48)
Cannella and Scoloveno (2003) Systematic review of studies using both adult and adolescent populations	social support, self-esteem, and future time orientation positively related to positive health practices; perceived stress and chance locus of control were negatively related to positive health practices
Walker (1998) Longitudinal study with postpartum women	women who felt less satisfied with their perceived weight engaged in less positive health practices
Deforche, De Bourdeaudhuij and Tanghe (2006) Normal weight, overweight and obese adolescents	overweight and obese groups were more likely to cite extrinsic factors ("losing weight," "looking better," or "improving health and physical condition") as their motivation for engaging in physical activity; normal weight were most likely to cite an intrinsic factor "pleasure;" overweight and obese groups perceived significantly more barriers ("insecure about appearance," "not being good at it," "not liking it" and "physical complaints")
Park and Gaffey (2007) Systematic review of studies with cancer survivors	Social support was positively associated with engagement in health behaviours; internal locus of control was positively associated with health behaviours depending on perceptions of the association between behaviour and cancer recurrence

Table 2.
*Factors that contribute to the **maintenance** of a healthy diet and physical activity*

Study authors	**Factors associated with maintenance of health behaviours**
Riebe et al. (2005)	Perceived barriers to physical activity, self-efficacy
Kruger, Blanck and Gillespie (2006)	Amount of physical activity, self-monitoring behaviours, consistency of health practices, perceived barriers to healthy diet and exercise
Wing and Phelan (2005)	Physical activity for one hour a day, low-calorie diet, eating breakfast, self-monitoring weight, consistent eating pattern on weekdays and weekends, lower levels of depression, more control over eating
Burke and Dunbar-Jacob (1995)	Reasons for noncompliance: complexity of the regimen, changes in lifestyle required, side-effects, cost, skills needed to implement the regimen
Lynch et al. (2000)	Higher ratings of: susceptibility to illness, seriousness of health condition, potential health benefits of changing behaviour, control over health
Marcus et al. (2000)	Reasons for noncompliance (physical activity): perceived aversive consequences (i.e. injury, discomfort, extreme fatigue), inconvenience, unsupportive spouse or family
King et al. (1997)	Physical activity: less educated, less stressed, less fit, supervised follow-up
Dunn et al. (1999)	Exercise groups that were less structured, social support and rewarding target behaviour
Fabricatore and Wadden (2006)	Exercising at home, short bouts throughout the day
Grunberg and Lord (1990)	Unpleasant biological effects can reduce maintenance (i.e., pain, injury, hunger)

Table 3.
Demographic information: Means and percentages presented by weight group

	Total sample n = 374	Normal weight n = 183	Overweight n = 160	Obese n = 31
Gender % Female	65	65	67	64
% Male	35	35	33	36
Ethnicity: % Caucasian	70	68	73	71
% Asian	16	17	15	14
% Aboriginal	4	4	3	4
% Other	10	11	9	11
% Recently immigrated	8	8	8	8
Mean age	18	18	18	18
Education: % High school	82	83	80	84
% Trade/non-university certificate	12	12	13	12
% Bachelor's degree	6	5	7	4
Income: % Below 20,000	36	35	36	35
% Below 30,000	11	10	13	12
% Above 30,000	12	13	11	11
% Prefer not to answer	39	42		
Occupation: % Full-time student	93	92	93	92
% Other profession	7	8	7	8
Marital Status: % Single	89	90	88	88
% Significant health problems	7	7	6	8
% Taking medications	3	3	3	3
Cooking: % Parents	58	57	60	59
% Self	28	27	28	29
% Other	14	16	12	12
Afford to eat healthy: % Yes	87	88	86	87
% No	7	6	8	8
% No response	6	6	6	5
Afford to go to gym: % Yes	73	75	71	72
% No	22	19	24	25
% No response	5	6	5	3
On a diet: % Yes[16]	17	14	19	22
% No	79	82	77	75
% No response	4	4	2	3

[16]The most common types of diet reported, in order, were low-calorie, low-fat and low-carbohydrate

Table 4.
Descriptive statistics, internal consistency, and intercorrelations of measures for the normal weight subsample (n = 183).

Variables	*M*	*SD*	Alpha for this Sample	1	2	3	4	5	6	7	8	9
1. Gender	--	--	--	--								
2. BDI	9.14	6.57	.89	.10	--							
3. CFCS	39.80	6.31	.74	-.00	-.23*	--						
4. Intent	38.68	6.99	.92	.07	-.25**	.30**	--					
5. GHP	18.89	3.55	.79	-.13	-.38**	.28**	.33**	--				
6. MSPSS	68.04	12.27	.93	.12	-.20**	.13	.14	.16*	--			
7. Shame	26.61	8.47	.79	.16	.40**	-.04	-.02	-.30**	-.18	--		
8. ExpEx	38.21	4.87	.91	.02	-.26**	.20*	.47**	.38**	.19	-.06	--	
9. ExpEat	35.75	5.19	.91	.15	-.22	.12	.41**	.19	.15	-.04	.57**	--
10. Stress	18.70	6.17	.87	.23*	.66**	-.21*	-.19*	-.38**	-.22*	.48**	-.17	-.08
11. PlanEx	15.09	4.19	.92	.00	-.21**	.33**	.56**	.35**	.05	.00	.51**	.23*
12. PlanEat	12.56	3.88	.91	.07	-.17*	.21*	.51**	.23*	.05	.05	.37**	.43**
13. RecovEx	9.02	2.49	.93	-.09	-.25*	.22*	.42**	.37**	.04	-.26**	.54**	.22*
14. RecovEat	10.04	2.84	.85	.02	-.18*	.29**	.44**	.20*	.06	.00	.32**	.36**
15. Action	84.02	16.98	.94	-.02	-.43**	.27**	.43**	.49**	.32**	-.28**	.55**	.41**
16. T1 Food	46.34	7.64	.70	.33**	-.01	.18*	.37**	.07	.15*	.21*	.28**	.27**
17. T2 Food	49.34	8.73	.70	.24**	-.05	.21*	.35**	.13	.06	.12	.27**	.24*
18. T1 Exercise	2525.16	515.94	.80	-.31**	-.10	.10	.27**	.13	-.06	.06	.18*	.09
19. T2 Exercise	2604.03	595.44	.82	-.31**	-.14	-.10	.15	.10	-.08	.00	.08	.00

*$p < .01$, **$p < .001$

Table 4.
Continued

Variables	10	11	12	13	14	15	16	17	18
11. PlanEx	-.21**	--							
12. PlanEat	-.17*	.49**	--						
13. RecovEx	-.21*	.68**	.29**	--					
14. RecovEat	-.18	.35**	.65**	.33**	--				
15. Action	-.43**	.50**	.45**	.52**	.45**	--			
16. T1 Food	-.01	.27**	.37**	.19*	.36**	.35**	--		
17. T2 Food	-.05	.29**	.48**	.29**	.49**	.40**	.73**	--	
18. T1 Exercise	-.16*	.28**	.27**	.22*	.18*	.21*	.06	.04	--
19. T2 Exercise	.08	.27**	-.17	.18	.20*	.15	.07	.03	.73**

*$p < .01$, **$p < .001$

Table 5.
Descriptive statistics, internal consistency, and intercorrelations of measures for the overweight or obese subsample (n = 191).

