DECISIONAL BALANCE OF NUTRITION BEHAVIOUR AND PHYSICAL ACTIVITY AMONG CHILDREN AND ADOLESCENTS

by

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To my loving husband, David

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Abstract

As we gain a greater understanding about the factors that influence obesity, focus is being placed on prevention strategies to increase healthy eating and physical activity among youth. Yet, little is understood about how children and adolescents develop or choose health behaviours. Among adults, behavioural health experts have developed techniques directed at altering decisional balance (DB) to improve health behaviours. DB scales produce a difference score that represent an individual's relative balance of pros and cons for performing a health behaviour. This research examined the validity of youth DB measures for physical activity and nutrition behaviour among students in Grades 11, 7, and 3 using two informants: child self-report and parent proxy. First, youth DB measures were developed regarding choices about foods (calorie-dense vs. nutrient-dense) and activities (sedentary vs. active). Items were generated through literature searches, focus groups, and written feedback from parents. Second, expert advice and five statistical procedures on a survey of 296 youth were utilized to select items. The resulting measures showed an expected 2-factor structure, accounting for 35% and 30% of the variance for the activity and nutrition domains, respectively. Good psychometric properties, such as content validity with self-efficacy and one-week test-retest reliability, were observed for students in Grades 11 and 7, but not Grade 3. Finally, predictive validation studies measured physical activity and nutrition behaviours for a subsequent week using accelerometers and food frequency questionnaires. Results revealed that nutrition DB was significantly correlated with percent calories of fat and sugar consumed among adolescents in Grade 11 using self-report, and among youth in Grades 11 and 7 using parents as informants. Within the activity domain, DB did not predict average daily activity 'counts' among youth of any grade when using self report. However, with parent proxy reports, activity DB was temporally associated with activity 'counts' among Grade 11s. These results suggest that, depending on the informant, the youth DB measures were externally valid among Grade 11s for physical activity, and among Grade 11s and 7s for nutrition behaviour. Implications for future research and clinical interventions in the area of lifestyle modification among youth are discussed.

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CHAPTER 1

GENERAL INTRODUCTION

I. The Clinical Problem

Obesity has become a major health problem in North America; its prevalence rate has been increasing significantly throughout the industrialized world (Seidell, 1999). A widely used tool to measure weight status is the body mass index (BMI), a ratio of body weight to height (Garrow & Webster, 1985) that correlates highly with body fat (Gallagher, Visser, Sepulveda, Pierson, Harris & Heymsfield, 1996). BMI ranges are categorized into weight statuses based on the risk of disease and death (World Health Organization, 1995). Over the past 15 years in Canada, the prevalence of adults classified as overweight (i.e., BMI > or = 25 kg/(m^2)) increased from 48 to 57% in women and from 30 to 35% in men. Those classified as obese (i.e., BMI > or = 30 kg/(m^2)) increased from 8 to 12% in women and from 9 to 14% in men (MacDonald, Reeder, Chen & Despres, 1997; Tremblay, Katzmarzyk & Willms, 2002). Further contributing to this problem is the fact that obesity has been developing at earlier ages. According to the most recent reports from Statistics Canada, 29% to 37% of Canadian children, ages two to seventeen (Statistics Canada & Social Development Canada 2002; Le Petit & Berthelot, 2004), are classified as overweight (defined as age-adjusted BMI > or = 25 kg/(m^2)). Half are considered obese (8% to 18%; defined as age-adjusted BMI > or = 30 kg/(m^2)), a prevalence rate exceeding that reported in adults.

The higher prevalence of childhood obesity threatens their long-term health. Obesity is associated with numerous medical problems such as hypertension, cardiovascular disease, diabetes, respiratory disease, and orthopedic disorders in adults (Pi-Sunyer, 1999). Various biological risk factors for coronary heart disease (e.g., blood pressure, fasting total cholesterol) are elevated among overweight Canadian children compared to their normal weight peers (Katzmarzyk, Tremblay, Perusse, Despres & Bouchard, 2003). What is especially concerning is that cardiovascular disease and type 2 diabetes, once thought to onset in adulthood, are now being seen in youth (Ball & McCargar, 2003). In addition to this impact on physical health, we know that obesity is associated with significant psychosocial problems such as stigmatization, discrimination, clinical depression, lowered self-esteem and negative body image (Marcus, 2003; Strauss, 2000). These, in turn, contribute to a lowered quality of life (Larsson, Karlsson & Sullivan, 2002).

II. A Focus on Prevention

There is much agreement that preventative approaches that start in childhood would be the most effective in reducing adult obesity prevalence rates (Best, 1989; Hill & Trowbridge, 1998; Power, Lake, & Cole, 1997). Unfortunately, behavioural, pharmacological, or combined treatments of obesity among adults have been ineffective in producing long-term maintenance (> 5 years) of weight-loss (see review by Garner & Wooley, 1991; Wadden, Sternberg, Letizia, Stunkard, & Foster, 1989). Epstein's behavioural training program, however, has shown greater long-term efficacy in weight-loss with obese pre-adolescents (ages 8 - 12) and their families than treatments with obese adults (Jeffery, Drewnowski, Epstein, Stunkard, Wilson, Wing & Hill, 2000). In Canada, there is presently one clinic that treats children and adolescents who are obese:

the *Children's Exercise and Nutrition Clinic* at the Chedoke Child and Family Center at the Hamilton Health Sciences Center in Hamilton, Ontario. Other children's hospitals across the country are initiating similar treatments (e.g., Children's Hospital of Eastern Ontario, Alberta Children's Hospital, and IWK Health Sciences Centre; personal communications with staff, January 2004). Programs that target weight-loss among obese youth are useful endeavors, indeed. Yet, to best address the epidemic health problem of obesity in Canada, treating a sub-population of children and adolescents who are already obese will not be enough.

The etiology of obesity is complex, and includes social and environmental influences (Parizkova & Hill, 2001). Behavioural determinants, specifically low levels of physical activity and the consumption of high-calorie foods, have been the two primary areas of focus among researchers (Goran, Reynolds & Lindquist, 1999; Hill & Melanson, 1999; Poston & Foreyt, 1999). One problem with current obesity treatments is their main focus is on weight-loss outcomes (i.e., BMI or percentage body fat), rather than behaviour changes in nutrition or physical activity. A focus on weight-loss outcome alone can be problematic for two reasons.

First, weight-loss is less responsive to change than behaviours. The biological changes necessary for weight loss are slow in producing visible outcomes (e.g., the body's adaptation of adipose tissue metabolism; Poirier & Despres, 2001; Schwartz, 2001). In addition, because the body's muscle mass weights more than fat, BMI changes or weight loss can sometimes be a misleading indicator of health and fitness (Kahn, Tatham & Heath, 1997). Finally, dieting enhances the body's metabolic efficiency, which in turn increases its tendency to maintain a higher body weight (Brownell, Greenwood, Stellar & Shrager, 1986). Therefore, when an individual focuses on weight-loss exclusively, reinforcements for their efforts can often be delayed or not exist. On the other hand, behavioural indices respond more proportionally to the effort an individual exerts. A guiding principle of reinforcement (an extensively studied concept within the field of psychology) states that positive consequences immediately contingent on the occurrence of a behaviour are effective at increasing the frequency of that behaviour (Cautela & Lynch, 1983). Accordingly, tracking behaviour can provide reinforcing feedback. For example, monitoring activity with a pedometer (a small device worn on the hip that measures the number of steps an individual takes) has shown to be an effective intervention for increasing physical activity (Speck & Looney, 2001; Tudor-Locke, Myers, & Rodger, 2001).

A second reason why a focus on weight-loss outcome alone can be problematic is that excessive weight-loss may prove to be an unnecessary goal for obtaining health outcomes. Recent research among adults suggests that modest weight losses of 10 to 15% of one's body weight over a 6 month period can lead to many benefits, such as lowered blood pressure, reduction in triglycerides, increase in HDL cholesterol, and significant improvement in glycemic control (Van Gaal, Wauters & De Leeuw, 1997; Anderson & Wadden, 1999). In addition, the area of the body where fat is lost (i.e., waist measurements around the abdomen) is an important factor in terms of improving these health outcomes (Kahn et al., 1997). To maximize health benefits, the primary focus of interventions should be on health behaviour change in addition to modest weight-loss.

The Canadian health care system has predominantly followed a biomedical disease model in which health practitioners respond to patients after they have been diagnosed with a medical problem. Expanding our focus and resources from a biomedical disease model to a behavioural primary prevention model of health can have substantial benefits (Kaplan, 2000). For example, there have been two primary prevention trials for type 2 diabetes that have demonstrated health and monetary benefits of long-term nutrition and exercise behaviour change. The Finnish Diabetes Prevention Study showed glucose and lipid metabolism improvements among middle-aged, overweight participants after 3 years of lifestyle behaviour changes compared to those receiving usual care (Lindstrom, Louheranta, Mannelin, Rastas, Salminen, Eriksson et al., 2003). Another is the Diabetes Prevention Program, which showed modest monetary benefits to health systems and society (e.g., reduced medical costs) among adults undergoing 3 years of lifestyle intervention compared to treatment as usual (Herman, Brandle, Zhang, Williamson, Matulik, Ratner et al., 2003). Certainly, the "pay off" of preventative medicine (i.e., the concept of most health at lowest cost; Kaplan, 2000) has received growing public attention amongst researchers (e.g., physical activity; Hatziandreu, Koplan, Weinstein, Caspersen, & Warner, 1988). In regards to the rising rates of obesity in Canada, a primary preventative approach would include lifestyle behavioural change, particularly among youth who are still within the normal weight range (i.e., age adjusted BMI of 18 to 24.9 kg/(m^2)).

III. A Focus on Motivation

Most individuals who think about health behaviour change know what they "should do", i.e., eat less calorie-dense foods and exercise more, but often struggle with sustained behaviour change for various environmental and psychological reasons. For example, various contextual factors are associated with sedentary behaviour such as the reliance on motor vehicles due to "urban sprawl" (i.e., the increase of suburban communities; Saelens, Sallis & Frank, 2003). An example of a contextual factor associated with the over consumption of calorie dense foods is the high availability and low cost of fast foods (Brownell, 2003). Behavioural change maintained over the long term requires certain psychological characteristics such as intrinsic reasons to change (Miller & Rollnick, 2002), and a belief in one's ability to change (Bandura, 1977, 1982). Clearly, changing health behaviour is more complicated than simply giving a behavioural prescription. One limitation with current prevention strategies, such as government advertising, is their reliance on behavioural prescriptions of action-oriented change (e.g., messages regarding dietary restriction of hydrogenated fats).

Research has shown that the majority of adults seeking treatment regarding their health behaviour are only contemplating change (Prochaska & Norcross, 1994; Rossi, 1992b). In other words, these individuals do not have plans to change in the near future (i.e., within the next 6 months), and therefore are unlikely to comply with behavioural prescriptions or action-based treatment programs. To reach the majority of individuals, prevention efforts need to go beyond traditional, action-oriented recommendations and include motivational readiness strategies.

IV. A Focus on the Transtheoretical Model

Over the past 2 decades, behavioural health experts have developed a cognitive-behavioural motivation theory, the transtheoretical model (Prochaska, 1994), to understand and influence motivational readiness across a range of adult populations for various health behaviours, including healthy eating and physical activity (Jones, Edwards, Vallis, Ruggiero, Rossi, Rossi et al., 2003; Riebe, Greene, Ruggiero, Stillwell, Blissmer, Nigg et al., 2003; Prochaska, Velicer, Rossi, Goldstein, Marcus, Rakowski et al., 1994). The transtheoretical model (TTM), or stages of change model, has proven useful in designing prevention and intervention strategies for health behaviour as it considers an individual's readiness for behavioural change when matching appropriate intervention strategies. In other words, the strategies of the TTM go beyond typical action-oriented prescriptions, and are appropriate for those who are simply considering change.

The TTM was initially developed from a comparative analysis of major theories of psychotherapy and behavioural change (Prochaska & Norcross, 1999), and from an empirical analysis of self-changed smokers in and out of the therapy settings (Prochaska, Norcross, & Diclemente, 1994). According to the TTM, at a given moment of time, a change of a particular defined behaviour (e.g., reaching a goal of 60 minutes of moderate to vigorous physical activity on most days of the week) for an individual can be categorized along stages of readiness (DiClemente & Prochaska, 1985). The five stages include: precontemplation (unaware or unwilling to change), contemplation (thinking about change but no action), preparation (planning to change in the near future), action (in the act of changing for less than 6 months), and maintenance (in the act of changing for at least 6 months, and working to prevent relapse). Stages of change measures assess an individual's intention to change, as well as their current health behaviour. In the literature to date, self-reports of health behaviour are used, often taking the form of a simple yes/no question. Sometimes, multiple item self-report measures of behaviour are used to confirm a behavioural goal. For example, food frequency questionnaires have been used to assess whether or not participants were consuming less than 30% of their calories from dietary fat (e.g., Rossi, Greene, Rossi, Plummer, Benisovich, Keller et al., 2001).

The TTM assumes that transition occurs between stages via stage-specific experiences and behaviours, referred to as 'experiential' and 'behavioural' processes (Prochaska, Velicer, DiClemente, & Fava, 1988). The experiential processes are thought to be most helpful in the early stages. They include consciousness raising (i.e., increasing information about one's self and the health/problem behaviour), dramatic relief (i.e., experiencing and expressing emotions about one's health/problem behaviour), environmental reevaluation (i.e., assessing how one's health/problem behaviour affects others and their environment), self-reevaluation (i.e., assessing one's evaluation of the self and the health/problem behaviour), and social liberation (i.e., awareness of one's environmental aspects that support the health behaviour). The behavioural processes, more frequently employed during the later stages, include counterconditioning (i.e., substituting alternatives for the problem behaviour), helping relationships (i.e., being open with a trusted, caring individual), reinforcement management (i.e., being rewarded for making change), self-liberation (i.e., committing and believing in one's ability to change), and stimulus control (i.e., avoiding or countering stimuli that promote the problem behaviour).

Prochaska and his colleagues include additional, previously established concepts into their TTM. Decisional balance originated from Janis and Mann's (1968) decision-making theories, and self-efficacy was borrowed from Bandura's (1977, 1982) self-efficacy theory. The TTM assumes that behavioural change is a function of, or is moderated by, three constructs: decisional balance, self-efficacy, and temptations/barriers. Decisional balance is the relative importance of an individual's perceived pros and cons for the behaviour. Self-efficacy is an individual's confidence to engage in the behaviour across problem situations. Finally, temptations/ barriers are psychosocial factors that impede an individual's health behaviour. Prochaska and colleagues have stated that the decisional balance is an important mediator of progression within the earlier stages of change (i.e., pre-action stages of change: precontemplation, contemplation and preparation), where as self-efficacy is thought to be more important in the later stages of change (i.e., action stages of change: action and maintenance) (Plummer, Velicer, Redding, Prochaska, Rossi, Pallonen et al., 2001; Prochaska & Velicer, 1997). Given the importance of targeting individuals in the early stages of change, this dissertation focuses on the decisional balance model.

V. A Focus on Decisional Balance

The decisional balance (DB) construct of the TTM represents an individual's conscious cognitive and motivational factors influencing their future health behaviour. The internal and construct validity of the DB model is evident in a meta-analytic study of DB cognitive shifts across 12 different health risk behaviours in a wide range of adult health problems (i.e., smoking, cocaine, weight control, high-fat diet, delinquency, safe sex, condom use, sunscreen use, radon gas exposure, exercise, mammography, and attending physician appointments; Prochaska et al., 1994). Principal components analysis across the 12 different health risk behaviours demonstrated that the structure for decision-making reliably consisted of two components: the pros and cons. This 2-factor model was shown to attribute 40 to 80% of the variance across studies (Prochaska et al., 1994). These analyses also indicated that, for those in the precontemplation stage, i.e., individuals who were not thinking about changing their health behaviour, the cons of changing the behaviours consistently out-weighed the pros. In other words, the cons were rated as more important in influencing their decisions to engage or not engage in the health behaviour than the pros. The opposite was found for those in the action stage. The pros out weighted the cons for individuals who had decided to change and already took action in the past 6 months.

Mathematical relationships were established between DB and the stages of change (Prochaska et al., 1994). As an individual moves through the stages, their pros increase and their cons decrease. Progress from the contemplation to the action stage of change involves approximately one standard deviation increase on the scale that measured the pros of changing. Prochaska and colleagues (1994) called this phenomenon, the strong principle. Progress from the precontemplation to the action stage of change involves approximately a 0.5 standard deviation decrease on the scale that measured the cons of changing. This phenomenon was called the weak principle (Prochaska et al., 1994). Somewhere between the pre-action stages (i.e., precontemplation, contemplation, and preparation) and the action stages (i.e., action and maintenance), a tipping of the DB occurs between the pros and cons. Although some exceptions have been found (e.g., Prochaska et al., 1994; Velicer, Rossi, Prochaska & DiClemente, 1996), line graphs that display the relationships of pro and con scale scores across stage typically show a characteristic cross over between the contemplation and action stage of change

(Prochaska et al., 1994). This point of intersection represents the stage of change at which the pro and con scale scores have equal values.

The underlying assumption of the DB construct is that it predicts motivational readiness, and therefore, is an indicator of future health behaviour. In other words, if an individual's pros outweigh their cons in terms of importance, he or she is predicted to be in an action stage of change (i.e., action or maintenance) and performing the target behaviour at that moment in time. Along the same lines, if an individual's cons outweigh their pros, he or she is predicted to be in a pre-action stage of change (i.e., precontemplation, contemplation, or preparation) and not performing the target behaviour. If an individual's pro and con scores are equal in value, he or she is predicted to be in conflict regarding the decision to engage in the target behaviour. In this case, the individual's health behaviour is hypothesized to be inconsistent and highly influenced by socioenvironmental factors, such as food availability, or number of sidewalks in a community area (Velicer et al., 1996).

The relative balance of pros and cons is an important and clinically relevant concept of the DB model (Prochaska et al., 1985; Velicer, DiClemente, Prochaska & Brandenburg, 1985; Velicer et al., 1996). For example, an individual could be aware and appreciate many health benefits of engaging in a particular health behaviour (e.g., exercise lowers blood cholesterol), yet have some important, conflicting cons that offset these pros and prevent him or her from engaging in that behaviour (e.g., fear of heart palpitations, dislike of sweating). In this case, the pro items that concern health benefits would be rated as moderately important in terms of influencing his or her decision-making, but the con items would be rated as highly important. Therefore, examining this dual process of decision making is more informative and clinically relevant than examining either pros or cons alone.

To measure the relative relationship between an individual's pros and cons, a DB difference score can be calculated. This score is calculated by converting the pro and con scale scores to standardized T-scores (M = 50, SD = 10) to give them equal weight, and then subtracting the con T-score from the pro T-score. For example, if an individuals pro scale T-score was 50 and their con scale T-score was 40, their difference score would be 10. This positive difference score predicts that the individual is in an action stage, and would engage in the particular health behaviour. The DB model assumes a linear function between the DB difference score and behaviour. The higher the DB difference score in the positive direction, the more resistant an individual's health behaviour is to socioenvironmental influences. Therefore, the more positive an individual's DB difference score, the more consistent and frequent the individual's health behaviour is predicted to be. A difference score of zero, on the other hand, indicates equivalent positive and negative thinking regarding the health behaviour. Therefore, the closer an individual's DB difference score is to the value of zero, the less resistant an individual's health behaviour is to socioenvironmental influences, and in turn, the more inconsistent his or her health behaviour is predicted to be. Finally, the lower or more negative the DB difference score, the more resistant an individual's avoidance of a particular health behaviour is to socioenvironmental influences. Therefore, the lower an individual's DB difference score, the more infrequent the health behaviour is predicted to be.

Prochaska and colleague's (1994) meta-analysis of DB did not include an examination of the relative balance of the pro and con scale scores across stage (i.e., the

DB difference score). If the DB difference score was examined across stage, Prochaska's (1994) strong and weak principals would predict that the DB difference score would increase by 1.5 standard deviations across stage. This suggests that the DB difference scores (SD = 1.5) have more variability across stage compared to the pro (SD = 1.0) or con (SD = 0.5) scale scores alone. The DB difference score considers both pro and con scales in one number. Consequently, the DB difference score, in addition to being more clinically informative, should have a greater ability to predict behaviour compared to the pro and con scale scores alone. However, the difference score combines the error variances of the pro and con scales, thereby increasing its unreliability.

DB inventories are measures of motivation; they assess individuals' perceptions of the importance of the reasons they engage or not engage in a particular health behaviour. These are the pros and cons, or benefits and costs. Most DB inventories sample a range of thoughts, and thus assess the presence or absence of overall positive and negative thinking about a particular behaviour by using pro and con scale scores (Prochaska et al., 1994). Other DB measures use balance sheets in which an individual explores and freely recalls reasons or consequences in their own words (e.g., Hall & Fong, 2003; Janis & Mann 1968). Constructs similar to DB have been included in a number of other health behaviour change models, such as "outcome expectancy" from the social cognitive theory (e.g., Willams, Anderson & Winett, 2005), or "attitude to act" from the theory of planned behaviour (e.g., Armitage & Conner, 2002).

DB measures can be useful research and clinical tools as they can further our understanding of a population's or individual's motivation for performing a target behaviour. For example, the DB difference score can serve as a clinical assessment tool for psychotherapy, or as an outcome measure for program evaluation or intervention research. In the context of individual psychotherapy, discussions of pros and cons, and their relative balance, often increase an individual's awareness of him/herself in relation to the behaviour, which can promote better problem-solving or a shift in commitment. Such an assessment can aid in treatment planning, as well. On a group level, the DB pro and con items could be useful when evaluating an intervention, or making recommendations for a specific population (e.g., policy making).

Most of the TTM theory has been developed using adult populations. Hence, we do not yet known how youth develop motivation for health behaviours, or whether the adult TTM model could be applied to understand children's health behaviours. In order for the DB model and its potential interventions to be considered valid for children and adolescents, the DB difference score's prediction validity for youth's actual health behaviour needs to be examined. Accordingly, the purpose of this dissertation will centre on the decisional balance construct for health behaviours associated with obesity among children and adolescents, namely, nutrition behaviour and physical activity. Specifically, the relationship between the decisional balance difference score and nutrition behaviour, as well as physical activity among high school, junior high, and elementary students will be examined using multiple informants: child self-report, and parent proxy.

VI. Decisional Balance among Youth

Recently, there has been a growing literature examining the application of the DB construct among adolescent health behaviour, including smoking (Chen, Horner & Percy, 2003; Elder, DeMoor, Young, Wildey, Molgaard, Golbeck et al., 1990; Hudmon, Prokhorov, Koehly, DiClemente & Gritz, 1997; Otake & Shimai, 2001; Pallonen, 1998; Pallonen, Prochaska, Velicer, Prokhorov & Smith, 1998; Pallonen, Velicer, Prochaska, Rossi, Bellis, Tsoh et al., 1998; Plummer et al., 2001; Stern, Prochaska, Velicer & Elder, 1987), sun exposure (Maddock, Rossi, Redding, Meier, Velicer & Prochaska, 1998), alcohol use (Elder et al., 1990; Maddock et al., 1998; Migneault, Pallonen & Velicer, 1997; Pallonen, Prochaska et al., 1998; Stern et al., 1987), sexual decision-making (Galavotti, Cabral & Lansky, 1995; Hanna, 1994; Hulton, 2001; Lauby, Semaan & Cohen, 1998; Semaan, Lauby, O'Connell & Cohen, 2003), exercise (Hausenblas, Nigg, Downs, Fleming & Connaughton, 2002; Nigg, 2001; Nigg & Courneya, 1998), and dietary fat reduction (Rossi et al., 2001; Rossi, Greene, Rossi, & Levesque, 2000). Similar to the adult literature, these studies evaluated the internal and external validity of the DB model among adolescents by examining it's factor structure, correlations with other TTM measures (e.g., self-efficacy), profiles across a stage of change measure (e.g., the strong and weak principals of behaviour change suggested by Prochaska and colleagues (1994), and/or relationships with self-reported behaviour. This body of literature demonstrates similar profiles and findings to those seen among adults. Exceptions to this agreement were studies that showed a 3-factor instead of 2-factor model for smoking acquisition among adolescents (i.e., a social pro scale, coping pro scale and con scale; Pallonen, 1988; Pallonen et al., 1988; Plummer et al., 2001) and sexual abstinence among virgin adolescents (i.e., an internal pro scale, and an external pro scale and con scale; Hulton, 2001). Although exceptions exist (e.g., Hausenblas et al., 2002), the literature suggests that DB measures can be applied to adolescents across a number of health behaviours. This dissertation will begin to address the issue of how young in age DB measures can be applied to obesity-related health behaviours.

Four of the 24 DB studies listed above examined DB among preadolescents as young as 11 years of age. Three of these four studies examined DB of beginning smoking (556 Japanese students in Grades 7–12, Otake & Shimai, 2001; 401 Taiwanese 11-14 year olds, Chen et al., 2003; 368 American students in Grades 5-12, Hudmon et al., 1997), and the other study examined DB of physical activity (387 American 11-15 year olds, Hausenblas et al., 2002). These studies included older children in their samples, and did not compare results across age. Nonetheless, these studies suggest that the DB measure can be completed by children as young as 11 years old (i.e., Grade 6). Clearly, more research is needed to make conclusions regarding the validity of DB among younger populations.

A. Nutrition Behaviour

Central to this dissertation is obesity related health behaviours. Of the literature examining the application of the DB construct among adolescents, a total of four studies examined nutrition behaviour or physical activity. One of these four investigations addressed self-report dietary fat reduction DB among 2639 primarily Caucasian (83%) students in Grade 9 (Mean age = 15.2, SD = 0.6) from 12 different Rhode-Island high schools (Rossi et al., 2001). Their brief, 8-item nutrition DB measure used a 5-point Likert scale to rate the importance of the pro and con items. A major strength of this study was the fact that the DB measure for dietary fat reduction was specifically designed for adolescents. Unfortunately, details regarding the development of this measure was not published (i.e., it was referenced as a manuscript in preparation). It was reported that the unpublished study validated a 2-factor model (pros and cons) among a sample of 224 Grade 9 students. Factor analytic results, including item loadings or percentage of variance accounted for by the 2-factor model, were not reported. Rossi and colleagues (2001) instead replicated the finding of the unpublished study using Structural Equation Modeling. They examined 4 competing factor models for their nutrition DB measure: an 8 factor model, a one factor model, an uncorrelated 2-factor model, and a correlated factor model. A correlated (r = -.25) 2-factor model had the best fit (Comparative Fit Index, C.F.I. > .90). Indices of fit for items on the pro and con factors were high (.53 to .77). As well, the pro and con scales showed good internal consistencies (Cronbach's α = .81 and .69, respectively).

Rossi and colleagues (2001) also confirmed theoretically predicted relationships between nutrition DB pro and con scales and stage of change among their Grade 9 participants. The stage of change measure examined the adolescent's intention to consistently avoid eating high fat foods, and whether or not the adolescent consumed less than 30 percent of their calories from fat. To measure behaviour, Rossi and colleagues used a 46-item food behaviour checklist that measured consumption foods related to adopting a lower-fat and higher fiber diet (Kristal, SeLett, Henry & Fowler, 1990). This measure was based on a well known adult food frequency questionnaire (the Block/National Cancer Institute Food Frequency Questionnaire; Block, Hartman, Dresser, Carroll, Gannon & Gardner, 1986). Rossi and colleagues (2001) found that the pros and cons of their nutrition DB measure varied across stage. The pro scale increased 0.96 SD (i.e., the strong principle) and the con scale decreased 0.35 SD (i.e., the weak principle) from precontemplation to action. DB difference scores, which can be calculated by using the published pro and con scale T-scores, were found to be negative in the precontemplation stage (-7.48), near zero in the contemplation stage (0.07), and positive in the preparation (2.09), action (5.95), and maintenance (9.69) stages. Taken together, the patterns of results among Grade 9 participants in Rossi and colleague's study (2001) are similar to those seen in the adult TTM literature. Overall, this study gives promise to future examinations of the DB model for nutrition behaviour among youth.

B. Physical Activity

Nigg and Courneya (1998) examined the relationships between DB, self-efficacy and stage of change for leisure time exercise behaviour among 819 high school students (Mean age = 15.0, $\underline{SD}$ = 1.22, range 13 - 19 years). The physical activity DB measure employed in this study was originally designed for adults (Marcus et al., 1992). Nigg and Courneya's (1998) physical activity DB measure had 10 pro items, 6 con items, and used a 5-point Likert scale for rating the importance of pro and con items. To adapt the DB measure for adolescents, changes in item wording were made, and a pilot study of 12 students was conducted. Further details regarding the adaptation of the adult physical activity DB measure for adolescents, or factor analytic statistics were not reported. The pro and con scale scores were reported to have good internal consistencies (Cronbach's α = .95 and .69, respectively).

Nigg and Courneya (1998) found that self-efficacy, i.e., confidence in choosing physical activity across a number of situations, was significantly related to the physical activity DB pro ($\underline{r} = .45$, $\underline{p} < .01$) and con ($\underline{r} = -.11$, $\underline{p} < .01$) scales in the hypothesized direction. The self-efficacy scale was adapted for adolescents from an adult physical activity self-efficacy measure by using expert opinions of one doctoral and two master's students. Further details regarding these methods were not published, however. The adult version of the physical activity self-efficacy measure has been shown to have good two week test-retest reliability among adults (r = .90; Marcus et al., 1992).

Nigg and Courneya (1998) also found that the physical activity DB pro scale, con scale and difference score (pro minus con T-scores) varied significantly across stage ($F_{4, 814}$ = 25.21, p < .05 for the difference score). As hypothesized, the DB difference score was negative for the precontemplation (-14.87), contemplation (-6.78) and preparation (-4.83) stages, near zero (2.01; i.e., no significant difference) for the action stage, and positive for the maintenance (3.36) stage. The stage of change measure examined intention to change leisure time activity. Among adults, this measure was found to have good 2-week test-retest reliability (r = .78 – .79; Courneya, 1995; Marcus, Selby, Niaura & Rossi, 1992) and external validity (i.e., was related to multiple measures of activity and fitness; Murphy, 1993). Overall, the youth profile in Nigg and Courneya's (1998) study was similar to that seen in the adult literature (i.e., the pros increased and the cons decreased across stage with a cross over at the action stage).

The second paper on physical activity DB in adolescents was a 3-year longitudinal study of adolescents from five Canadian high schools. This study followed approximately half of the participants in the study described above (Nigg & Courneya, 1998; n = 400; Mean baseline age = 14.89 years, SD = 1.15; Mean follow-up age = 17.62 years, SD = 1.18). The only difference between the participants in the follow-up study and those who did not participate in the follow-up study was participant sex (i.e., there were more females in the follow-up study, 55%, compared to those who were not participating, 44%). Nigg (2001) examined physical activity DB pro and con scale scores, as well as three levels of exercise behaviour (mild, moderate and strenuous) at a base line time (see Nigg & Courneya, 1998) and at a follow-up time, three years later. This study builds upon the first study in that it was longitudinal, and because it measured self-reported behaviour.

Nigg (2001) found that, at baseline, the pro scale was significantly related to self-reported strenuous ($r = .14$, $p < .05$) and moderate exercise ($r = .13$, $p < .05$), but not mild exercise ($r = .01$, $p < .05$). At three-year follow-up, self-reported strenuous exercise was significantly related to the baseline pro scale ($r = .14$, $p < .05$). In examining the predictive validity of the physical activity DB con scale, Nigg (2001) found that the baseline con scale was not significantly related to self-reported exercise at either time. This suggests that the pro scale is predictive of future exercise behaviour, but that the con scale is not. Interestingly, baseline self-reported strenuous exercise was significantly related to the con scale measured three years later ($r = -.17$, $p < .05$). This suggests that past self-reported behaviour predicted future con scale scores. The DB difference score was not reported in Nigg's (2001) study, and therefore could not be calculated. Therefore, it is unknown whether the DB difference score could have also predicted exercise three years later.

The main criticism of Nigg's (2001) study concerns the validity of its criterion measure, a self-report activity questionnaire: Godin's Leisure Time Exercise Questionnaire (Godin, Jobin & Bouilon, 1986; Godin & Shephard, 1985). Among adolescent samples, this measure has been shown to be reliable over time (Sallis, Buono, Roby, Micale & Nelson, 1993). As well, it displays good criterion validity against other self reports measures of activity (Sallis et al., 1993) and stages of change (Nigg & Courneya, 1998; Wyse, Mercer, Ashford, Buxton & Gleeson, 1995). However, Godin's Leisure Time Exercise Questionnaire has not been validated against an objective criterion of physical activity (i.e., non-self report), such as an activity monitor or direct observation. This point is critical because when activity monitors are compared to self-report data, there are important and meaningful differences in their estimated levels of activity (Coleman, Saelens, Wiedrich-Smith, Finn & Epstein, 1997; McMurray, Harrell, Bradley, Webb & Goodman, 1998; Sallis et al., 1993; Simons-Morton, Taylor & Huang, 1994). Usually, self-report instruments overestimate activity levels (see literature reviewed in: Pate, Long & Heath, 1994; McMurray et al., 1998; Simons-Morton et al., 1994).

The most recent publication on physical activity DB among youth examined 387 middle school students in Grades 6 through 8 (Mean age = 12.61, $\underline{SD}$ = 1.00; range 11 - 15 years; Hausenblas et al., 2002). This study used the same adult physical activity DB measure that was used in Nigg (2001) and Nigg and Courneya (1998). Hausenblas and colleague's (2002) study is unique in that it examined young adolescents and preteens. Among this population, they validated the 2-factor (i.e., pros and cons) internal structure of the physical activity DB measure using Structural Equation Modeling. They found that the correlated ($\underline{r} = .23$) 2-factor model had a good fit (Comparative Fit Index, C.F.I. > .90; Goodness of Fit Index, G.F.I. = .92). Factor analytic results, such as percent variance accounted for by the factors, were not reported.

Hausenblas and colleagues (2002) also found no significant differences in DB difference score across stage of change ($\underline{F}_{3,383} = .57$, $\underline{p} > .05$). The stage of change measure examined intention to exercise during leisure time. Exercise was defined as a physical activity, not including activity done in physical education classes that increased heart rate and caused some sweating for at least 20 minutes, three to five times per week. The authors explained the lack of significant differences between DB difference scores across stage may have been due to limited variability in the DB scores, and very low participant numbers in the pre-action stages (i.e., limited power due to 1.3% of participants in the precontemplation, 4.3% in the preparation and 6.4% in the preparation stages). In general, the literature on nutrition and physical activity DB among adolescents is very recent and limited in scope.