Variables	*M*	*SD*	Alpha for this Sample	1	2	3	4	5	6	7	8	9
1. Gender	--	--	--	--								
2. BDI	10.88	7.50	.87	.22*	--							
3. CFCS	39.87	7.14	.79	.01	-.11	--						
4. Intent	38.11	7.73	.90	-.07	-.15	.15	--					
5. GHP	17.86	3.78	.79	-.20*	-.45**	.31**	.30**	--				
6. MSPSS	66.97	13.66	.93	.15	-.32**	.08	-.01	.11	--			
7. Shame	30.17	9.90	.84	.27**	.53**	-.21*	-.11	-.41**	-.14	--		
8. ExpEx	37.50	5.13	.91	-.08	-.14	.15	.44**	.21*	.15	-.06	--	
9. ExpEat	34.86	5.01	.86	.01	-.13	.14	.33**	.16	.16	-.03	.62**	--
10. Stress	19.67	6.46	.87	.17	.62**	-.07	-.18	-.44**	-.05	.47**	-.26**	-.23*
11. PlanEx	14.76	3.92	.88	-.11	-.18	.12	.63**	.43**	.07	-.11	.51**	.34**
12. PlanEat	12.90	4.02	.90	.03	-.18	.12	.38**	.26**	.10	-.04	.36**	.45**
13. RecovEx	8.22	2.70	.91	-.26**	-.38**	.20	.49**	.39**	.13	-.37**	.41**	.32**
14. RecovEat	10.30	2.60	.79	.02	-.21**	.10	.48**	.31**	.10	-.07	.31**	.49**
15. Action	82.26	17.97	.94	.05	-.40**	.20*	.38**	.40**	.31**	-.35**	.42**	.47**
16. T1 Food	47.67	7.03	.65	.20*	-.07	.05	.30**	.19*	.01	.10	.09	.14
17. T2 Food	47.79	7.16	.67	.18*	-.06	.00	.28**	.20*	.00	.13	.10	.14
18. T1 Exercise	3206.34	630.57	.79	-.37**	.00	.14	.08	.16	-.14	-.02	.11	.01
19. T2 Exercise	3229.91	619.44	.79	-.40**	.01	-.03	.04	.14	-.13	.06	.03	-.11

*$p < .01$, **$p < .001$

Table 5.
Continued

Variables	10	11	12	13	14	15	16	17	18
11. PlanEx	-.32**	--							
12. PlanEat	-.20**	.50**	--						
13. RecovEx	-.28**	.59**	.49**	--					
14. RecovEat	-.27**	.46**	.66**	.48**	--				
15. Action	-.46**	.48**	.56**	.49**	.47**	--			
16. T1 Food	-.18	.32**	.22*	.14	.33**	.27**	--		
17. T2 Food	-.23*	.34**	.14	.09	.34**	.22**	.68**	--	
18. T1 Exercise	-.13	.18	.08	.21*	.03	.06	-.15	-.08	--
19. T2 Exercise	-.08	.17	.07	.17	.01	.02	-.07	-.08	.82**

*$p < .01$, **$p < .001$

Table 6.
Percentage of participants who were physically active at initial measurement and three month follow up

	Time 1	Time 2
Total sample (*n* = 374)	60%	57%
Normal Weight (*n* = 183)	64%	61%
Overweight and Obese (*n* = 191)	55%	54%

Table 7.
Percentage of participants who consumed a healthy diet at initial measurement and three month follow up

	Time 1	Time 2
Total sample (*n* = 374)	33%	43%
Normal Weight (*n* = 183)	36%	48%
Overweight and Obese (*n* = 191)	31%	38%

Table 8.
Results of structural equation modeling for exercise behaviours – full sample (n = 374).

Model	χ^2	**df**	***CFI***	***TLI***	***SRMR***	**RMSEA**	**π**
Hypothesized Model	*183.60**	*27*	*.86*	*.78*	*.08*	.13 (.11 - .14)	
Revision 1	*122.63**	*25*	*.91*	*.85*	*.05*	.10 (.09 - .12)	
Revision 2	*38.87*	*9*	*.95*	*.90*	*.04*	.09 (.07 - .13)	
Revision 3	*51.92*	*12*	*.96*	*.93*	*.05*	.09 (.07 - .12)	.44

*$p < .001$

Note. All values are rounded to two decimal places. CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation. A 90% Confidence Interval is presented for the RMSEA (Kline, 2005).

Table 9.
Results of structural equation modeling for exercise behaviours –normal weight sample (n = 183).

Model	χ^2	**df**	***CFI***	***TLI***	***SRMR***	**RMSEA**	**π**
Hypothesized Model	*76.98***	*27*	*.90*	*.85*	*.07*	.10 (.08 - .13)	
Revision 1	*47.23**	*25*	*.96*	*.93*	*.04*	.07 (.04 - .14)	
Revision 2	*9.64*	*9*	*.99*	*.99*	*.03*	.02 (.00 - .09)	
Revision 3	*18.59*	*12*	*.98*	*.97*	*.05*	.06 (.00 - .10)	.27

*$p < .01$, **$p < .001$

Note. All values are rounded to two decimal places. CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation. A 90% Confidence Interval is presented for the RMSEA (Kline, 2005).

Table 10.
Results of structural equation modeling for exercise behaviors –overweight or obese sample (n = 191).

Model	χ^2	**df**	***CFI***	***TLI***	***SRMR***	**RMSEA**	**π**
Hypothesized Model	*130.28**	*27*	*.82*	*.73*	*.09*	.14 (.12 - .17)	
Revision 1	*42.28**	*9*	*.89*	*.78*	*.06*	.14 (.10 - .18)	
Revision 2	*77.51**	*5*	*.71*	*.42*	*.14*	.28 (.22 - .33)	
Revision 3	*142.17**	*12*	*.88*	*.79*	*.05*	.24 (.21-.28)	.30

**p* < .001

Note. All values are rounded to two decimal places. CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation. A 90% Confidence Interval is presented for the RMSEA (Kline, 2005).