Most of the literature on DB among adolescents across the various health behaviours employed adult measures of DB to examine its validity. With the exception of four studies (Chen et al., 2003; Hulton, 2001; Migneault, et al., 1997; Rossi et al., 2001), most of the DB scales were originally designed for adults, with minor changes in wording or items (e.g., Marcus et al., 1992; Velicer et al., 1985; Velicer, DiClemente, Rossi & Prochaska, 1990). Chen and colleagues (2003) made alterations to the item content of their smoking acquisition DB measure by using focus groups, expert and lay person's advice, as well as pilot testing among Taiwanese pre-adolescents to generate and select appropriate DB smoking acquisition items. Migneault and colleagues (1997) used expert advice, as well as other related drinking measures (e.g., the Alcohol Expectancy Inventory; Brown, Goldman, Inn, & Anderson, 1980) to generate drinking DB items, and then used some statistical procedures (i.e., factor analysis and item endorsement variability) on a sample of adolescents who completed the measure to select their final drinking DB items. Finally, Hulton (2001) used a combination of literature reviews and interviews with consultants to generate and select appropriate items for her decisional balance scale for sexual abstinence among adolescents. One of the goals of this dissertation is to rigorously and systematically utilize these types of measure development procedures in creating appropriate and valid DB measures for youth with regards to their nutrition behaviour and physical activity.

VII. Developmental Issues

It is often necessary to make significant alterations when adapting an established psychological construct to a new population, especially when clinicians apply adult therapies to children or adolescents. Psychotherapists often refer to the idiosyncratic nature of children's experiences and psychological make-up. Wasserman (1983), for example, states that it is difficult for children to generalize cognitive behaviour therapy skills, and that these types of therapy techniques cannot be applied without first determining the child's cognitive developmental level of information processing and taking into account the youth's contextual issues. Play therapists have stated that helping youth requires revising adult counseling techniques if they are to be used with children (Landreth, Baggerly & Tyndall-Lind, 1999). Similarly, Fitzgerald (2000) supports the notion of modifying approaches with children as they proceed through stages of grieving in a similar, yet different way than approaches used adults. From a theoretical standpoint, there is a growing body of research regarding the developmental and contextual issues that are important to consider when adapting adult psychological constructs to a younger population.

A. Cognitive Development of Decision-Making

Recently, researchers have considered the development of decision-making (see review by Brynes, 2002), particularly in the study of adolescents' competence in decision-making (e.g., Klaczynski, Byrnes & Jacobs, 2001; Lewis, 1980). The decision-making process is thought to be multifaceted, that is, influenced by cognitive, affective, motivational and social-contextual factors, as well as domain and context specific (Brynes, 2002). Decision making is thought to consist of four steps: (1) goal setting (e.g., having fun with friends); (2) listing options (e.g., sports, video games, alcohol); (3) ranking options (e.g., playing sports is better than playing video games); and, (4) selecting the highest ranked option (Brynes, 2002). The decisional balance construct of the TTM is relevant to the third step of the decision-making process outlined by Brynes (2002): evaluating options through weighing pros and cons. In a review of this small body of literature, Brynes (2002) stated that there are optimal approaches to decision-making that require knowledge and experience, multidimensional thinking, and the use of effective strategies. Furthermore, he concluded that adolescents have lower decision-making competence in certain areas compared to adults (e.g., evaluation processes, adaptive goal setting), but similar levels to adults in other areas (e.g., knowledge of options). For example, research has shown that adults are more likely than 13-year olds to incorporate multiple goals in their choices (Byrnes & McClenny, 1994; Byrnes, Miller & Reynolds, 1999), but are similar to youth older than 8 years of age in their working memory ability (Brynes, 1998). The next section will examine the extent to which the literature on the development of decision-making can be generalized to health behaviour choices, such as nutrition behaviour and physical activity.

B. Health Perceptions of Youth

There is some evidence to suggest that school-aged children are thinking about and making decisions regarding their health behaviour. A collection of survey studies have shown that North American girls between the ages of 8 and 11 worry about their weight and attempt to change their health behaviours by attempting to eat less and exercise more (Gustafson-Larson & Terry, 1992; Ricciardelli, McCabe, Holt & Finemore, 2003; Wardle & Masland, 1990). The most recent study among Canadian girls (n = 2279 students from southern Ontario; age 10-14 years) revealed that approximately one third reported that they were currently trying to lose weight (McVey, Tweed & Blackmore, 2004). One study from the US found that girls as young as 6 and 7 years old worry about their weight (Hill, Oliver & Rojers, 1992). For boys, preferences for large, muscular bodies have been shown to develop between the ages of 6 and 7 years (Spitzer, Henderson & Zivian, 1999). The National Population Health Survey (1994-5) found that among 12 to 14 year old children, 14% of boys reported trying to lose weight. Using the same survey, the WHO Regional Publications (1996) reported that 22% of male Canadian students were either on a diet, or felt they needed to lose weight. Taken together, this collection of survey statistics signify that sizeable numbers of young children think about changing their weight by altering their nutrition behaviour and/or physical activity.

Decisions to change weight may not reflect a desire to improve health, however. For youth between the ages of 8 and 15, health is not an especially salient motive in comparison to cosmetic concerns (Gochman, 1986; Gochman, 1971). Nonetheless, there is a small body of research that examines how children at different ages conceptualize health. Natapoff (1982) found that when children younger than 7 or 8, or at Piaget's preoperational stage of development (Piaget, 1963; Piaget & Inhelder, 1969) were asked about health concepts, they tended to focus on current desires and goals (e.g., sensory inputs), rather than future health. After this age, children's health beliefs are thought by some researchers to begin to differentiate into a coherent system at approximately 9-11 years of age (Dielman, Leech, Becker, Roesenstock & Horvath, 1980; Gochman, 1972; Lewis, Lewis, Lorimer & Palmer, 1977; Lau & Klepper, 1988; Natapoff, 1982;), a period which closely corresponds to Piaget's (1963) concrete operational stage. At this stage, children begin to understand that disease is preventable (Lau & Klepper, 1988), and are able to formulate and carry-out a plan, such as making health decisions (Inhelder & Piaget, 1964; Michela & Contento, 1986; Palmer & Lewis, 1976). The transition into adolescence, or Piaget's formal operational thinking stage of development (i.e., above 10 or 11 years of age; Piaget, 1963), is thought by some researchers to be a critical time for learning health knowledge and skills (Edmundson, Parcel, Perry, Feldman, Smyth, Johnson et al., 1996). Adolescents at this stage of development begin having an understanding of abstractions, that is, the links between health and future (Gochman, 1986), are able to formulate multiple hypotheses about health based on realty testing (Natapoff, 1982), and are more successful in their health-related decision-making (Okwumabua, Okwumabua, Hayes & Stovall, 1994).

The findings on youth's perceptions of health and health behaviours suggest that a decisional balance measure that has many of it items focused on future health may not be valid among children and adolescents, especially those in early elementary school (i.e., grades K-3) who are primarily driven by immediate contingencies. A DB measure appropriate for youth should consider, for example, current goals and desires. This suggestion highlights the importance of designing DB measures specifically for youth, rather than simply borrowing or adapting adult DB measures.

C. Socioenvironmental Factors of Youth

Besides the cognitive and emotional factors outlined above, there are various social and environmental variables that would be important to consider when applying the DB construct to health behaviours among children and adolescents. As children grow older and begin the process of separating from their families, there are various environmental changes, such as new foods available at school, or the influence of peers and the media (Baranowski, 1997; Birch, 1980; Goldberg, Gorn & Gibson, 1978). At some point in development, children also begin to take more personal responsibility for their health behaviour. Simultaneously, parents begin to take less responsibility. Even though children share many of the same values as their parents, conflict begins to increase during adolescence (Crockett & Peterson, 1993). Little is known about how much individual variation there is among parent-child pairs for these types of transitions regarding the youth's health behaviour, or when they typically transpire.

What we do know is, healthy behaviours tend to decline and poor choices tend to increase among school-aged children and adolescents. For example, physical activity decreases, dietary fat intake increases, diabetes management behaviours decrease, and smoking increases (Arnett, 1992; Johnson, Silverstein, Rosenbloom, Carter & Cunningham, 1986; Kimm, Gerhen, Malloy, Dresser & Carol, 1990; Sallis, 2000; Saris, Elvers, Van't Hof & Binkhorst, 1986). Interestingly, with regards to nutrition behaviour, pre-school children have been shown to moderate their 24-hour food intake very well (Birch, Fisher & Grimm-Thomas, 1999). Birch and her colleagues (1991) showed that when given free access to healthy food, young children's calorie intake balanced over time to match their energy requirements (Birch, Johnson, Andresen, Peters & Schulte, 1991). Birch and Fisher (1998) concluded that a child's ability to regulate calories as they grow older is determined by socioenvironmental factors, such as parent behaviours (e.g., strategies to control what, when and how much their child eats). These socioenviromental factors negatively influence a child's food preference and his/her ability to regulate their caloric intake. Supporting this idea is the finding that adult overweight individuals report past controlling parenting behaviours regarding their eating more often than normal weight persons (Costanzo & Woody, 1985; Johnson & Birch, 1994; Satter, 1988).

In summary, when considering the pros and cons of youth's health behaviour choices, children and adolescents are likely influenced by socioenvironmental contextual issues that differ from adults, such as parental influence, peer influence, and school environment. Again, this further highlights the importance of designing DB measure items specifically for youth, rather than simply adapting adult DB measures.

D. Parent Informants

In addition to altering item content, other changes need to be considered when designing a DB measure to suit children and adolescents. One of the goals in developing psychological measures for children and adolescents regarding their motivations for health behaviour would be to consider their ability to accurately self-report. A common method in assessing children's external behaviour or internal world (i.e., their values, priorities and goals) is the use of multiple informants, such as self, parents, and teachers (Achenbach, McConaughy & Howell, 1987). Depending on the area being assessed, the informant most often used is the child's primary caregiver or parent. A parent proxy can be a valuable source of information about a child (Sprangers & Aaronson, 1992), and is often used as an alternative or compliment to a child's self-report (e.g., Ronen, Streiner, Rosenbaum & the Canadian Pediatric Epilepsy Network, 2003). Regarding the accurate assessment of a child's DB for health behaviour, such as nutrition and physical activity, parents are likely the most familiar and sensitive informants. Parents live in close proximity to their child, are often involved in buying and preparing food for their child to eat, and engage in physical activity or sedentary leisure time activities with their child.

Of course, parents and children do not always agree, especially when parents are assessing their children's internal processes, such as anxious thinking or moods, which are not concrete or directly observable (e.g., Choudhury, Pimentel & Kendall, 2003; Eiser & Morse, 2001; Rubio-Stipec, Fitzmaurice, Murphy & Walker, 2003; Yeh & Weisz, 2001). In general, research examining parent-child agreement has shown conflicting results. Some studies have found a tendency for parents to exaggerate their child's cognitive and behavioural symptoms (e.g., Frick, Silverhorn & Evans, 1994; Last, Hersen, Kazdin, Francis & Grubb, 1987; Rapee, Barrett, Dadds & Evans, 1994). Others found a tendency to underestimate their child's cognitive and behaivoural symptoms (Bellman & Paley, 1993; Bird, Gould & Staghezza, 1992; Chambers, Reid, Craig, McGrath & Finley, 1998; Edelbrock, Costello, Dulcan, Conover & Kalas, 1986; Lollar, Smits & Patterson, 1982). On the other hand, some researchers have found good concordance among child and parental reports (e.g., Ivens & Rehm, 1988; Moinpour, Donaldson, Wallace, Hiraga & Joss, 1990; Schneider & LoBiondo-Wood, 1992; Silverman, Cerny, Nelles & Burke, 1988).

The factors responsible for this inter-informant variance are poorly understood. The following factors have been hypothesized to account for inter-informant variance: the subjectivity of the domain being assessed, measurement error, the cognitive level of the child, differences in the child's behaviour across settings (e.g., home and school), social desirability response biases in children, and the difficulty parents may have in accurately perceiving their child's inner world (Bird, Gould & Staghezza, 1992; Dadds, Perrin & Yule, 1998; DiBartolo, Albano, Barlow & Heimberg, 1998; Eiser & Morse, 2001; Pina, Silverman, Saavedra & Weems, 2001; Rubio-Stipec et al., 2003).

A meta-analytic study by Achenbach and colleagues (1987) showed that, even though each informant demonstrated good reliability and validity, the average correlation coefficient ($\underline{r}$) between child's self-ratings and ratings of other informants was only .22, which estimates that parent-child concordance occurs approximately four percent of the time. As there is no gold standard to evaluate the accuracy of the informants, it is generally thought that each informant brings a unique perspective and experience to the assessment (Johnson et al., 1986; Tein, Roosa & Michaels, 1994).

VIII. Purpose of Dissertation

Using child and parent informants, this dissertation examined the application of the decisional balance construct for nutrition behaviour and physical activity among children and adolescents of three age groups (i.e., those in high school – Grade 11, junior high school – Grade 7, and elementary school – Grade 3). Grades have been presented and discussed in descending order to reflect the over arching goal of this dissertation - to address the question of the youngest age in which the DB model can be validly applied to youth.

The first goal of this dissertation was to develop appropriate self-report DB measures for nutrition and physical activity behaviours in youth. This was accomplished by using focus groups and literature searches to generate items. To select items, expert advice and various statistical procedures (e.g., factor analysis, item-total correlations) were utilized on a sample of youth who completed the measures. The second goal was to examine the newly developed child and adolescent DB measures' psychometric properties, including factor validity, internal consistency, test-retest reliability, and construct validity. The third goal was to measure, for each group (Grades 11, 7 and 3), temporal associations between the self-report DB measures and the children and adolescent's actual health behaviour during the following week using food frequency questionnaires to assess the frequency of certain food choices and accelerometers to assess their activity levels. The fourth goal was to measure for each group (Grades 11, 7 and 3), the temporal associations of parent proxy report of child DB with the children's actual health behaviour one week later. Hence, these dissertation goals were to:

(1) Develop reliable and valid DB measures for youth's nutrition behaviour and physical activity,

(2) Provide information about the youngest age in which the DB construct can be applied to youth concerning their nutrition behaviour and physical activity, and

(3) Recommend the age groups in which parent proxy DB reports could be informative when predicting nutrition behaviour and physical activity

among youth.

IX. Dissertation Hypotheses and Outline

This dissertation is exploratory in nature. Nevertheless, hypotheses are offered based on previous literature reviewed in this Chapter, and then are built upon using results found in this dissertation.

Hypothesis 1: The 2-factor, pro/con internal structure of the nutrition and physical activity DB measures will be replicated among the entire sample of children and adolescents (i.e., those in Grades 11, 7 and 3s, who were approximately 16, 12 and 8 years, respectively).

Hypothesis 2: The DB difference scores, as well as the pro and cons scales, will have acceptable psychometric properties (i.e., internal consistency, construct validity, test-retest reliability) among those in each Grade (11, 7 and 3). Standards for these acceptable psychometric properties are outlined in Chapter 2.

Hypotheses 1 and 2 are examined in Chapter 2. Chapter 2 describes the format development and item generation of the newly created nutrition and activity DB measures for youth. Chapters 3 and 4 examines the external validity of the newly developed nutrition and activity DB measures, respectively, as well as discusses the measurement issues of assessing nutrition behaviours and physical activity among youth. Finally, Chapter 5 gives a general summary of the dissertation results and limitations, suggests recommendations for future research, and comments on clinical implications.

CHAPTER 2

DECISIONAL BALANCE SCALES

Decisional balance (DB) scales measure cognitive and motivational factors that mediate future choices about a particular health behaviour. It does so by weighing the individual's relative pros and cons for engaging in the behaviour. The first and most critical phase of this dissertation was the development of appropriate, valid and reliable DB pro and con scales for children and adolescents' choices regarding their nutrition behaviour and physical activity. Construction of these DB scales was divided into the following three parts:

- I. Scale development;
- II. Item reduction; and,
- III. Evaluation of psychometric properties.

I. Scale Development

The scale development procedures involved the following four steps (Hagino, 2002; Nunnally & Bernstein, 1994; Streiner & Norman, 1995):

- A. Format development;
- B. Item generation using focus groups;
- C. Item generation using literature reviews; and,
- D. Item selection using expert advice.

A. Format Development

The format for the new DB scales was modified from existing adult measures to be suitable for children. Published adult versions of DB measures typically contain an instructional paragraph, followed by a list of pro and con statements about a particular health behaviour (Jones, Ruggiero, Edwards, Vallis, Rossi, Rossi, Green, Kelly, Prochaska & Zinman, 2001). The adult is directed to rate a list of items on a Likert scale regarding the item's importance in influencing their health behaviour decisions. For example, an adult DB measure for the consumption of high fat foods contained the following instructions:

> *"The following statements represent different opinions people have about eating foods that are high in fat. Please rate HOW IMPORTANT each statement is to you in deciding whether or not to limit the fat in your diet, according to the following 5-point scale (1 – 'not important' to 5 - 'extremely important')"* (Jones, et al., 2001).

To complete this DB measure, an individual must first be able to categorize foods that are low and high in fat. An example of an item used in this DB measure was: "I am relaxed and, therefore, more pleasant to be with when free to eat foods high in fat." It cannot be assumed that young children are able to make this judgement without more specific instructions. Hence, the instructions were broken into smaller steps. The first step in the nutrition DB measure's instructions was the categorization of the behaviour choice: nutrient-dense foods versus calorie-dense foods. Similarly, the first step in the activity

DB measure's instructions was the categorization of physical activities versus sedentary activities.