Table 11.
Significance levels and unstandardized and standardized estimates for the exercise model

	Full sample		*Normal weight sample*	
Parameter Estimate	*Unstandardized*	*Standardized*	*Unstandardized*	*Standardized*
Structural Model				
T1 Exercise → T2 Exercise	.86 (.03)**	.82	.84 (.06)**	.73
Planning → T2 Exercise	-1.18 (4.96)	-.01	-3.86 (7.50)	-.03
Recovery SE → Planning	.69 (.06)**	.45	.91 (.09)**	.54
Intentions → Planning	.22 (.02)**	.39	.20 (.03)**	.34
Action SE → Recovery SE	.05 (.01)**	.30	.04 (.01)**	.28
Outcome Exp → Recovery SE	.12 (.03)**	.23	.16 (.04)**	.32
Intentions → Recovery SE	.08 (.02)**	.24	.05 (.02)*	.15
Action SE → Intentions	.08 (.02)*	.18	.09 (.03)*	.21
Outcome Exp → Intentions	.48 (.08)**	.33	.45 (.11)**	.31
GHP → Intentions	.27 (.10)**	.14	.21 (.15)	.10

Note. Full Sample: χ^2 (9) = 38.87, $p < .001$, CFI = .95, TLI = .90, SRMR = .04, RMSEA = .09 ($CI_{90\%}$ = .07 - .13); 'Normal' Sample: χ^2 (9) = 9.64, $p = ns$, CFI = .99, TLI = .99, SRMR = .03, RMSEA = .02 ($CI_{90\%}$ = .00 - .09).

Table 12.
Results of structural equation modeling for eating behaviors – full sample (n = 374).

Model	χ^2	**df**	***CFI***	***TLI***	***SRMR***	**RMSEA**	**π**
Hypothesized Model	*166.43**	*27*	*.87*	*.80*	*.08*	.12 (.10 - .14)	
Revision 1	*107.33**	*25*	*.92*	*.87*	*.05*	.09 (.08 - .11)	
Revision 2	*83.46**	*9*	*.87*	*.74*	*.07*	.15 (.12 - .18)	
Revision 3	*87.65**	*12*	*.91*	*.83*	*.08*	.13 (.11-.16)	.44

*$p < .001$

Note. All values are rounded to two decimal places. CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation. A 90% Confidence Interval is presented for the RMSEA (Kline, 2005).

Table 13.
Results of structural equation modeling for eating behaviors – normal weight sample (n = 183).

Model	χ^2	**df**	***CFI***	***TLI***	***SRMR***	**RMSEA**
Hypothesized Model	*77.93**	*27*	*.90*	*.85*	*.08*	.10 (.08 - .13)
Revision 1	*57.61**	*25*	*.94*	*.89*	*.06*	.09 (.06 - .11)
Revision 2	*34.27*	*9*	*.92*	*.83*	*.07*	.12 (.08 - .17)
Revision 3	*38.59**	*12*	*.94*	*.88*	*.08*	.11 (.07 - .15)

*$p < .001$

Note. All values are rounded to two decimal places. CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation. A 90% Confidence Interval is presented for the RMSEA (Kline, 2005).

Table 14.
Results of structural equation modeling for eating behaviors – overweight or obese sample (n = 191).

Model	χ^2	**df**	***CFI***	***TLI***	***SRMR***	**RMSEA**
Hypothesized Model	*130.58**	*27*	*.82*	*.71*	*.09*	.14 (.12 - .17)
Revision 1	*84.49**	*25*	*.89*	*.82*	*.06*	.11 (.09 - .14)
Revision 2	*41.57**	*9*	*.89*	*.74*	*.06*	.15 (.11 - .20)
Revision 3	*142.17**	*12*	*.88*	*.79*	*.05*	.24 (.21 - .28)

*$p < .001$

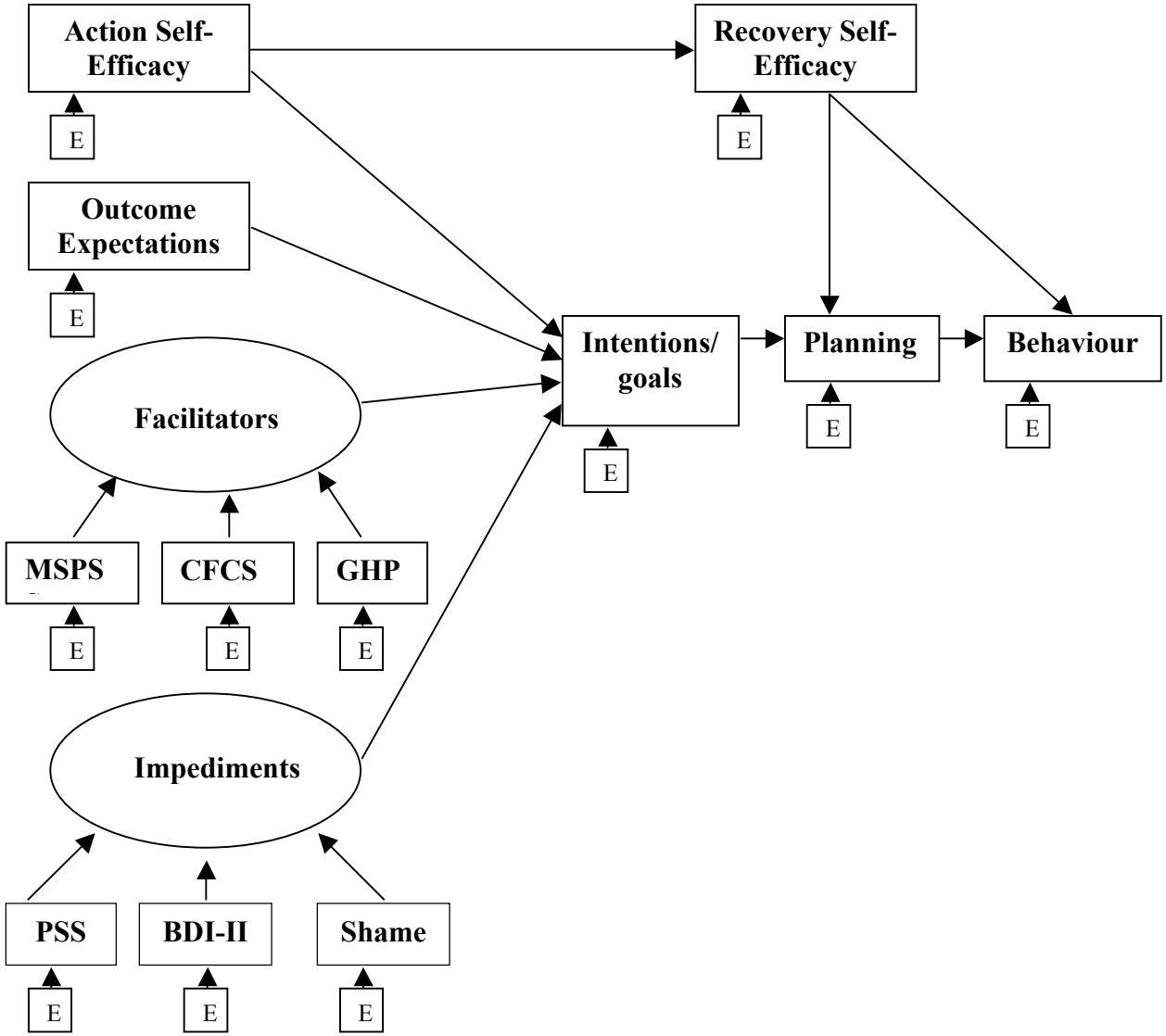
Note. All values are rounded to two decimal places. CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation. A 90% Confidence Interval is presented for the RMSEA (Kline, 2005).