Previous research has demonstrated creative ways to describe food choices to children. For instance, Epstein and his colleagues (1985) used a traffic light concept as a component of their behavioural family treatment program for pediatric obesity (Epstein, Wing & Valoski, 1985). In their traffic light diet, foods were described in three colour groups: red, yellow, and green according to their fat gram content, percent calories from fat and sugar, and nutrient density (i.e., the amount of vitamins and minerals compared to the amount of calories). These colours corresponded to the colours of a traffic light, and signified go (green), eat as much as you like; caution (yellow), eat in moderate amounts; and stop (red), eat only occasionally. Examples of red foods included ice cream, fried foods and burgers (lowest in nutrient density, and greater than five grams of fat per serving or greater than 25% of calories from fat, or greater than 30% calories from sugar). Yellow foods included skinless chicken or baked potatoes (contain a good amount of nutrients, and have two to five grams of fat or 6 to 24% of calories from fat, or 16 to 29% calories from sugar). Green foods included fruits and vegetables (highest in nutrients, and zero to one gram of fat per serving, or less than 5% of calories from fat, or less then 15% calories from sugar). Other researchers have used similar concepts to Epstein's traffic light diet in a program called "Go for Health" with 3rd and 4th graders (Parcel, Simons-Morton, O'Hara, Baranowski & Wilson, 1989). In this school-based health prevention program, students categorized and labeled foods as 'go' (low in fat and sodium; to be consumed anytime), 'slow' (moderately high in fat and/or sodium, but rich in important other nutritients; to be consumed sometimes), and 'whoa' (high in fat and/or sodium; to be consumed only occasionally). The concept of using colours to give a visual representation of health behavioural choices to children was adopted.

For greater simplicity, only two colour concepts, blue and yellow, were used to label food and activity choices. The colour categorizes were as follows:

(1) Yellow foods: foods that are low in calories, fat or sugar, but high in nutritional value (e.g., fruits, vegetables, whole grains);

(2) Blue foods: foods that are high in calories, fat or sugar, and low in nutritional value (e.g., pastries, chips, soda);

(3) Yellow activities: activities that involve movement of the body (e.g., walking, biking); and,

(4) Blue activities: activities that involve being sedentary (e.g., watching television, reading).

Handouts were used to facilitate children's learning of the health behaviour choice categories (see Appendices 1, 2, 3 and 4). When describing the health choices to children, it was emphasized that the colour of the label did not relate to the actual colour of the foods or activities themselves, but rather the type of food or activity. To test whether children understood these colour concept categories, they were asked to categorize various examples of foods and activities using the colour categories, and to give their own examples of foods and activities for each of the colours.

One of the goals of the format development phase was to prevent, as much as possible, youth answering in a socially desirable way. Social desirability is the tendency to respond positively to interpersonal demands, present oneself in a favorable light, and/or deny weaknesses (Pina et al., 2001). Research has shown that younger children tend to respond with more social desirability biases than older children (e.g., Dadds et al., 1998; Pina, et al., 2001; Reynolds & Richmond, 1979). For example, Dadds and colleagues (1998) found that 7 to 10 year olds ($\underline{n} = 513$) had significantly higher scores on the Lie scale of the Revised Children's Manifest Anxiety Scale (Reynolds & Richmond, 1979) compared to 11 to 14 year olds ($\underline{n} = 217$). Examples of items on the Lie scale include: "I never get angry", "I like everyone I know", and "I am always kind". Differences in social desirability responses across age likely represent normal developmental changes in ability to report accurately on one's behaviour compared to ideals of behaviour. Thus far, literature within the area of the TTM among youth (e.g., self-efficacy) has not empirically addressed social desirability response biases. It is possible that social desirability is an important measurement issue for self-report assessment methods with children, especially those 10 years and younger. To help address this issue in the present research, a number of procedures were taken during the administration of the DB measures. First, yellow and blue colours were chosen to describe the behavioural options. These colours were considered less evaluative than the colours of the traffic light (e.g., red meaning stop). When administering the scales, researchers were careful to use neutral wording and tone when explaining health behaviour choices. They were cautious to not use either positive or negative feedback regarding "good" or "bad" dietary or activity habits. They used statements such as: "all foods can fit into a healthy diet", and "both activities are an important part of our daily routine".

Additional steps to adapt the adult DB directions for children included the use of interesting and visually appealing illustrations to go along with written information. The scales were formatted to read like a story book[1] with specific examples. The pages were bound to make coloured, reusable instructional DB booklets titled "The reasons I eat" and "The reasons I run, jump and play" (see Appendices 5 and 6, respectively). The first page of the DB measure reviewed the colour category concept. The second page introduced the idea that choices about food or activities are made at various times and places. Examples located at the bottom of these pages were derived from the data collected from focus groups with children (see Page 42), and represented the most highly endorsed examples. Pages 3 and 4 of the scale introduced the concept that choices are sometimes made either to do or *not* to do the health behaviour (e.g., eat a certain food, or do a certain activity). Reasons to do the behaviour were visually represented with a plus (+) icon. Reasons *not* to do the behaviour were visually represented with a minus (-) icon. On the fifth page, the concept of importance was introduced. It was pointed out that some reasons for making a choice are very important reasons, stated as "a big reason"; some reasons are somewhat important, stated as "a small reason"; and, some reasons do not affect our choices, stated as "not a reason". A "big reason" was visually represented with a large light bulb icon in a cartoon thought bubble, a "small reason" was a small light bulb icon in a thought bubble, and "not a reason" was a thought bubble with no icon inside. The last page of the DB booklet gave instructions on how to complete the measure. Participants were asked to read each item, and then to rate the item regarding how important the item is to them when they make decisions about the health behaviour (i.e., a big reason, a small reason, or not a reason).

Adult versions of DB measures use 5- to 11-point Likert scales. Previous research has shown that children in grade 5 had difficulty with understanding 5-point Likert scales, but could reliably use a 3-point scale on a physical activity self-efficacy measures (Saunders, Pate, Felton, Dowda, Weinrich, Ward et al., 1997). Hence, an additional adaptation of the DB scales for youth was a change in the scaling options, that is, the use of a 3-point Likert scale. Although using a smaller point scale may sacrifice some variance, it was judged to be necessary in order to obtain potentially meaningful self-report data from younger children (Saunders et al., 1997). Moreover, researchers have supported the view that conversions to trichotomous scales do not result in significant decrements in reliability and validity (Jacob & Mattel, 1971).

Before the next step of scale development (item generation), pilot testing of the DB instructional materials were conducted with four children and adolescents known personally to the researcher. During pilot testing of the new DB scales, participants were able to generate pros and cons using their own words for both health behaviours (i.e., nutrition and physical activity). They were also able to use the 3-point Likert scale to rate the importance of their self-generated DB items. Hence, it was decided that the new DB measures were ready to be tested among a larger sample of children and adolescents in focus group studies (see below, Page 40).

It should be noted that during this pilot study the primary researcher formed the opinion that the physical activity choice was more straightforward for younger children to learn than the food choice concept. Therefore, during the subsequent focus group and survey studies, the physical activity DB measure was introduced to participants before the nutrition behaviour DB measure. This teaching benefit was seen to override possible order effects from not counterbalancing the order of presentation.

B. Item Generation using Focus Groups

Item generation using focus groups formed the next step in the DB scale development procedure. The purpose of generating new items that differed from and expanded the available items from adult and adolescent DB measures was to capture the unique culture of childhood and adolescence (Landgraf & Abetz, 1996) with regards to their cognitions and motivations for their nutrition behaviour and physical activity choices. Focus group research assumes that knowledge can be directly obtained from the target audience, in addition to experts and existing literature (Hagino, 2002; Nunnally & Bernstein, 1994), and is thought to provide richer, more in-depth information compared to individual interviews (Krueger, 1994; 1996). The approach of this method is to gather a range of perceptions from individuals in a homogeneous group, such as similar ages, who hear the opinions of others and present their own views (Krueger, 1996). The focus groups of this study were more structured than typical focus groups. Since pro and con items were ultimately provided on an individual basis, the focus groups were similar to the nominal group technique (Elliott & Shewchuk, 2002). The purpose of the present focus group study was to generate representative and relevant DB items about youth's food and activity choices, that is, nutrient-dense versus calorie-dense foods, and physically active versus sedentary activities.

1. Methods

a. Participants and Setting

Participants were students in Grades 11, 7 and 3 from schools within the Halifax region of Nova Scotia, Canada, and their primary caregiver. A primary caregiver was defined as the parent who reported doing the majority, that is, 50% or greater of the care taking regarding the child's physical activity and nutrition. Examples of relevant care taking activities included, for example, grocery shopping, food preparation, cooking, monitoring food intake, scheduling activities for their child, driving their child to activities, or talking with their child about nutrition and physical activity. Participants for the focus groups were selected from a larger study titled, Monitoring Physical Activity Levels in Children and Youth in the Province of Nova Scotia[2] (n = 1685; Grades 11, 7 and 3; randomly selected sample of schools within the province). Participants were those who gave written permission to be contacted[3] by telephone for a future research study. A large proportion of those from the Halifax region who participated in this province-wide study gave permission to be contacted (i.e., 74%). The sample of focus group participants represent those who live in an urban area, participated in a study on physical activity, and agreed to participate in a second study about their health behaviour decision-making. Hence, the present focus group study cannot be generalized to youth who live in rural areas, or to youth who refuse to participate in research regarding their health behaviours.

All parent participants were asked to give informed consent and child participants were asked to give assent (see Appendices 7 and 8). In order to address the research questions of this dissertation, it was necessary that all participants of this dissertation were able to communicate their decision-making and health behaviour in written form, as well as have their physical activity measured using an accelerometer (see Chapter 4, which examines a different sample of participants). Students who participated in the study and had intellectual or physical disabilities identified by the teacher and/or parent were later excluded from the data analyses. Therefore, the present research can not be generalized to populations that are intellectually or physically disabled.

b. Materials and Procedure

Before the commencement of focus groups, informed assent and consent with participants and their parents were given (see Appendices 7 and 8). The forms were read out loud to the participants as a group, and sufficient time was given for participants to read and sign the forms. All materials were assigned a code number to ensure confidentiality[4].

Parents who consented were given instruction booklets (see Appendices 5 and 6) and blank DB sheets (see Appendices 9 and 10). Parents were asked to fill out the DB sheets with regards to their perceptions of *their child's* decisional balance for *their child's* food choices and physical activity. Parents were asked to leave the room to complete these measures, separate from their child. They were invited to return to the room approximately 60 minutes later when the focus group was complete.

The focus groups with youth began with an ice breaker introduction game that was intended to help participants feel comfortable about sharing information about themselves within the group. Colour concepts for the health behaviour choices were then explained and discussed using handouts (see Appendices 1 - 4). After each participant had demonstrated an understanding of the yellow and blue choices by generating their own examples verbally to the group, the instructions to the DB measure were read out loud (see Appendices 5 and 6). Fill-in-the-blank sentences were located at the bottoms of some of the pages to collect information for the final version of the DB measure (e.g., "My favorite blue foods are: _____"). After each page was read aloud, the group was given an opportunity to share some of their written answers to the fill-in-the-blank sentences. This procedure also allowed the researcher to, again, informally assess the children's understanding of the concepts presented.

The last page of the instructional booklet directed participants to write down their reasons for their food or activity choices using blank DB sheets (see Appendices 9 and 10), and then to circle the items that were most important to them, that is, their "big reasons". A script that was adapted from previous literature (Hall & Fong, 2003; Janis & Mann, 1968; Krueger, 1994) was used to prompt participants to generate DB items (see Appendix 11). After sufficient time was given to participants to produce as many items as they could on their own, they were asked to verbally share with the group items from their own DB sheet. Any DB items shared with the group were written on a poster board for others to read and discuss. Participants were instructed to add any items that had been generated from the group on their own DB sheets if they believed that those items applied to them.

After the focus group about physical activity decision-making was complete, the process was repeated for nutrition decision-making. At the end, participants were debriefed, thanked, given age-appropriate government of Canada health information about nutrition and physical activity, and served refreshments belonging to the yellow and blue food categories.

2. Analyses

The DB items that were generated by youth and their parents on the DB sheets (see Appendices 9 and 10) were reviewed by the primary researcher and a psychology undergraduate honors student from Dalhousie University. The two researchers independently organized and reworded the generated DB items from youth and their parents into the following four categories:

(1) Nutrition pros: Reasons the youth chooses yellow instead of blue foods;

(2) Nutrition cons: Reasons the youth chooses blue instead of yellow foods;

(3) Activity pros: Reasons the child chooses yellow instead of blue activities; and,

(4) Activity cons: Reasons the child chooses blue instead of yellow activities.

An effort was made to word items at a Grade 2 reading level. Items were disregarded if they were judged by the researchers to be too vague (e.g., "I don't like it", or "It is good"), too idiosyncratic (e.g., "because I am allergic", or "because I steal it from my brother"), or too value-laden (e.g., "because I am greedy"), or if the item did not describe a reason for a choice between yellow and blue category options (e.g., "because I'm hungry"). After organizing and re-wording the items, an endorsement frequency count for each item was independently calculated by each researcher. Endorsement frequencies were the number of participants who wrote about the item on their DB sheet.

Agreement between the researchers was then examined. Only those items that were listed by both researchers were included, and the exact wording of each item was agreed upon. To assess consistency between researchers, an inter-rater agreement check of the endorsement frequency data was conducted with approximately 10% of randomly selected data.

Finally, participants' written answers to the fill-in-the-blank sentences of the DB booklets were tallied to calculate the most endorsed examples, which were then used for the final DB measures (see Appendices 5 and 6).

3. Results and Discussion

Focus group participants were 45 English-speaking children from seven schools from the Halifax/Dartmouth region. A total of five focus groups were conducted in the Spring of 2002 at Dalhousie University and two at separate community locations (Dartmouth and Spryfield) in March and April of 2002. Two focus groups were conducted with third graders (n = 20), two with seventh graders (n = 12), and one with eleventh graders (n = 13). The sample sizes of the focus groups (4-12 per group) were similar to those recommended by Krueger (1994). Parent participants were 37 primary care-givers who came to the focus group with their child. Out of the 37 parent participants, 19 were parents of third graders, 11 were parents of seventh graders, and 7 were parents of eleventh graders. None of the recruited participants met the exclusion criteria of being intellectually or physically disabled. All participants demonstrated an ability to categorize various examples of foods and activities using the yellow and blue colour concepts, and to give their own examples of foods and activities for each colour.

An acceptable percent agreement of 93.5% was found between the researchers' calculated item endorsement frequency counts. Items with two or less endorsements were excluded, leaving a total of 25 items for the nutrition pro scale (see Appendix 12), 23 items for the nutrition con scale (see Appendix 13), 30 items for the activity pro scale (see Appendix 14), and 27 items for the activity con scale (see Appendix 15).

To assess the quality of the items that had been generated by focus groups and parent feedback, items were then compared to literature searches and evaluated by experts (see Sections C and D below).

C. Item Generation using Literature Searches

A second and concurrent technique for generating items for the present research's DB measures was the use of narrative literature reviews on the determinants of nutrition behaviour and physical activity among children and adolescents (Hagino, 2002; Nunnally & Bernstein, 1994; Streiner & Norman, 1995). The purpose of these literature reviews was to generate representative and relevant nutrition and activity DB items using empirical data.

1. Methods

The primary researcher searched *PsycInfo* and *Pubmed* databases for the time period of 5 years prior to and including January 2002 (i.e., 1997-2002). The following key words were used: "[determinants OR attitudes OR (decisional AND balance) OR psychosocial factors OR psychological correlates OR motivation] AND [nutrition OR food preferences OR physical fitness OR exercise] NOT treatment". Additional studies were found from reference sections of articles extracted from the literature search. Studies chosen and reviewed by the primary researcher for generating nutrition and physical activity DB pro and con items for children and adolescents met the following criteria:

(1) Were about children and/or adolescents,

(2) Appeared in English-language journals or books,

(3) Contained information about psychological determinants of eating, exercising, or both (*i.e.,* cognitions, motivations or attitudes),

(4) Were empirical studies; and,

(5) Were not simply evaluating the psychometric properties of another psychological measure, such as self-efficacy, health locus of control, self-concept, or self-esteem.

For each article chosen, a list of items that the study supported was generated and included in tables (see Appendices 16 and 17) to be used later in an item selection procedure for the development of the new DB measures. All items generated this way were then added and summarized in tables (see Appendices 12 -15) with the corresponding number of supporting articles listed beside it. These tables also compared the types of items that had been generated by the focus groups, the literature search methods, or both. To further compare the items generated by each method, items were categorized by the primary researcher into themes (see Appendices 12-15).

2. Results and Discussion

A total of 35 articles were identified: ten were about nutrition behaviour only, 19 were about physical activity only, and seven had information about both (see Appendices 16 and 17). By conducting these literature searches, 21 items were generated in addition to those items that had already been generated by the focus groups and written feedback from parents. More specifically, eight additional nutrition pro items, three additional nutrition con items, three additional activity pro items and seven additional activity con items were generated. In total, the DB questionnaires contained 33 items on the nutrition pro scale (see Appendix 12), 26 items on the nutrition con scale (see Appendix 13), 33 items on the activity pro scale (see Appendix 14), and 34 items on the activity con scale (see Appendix 15).

A large proportion of items generated by the focus groups and written parent feedback were also supported by the literature (63%). Amongst the generated items for both methods, the primary researcher identified ten thematic categories:

(1) Health: Health and safety consequences;

(2) Sensory: Immediate affective or sensory consequences;

(3) Cognitive: Cognitive consequences;

(4) Somatic: Physical or bodily consequences;

(5) Social: Social consequences;

(6) Time: Time, convenience and availability concerns;

(7) Cost: Monetary costs;

(8) Aesthetic: Concerns regarding physical appearance;

(9) Reward: A reward or celebration; and,

(10) Esteem: Performance, achievement and self-esteem concerns.