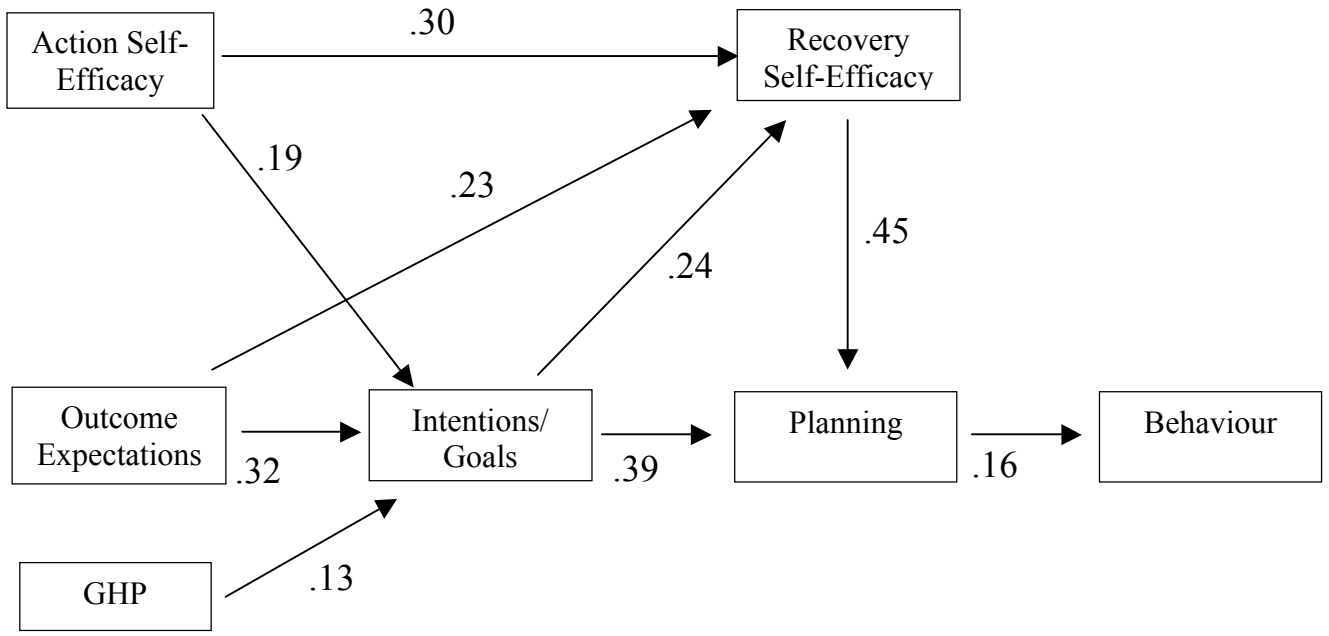
Figure Captions

Figure 1. Hypothesized Model

Figure 2. Final model (revision 2) with standardized estimates based on the full sample.

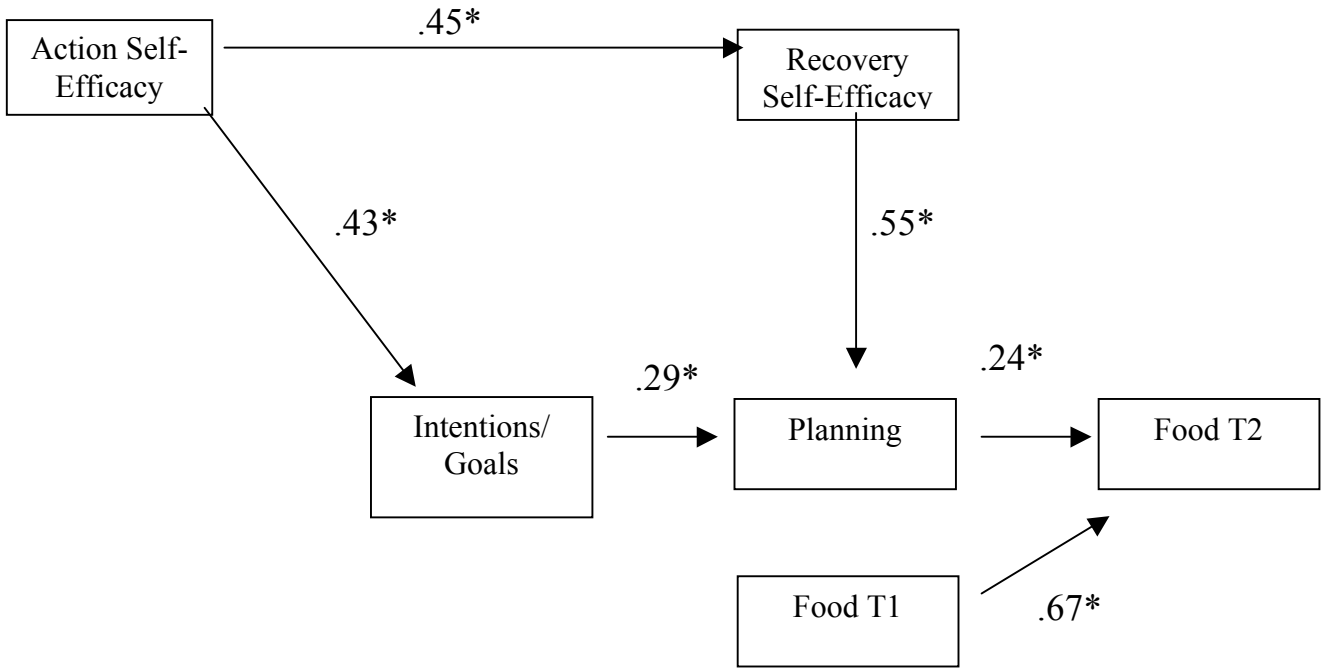
Figure 3. Simplified model for eating behaviours.


Action Self-Efficacy
Recovery Self-Efficacy
Outcome Expectations
Intentions/ goals
Planning
Behaviour
Facilitators
MSPS
CFCS
GHP
Impediments
PSS
BDI-II
Shame
E



Note: χ^2 (9) = 38.87, $p < .001$, CFI = .95, TLI = .90, SRMR = .04, RMSEA = .094 ($CI_{90\%}$ = .07 - .13)

GHP = General Health Perceptions subscale


Action Self-Efficacy
.45*
Recovery Self-Efficacy
.43*
.55*
.29*
.24*
Intentions/ Goals
Planning
Food T2
Food T1
.67*

Appendix A: Food Habits Questionnaire

Please answer each of the questions below about your eating habits in the past month by circling the appropriate number. If you are unsure about how to answer a question, please give the best answer you can. If you do not eat the food asked about in the question (I.e. if you do not eat meat), please circle "Not applicable". Use the following scale:

	1 Rarely or Never	**2 Sometimes**	**3 Often**	**4 Usually or Always**	**NA Not applicable**
1. Wh[illegible]e it baked or broiled?	1				
2. When eating chicken, how often did you take off the skin?	1	2	3	4	NA
3. When eating red meat, how often did you only eat small portions?	1	2	3	4	NA
4. When eating red meat, how often did you trim all visible fat?	1	2	3	4	NA
5. How often did you eat fish or chicken instead of red meat?	1	2	3	4	NA
6. How often did you put butter or margarine on cooked vegetables?	1	2	3	4	NA
7. How often did you eat boiled or baked potatoes without butter or margarine?	1	2	3	4	NA
8. How often did you put sour cream, cheese, or other sauces on vegetables or potatoes?	1	2	3	4	NA
9. How often did you eat bread, rolls, or muffins without butter or margarine?	1	2	3	4	NA
10. How often did you use meatless tomato sauce on spaghetti or noodles?	1	2	3	4	NA
11. How often did you have a vegetarian meal?	1	2	3	4	NA
12. How often did you use yogurt instead of sour cream?	1	2	3	4	NA

	1 Rarely or Never	**2 Sometimes**	**3 Often**	**4 Usually or Always**	**NA Not applicable**
13. How often did you use very-low-fat (1%) or nonfat milk?	1	2	3	4	NA
14. How often did you eat special low-fat, diet cheeses?	1	2	3	4	NA
15. How often did you eat ice milk, frozen yogurt, or sherbet instead of ice cream?	1	2	3	4	NA
16. How often did you use low-calorie instead of regular	1	2	3	4	NA

salad dressing?					
17. How often did you use PAM or another nonstick spray when cooking?	1	2	3	4	NA
18. How often did you have only fruit for dessert?	1	2	3	4	NA
19. How often did you eat at least two vegetables (not green salad) at dinner?	1	2	3	4	NA
20. How often did you snack on raw vegetables instead of on potato, corn or taco chips?	1	2	3	4	NA

Appendix B: Stanford 7-day Physical Activity Re-call Scale

We would like to know about your physical activity during the past 7 days. But first, we would like to know about your sleep habits:

1. On the average, how many hours did you sleep each night during the last five weekday nights (Sunday - Thursday)? _____ hours

2. On the average, how many hours did you sleep each night last Friday and Saturday nights? _____ hours

Now we would like to know about your physical activity during the past 7 days, that is, the last 5 weekdays, and last weekend, Saturday and Sunday. We are not talking about light activities such as slow walking, light housework, or unstrenuous sports such as bowling, archery or softball. Please look at the list below which shows some examples of what we consider moderate, hard and very hard activities.

Moderate activity

Occupational tasks: 1) delivering mail, or patrolling on foot; 2) house painting; 3) truck driving (making deliveries, lifting and carrying light objects)

Household activities: 1) raking the lawn; 2) sweeping and mopping; 3) mowing the lawn with a power mower; 4) cleaning windows

Sports activities (actual playing time): 1) volleyball; 2) ping-pong; 3) brisk walking for pleasure or for work (approximately 4.83 km/hour, 3 miles/hour, or 20 minutes/km (mile)); 4) golf, walking and pulling or carrying clubs; 5) calisthenic exercises

Hard activity

Occupational tasks: 1) heavy carpentry; 2) construction work, doing physical labour

Household activities: 1) scrubbing floors

Sports activities (actual playing time): 1) tennis doubles; 2) dancing

Very hard activity

Occupational tasks: 1) very hard physical labour, digging or chopping with heavy tools; 2) carrying heavy loads such as brick or lumber

Sports activities (actual playing time): 1) jogging or swimming; 2) singles tennis; 3) racquetball; 4) soccer

3. First let's consider moderate activities. What activities did you do?

a._____ b. _____ c. _____

How many total hours did you spend during the last 5 weekdays doing these moderate activities or others like them? Please indicate to the nearest half hour: _____hours

4. Last Saturday and Sunday, how many hours did you spend on moderate activities? _____hours

5. Now let's consider hard activities. What activities did you do?

a._____ b. _____ c. _____

How many total hours did you spend during the last 5 weekdays doing these hard activities or others like them? Please indicate to the nearest half hour: _____hours

6. Last Saturday and Sunday, how many hours did you spend on hard activities? _____hours

7. Now let's consider very hard activities. What activities did you do?

a._____ b. _____ c. _____

How many total hours did you spend during the last 5 weekdays doing these very hard activities or others like them? Please indicate to the nearest half hour: _____hours

8. Last Saturday and Sunday, how many hours did you spend on very hard activities? _____hours

9. Compared with your physical activity over the past 3 months, was last week's physical activity more, less, or about the same?

____More

____Less

____About the same

Appendix C: Beck Depression Inventory-II

This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the one statement that best describes the way you have been feeling during that past two weeks, including today. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for the group. Be sure that you do not choose more than one statement for any group, including Item 16 (Changes in Sleeping Pattern) or Item 18 (Changes in Appetite).

1. Sadness
0 I do not feel sad.
1 I feel sad much of the time.
2 I am sad all the time.
3 I am so sad or unhappy that I can't stand it.

2. Pessimism
0 I am not discouraged about my future.
1 I feel more discouraged about my future than I used to be.
2 I do not expect things to work out for me.
3 I feel my future is hopeless and will only get worse.

3. Past Failure
0 I do not feel like a failure.
1 I have failed more than I should have.
2 As I look back, I see a lot of failures.
3 I feel I am a total failure as a person.

4. Loss of Pleasure
0 I get as much pleasure as I ever did from the things I enjoy.
1 I don't enjoy things as much as I used to.
2 I get very little pleasure from the things I used to enjoy.
3 I can’t get any pleasure from the things I used to enjoy.

5. Guilty Feelings
0 I don't feel particularly guilty
1 I feel guilty over many things I have done or should have done.
2 I feel quite guilty most of the time.
3 I feel guilty all of the time.

6. Punishment Feelings
0 I don't feel I am being punished.
1 I feel I may be punished.
2 I expect to be punished.
3 I feel I am being punished.

7. Self-Dislike
0 I feel the same about myself as ever.
1 I have lost confidence in myself.
2 I am disappointed in myself.
3 I dislike myself.

8. Self-Criticalness
0 I don’t criticize or blame myself more than usual.

1 I am more critical of myself than I used to be.
2 I criticize myself for all of my faults.
3 I blame myself for everything bad that happens.

9. Suicidal Thoughts or Wishes
0 I don't have any thoughts of killing myself.
1 I have thoughts of killing myself, but I would not carry them out.
2 I would like to kill myself.
3 I would kill myself if I had the chance.

10. Crying
0 I don't cry anymore than I used to.
1 I cry more than I used to.
2 I cry over every little thing.
3 I feel like crying, but I can't.

11. Agitation
0 I am no more restless or wound up than usual.
1 I feel more restless or wound up than usual.
2 I am so restless or agitated that it's hard to stay still.
3 I am so restless or agitated that I have to keep moving or doing something.

12. Loss of Interest
0 I have not lost interest in other people or activities.
1 I am less interested in other people or things than before.
2 I have lost most of my interest in other people or things.
3 It's hard to get interested in anything.