It should be noted that these themes are similar to those found in a recent focus group study that assessed youth's perceived benefits and barriers to healthful eating and physical activity (n = 213; grades 2 – 11; 34 different schools; O'Dea, 2003). O'Dea's

(2003) study was not included in the literature searches of the current study. The primary researcher of this dissertation judged there to be no major differences between themes drawn from the literature searches and themes drawn from this dissertation's focus groups. Across each of the ten thematic categories, the difference between the number of items generated by the focus group/ written parent feedback and the number of items generated by the literature searches were four or less. Of the themes in which only one method (participant feedback or literature search) had generated items in its category, only one or two items had been generated by only one method. As no major differences in item generation method were found, no items were discarded at this stage. Next, experts were asked to rate the quality of the items.

D. Item Selection using Expert Advice

Expert opinion was employed to revise and select the best 40 items (20 pros, 20 cons) from those generated by focus groups, parent feedback and the literature (DeVellis, 1991; Nunnally & Bernstein, 1994; Streiner & Norman, 1995) for the new nutrition and activity DB measures. An item number of 40 for each DB measures was chosen to minimize the administration time, yet support content validity (Hagino, 2002; Marx, Bombardier, Hogg-Johnson & Wright, 1999). This item number also assured enough power for factor analysis procedures (Tabachnick & Fidell, 1996) for a subsequent survey study that further reduced the items (see Page 51 below).

1. Methods

a. Participants

Ten experts personally known to the primary researcher were chosen to select the final DB items for the 40-item DB measures. An expert was defined as someone who directly worked with children and/or adolescents regarding their nutrition behaviour or physical activity, or someone with a Ph.D. or a Ph.D. student in the field of psychology or kinesiology. Six of the ten experts were professors in the field of clinical psychology and/or were practicing clinical psychologists (two worked in the field of child health psychology, one in adult health psychology, one in experimental psychology, one in child eating disorders, and one in kinesiology). The remaining four experts, who included two dieticians, were employed by government agencies: the Nova Scotia Sport and Recreation Commission, and the Canadian Diabetes Association, and Health Canada. As a group, the quality of these experts' knowledge was deemed acceptable by the writer as there was sufficient depth, breadth, expertise, and naïveté in terms of knowledge about nutrition and physical activity behaviour in youth.

b. Materials and Procedure

Ten experts filled out a questionnaire that asked them to review, rate and revise items that were collected from the focus group and literature search studies (see Appendices 12 – 15). First, the experts were given a copy of the nutrition and physical activity DB handouts and booklets to read (see Appendices 1-6). Second, they were instructed to use an 11-point Likert scale (with "0" meaning not at all representative and "10" meaning extremely representative) to rate each item's representativeness and relevance to children and adolescence with regards to their nutrition or activity DB. Third, the experts were asked to possibly revise each item as needed, using the following questions and prompts (taken in part from Streiner & Norman, 1995):

(1) Does the item read well? (*i.e.,* comprehensiveness, ambiguousness, clarity, length, double-barreled questioning, jargon),

(2) Is the item suitable for our youngest participants (age 8, and in grade 3)? (*i.e.,* interpretability, reading level),

(3) Is the item's content covered by another item? (*i.e.,* redundancy),

(4) Will the item likely elicit an honest response? (*i.e.,* value-laden words),

(5) Does the item appear to assess the desired qualities? (*i.e.,* face validity); and,

(6) Will the item assist policy making, clinical recommendations, etc.? (*i.e.,* relevance).

<u>2. Analysis</u>

Each item's rating was tallied and weighted to produce the top, most representative 20 pro and 20 con items for each DB measure. Those items regarded by experts as redundant or problematic were rejected or revised. It should be noted that when reviewing the chosen items, the researcher assured that the pro and con items were measuring something different from one another, rather than simply being opposite in valance.

<u>3. Results and Discussion</u>

The final list of items contained 20 pros and 20 cons for each DB measure (see items with "*" notations in Appendices 12- 15). Of these items, 37.5% were generated by focus groups only, 13.8% were generated by the literature only, and 48.8% were generated from both. More than a third of the items from the two DB measures were generated by a subsample of urban-living participants who had previously participated in a province-wide study on physical activity. The next step in the construction of new nutrition and activity DB measures for youth involved a larger, more representative sample of participants, separate from Campagna's (2002) larger study (Campagna, Ness, Murphy, Rasmussen, Thompson, Porter et al., 2002).

II. Item Reduction

To develop the final nutrition and activity DB measures for children and adolescents, five item reduction statistical procedures (DeVellis, 1991; Hagino, 2002; McConnell, Beaton & Bombardier, 1999; Nunnally & Berstein, 1994; Streiner & Norman, 1995) were sequentially conducted on a survey sample of youth, separate from the focus group participants (see Table 1, Page 78). The participants of this survey were asked to fill out the 40-item DB measures that were created above. This section describes the five, step-wise item reduction techniques. As well, the final DB measure's factor structure, descriptive statistics and grade differences are examined to facilitate investigations of the following hypotheses that were also stated in Chapter 1:

> Hypothesis 1: The 2-factor (pros and cons) internal structure of the nutrition and physical activity DB measures will be replicated among the whole sample of children and adolescents participants.
>
> Hypothesis 2: The DB difference score, as well as the pro and cons scales, will have acceptable psychometric properties, that is, internal consistency, construct

validity, test-retest reliability, among the whole sample of children and adolescents participants.

More specifically, the DB measures' factor structure, internal consistency and item themes will be examined. The other psychometric properties of the DB measures, that is, construct validity and test-retest reliability, will be examined in the next section of this chapter (see Page 86).

A. Methods

1. Participants and Setting

This study was a cohort, cross-sectional survey of school-aged children in Grades 11, 7 and 3 from the Halifax/Dartmouth region of Nova Scotia, Canada during the fall of 2003. The Dalhousie Research Ethics Board, Halifax Regional School Board, and school principals granted permission to conduct this study in classrooms. One week prior to the first classroom visit, a letter was sent to parents to inform them about the upcoming study (see Appendix 18). The letter was handed to each child in their classroom by either their teacher or the primary researcher. Along with this letter was a parent consent and participation decline form (see Appendix 19). Parents were instructed to return one of these forms to the teacher within the week. The participation decline form allowed the parent to inform the researcher that they, or their child, did not wish to participate in the study, whereas the consent form allowed parents to communicate agreement to participate. Exclusion criteria were identical to that used in the focus group study: those with intellectual or physical disabilities were included in participation, but were excluded from analyses.

2. Materials and Procedure

The first classroom visit lasted approximately 45 or 90 minutes (45 minutes if they also participated in the test-retest study, or 90 minutes if they also participated in the behavioural studies). The primary researcher, as well as two or three research assistants, were present for all classroom visits. All child participants were asked to give assent (see Appendix 20) using the same procedure that is outlined in the focus group study (see Pages 40 - 46). Research materials were handed to all children in the classroom. Children not participating in the study were instructed to simply follow along with the group's discussion, or work silently at their desks on an activity they chose, such as homework, so as to not to disturb the participants or single themselves out from the group.

After the study was introduced, the colour concepts for food choice or activity were discussed using handouts (see Appendices 1 - 4), and the DB nutrition or activity instruction booklets (see Appendices 5 and 6) were read aloud. Participants were then asked to fill out the 40-item DB scale regarding their nutrition behaviour or physical activity (see Appendix 21 or 22). Items were read out loud and participants were given time to mark their answers and ask questions. For each item, children were asked to endorse one of the four options: 'not a reason', 'a small reason', 'a big reason', or 'I don't understand'. At the bottom of each DB scale, spaces were provided for participants to include other items that might have been missing that described their decision-making.

One week later, after all the studies of this dissertation were complete (including those described in Chapters 3 and 4), students were debriefed, thanked, and given age-appropriate government of Canada health information about nutrition and physical activity. The classroom debriefing sessions were approximately 20 minutes, were educational in nature, and were about nutrition behaviour and physical activity.

B. Data Analysis

To manage and conduct statistical procedures on the survey data, DB item responses were entered into a computer software program, Statistical Package for the Social Sciences (SPSS inc., 1999), by two research assistants. To assure that the data entry among research assistants was reliable, an inter-rater agreement check was conducted with approximately 10% of randomly selected data.

A value of 0, 1 or 2 was entered when participants endorsed a DB item as not a reason, a small reason, or a big reason, respectively. Any missing data or items that were endorsed with "I don't understand" were left blank in the data base variable. To code items endorsed with the "I don't understand" option, a separate variable was created. To further examine item representativeness and assess possible missed topics in the item generation phase, additional items that were listed by participants located at the bottoms of the DB measures were included in a table.

Item Comprehensibility Ratings. The first item reduction step in the creation the final DB measures was the examination of self-reported comprehension of each item. The goal of this step was to include only those items for which most children indicated that they understood their meaning. Hence, item endorsement frequencies for the 'I don't understand' option were calculated for each item within each grade. Items were discarded if more than 20% of students within a grade indicated that they did not understand the meaning or vocabulary of a particular item.

Item Endorsement Frequencies. The purpose of the second item reduction step was to assure that each item was normally distributed and added information. Researchers have recommended that endorsement frequencies should be between 20% and 80% for items that give 2 options (McConnell et al., 1999; Streiner & Norman, 1995). Since the items of the present research give three options (i.e., not a reason, a small reason, and a big reason), items were dropped if their endorsement frequencies for the "not a reason" option was less than 10% (i.e., more than 90% of participants endorsed the item as either a small or big reason).

Item Discrimination Ability. The purpose of the third item reduction step was to assure that each item gave discriminative information about participant's responses. Therefore, item discrimination abilities were calculated for each item of the four DB scales (nutrition pro, nutrition con, activity pro and activity con scales). Discrimination ability (d_i) looks at each item in relation to the other items on the scale (Hagino, 2002; Streiner & Norman, 1995, pg 60), and is closely related to endorsement frequency. Its formula is the following: $d_i = (U_i - L_i)/ n_i$, where U_i is the number of people above the median who score positive on item i, L_i is the number of people below the median who scored positive on item i, and n_i is the number of people above the median. Items were dropped if the discrimination ability values were less than .20.

Item-total Correlations. The purpose of the fourth item reduction step was to ensure items were assessing the same construct. Therefore, Pearson's bivariate correlation coefficients were calculated for each of the items and its related DB scale total score (i.e., nutrition pro, nutrition con, activity pro and activity con scales), minus that item. An item was dropped if its item-total correlation was less than .30 (Ware, Harris, Gandek, Rogers & Reese, 1997).

Item Factor Loadings. To examine the factor structure and item loadings of the DB scale items, exploratory principal components analysis with an orthogonal rotation was computed for each the nutrition and activity DB measures. Varimax rotation is the most commonly used orthogonal rotation, and was chosen due to its ability to improve interpretability, describe and report results, and scientific utility of the solution (see Tabachnick & Fidell, 1996). Cattel's scree test was used to determine the number of factors. This is a subjective method that consists of the plotting of Eigenvalues of the observed correlation matrix against their ordinal number, and noting the point at which the plot becomes nearly horizontal. Factor loadings of each item on the resulting factors were examined to identify items that appeared to be isolated from most of the others. Items were dropped if they possessed component loadings of less than .30, or if the items were complex (i.e., theoretically inconsistent; loaded more than .30 on both factors). To determine the percent variance accounted for by each factor, a second principal components analysis was conducted using the final number of items for each DB measure. This analysis was conducted on the whole sample, and again on each grade.

Descriptive Statistics. After the five item reduction steps were completed, total scores for the pro and con scales were calculated. In order to best reflect participants' true overall scale scores, missing items within the scales were estimated using an 'item mean substitution' procedure if the number of items missing in the data set (including items where participants endorsed the "I don't understand" option) were 30% or less (Downey & King, 1998). If the percentage of items missing in the data set was more than 30%, the participant was recorded as 'non-compliant' and their data for the measure was dropped. The item mean substitution procedure replaced the omitted value with the mean for that particular item calculated across all of the respondents who provided a response for that item. This procedure is more conservative in terms of estimating internal reliabilities than the person mean substitution procedure that replaces the missing item with the mean of the responses for the other items that were answered by a particular person. It is more conservative because the item mean substitution procedure tends to underestimate the standard deviation (Downey & King, 1998).

Scale score distributions were described and their normality was tested using the Kolmogorov-Smirnov statistic (i.e., Lilliefors test; Dallal & Wilkinson, 1986; Thode, 2002). Internal consistency, which is the extent to which the items in a scale interrelate with each other, was also assessed using Cronbach's alpha (Cronbach, 1951). When evaluating internal consistency values, the following standards were used: >.9 is excellent, >.8 is good, >.7 is acceptable, >.6 is questionable, and >.5 is poor (George & Mallery, 2003).

Mean Differences between Grades. In order to calculate a DB difference score, the DB scale pro and con scale scores were converted to standardized T-scores ($\underline{M}$ = 50, $\underline{SD}$ = 10) based on the whole sample (i.e., all grades, $\underline{N}$ = 297). A T-score transformation is necessary to equate the pro and con scales, which contain differing numbers of items. As well, it permits direct comparisons of scale scores across grade levels. The DB difference score is the focus of this dissertation, and represents the relative balance of pro and con item endorsements. It is calculated by subtracting the con T-score from the pro T-score. A positive difference score on the nutrition DB measure indicates that the pro scale score outweighs the con scale score. With the nutrition DB measure, for example, a positive difference score would predict that the individual would choose nutrient-dense foods more often than calorie-dense foods. Likewise, a negative difference score on the activity DB measure would indicate that the con scale score outweighs the pro scale score. With the activity DB measure, for example, a negative difference score would predict that the individual would choose sedentary activities more often than physical activity.

To examine potential differences between grades on the DB difference, pro scale and con scale scores, three one-way analyses of variances (ANOVAs) were calculated. Levene's test was used to examine the homogeneity of variance assumptions. Games-Howell's procedure was used for post hoc difference analysis as there were unequal sample sizes between grades (Games & Howell, 1976; Games, Keselman & Rogan, 1981; Keselman & Rogan, 1977; as sited in Howell, 1997).

C. Results

Participants. Table 2 (see Page 80) displays the participant attrition rates for the entire sample and each grade. The overall response rate was 73%, which is similar to or higher than previous cross-sectional research that examined nutrition and activity DB among adolescents (e.g., response rates were 70% in Rossi et al., 2001; 47% in Hausenblas et al., 2002; and, 61% in Nigg & Courneya, 1998). The decline rate of the present study, 20.1%, was judged to be very good considering the amount of time (i.e., one week) the research required. Participants of the item reduction study were asked to either participate in a test-retest study or a behaviour study (see Table 1, Page 79). A separate, but larger, province-wide study on youth health behaviours had decline rates of approximately 58% (Campagna et al., 2002), which is the kind of response rate reported by other researchers in this area of study that have also measured behaviour (i.e., ~50%; Craig, Goldberg & Dietz, 1996; Hausenblas et al., 2002).

During the fall of 2003, a total of 15 classrooms with 407 potential participants were visited at one high school (n = 110, four Grade 11 "Physical Activity and Lifestyle" classes), one junior high school (n = 165, six Grade 7 "Health/Personal Development and Relationships" classes), and three elementary schools (n = 132, five Grade 3 regular classrooms).

Data Entry. Inter-rater reliability of the data entry was 98.7% accurate using 10% of randomly-selected data. No participants were recorded as non-compliant, i.e., no participants had 30% or more of their data missing. Out of 23, 760 data points, there was a total of 6.4% missing data on an item level (40 items per measure) across two DB measures and 297 participants. More specifically, 5.7% of the data was missing on the nutrition DB measure, and 7.1% of the data was missing from the activity DB measure. As the number of missing items was 30% or less for each measure, all missing items were estimated with the 'item mean substitution' procedure (Downey & King, 1998).

Additional Items. Less than 10% of participants gave additional reasons for their health behaviour choices at the bottom of the DB measures (see Appendix 23). For the nutrition pro scale, nine extra items were given; for the nutrition con scale, five items were given; for the activity pro scale, 13 items; and, for the activity con scale, nine items. All together, only seven out of the 36 items had endorsement frequency values greater than two. These items were similar to those generated and rejected in the item generation phase of this dissertation, that is, items generated from focus groups that were rejected because they had low endorsement rates, or were rejected by the experts. These results provide additional evidence that the DB items generated by the focus groups and literature searches were representative and comprehensive.

Item Comprehensibility Ratings. Across the 23, 760 data points on the DB measures of this study, only 39 "I don't understand" options were endorsed (four of these were from Grade 7 students, and 35 from Grade 3 students). Except for two items, the 'I don't understand' endorsements values were less than five each. For Item 7 of the nutrition pro scale ("because they are in the *Canadian Food Guide*"), ten Grade 3 students (9.7%) endorsed the "I don't understand" option. It is assumed that these ten Grade 3 students had not yet learned about the government of Canada nutrition guidelines. For Item 8 of the nutrition pro scale ("because they are comforting to eat"), ten Grade 3 students (9.7%) endorsed the 'I don't understand' option. It is concluded that these ten Grade 3 students likely did not understand the meaning of the word "comforting". As only a small percentage of students reported that they did not comprehend any one item, no items were discarded using this item reduction step (see Table 3, page 81). In other words, no item reached the criteria of >20% of participants within a grade endorsing the 'I don't understand' option.

Item Endorsement Frequencies. Item endorsement frequency values were the percentage of those who indicated 'not a reason'. The frequency values ranged from .56 to .70 for the nutrition pros, .13 to .65 for the nutrition cons, .05 to .53 for the activity pros, and .06 to .67 for the activity cons (see Table 4, Page 82). A total of five items were dropped using this item reduction step because their endorsement frequency values were less than .10, that is, more than 90% of participants endorsed these items as either a small or big reason. For the nutrition pro scale, one item met rejection criteria: Item 1 ("to be more healthy"). No items met rejection criteria on the nutrition con scale. For the activity pro scale, three items met rejection criteria: Item 1 ("to be more healthy"), Item 2 ("to be more active"), and Item 3 ("to be more fit"). For the activity con scale, two items meet rejection criteria: Item 1 ("to rest my body when it is sore, injured, or sick") and Item 2 ("to relax when I am feeling tired").

Item Discrimination Ability. Discriminant ability values range from .14 to .59 for nutrition pros, .20 to .49 for nutrition cons, .28 to .60 for activity pros, and .23 to .55 for activity cons (see Table 4, Page 82). A total of five more items from the nutrition pro scale were dropped (see Table 3, Page 81) on the basis that their discrimination ability values were less than .20: Item 2 ("to grow faster and stronger"), Item 6 ("because they are fresher"), Item 10 ("because they give me more energy for yellow activities"), Item 15 ("because my parents tell me to"), and Item 19 ("because they are around more at home").

Correlational Item Analysis. All item-total correlations for the remaining items were statistically significant ($p < 0.05$; see Table 4, Page 82). They ranged from .46 to .73 for the nutrition pros, .43 to .60 for the nutrition cons, .29 to .64 for the activity pros, and .42 to .64 for the activity cons. One item from the activity pro scale had a coefficient value of less than .30 (Item 20: "so I can get somewhere - for example, bike or walk to school"), and therefore was removed (see Table 3, Page 81) before the factor analysis step described below.

Factor Analysis of Nutrition DB. A total of 34 items (14 pros and 20 cons) went into the factor analysis of the nutrition DB measure. Two factors were retained, accounting for 27.3% of the variance. The first principal component accounted for 18.6% of the variance in the data set, and the second factor accounted for 8.7%. The two factors were clearly interpretable as the cons and pros, and were therefore named the con factor and the pro factor, respectively (see Table 5, Page 83). All but two of the 20 con items show loadings greater than .30 on the con factor only. One con item had its highest salient loading on the pro factor: Item 1 ("because I want them more - they are harder for me to resist"). The other con item had low loadings on both factors: Item 2 ("because they taste better – for example, sweet, not too sour"). Ten out of the 14 pro items showed their highest salient loadings on the pro factor. Three pro items have their highest salient loadings on the con factor: Item 12 ("because they taste better – for example, not too salty or sweet"), Item 13 ("because they will help me pay better attention in school"), and Item 14 ("they look better – for example, the colours"). One pro item had low loadings on both factors: Item 20 ("because they are around more at school"). Hence, four more items (Items 12, 13, 14 and 20) were dropped from the pro scale, and two more items (Items 1 and 2) were dropped from the con scale (see Table 3, Page 81).

When completing a second, confirmatory principal component analysis with the final nutrition items on the whole sample, two factors were again retained. Together, the pro and con factors accounted for 35.2% of the variance. The con factor accounted for 21.9% of the variance in the data set, and the pro factor accounted for 13.3%. Similar findings were found when this analysis was conducted with each grade separately. Amongst Grades 11, 7 and 3, the two factors accounted for 33.3%, 33.2%, and 38.8% of the variance, respectively. The percent variance accounted by the con factor amongst

Grades 11, 7 and 3 was 20.4%, 17.9% and 26.1%, respectively. With regards to the pro factor, the percent variance accounted for was 13.0%, 15.3% and 12.7%, respectively.

Factor Analysis of Activity DB. A total of 34 items (16 pros and 18 cons) went into the factor analysis of the activity DB measure. Together, the factors accounted for 28.8% of the variance. The first principal component accounted for 19.4% of the variance in the data set, and the second factor accounted for 9.6%. The two factors were clearly interpretable as the cons and pros, and were therefore named "the cons factor" and "the pros factor", respectively (see Table 6, Page 84). All of the con items showed salient loadings (>.30) on the con factor only. Twelve of the 16 pro items showed their highest salient loadings on the pro factor. Three pro items had their highest salient loadings on the con factor: Item 12 ("because adults tell me to"), Item 13 ("because my family does them"), and Item 14 ("because my friends do them"). One pro item showed secondary complex loadings: Item 15 ("so I don't have to be on my own too much"). Finally, one pro item had low loadings on both factors: Item 19 ("to use up calories and loose weight"). All together, five more pro items (Items 12, 13, 14, 15 and 19) were dropped (see Table 3, Page 81).

When completing a second, confirmatory principal component analysis on the final items on the whole sample, two factors were again retained. Together, the pro and con factors accounted for 30.2% of the variance. The con factor accounted for 19.4% of the variance in the data set, and the pro factor accounted for 11.0%. Similar findings were shown when this analysis was conducted with each grade separately. Amongst Grades 11, 7 and 3, the two factors accounted for 29.0%, 29.6%, and 32.2% of the variance, respectively. The percent variance accounted by the con factor amongst Grades

11, 7 and 3 was 17.6%, 19.0% and 20.0%, respectively. With regards to the pro factor, the percent variance accounted for was 11.4%, 10.6% and 12.3%, respectively.

Descriptive Statistics of the Nutrition DB Difference Score. The nutrition DB difference score had a mean raw score of .00 (SD = 11.80). The median score was .16. The distribution of scores was normally distributed (Kolmogorov-Smirnov statistic = .06, p >.05) with a skewness of -.06 and a kurtosis of -.03. The nutrition DB difference score had good internal consistency between its 28 items (α = .83, N = 297).

Descriptive Statistics of the Nutrition DB Pro Scale Score. The final nutrition pro scale consisted of ten items (see "*" on Table 5, Page 83). Hence, scores on the nutrition pro scale ranged from 0 to 20. Higher scores represent more reasons for choosing nutrient-dense over calorie-dense foods. The mean raw score was 10.0 (SD = 5.3), and the median score was 10.0. The distribution of scores was normally distributed (Kolmogorov-Smirnov statistic = .06, p >.05) with a skewness of .15 and a kurtosis of -.25. The nutrition DB pro scale had good internal consistency between its ten items (α = .86, N = 297).

Descriptive Statistics of the Nutrition DB Con Scale Score. The final nutrition con scale consisted of 18 items (see "*" on Table 5, Page 83). Scores on the nutrition con scale, therefore, ranged from 0 to 36. Higher scores represent more reasons for choosing calorie-dense over nutrient-dense foods. The mean raw score was 15.7 (SD = 7.4), and the median score was 11.00. The distribution of scores was normally distributed (Kolmogorov-Smirnov statistic = .10, p >.05) with a skewness of .28 and a kurtosis of -.40. The nutrition con scale had good internal consistency between its 18 items (α = .86, N = 297).

Descriptive Statistics of the Activity DB Difference Score. The physical activity DB difference score had a mean raw score of .00 (SD = 12.59) and a median score of -.36. The distribution had a skewness of -.04, a kurtosis of .24, and was significantly different from a normal distribution (i.e., it was not normally distributed; Kolmogorov-Smirnov statistic = .06, $p < .05$). A high concentration of the scores was in the center and tails (i.e., leptokurtic in shape). The activity difference score had good internal consistency between its 29 items ($\alpha = .86$, $N = 297$).

Descriptive Statistics of the Activity DB Pro Scale Score. The final activity pro scale consisted of 11 items (see items with a "*" notation on Table 6, Page 84). Hence, scores on the activity pro scale ranged from 0 to 22. Higher scores represent more reasons for choosing physical activities over sedentary activities. The mean raw score was 13.4 (SD = 4.3) and the median score was 13.8. The distribution of scores had a skewness of -.21 and a kurtosis of -.69. This distribution was significantly different from a normal distribution (Kolmogorov-Smirnov statistic = .06, $p < .05$). The scores were distributed more evenly along the center and tails compared to a normal curve (i.e., platykurtic or flat in shape). The activity pro scale had adequate internal consistency among its 11 items ($\alpha = .74$, $N = 297$).

Descriptive Statistics of the Activity DB Con Scale Score. The final activity con scale consisted of 18 items (see "*" on Table 6, Page 84). Scores on the activity con scale ranged from 0 to 36. Higher scores represent more reasons for choosing sedentary activities over physical activities. The mean raw score was 15.5 (SD = 7.3) and the median score was 15.0. The distribution of scores were normal (Kolmogorov-Smirnov statistic = .07, p >.05) with a skewness of .30 and a kurtosis of -.20. The activity con scale had good internal consistency between its 18 items ($\alpha = .85$, N = 297).

Effect of Grade on Nutrition DB Difference Scores. There was a main effect of grade for the nutrition DB difference score ($F_{2, 297} = 6.19$, $p < .01$; see Table 7, Page 85). Levene's tests of homogeneity of variance revealed that the population variances were homogeneous ($p > .05$). Games-Howell's post-hoc analyses indicated that Grade 3 (M = 2.78, SD = 11.94) scores were significantly different than Grade 11 (M = -3.51, SD = 10.09) scores. The main effect of the difference score across grade indicates that Grade 3s had higher pro scale T-scores relative to their con scale T-scores compared to Grade 11s. The Grade 7 difference score (M = -.11, SD = 12.14) was not significantly different from the other grades.

Effect of Grade on Nutrition DB Pro Scale Scores. There was a main effect of grade for the nutrition DB pro scale score ($F_{2, 297} = 23.41$, $p < .001$; see Table 7, Page 85). Levene's tests of homogeneity of variance revealed that the population variances were homogeneous ($p > .05$). Games-Howell's post-hoc analyses indicated that Grade 3 (M = 55.23, SD = 9.99) scores were significantly higher than Grade 11 (M = 47.46, SD = 8.60) and Grade 7 (M = 47.23, SD = 9.13) scores. In other words, Grade 3s had higher pro scale T-scores, and therefore endorse higher importance on reasons to choose nutrient-dense foods over calorie-dense foods compared to Grade 11s and 7s.

Effect of Grade on Nutrition DB Con Scale Scores. There was a significant main effect of grade for the nutrition DB con scale score ($F_{2, 297} = 7.86$, $p < .01$; see Table 7, Page 85). Levene's tests of homogeneity of variance reveal that the population variances were significantly different (i.e., heterogeneous; Levene's Statistic $_{2, 297} = 4.93$, $p < .05$).

Games-Howell's post-hoc analyses, which is designed for the case of unequal sample sizes or heterogeneity of variance (Games & Howell, 1976; Games, et al., 1981; Keselman & Rogan, 1977; as sited in Howell, 1997), indicated that Grade 3 ($\underline{M}$ = 52.45, $\underline{SD}$ = 11.34) and Grade 11 ($\underline{M}$ = 50.98, $\underline{SD}$ = 8.56) T-scores were significantly higher than Grade 7 ($\underline{M}$ = 47.34, $\underline{SD}$ = 9.02) T-scores. Hence, Grade 7s had lower con scale T-scores, and therefore endorsed lower importance on reasons to choose calorie-dense foods over nutrient-dense foods compared to Grade 11s and 3s.

Effect of Grade on Activity DB Difference Scores. One of the assumptions of an ANOVA is that the variables are normally distributed around their mean. As was described above, the distribution of the activity DB difference score was found to be leptokurtic in shape, and not normal. Howell (1997) stated that the ANOVA is a robust statistical procedure and that moderate departures from normality can have relatively minor effects (Boneau, 1960; Box, 1953, 1954; Bradley, 1964; as cited by Howell, 1997). Howell (1997) went on to say that if the largest variance is no more than four times the smallest, the ANOVA is most likely valid. When examining the activity DB difference scores across grade, it was found that the largest variance (i.e., $\underline{SD}$ = 12.21) was *not* four times larger than the smallest variance (i.e., $\underline{SD}$ = 11.62). Therefore, the following ANOVA was assumed to be valid.

There was a main effect of grade for the activity DB difference score ($\underline{F}_{2, 297}$ = 18.15, $\underline{p} < .001$, see Table 7, Page 85). Levene's tests of homogeneity of variance reveal that the population variances were homogeneous ($\underline{p} > .05$). Games-Howell's post-hoc analyses indicated that Grade 7 ($\underline{M}$ = 5.14, $\underline{SD}$ = 11.62) scores were significantly higher than Grade 3 ($\underline{M}$ = -3.40, $\underline{SD}$ = 12.03) and Grade 11 ($\underline{M}$ = -3.48, $\underline{SD}$ = 12.21) scores. In comparison to students in Grades 11 and 3, Grade 7s had higher pro scale T-scores relative to their con scale T-scores.

Effect of Grade on Activity DB Pro Scale Scores. The distribution of the activity DB pro scale score was found to be platykurtic in shape, and not normal. Upon examining the variable across grade, it was found that the largest variance (i.e., SD = 9.75) was not four times larger than the smallest variance (i.e., SD = 9.30). Therefore, the following ANOVA was assumed to be valid.

There was a main effect of grade for the activity DB pro scale score ($F_{2, 297}$ = 16.91, $p < .001$; see Table 7, Page 85). Levene's tests of homogeneity of variance reveal that the population variances are homogeneous ($p > .05$). Games-Howell's post-hoc analyses indicated that Grade 3 (M = 52.20, SD = 9.75) and Grade 7 (M = 51.64, SD = 9.40) scores were significantly higher than Grade 11 scores (M = 44.48, SD = 9.30). Hence, Grade 11s had lower pro scale T-scores, and therefore endorse lower importance on reasons to choose physical activities over sedentary activities compared to Grade 7s and 3s.

Effect of Grade on Activity DB Con Scale Scores. There was a main effect of grade for the activity DB con scale score ($F_{2, 297}$ = 29.47, $p < .001$; see Table 7, Page 85). Levene's tests of homogeneity of variance reveal that the population variances were homogeneous ($p > .05$). Games-Howell's post-hoc analyses indicated that Grade 3 (M = 55.64, SD = 10.18) scores were significantly higher than Grade 7 (M = 46.50, SD = 8.58) and Grade 11 (M = 47.96, SD = 8.53) scores. Grade 3s had higher con scale T-scores, and therefore endorsed greater importance on reasons to choose sedentary activities over physical activities compared to those in Grade 11 and 7.

D. Discussion

Diverse resources were utilized to generate items for nutrition and activity DB measures for youth. Only seven additional items with endorsement frequency values of greater than two were generated by survey participants, all of which were similar to those generated and rejected during the item generation phase of this dissertation. It is possible that separate focus groups of males and females might have generated additional items that were sex specific. This survey study, however, provided some evidence that the 40-item DB measures were representative and comprehensive in scope. Taken together, the quantitative data of this study complements the qualitative data obtained from the focus group, parent feedback, literature review and expert advice studies.

The purpose of this item reduction study was three fold. The first goal was to reduce the 40-item DB nutrition and activity DB measures by using various statistical techniques recommended by other researchers for developing health-related scales DeVellis, 1991; Hagino, 2002; McConnell, et. al., 1999; Nunnally & Berstein, 1994; Streiner & Norman, 1995). To meet this goal, a survey was conducted with 297 children and adolescents from Grades 11, 7 and 3 who completed the 40-item DB measures. Items were rejected if they were psychometrically weak, i.e., had high endorsement rates, low item discrimination abilities, low item-total correlations, or low/ complex factor loadings.

Items were categorized into themes identified by the primary researcher (see Tables 5 and 6, Pages 83 and 84) in order to compare the final DB measures to comparable measures previously used among adolescents (Marcus et al., 1992; Rossi et al., 2001). The resulting items of the nutrition DB pro scale were categorized using four themes: health (5 items), somatic (2 items), social (1 item) and aesthetic (2 items) concerns. The nutrition DB con scale consisted of items describing five themes: sensory (2 items), cognitive (3 items), somatic (2 items), social (2 items) and time (2 items) concerns. The themes of the nutrition DB pro items were broader in scope in comparison to the types of items found in Rossi and colleagues (2001) dietary fat reduction DB pro scale. In Rossi and colleagues' (2001) nutrition DB measure, all 4 of the pro items related to social concerns (e.g., "It bothers other people when I eat a lot of high fat foods). Rossi and colleagues' (2001) DB con scale consisted of 4 items related to social (2 items), sensory (1 item) and esteem (1 item) concerns. Compared to Rossi and colleagues' (2001) nutrition DB measure, the present study's measure assesses a broader scope of issues, is longer in length, and has less of an emphasis on social concerns. The Rossi and colleagues' (2001) measure also differs with regards to its targeted behaviour. Their measure assessed DB for choosing foods high in fat, versus the present study's measure, which assesses DB for choosing foods high in fat *and* sugar.

The resulting items of the final physical activity DB pro scale of this dissertation were categorized into six themes: health (1 item), cognitive (3 items), somatic (2 items), social (2 items), rewards (1 item), and esteem (2 items). The corresponding DB con scale consisted of items categorized in five themes: cognitive (3 items), physical (2 items), social (5 items), time (6 items), and esteem (2 items). The scope of these topics are similar to the types of items found in Marcus and colleagues' (1992) exercise DB measure for adults, which was later adapted for adolescents by changing the wording of items (Hausenblas et al., 2002; Nigg, 2001; Nigg & Courneya, 1998). This adapted exercise DB measure by Marcus and colleagues (1992) consists of ten pro items that were categorized by the primary research using five themes: cognitive (3 items), physical (2 items), social (1 item), aesthetics (1 item) and esteem (3 items). Its six con items were categorized into three themes: physical (3 items), social (1 item) and time (3 items). It should be noted that the items on Marcus and colleagues' (1992) exercise DB measure that were not covered in the present study's physical activity DB measure were included in the original item pool, but were later dropped due to low endorsement frequencies among the focus groups/ parent feedback (e.g., ""I would sleep more soundly if I exercised regularly"), expert advice (e.g., I would feel more comfortable with my body"), or the above statistical procedures (e.g., "At the end of the day, I am too exhausted to exercise").