13. Indecisiveness
0 I make decisions about as well as ever.
1 I find it more difficult to make decisions than usual.
2 I have much greater difficulty in making decisions than I used to.
3 I have trouble making any decisions.

14. Worthlessness
0 I do not feel I am worthless.
1 I don't consider myself as worthwhile and useful as I used to.
2 I feel more worthless as compared to other people.
3 I feel utterly worthless.

15. Loss of Energy
0 I have as much energy as ever.
1 I have less energy than I used to have.
2 I don't have enough energy to do very much.
3 I don't have enough energy to do anything.

16. Changes in Sleeping Pattern
0 I have not experienced any change in my sleeping pattern.
1a I sleep somewhat more than usual.
1b I sleep somewhat less than usual.
2a I sleep a lot more than usual.
2b I sleep a lot less than usual.
3a I sleep most of the day.

3b I wake up 1-2 hours early and can't get back to sleep.

17. Irritability
0 I am no more irritable than usual.
1 I am more irritable than usual.
2 I am much more irritable than usual.
3 I am irritable all the time.

18. Changes in Appetite
0 I have not experienced any change in my appetite
1a My appetite is somewhat less than usual.
1b My appetite is somewhat greater than usual.
2a My appetite is much less than before.
2b My appetite is much greater than usual.
3a I have no appetite at all.
3b I crave food all the time.

19. Concentration Difficulty
0 I can concentrate as well as ever.
1 I can't concentrate as well as usual.
2 It's hard to keep my mind on anything for very long.
3 I find I can't concentrate on anything.

20. Tiredness or Fatigue
0 I am no more tired or fatigued than usual.
1 I get more tired or fatigued more easily than usual.
2 I am too tired or fatigued to do a lot of the things I used to do.
3 I am too tired or fatigued to do most of the things I used to do.

21. Loss of Interest in Sex
0 I have not noticed any recent change in my interest in sex.
1 I am less interested in sex than I used to be.
2 I am much less interested in sex now.
3 I have lost interest in sex completely.

Appendix D: Consideration of Future Consequences Scale

For each of the statements below, please indicate whether or not the statement is characteristic of you. If the statement is extremely uncharacteristic of you (not at all like you) please circle the "1" to the right of the question; if the statement is extremely characteristic of you (very much like you) please circle the "5" to the right of the question. And, of course, use the numbers in the middle if you fall between the extremes. Please keep the following scale in mind as you rate each of the statements below.

1 Extremely Uncharacteristic	**2 Somewhat Uncharacteristic**	**3 Uncertain**	**4 Somewhat Characteristic**	**5 Extremely Characteristic**

1. I consider how things might be in the future, and try to influence those things with my day to day behaviour.	1	2	3	4	5
2. Often I engage in a particular behaviour in order to achieve outcomes that may not result for many years.	1	2	3	4	5
3. I only act to satisfy immediate concerns, figuring the future will take care of itself.	1	2	3	4	5
4. My behaviour is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions.	1	2	3	4	5
5. My convenience is a big factor in the decisions I make or the actions I take.	1	2	3	4	5
6. I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes.	1	2	3	4	5

1 Extremely Uncharacteristic	**2 Somewhat Uncharacteristic**	**3 Uncertain**	**4 Somewhat Characteristic**	**5 Extremely Characteristic**

7. I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not occur for many years.	1	2	3	4	5
8. I think it is more important to perform a behaviour with important distant consequences than a behaviour with less-	1	2	3	4	5

important immediate consequences.

9. I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level.	1	2	3	4	5
10. I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time.	1	2	3	4	5
11. I only act to satisfy immediate concerns, figuring that I will take care of future problems that may occur at a later date.	1	2	3	4	5
12. Since my day to day work has specific outcomes, it is more important to me than behaviour that has distant outcomes.	1	2	3	4	5

Appendix E: Measure of Intention

Below are a series of statements about your intentions to engage in physical activity and consume a healthy diet. Please indicate the degree to which you agree with each of the statements by circling the appropriate number.

1 Very Strongly Disagree
2 Strongly Disagree
3 Slightly Disagree
4 Slightly Agree
5 Strongly Agree
6 Very Strongly Agree

1. I plan to engage in regular physical activity (i.e. 30 minutes at least three times per week) over the next three months.	1	2	3	4	5	6
2. I plan to consume a healthy diet over the next three months.	1	2	3	4	5	6
3. I intend to engage in regular physical activity over the next three months.	1	2	3	4	5	6
4. I intend to consume a healthy diet over the next three months.	1	2	3	4	5	6
5. I will engage in regular physical activity over the next three months.	1	2	3	4	5	6
6. I will consume a healthy diet over the next three months.	1	2	3	4	5	6

1 Extremely Unlikely
2 Moderately Unlikely
3 Slightly Unlikely
4 Slightly Likely
5 Moderately Likely
6 Extremely Likely

7. How likely is it that you will engage in regular physical activity over the next three months?	1	2	3	4	5	6
8. How likely is it that you will consume a healthy diet over the next three months?	1	2	3	4	5	6

Appendix F: Medical Outcome Study SF-36v2 Short-Form (General Health Perceptions subscale)

Instructions: This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

Answer each question by circling the appropriate number. If you are unsure about how to answer a question, please give the best answer you can.

1. In general, would you say your health is:

1	**Excellent**
2	**Very Good**
3	**Good**
4	**Fair**
5	**Poor**

---

2. Please choose the answer that best describes how true or false each of the following statements is for you. (Circle one number on each line).

	1 Definitely True	**2 Mostly True**	**3 Not Sure**	**4 Mostly False**	**5 Definitely False**
a. I s			ople.		
b. I am as healthy as anybody I know.	1	2	3	4	5
c. I expect my health to get worse.	1	2	3	4	5
b. My health is excellent.	1	2	3	4	5

Appendix G: Multidimensional Scale of Perceived Social Support (MSPSS)

Instructions: We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement.

Circle the "1" if you **Very Strongly Disagree**
Circle the "2" if you **Strongly Disagree**
Circle the "3" if you **Mildly Disagree**
Circle the "4" if you are **Neutral**
Circle the "5" if you **Mildly Agree**
Circle the "6" if you **Strongly Agree**
Circle the "7" if you **Very Strongly Agree**

1. There is a special person who is around when I am in need.	1	2	3	4	5	6	7
2. There is a special person with whom I can share my joys and sorrows.	1	2	3	4	5	6	7
3. My family really tries to help me.	1	2	3	4	5	6	7
4. I get the emotional help and support I need from my family.	1	2	3	4	5	6	7
5. I have a special person who is a real source of comfort to me.	1	2	3	4	5	6	7
6. My friends really try to help me.	1	2	3	4	5	6	7
7. I can count on my friends when things go wrong.	1	2	3	4	5	6	7
8. I can talk about my problems with my family.	1	2	3	4	5	6	7
9. I have friends with whom I can share my joys and sorrows.	1	2	3	4	5	6	7
10. There is a special person in my life who cares about my feelings.	1	2	3	4	5	6	7

11. My family is willing to help me make decisions.	1	2	3	4	5	6	7
12. I can talk about my problems with my friends.	1	2	3	4	5	6	7

Appendix H: The Objectified Body Consciousness Scale—Body Shame subscale

Instructions: The following are statements about your feelings related to your body. State the degree to which you agree or disagree with these statements.