Marcus and colleague's (1992) exercise DB measure also differed from the present study's physical activity DB measure with regards to its targeted behaviour. It assessed DB for exercise or leisure activity, which is conceptually different from physical activity. Exercise or leisure activity is a more of an exclusive definition: an activity that increases heart rate and causes one to break a sweat, and is done during free time, such as intramural sports (Hausenblas et al., 2002; Nigg, 2001; Nigg & Courneya, 1998). Physical activity, on the other hand, includes exercise and leisure activities, as well as all other strenuous, moderate or light activities, such as physical education classes, walking, or chores. In summary, there were both similarities and differences between the present physical activity DB measure and Marcus and colleagues' (1992) exercise DB measure.

The second goal of this survey study was to assess the hypotheses stated in Chapter 1 regarding the final DB measure's factor structure and descriptive statistics, including internal consistency. As hypothesized, the 2-factor internal structure (pros and cons) of the physical activity and nutrition behaviour DB measures were replicated among children and adolescents. These factors reflect the nature of underlying processes that affect youth's decision making about their nutrition behaviour and physical activity choices. It should be noted that items that described the advantages and disadvantages to the health behaviour were presented separately and reverse scoring was not used to offset potential response biases. These measure characteristics might have inflated the results that supported a 2-factor model.

The percentage of variance accounted for by the con factors, 21.9% and 19.4%, were higher than the percentage of variance accounted for by the pro factors, 13.3% and 11.0%, for the nutrition and activity DB measures, respectively. The higher proportion of variance accounted for by the con scales was likely due to the fact that there were more con scale items (20 items, 18 items) than pro scale items (14 items, 16 items) for both measures. It is also possible that the con factor is more important than the pro factor in understanding the underlying processes of youth's decision making about their nutrition and activity choices. This notion makes some intuitive sense to clinicians who work closely with adults on their goals to change health behaviour. Psychotherapy is often focused on changing perceptions of and problem-solving around the costs of healthy behaviours (e.g., changing perceptions of social pressure, counter conditioning, stimulus control; see description in Chapter 1, Page 8).

The resulting nutrition and activity DB pro and con factors accounted for 30.3% and 32.4% of the variance, respectively. Percent variance represents the variance of a factor relative to the variance of the items. In a "good" factor analytic study, a "high percentage of the variance of the items is accounted for by the first few factors"

(Tabachnick & Fidell, 1996, p.638). The percent variance accounted for by the 2-factor model in the present study is lower than that seen in previous research among adults. In a meta-analysis study across 12 health behaviours among adults, the pro and con components of DB measures accounted for 40% to 80% percent of the total variance (Prochaska, et al., 1994). The results of the principal components analyses of the current study suggest that there is lower percent variance accounted for by the 2-factor pro/con DB model among youth compared to adults.

The lowered percent variance observed among youth may be due to varying factor structures across age. Both the typical 2-factor model (Chen et al., 2003; Hudman et al., 1997; Otake & Shimai, 2001; Pallonen, 1998; Stern et al., 1987) and a 3-factor model has been supported for smoking DB and drinking alcohol DB among adolescents when using factor analyses (Social Pros, Coping Pros and Cons for smoking; Pallonen et al., 1998; Plummer et al., 2001; Pros, Cons-Actual, Cons-Potential for drinking; Migneault et al., 1999). Unfortunately, a similar comparison for the factor structure of nutrition or activity DB among adolescents was not available at the time of this dissertation. Previous studies among adolescents either did not report their factor analytic results (Nigg, 2001; Nigg & Courneya, 1998), or used a confirmatory technique, Structural Equation Modeling (Hausenblas et al., 2002; Rossi et al., 2001), to validate the 2-factor DB model.

Within the area of nutrition and physical activity DB measures among adults, a factor structure larger than two was supported in one study. Using a 48-item activity DB measure, Myers and Roth (1997) suggested a model containing 4 benefit factors (social, psychological, body image, and health) and 4 barrier factors (time-effort, social, physical effects, and specific obstacles). This factor structure differed from the 2-factor model supported by Marcus and colleagues (1992), who used a separate 16-item activity DB measure. The 8-factor model (Myers & Roth, 1997) might have been selected instead of the usual 2-factor model (Marcus et al., 1992) due to a larger amount of items (i.e., 48 versus 16). It is also possible that the 2-factor model is hierarchical to the 8-factor model.

In order to make more definitive conclusions about the factor structures of the new nutrition and activity DB measures for youth that were used in the current study, it will be important for future research to replicate the present factor analytic study across varying ages. The factor analyses in the current study only utilized child self-reports of DB due to the fact that there were not enough parent participants to conduct factor analyses on their proxy data. Future research might also consider replicating the factor analysis study using parent proxy reports, as well. It should also be noted that the next step in this line of research would be to administer the final 28-item and 29-item nutrition and activity DB measures for subsequent factor analyses, rather than the 40-item measures that were administered in the present study.

Comparisons of internal consistencies with previous research on DB measures among adolescents were also made. The final DB pro and cons scales of the present study had better internal consistency coefficients (Cronbach's α's were at and above .69) compared to those reported in previous studies (Nigg & Courneya, 1998; Rossi et al., 2001). The Cronbach's α's of the present research fell in the acceptable and good ranges (George & Mallery, 2003), and were .86, .86, .74, and .85 for the nutrition pro scale, nutrition con scale, activity pro scale and activity con scale scores, respectively.

The items of the two original 40-item DB measures were reduced to produce the final 11-item physical activity pro scale, 18-item physical activity con scale, 10-item nutrition pro scale, and 18-item nutrition con scale. The unequal number of pro and con items for the final DB measures did not affect the DB difference score, which represents the relative balance of pro and con item endorsements. To equate the pro and con scale scores for the DB difference score, scale scores were transformed into standardized T-scores to make them equivalent.

Overall, more pro items were rejected than con items. The pro items were rejected for a variety of reasons. For the nutrition DB pro scale, five items were dropped due to low item-discrimination ability, five loaded on the con scale, and one had a high endorsement frequency. For the activity DB pro scale, four items were dropped because they loaded on the con scale, three items had high endorsement frequencies, and one had low item-total correlations. The majority of the dropped pro items (11/19) were categorized into the health and social themes (see Tables 4 and 5, Pages 82 and 83). Many of the pro items that concerned health (6/12) had high endorsement rates (>90%), and were therefore dropped. Hence, most youth reported choosing the "healthy" options, that is, nutrient-dense foods and physical activities, for health reasons. The pro items under the social theme (e.g., "because adults tell me to", and "my friends do them") were dropped because they had high factor loadings on the con scale (3/5), or had high factor loadings on both the pro and con scale (1/5). In other words, the dropped items about the social benefits for choosing the "healthy" behaviours went better with social benefits for choosing the "*unhealthy*" behaviours (i.e., calorie-dense foods, sedentary activities). Along the same lines, similarly worded items with a social concern theme (e.g., "because my family does them") were not dropped from the con scale, suggesting that items about social benefits or pressures went better with reasons to choose the "*unhealthy*" behaviours. In summary, more pro items were dropped compared to con items, largely because of two reasons. First, most youth indicated that they choose "healthy" behaviours because of health concerns, and therefore these types of items did not discriminate between participants. Second, items about social concerns loaded on the con factor. Youth indicated social pressures to choose the "unhealthy" behaviours, as opposed to the "healthy" behaviours.

The third goal of this study was to examine grade differences among the final nutrition and activity DB difference, pro scale and con scale scores. These data were used as normative data for subsequent experimental studies that used a smaller subsample (see Chapters 3 and 4), approximately one half of the survey study's 297 participants. Examining grade differences between DB scale scores also helped to address possible social desirability response biases among younger participants.

If younger participants, the third graders, were responding in a social desirable way, one would expect that their pro scale scores would be high and that their con scale scores would be low for both behavioural domains. However, participants in Grade 3 tended to endorse more items in general. They had significantly higher pro *and* con scale scores compared to the other grades for both behaviour domains. If Grade 3 students were responding in a socially desirable way, one would also expect that their DB difference scores would be higher than the other grades for both health behaviours. In fact, Grade 3 DB difference scores were only higher for the nutrition DB measure (3 > 11), and not the activity DB measure. Given these data, a social desirability response bias might have been minimized among the younger participants when completing the DB measures.

The difference scores of the nutrition and activity DB measures differed significantly across grade. Nutrition DB difference scores were significantly higher among students in Grade 3 than those in Grade 11. Activity DB difference scores were significantly higher among those in Grade 7 compared to students in Grades 11 and 3. Hypotheses about how the DB measures would predict behaviour were not made at this stage due to the fact that the construct validity and test-retest reliability of the newly developed DB measures were not yet examined. The last section of this chapter evaluates the psychometric properties, and then states additional hypotheses that are later tested in Chapters 3 and 4.

Table 1.

Number of Participants for Each Dissertation Study

	Number of Youth Participant (Number of Parent Participants)			
	All Grades	**Grade 11**	**Grade 7**	**Grade 3**
		Sample 1		
Focus group study, Page 40	45	13	12	20
(Parent participants)	(37)	(7)	(11)	(19)
		Sample 2		
Item reduction study, Page 51	297	75	119	103
Construct validity study, Page 86	297	75	119	103
		(Sample 2 Split into Two Subsamples)		
		Subsample a		
Test-retest reliability study, Page 99	110	15	58	37
		Subsample b		
Behaviour studies				
Nutrition behaviour study, Page 116	148	46	49	53
(Parent participants)	(147)	(44)	(51)	(52)
Physical activity study, Page 144	149	45	47	57
(Parent participants)	(142)	(42)	(50)	(50)

Table 2.

Participant Attrition Rates for Each Dissertation Study

	All Grades	Grade 11	Grade 7	Grade 3
Item Reduction Study	**Number of students enrolled in class**			
	407	110	165	132
	Attrition number			
Declined	82	22	34	25
Absent on first visit	28	13	12	3
Excluded (mental disability)	0	0	0	1
	No. of participants in item reduction study (% females)			
	297 (48.6%)	75 (48.0%)	119 (51.3%)	103 (46.1%)
Test Re-test Study	**No. of students chosen for test re-test reliability study**			
	114	16	58	40
	Attrition number			
Absent on second visit	4	1	0	3
	No. or participants in test re-test reliability study (% females)			
	110 (48.2%)	15 (53.3%)	58 (50.0%)	37 (43.2%)
Behaviour Studies	**Number of students chosen for behaviour studies**			
	183	59	61	63
	Attrition number			
Absent on second visit	11	7	3	1
	No. of participants in behaviour studies			
	172	52	58	62
Nutrition behaviour study	**Attrition number**			
Non-compliance with FFQ	18	3	8	
FFQ error (missing data)	6	3	1	2
	No. of participants in nutrition study (% females)			
	148 (48.6%)	46 (47.8%)	49 (49.0%)	53 (49.1%)
Physical activity study	**Attrition number**			
Accelerometer loss	7	5	0	2
Accelerometer error	7	2	3	2
Non-compliance with accelerometer	9	0	8	1
	Participants in activity study (% females)			
	149 (50.3%)	45 (46.7%)	47 (53.2%)	57 (49.1%)

Table 3.

Item Reduction Steps Used on the Nutrition and Activity DB Scales

	Number of Items					
	Nutrition DB			Physical Activity DB		
	Pro	Con	Total	Pro	Con	Total
Before the reduction steps:	20	20	40	20	20	40
After each reduction step:						
Comprehensibility	20	20	40	20	20	40
Endorsement Frequency	19	20	39	17	18	35
Discrimination Ability	14	20	34	17	18	35
Item Correlations	14	20	34	16	18	34
Factor Analysis	10	18	28	11	18	29

Table 4.

Item Endorsement Values, Discrimination Values and Item-total Correlation Coefficients for DB Pro and Con Scale Items

	Nutrition DB						**Activity DB**					
	Pros			**Cons**			**Pros**			**Cons**		
	E	**D**	**I**	**E**	**D**	**I**	**E**	**D**	**I**	**E**	**D**	**I**
Item												
1	**5.6**			19.1	0.34	0.54	**5.2**			**7.4**		
2	10.2	**0.14**		13.1	0.23	0.45	**4.9**			**5.6**		
3	16.0	0.23	0.58	30.0	0.43	0.54	**4.6**			58.4	0.54	0.55
4	22.2	0.31	0.64	43.1	0.45	0.54	23.6	0.42	0.43	60.9	0.41	0.46
5	28.3	0.43	0.60	37.8	0.38	0.53	22.6	0.42	0.46	50.2	0.55	0.61
6	14.1	**0.16**		55.4	0.41	0.46	10.0	0.33	0.57	47.5	0.55	0.57
7	50.5	0.59	0.62	33.2	0.37	0.49	33.0	0.35	0.29	23.1	0.40	0.48
8	19.4	0.28	0.65	41.1	0.49	0.57	10.3	0.28	0.40	17.2	0.36	0.51
9	47.7	0.58	0.64	37.6	0.40	0.56	15.2	0.34	0.37	20.6	0.33	0.47
10	13.5	**0.18**		28.0	0.37	0.54	12.2	0.32	0.42	21.3	0.44	0.49
11	31.9	0.50	0.63	14.3	0.22	0.41	20.2	0.39	0.49	21.3	0.28	0.39
12	30.8	0.31	0.50	13.2	0.20	0.45	40.2	0.47	0.41	57.0	0.37	0.47
13	40.4	0.59	0.70	60.3	0.43	0.48	52.8	0.38	0.41	46.5	0.42	0.45
14	57.1	0.36	0.46	65.1	0.38	0.44	30.4	0.30	0.32	59.4	0.45	0.50
15	26.9	**0.14**		61.4	0.41	0.46	32.2	0.50	0.53	57.3	0.47	0.53
16	69.7	0.27	0.44	37.8	0.49	0.55	21.0	0.50	0.61	38.5	0.55	0.57
17	26.5	0.30	0.52	32.1	0.36	0.54	35.2	0.60	0.59	17.4	0.23	0.40
18	34.5	0.53	0.71	50.9	0.43	0.51	30.0	0.39	0.35	17.8	0.32	0.49
19	22.7	**0.17**		37.4	0.46	0.55	34.3	0.32	0.35	49.1	0.55	0.58
20	63.1	0.32	0.49	49.0	0.46	0.52	14.9	0.26	**0.27**	66.5	0.48	0.55

Note. E = percentage of participants who endorsed "not a reason"; D = discrimination ability value; and, I = Item-total correlation (r)
Bold numbers represent values that did not meet criteria for item inclusion

Table 5.

Pattern Matrix of the Nutrition DB Items

Item		Factor 1 "Con"	Factor 2 "Pro"
	I choose yellow foods over blue foods...		
1	to be more healthy *(a)*		
2	to grow faster and stronger *(a)*		
3	*because they have more fiber, vitamins and nutrients in them *(a)*	0.00	.410
4	*because they have less fat or sugar in them *(a)*	.104	.339
5	*because they have less bad chemicals in them *(a)*	0.00	.489
6	because they are fresher *(a)*		
7	*because they are in the *Canadian Food Guide (a)*	0.00	.442
8	*because they are not as bad for my teeth *(a)*	.196	.351
9	*because they do not make me feel sleepy after eating them *(d)*	-.223	.467
10	because they give me more energy for yellow activities *(d)*		
11	*because they do not feel heavy in my stomach *(d)*	.104	.495
12	because they taste better (For example: not too salty or sweet) *(b)*	**.463**	.205
13	because they will help me pay better attention for school *(c)*	**.498**	.251
14	because they look better (For example, the colours) *(b)*	**.419**	.155
15	because my parents tell me to *(e)*		
16	*because my friends eat them *(e)*	.191	.606
17	*because they will not make me gain as much weight *(h)*	0.00	.663
18	*because they are better for my skin *(h)*	0.00	.469
19	because they are around more at home *(f)*		
20	because they are around more at school (For example, the cafeteria) *(f)*	.208	**.228**
	I choose blue foods over yellow foods...		
1	because I want them more (they are hard for me to resist) *(b)*	.230	**.489**
2	because they taste better (For example, sweet, not too sour) *(b)*	**0.00**	.272
3	*because they give me more instant or quick energy *(d)*	.616	0.00
4	*because they fill me up better *(d)*	.507	0.00
5	*because they feel better in my mouth (For example, cold, crunchy, sticky) *(b)*	.693	-.116
6	*because they look better (For example, the package) *(b)*	.652	-.170
7	*because eating them passes the time away when I am bored *(c)*	.444	.174
8	*because they are comforting to eat *(c)*	.490	.186
9	*because they are fun to eat *(c)*	.391	.268
10	*because they are a reward or treat *(i)*	.488	0.00
11	*because I am at a special event (For example, a holiday party) *(i)*	.337	.123
12	*because they are offered to me as a gift (For example, candy at Easter or Halloween) *(i)*	.547	0.00
13	*because my friends eat them *(e)*	.531	0.00
14	*because my parents eat them *(e)*	.554	0.00
15	*because they cost less to buy *(g)*	.557	.131
16	*because it is a habit for me to eat blue foods *(f)*	.658	-.215
17	*because they are easier and faster to make/pack (For example, are packaged) *(f)*	.320	.243
18	*because they are around more at home *(f)*	.499	-.138
19	*because they are around more at school (For example, vending machines, or the cafeteria) *(f)*	.583	.203
20	*because they do not go stale, moldy or rotten as fast *(g)*	.575	.166
	Percent variance accounted for with the first factor analysis:	**18.6**	**8.7**
	Percent variance accounted for with the second factor analysis:	**21.9**	**13.3**

* = Items chosen for the final DB physical activity scale; note. a-j are theme categories: a=health, b=sensory, c=cognitive, d=somatic, e=social, f=time, g=cost, h=aesthetic, i=reward, j=esteem

Table 6.