1 = **Very Strongly Disagree**
2 = **Strongly Disagree**
3 = **Mildly Disagree**
4 = **Neutral**
5 = **Mildly Agree**
6 = **Strongly Agree**
7 = **Very Strongly Agree**

1. When I can't control my weight, I feel like something must be wrong with me.	1	2	3	4	5	6	7
2. I feel ashamed of myself when I haven't made the effort to look my best.	1	2	3	4	5	6	7
3. I feel like I must be a bad person when I don't look as good as I could.	1	2	3	4	5	6	7
4. I would be ashamed for people to know what I really weigh.	1	2	3	4	5	6	7
5. I never worry that something is wrong with me when I am not exercising as much as I should.	1	2	3	4	5	6	7
6. When I am not exercising enough, I question whether I am a good enough person.	1	2	3	4	5	6	7
7. Even when I can't control my weight, I think I'm an okay person.	1	2	3	4	5	6	7
8. When I'm not the size I think I should be, I feel ashamed.	1	2	3	4	5	6	7

Appendix I: Outcome Expectations for Exercise Scale (OEE)

Instructions: The following are statements about the benefits of *exercise* (walking, jogging, swimming, biking, stretching, or lifting weight). State the degree to which you agree or disagree with these statements.

Exercise…	**Strongly disagree**	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
1. Makes me feel better physically.					
2. Makes my mood better in general.	1	2	3	4	5
3. Helps me feel less tired.	1	2	3	4	5
4. Makes my muscles stronger.	1	2	3	4	5
5. Is an activity I enjoy doing.	1	2	3	4	5
6. Gives me a sense of personal accomplishment.	1	2	3	4	5
7. Makes me more alert mentally.	1	2	3	4	5
8. Improves my endurance in performing my daily activities (such as personal care, cooking, shopping, light cleaning, taking out garbage).	1	2	3	4	5
9. Helps to strengthen my bones.	1	2	3	4	5

Appendix J: Outcome Expectations for Healthy Eating Scale

Instructions: The following are statements about the benefits of *healthy eating* (consuming a balanced diet including vegetables, whole grains, etc.). State the degree to which you agree or disagree with these statements.

Exercise…	**Strongly disagree**	**Disagree**	**Neither agree Nor disagree**	**Agree**	**Strongly agree**
1. Makes me feel better physically.					
2. Makes my mood better in general.	1	2	3	4	5
3. Helps me feel less tired.	1	2	3	4	5
4. Makes my muscles stronger.	1	2	3	4	5
5. Is an activity I enjoy doing.	1	2	3	4	5
6. Gives me a sense of personal accomplishment.	1	2	3	4	5
7. Makes me more alert mentally.	1	2	3	4	5
8. Improves my endurance in performing my daily activities (such as personal care, cooking, shopping, light cleaning, taking out garbage).	1	2	3	4	5
9. Helps to strengthen my bones.	1	2	3	4	5

Appendix K: Perceived Stress Scale (PSS)

INSTRUCTIONS: The questions in this scale ask you about your feelings and thoughts during THE LAST MONTH. In each case, you will be asked to indicate your response by placing an "X" over the circle representing HOW OFTEN you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate. Please use the following scale:

	0 Never	**1 Almost Never**	**2 Sometimes**	**3 Fairly Often**	**4 Very Often**
1. In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2. In the last month, how often have you felt that you were unable to control the important things in your life?	0	1	2	3	4
3. In the last month, how often have you felt nervous and "stressed"?	0	1	2	3	4
4. In the last month, how often have you felt confident about your ability to handle your personal problems?	0	1	2	3	4
5. In the last month, how often have you felt that things were going your way?	0	1	2	3	4
6. In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
7. In the last month, how often have you been able to control irritations in your life?	0	1	2	3	4
8. In the last month, how often have you felt that you were on top of things?	0	1	2	3	4
9. In the last month, how often have you been angered because of things that happened that were outside of your control?	0	1	2	3	4
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	0	1	2	3	4

Appendix L: Planning Behaviours

Instructions: Please answer the following statements about planning exercise activities and nutritional habits.

Do you already have concrete plans with regard to exercising?

I already have concrete plans...

	Not at all true	Barely true	Mostly true	Exactly true
1. When to exercise.	1	2	3	4
2. Where to exercise.	1	2	3	4
3. How to exercise.	1	2	3	4
4. How often to exercise.	1	2	3	4
5. With whom to exercise.	1	2	3	4

Most people would like to further improve their nutrition by taking in less salt and fat. How about you?

I already have concrete plans...

	Not at all true	Barely true	Mostly true	Exactly true
1. How to change my nutrition habits.	1	2	3	4
2. When to change my nutrition habits.	1	2	3	4
3. When to especially watch out in order to maintain my new nutrition habits.	1	2	3	4
4. What to do in difficult situations in order to stick to my intentions.	1	2	3	4
5. How to deal with relapses.	1	2	3	4

Appendix M: Recovery Self-Efficacy

Instructions: Please read the following statements and use the scales below to rate them.

Despite the best intentions, minor or major setbacks may occur. Please imagine you had taken a break from being physically active. How confident are you that you can return to being physically active on a regular basis after having taken a break?

I am confident that I can return to a physically active lifestyle…

	Not at all true	Slightly true	Mostly true	Exactly true
1. Even if I have relapsed several times	1	2	3	4
2. Even if I have relapsed for several weeks	1	2	3	4
3. Even if I do not receive a great deal of support from others when making my first attempts	1	2	3	4

How certain are you about being able to overcome the following barriers?

I can manage to stick to healthy food . …

	Strongly disagree	Disagree	Agree	Strongly Agree
1. Even if something delicious but unhealthy is served	1	2	3	4
2. Even if this will be more expensive	1	2	3	4
3. Even if I am short of time to do my shopping and preparation	1	2	3	4
4. Even if this means I cannot eat everything I crave for	1	2	3	4

Appendix N: Self-Rated Abilities for Health Practices Scale

Please rate how well you are able to perform each of the health practices listed below using the following scale:

	0 Not at all	1	2	3	4 Completely
1. I am able to find healthy foods that are within my budget.	0	1	2	3	4
2. I am able to eat a balanced diet.	0	1	2	3	4
3. I am able to figure out how much I should weigh to be healthy.	0	1	2	3	4
4. I am able to brush my teeth regularly.	0	1	2	3	4
5. I am able to tell which foods are high in fiber content.	0	1	2	3	4
6. I am able to figure out from labels what foods are good for me.	0	1	2	3	4
7. I am able to drink as much water as I need to drink everyday.	0	1	2	3	4
8. I am able to figure out things I can do to help me relax.	0	1	2	3	4
9. I am able to keep myself from feeling lonely.	0	1	2	3	4
10. I am able to do things that make me feel good about myself.	0	1	2	3	4
11. I am able to avoid being bored.	0	1	2	3	4
12. I am able to talk to friends and family about the things that are bothering me.	0	1	2	3	4
13. I am able to figure out how I respond to stress.	0	1	2	3	4
14. I am able to change things in my life to reduce stress.	0	1	2	3	4
15. I am able to do exercises that are good for me.	0	1	2	3	4
16. I am able to fit exercise into my regular routine.	0	1	2	3	4
17. I am able to find ways to exercise that I enjoy.	0	1	2	3	4
18. I am able to find accessible places for me to exercise in the community.	0	1	2	3	4
19. I am able to know when to quit exercising.	0	1	2	3	4
20. I am able to do stretching exercises.	0	1	2	3	4
21. I am able to keep from getting hurt when I exercise.	0	1	2	3	4
22. I am able to figure out where to get information on how to take care of my health.	0	1	2	3	4
23. I am able to watch for negative changes in my body's condition.	0	1	2	3	4

24. I am able to recognize what symptoms should be reported to a doctor or nurse.	0	1	2	3	4
25. I am able to use medication correctly.	0	1	2	3	4
26. I am able to find a doctor or nurse who gives me good advice about how to stay healthy.	0	1	2	3	4
27. I am able to know my rights and stand up for myself.	0	1	2	3	4
28. I am able to get help from others when I need it.	0	1	2	3	4

Appendix O: Demographic Questionnaire

1. Please indicate you height and weight:

   Height: _____ Weight: _____

2. Please indicate your age: _____

3. Please indicate if you have any significant health problems and what they are:

_____

4. Please indicate whether you take any medications for health problems and what they are: _____

5. Please indicate your ethnicity: _____

6. Please indicate whether you have recently immigrated to Canada: _____

7. Please indicate your marital status by choosing one of the following options:

   Single, never married Married
   Living common-law Divorced
   Separated Widowed

8. Please indicate your primary occupation by choosing one of the following options:

   Student Management
   Professional Administrative
   Sales or service
   Other: _____

9. Please indicate the highest level of education you have completed by choosing one of the following options:

   High school
   Trades certificate or diploma
   Non university certificate
   University certificate below a bachelor's
   Bachelor's degree
   University certificate or diploma above a bachelor's

10. Please indicate your annual household income by choosing one of the following options:

    Less than 10,000 10,000 to 19,000
    20,000 to 29,000 30,000 to 39,000 ...continued on next page...
    40,000 to 49,000 50,000 to 59,000
    60,000 to 69,000 70,000 to 79,000
    80,000 or higher don't know
    prefer not to say

11. Please indicate who in your household does the majority of the cooking by choosing one of the following options:

    Self Parents
    Spouse Other (please specify):_____

12. Do you think you can afford to:

Eat a healthy diet? Yes No

Join a gym? Yes No

13. Please indicate whether you are on a diet: _____

If so, what kind of diet are you on? _____

Appendix P: Consent Form

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The research project title is "Maintenance of a healthy lifestyle." This study will investigate factors that may influence the maintenance of health-related behaviours. You will be asked to answer a series of questionnaires that measure different health-related behaviours and factors that may affect engagement in health-related behaviours. Also, in order to investigate how health behaviours are maintained over time, you will be asked to complete additional questionnaires in **3 months**. The study will take approximately two hours of your time. You will receive two credits at the initial session and two additional credits at the 3-month follow-up session. We hope that the results of this study will promote a better understanding of how to help people adopt and maintain health-related behaviours. There is no harm anticipated for participants in this study.

Your responses will be anonymous and will only be identified with a study number. Data with identifying information will be destroyed immediately after the completion of the study. For the purpose of potential publications, the remainder of the study data will be kept for up to 7 years in a locked research office, after which time it will be destroyed. A feedback sheet at the end of the study will provide more information about the study and contact numbers should you have any questions or concerns. Your signature on this form indicates that you have understood to your satisfaction the information regarding your participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. Your participation is voluntary. **Declining to participate will have no negative consequences.** Also, you are free to withdraw from the study at any time, and/or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

The principle researcher in the present study is Laura Jakul, PhD Student in the department of Clinical Psychology (474-9222). This research is supervised by Dr. David Martin (474-8194) and Dr. Norah Vincent (787-3272). This study has been sponsored by the University of Manitoba and the Social Sciences and Humanities Research Council of Canada. This research has been approved by the Psychology/Sociology Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Secretariat at 474-7122, or email margaret_bowman@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference. We appreciate you taking the time to consider participating.

_____ _____

Participant's signature Date

_____ _____

Researcher's signature Date

If you wish to receive a summary of the study results (available by August, 2011), please provide your email or mailing address. If not, please do not write in your contact information.

Email or mailing address: _____

Appendix Q: Debriefing form

Thank you for your participation in this study which is being conducted by the Department of Psychology at the University of Manitoba. The investigators of this study are Laura Jakul, a PhD candidate, Dr. Norah Vincent, a researcher and clinician, and Dr. David Martin, a researcher, clinician and professor of psychology. The study is being funded by the University of Manitoba and the Social Sciences and Humanities Research Council of Canada.

The purpose of this study is to identify factors that influence individuals to maintain healthy lifestyle behaviours (namely consuming a healthy diet and engaging in regular physical activity). It is important on an individual level, and from a public health perspective, to encourage people to engage in a healthy lifestyle. Large proportions of individuals are currently making unhealthy lifestyle choices. For instance, in Canada, only 50.4% of the population is physically active, and only 38.9% of the population report eating five or more servings of fruits and vegetables a day (Statistics Canada, 2004). The rates of obesity in Canada have risen dramatically in recent years; approximately 48.2% of Canadians have a Body Mass Index (BMI) of more than 25 and are considered overweight, and 14.9% have a BMI of 30 or more, and meet the criteria for obesity. Previous research suggests that failure to adopt a healthy lifestyle is a significant contributor to overweight and obesity and the resulting detrimental effects on health (i.e. Horgen & Brownell, 2002). Further, maintenance of a healthy lifestyle (including healthy diet and regular physical activity) is vital in both reducing overweight and obesity and preventing their onset (World Health Organization, 2000).

This study will compare the factors that influence the maintenance of a healthy lifestyle between two groups of raters: those who are of normal weight and those who are overweight or obese. It is predicted that various factors will differentiate individuals of normal weight from the overweight and obese in terms of their participation in health-related behaviours, such as perceived health status, levels of social support and stress, perceived benefits and barriers to engaging in a healthy lifestyle and strategies and self-efficacy for maintaining a healthy lifestyle. It is critical to identify factors that influence healthy lifestyle choices in the overweight and obese in order to inform treatment and prevention efforts (Brownell & Cohen, 1995).

If you are interested in learning more details about this study or about the results, please do not hesitate to contact me by email (laurajakul@yahoo.ca). I thank you again for your participation.

Sincerely,

Laura Jakul

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