Pattern Matrix of the Activity DB Items

Item		Factor 1 "Con"	Factor 2 "Pro"
	I choose yellow activities over blue activities...		
1	to be more healthy *(a)*		
2	to be more active *(a)*		
3	to be more fit (For example, to be stronger, or more flexible) *(a)*		
4	*to use up my energy when I feel hyper *(d)*	0.00	.386
5	*to give me energy, so I will not feel tired *(d)*	0.00	.558
6	*to work hard and prove that I did it *(j)*	0.00	.658
7	*to win a prize *(i)*	0.00	.370
8	*so I can be outdoors and get fresh air *(a)*	.177	.362
9	*because they are more fun *(c)*	-.238	.479
10	*for the excitement I will feel *(c)*	0.00	.536
11	*to let out my stress, or deal with things that are bothering me *(c)*	.108	.535
12	Because adults tell me to (For example, a parent, coach, or teacher) *(e)*	**.457**	**.214**
13	because my family does them *(e)*	**.494**	**.283**
14	because my friends do them *(e)*	**.448**	**0.00**
15	so that I will not have to be on my own too much *(e)*	**.434**	.446
16	*because I want to be part of a group (For example, a team) *(e)*	.218	.622
17	*so that people think of me as "an athlete" *(e)*	0.00	.626
18	*because I like to compete and win against others this way *(j)*	0.00	.392
19	to use up calories and loose weight *(h)*	.186	**.209**
20	so I can get somewhere (For example, bike or walk to school) *(f)*		
	I choose blue activities over yellow activities...		
1	to rest my body when it is sore, injured, or sick *(a)*		
2	to relax when I am feeling tired *(d)*		
3	*because I do not like playing rough *(d)*	.591	.108
4	*because I do not want to get too sweaty or hot *(d)*	.491	-.123
5	*because they are easier for me to do *(j)*	.684	-.102
6	*because they are more fun *(c)*	.637	-.150
7	*to learn more, or collect information (For example, magazines or the internet) *(c)*	.457	0.00
8	*to practice and get better (For example, at a video game, or a quiz at school) *(j)*	.489	.169
9	*so I can have quiet time to think *(c)*	.397	.195
10	*because they are things I can do by myself *(f)*	.504	0.00
11	*to talk or chat with others (For example, the phone, email, or ICQ) *(e)*	.365	0.00
12	*because my family does them *(e)*	.526	0.00
13	*because my friends do them *(e)*	.546	0.00
14	*because it is the cool thing to do *(e)*	.541	.137
15	*because yellow activities are not open to everyone *(e)*	.569	.138
16	*because they come more naturally to me (they are a habit) *(f)*	.658	-.227
17	*because they are better to do when the weather is bad *(f)*	.343	0.00
18	*because I can do them whenever I want *(f)*	.503	-.196
19	*because there is no place I can go and do yellow activities (For example, skating park or gym) *(f)*	.579	.192
20	*because I do not have the equipment or money I need to do yellow activities *(g)*	.576	.169
	Percent variance accounted for with first factor analysis:	**19.2**	**9.6**
	Percent variance accounted for with second factor analysis:	**19.4**	**11.0**

* Items chosen for the final DB physical activity scale; note. a-j are theme categories: a=health, b=sensory, c=cognitive, d=physical, e=social, f=time, g=cost, h=aesthetic, i=reward, j=esteem.

Table 7.

Mean Differences of the Final DB Measures' T-scores across Grade

Scale	Grade	M	SD	F	
Final Nutrition DB Measure					
Difference Score	11	-3.51	10.09	6.19**	3 > 11
(Pro – Con T-Score)	7	-0.11	12.14		
	3	2.78	11.94		
Pro Scale T-Score	11	47.46	8.60	23.41***	3 > 11, 7
	7	47.23	9.13		
	3	55.23	9.99		
Con Scale T-Score	11	50.98	8.56	7.86***	3, 11 > 7
	7	47.34	9.02		
	3	52.45	11.34		
Final Activity DB Measure					
Difference Score	11	-3.48	12.21	18.15***	7 > 3, 11
(Pro – Con T-Score)	7	5.14	11.62		
	3	2.78	11.94		
Pro Scale T-Score	11	44.48	9.30	16.92***	3, 7 > 11
	7	51.64	9.40		
	3	52.20	9.75		
Con Scale T-Score	11	47.96	8.53	29.47***	3 > 11, 7
	7	46.50	8.58		
	3	55.64	10.18		

*= p < .05, **= p < .01, and *** = p < .001

III. Psychometric Properties

Thus far, various sources were utilized to generate and select appropriate items for the newly developed DB measures regarding nutrition behaviour and physical activity for children and adolescents. Information was gathered from the target audience and their parents, the current literature, professionals, and original empirical data. The purpose of this section is to further address the second hypothesis stated in Chapter 1 regarding the psychometric properties of the DB measures. The hypothesis stated that each DB scale score (i.e., difference, pro scale and con scale scores) would have acceptable psychometrics across Grades 11, 7 and 3. This section is divided into two parts:

- A. Construct validity; and,
- B. Test-retest reliability.

A. Construct Validity

Construct validity data gives information about the nature of a newly developed scale. It is typically evaluated by empirically measuring its association with a previously established, valid, and reliable scale designed to measure a construct that is similar in concept to the newly developed scale (Anastasi & Urbina, 1988). This correlational data give clues whether or not the new scale is a duplication (i.e., the new scale and the established scale have a high correlation of .8 or greater, and therefore measure the same construct), or is simply measuring an orthogonal variable (i.e., the new scale and the established scale do not have a significant correlation). These types of evaluations are also sometimes referred to as "criterion-related validity".

The TTM consists of the following constructs: stages of change, decisional balance, self-efficacy, barriers/temptations, and processes of change. To date, there are two published TTM measures that were specifically designed for children's nutrition behaviour and physical activity: nutrition self efficacy and activity self-efficacy (Edmundson et al., 1996; Parcel et al., 1989; Saunders et al., 1997). Because of their availability and acceptable psychometric properties, the present study evaluated the newly developed final DB measures against these two corresponding self-efficacy measures.

Self-efficacy scales originate from Bandura's self-efficacy theory (1977, 1982), and measure a person's confidence in performing a specific behaviour in a specific context at a specific time (usually immediately). Self-efficacy is a similar construct to DB in that it is a cognitive-behavioural measure of motivation that mediates readiness to change. Like DB scales, self-efficacy scales infer how an individual might move from pre-action stages of change (i.e., precontemplation, contemplation) towards a behaviourally active stage of change (i.e., action, maintenance). The mechanisms of movement that these constructs describe, however, differ. Therefore, self-efficacy and DB constructs are related, but theoretically separate ideas.

In theory, the DB difference and pro scale scores should be positively related to self-efficacy, and the DB con scale score should be negatively related to self-efficacy. Among the available nutrition and activity DB literature, only one study reported correlations between DB and self-efficacy scales. Nigg and Courneya (1998) found significant, moderate and positive correlations between self-efficacy and DB pro scale scores ($r = .45$, $p < .01$), and significant, weak and negative correlations between self-efficacy and DB con scale scores ($r = -.11$, $p < .01$) for adolescent exercise behaviour. Therefore, it is hypothesized that the newly developed, final DB measures will have significant, moderate and positive correlations between the self-efficacy and its difference and pro scale score, and significant, moderate and negative correlations between self-efficacy and its DB con scale for nutrition and activity among Grades 11, 7 and 3.

1. Methods

a. Participants and Setting

Participants were the same 297 children and youth from schools in the Halifax region in Nova Scotia, Canada, in Grades 11, 7 and 3 as those described in the item reduction (see Table 1, Page 79). Approximately half of these students also participated in a test-retest study one week later.

b. Measures

Nutrition Self-efficacy Scale. One self-efficacy measure for dietary behaviour for children as young as those in Grade 3 was found in the literature (Edmundson et al., 1996; Parcel et al., 1989). This 16-item scale asked children whether they could choose foods lower in fat and sodium most of the time in a variety of scenarios. It has been shown to have good internal consistency between its items (Cronbach's alpha of .83; Edmundson, et al., 1996). Participants were asked to answer questions regarding their self-efficacy for choosing foods low in fat and sodium over foods high in fat and sodium over a number of situations using a 3-point Likert Scale (0 = not sure, 1 = a little sure, and 2 = very sure; see Appendix 23). Scores ranged from 0 to 36, with higher scores representing more self-efficacy for choosing nutrient-dense foods (i.e., foods low in sodium and fat) over calorie-dense foods (i.e., foods high in sodium and fat).

Activity Self-efficacy Scale. The physical activity self-efficacy measure used in the present study was taken from an exercise self-efficacy measure used in previous research with children as young as those in Grade 3 (Edmundson et al., 1996; Parcel et al., 1989; Saunders, et al., 1997). This measure was originally adapted from an adult measures (Reynolds, Killen, Bryson, Maron, Taylor, MacCoby, et al., 1990; Sallis, Simons-Morton, Stone, Corbin, Epstein, Faucette et al., 1992) for fifth grade students who were primarily African American and from rural areas of the US (Saunders et al., 1997). The measure was shown to have good internal consistency (Cronbach's alpha = .54 - .71) and good one-week test-retest reliability (Pearson's r correlations = .61 - .82; Saunders et al., 1997). As well, the activity self-efficacy measure correlated significantly with intention to exercise, and self-reported after-school activity (Saunders et al., 1997). For consistency and ease of administration, the activity self-efficacy instructions were modified to include the yellow and blue colour concepts (see Appendix 24). Participants were asked to answer questions regarding their confidence in choosing yellow activities over blue ones in a number of situations using a 3-point Likert Scale (0 = not sure, 1 = a little sure, and 2 = very sure). Scores ranged from 0 to 34, with higher scores representing more self-efficacy for choosing active over sedentary activities.

Nutrition and Activity DB Difference, Pro Scale, Con Scale Scores. The final DB measures used for this study were identical to those utilized in the item reduction study described above (i.e., the same, original 40-item measures; see Appendices 21 and 22). However, only the selected, final 28- and 29-items for the nutrition and activity DB measures (see Tables 5 and 6, Pages 83 and 84), respectively, were used in the calculations of scale scores and analyses. The methods of calculating the final DB pro and con scale T-scores, as well as the DB difference scores, were identical to those described in the item reduction section (see Page 58).

c. Procedure

Child and adolescent participants completed the self-efficacy measures for nutrition and physical activity choices during the fist classroom visit, immediately following their completion of the corresponding DB measures (see Page 54). Similar to the administration of the DB measures, the self-efficacy measures were also read aloud. To examine test-retest reliability of the self-efficacy measures, approximately half of the participants (i.e., those who participated in the test-retest study described above; see Table 1, Page 79) completed the self-efficacy measures one week later.

2. Data Analysis

Descriptive Statistics for the Self-efficacy Scale. In order to best reflect participants' true overall scale scores, total scores for the nutrition and activity self-efficacy scales were calculated by prorating for missing data (i.e., the same item mean substitution procedure as that used to calculate DB scale scores, see Page 57). To examine the quality of the self-efficacy measures, scale score distributions, internal consistencies using Cronbach's α, and one-week test-retest reliabilities were assessed.

Mean Differences between Grades. Grade differences were examined to help identify possible issues with social desirability response biases. To examine grade differences, the same procedures that were used to examine the DB scales were used to examine the self-efficacy measures (i.e., one-way ANOVAs, see Page 59).

Correlations Between TTM Measures. To examine the degree to which the DB difference score, pro scale and con scale scores converged with self-efficacy scores, bivariate Pearson's r correlations were calculated for the whole sample and each grade.

3. Results

Descriptive Statistics of Nutrition Self-efficacy. The mean of the nutrition self-efficacy scale scores across all grades was 19.19 (SD = 6.58) and the median was 20.0. The distribution of scores were normally distributed (Kolmogorov-Smirnov statistic = .07, $p > .05$) with a skewness of -.37 and a kurtosis of -.36. In this sample, the nutrition self-efficacy scale had good reliability between its 15 items ($\alpha = .82$, $N = 297$; George & Mallery, 2003). One week test-retest reliability for the nutrition self-efficacy measure was also found to be good ($r = 0.77$, $n = 110$; Landgraf & Abetz, 1996; Aday, 1996). The means and standard deviations of this measure for each grade are shown in Table 8 (see Page 97).

Descriptive Statistics of Activity Self-efficacy. The mean of the physical activity self-efficacy scale scores across all grades was 23.18 (SD = 6.62, range = 4 to 34). The median was 24.0. The distribution of scores were normally distributed (Kolmogorov-Smirnov statistic = .07, $p > .05$) with a skewness of -.48 and a kurtosis of .27. The physical activity self-efficacy scale had good reliability between its 17 items ($\alpha = .86$, $N = 297$; George & Mallery, 2003). One week test-retest reliability was moderate ($r = .69$, $n = 110$; Landgraf & Abetz, 1996; Aday, 1996). The means and standard deviations of the activity self-efficacy scale scores for each grade are shown in Table 8 (see Page 97).

Effect of Grade on Nutrition Self-efficacy. There was a main effect of grade for the nutrition self-efficacy measure ($F_{2, 297} = 7.06$, $p < .01$; see Table 8, Page 97). Levene's tests of homogeneity of variance revealed that the population variances were homogeneous ($p > .05$). Games-Howell's post-hoc analyses indicated that Grade 7 self-efficacy scores ($M = 20.40$, $SD = 6.83$) scores were significantly different than Grade 3 scores ($M = 17.21$, $SD = 6.86$). The main effect of the self-efficacy score across grade indicates that Grade 7s reported more confidence to choose foods low in fat and sodium over foods high in fat and sodium during a number of situations compared to Grade 3s. The Grade 11 self-efficacy score ($M = 19.86$, $SD = 5.10$) was not significantly different from the other grades.

Effect of Grade on Activity Self-efficacy. There was a main effect of grade for the activity self-efficacy measure ($F_{2, 297} = 5.18$, $p < .01$; see Table 8, Page 97). Levene's tests of homogeneity of variance revealed that the population variances were homogeneous ($p > .05$). Games-Howell's post-hoc analyses indicated that Grade 7 self-efficacy scores ($M = 24.26$, $SD = 6.02$) scores were significantly different than Grade 3 scores ($M = 21.49$, $SD. = 7.49$). The main effect of the self-efficacy score across grade indicates that Grade 7s reported more confidence to choose active over sedentary activities compared to Grade 3s. The Grade 11 self-efficacy score ($M = 23.71$, $SD = 5.91$) was not significantly different from the other grades.

Correlations for Nutrition TTM Measures. There were significant, weak and positive correlations between the self-efficacy and DB pro scale for nutrition combining all grades (see Table 9, Page 98). The negative correlation between the self-efficacy and

DB con scale, however, was not statistically significant combining all grades. A similar pattern of results were seen for the correlations within each grade.

Correlations for Activity TTM Measures. Regarding the physical activity TTM measures, there were significant, moderate and positive correlations between the self-efficacy and DB difference and pro scale scores and significant, weak and negative correlations between the self-efficacy and DB con scale scores combining all grades (see Table 9, Page 98). A similar pattern of significant correlations was seen for correlations in Grades 11 and 7, but not Grade 3.

4. Discussion

Similar to previous literature, the nutrition and activity self-efficacy measures had acceptable psychometric properties in the present study. The internal consistency coefficient of the nutrition self-efficacy measure fell in the Good range ($\alpha = .82$), and was comparable to a previous study ($\alpha = .83$; Edmundson, et al., 1996). The nutrition self-efficacy measure also had good one-week test-retest reliability. With regards to the activity self-efficacy measure, its internal consistency coefficient also fell in the Good range ($\alpha = .86$), and was an improvement from previous research ($\alpha = .54 - .71$; Saunders et al., 1997). Finally, the activity self-efficacy measure's test-retest reliability fell in the Moderate range ($r = .69$) and was comparable to a previous study ($r = .61 - .82$; Saunders et al., 1997).

A secondary goal of this study was to assess possible social desirability response biases among younger participants by calculating grade differences among the self-efficacy measures. If younger participants, such as those in Grade 3, were responding in a social desirable way, one would expect their self-efficacy scores to be higher in the positive direction compared to students in Grades 7 and 11. In fact, Grade 3 self-efficacy scores were the lowest, significantly lower than Grade 7 students, in both behaviour domains. For these reasons, social desirability response biases were likely minimized in the present study for both TTM measures: self-efficacy and decisional balance.

As hypothesized, there were significant, moderate and positive correlations between nutrition self-efficacy and nutrition DB difference and pro scale scores across the entire sample, as well as in Grades 11 and 7. Among Grade 3 participants, there was the expected significant and positive correlation between the nutrition self-efficacy and DB pro scale score, but there was no significant correlation between the nutrition self-efficacy and DB difference score. Taken together, these data suggest that the nutrition DB difference and pro scale scores measure constructs in a similar area, but are not redundant with the self-efficacy nutrition scale among Grade 11s and 7s (i.e., showed good construct validity). The nutrition DB difference score and the nutrition self-efficacy measure did not have acceptable construct validity amongst students in Grade 3, however.

Contrary to what was hypothesized, there was no significant correlations between the self-efficacy and DB con scales in the combined sample, nor in each grade. These data suggest that the construct validity of the nutrition DB con scale score and/ or the nutrition self-efficacy measure is low. The low construct validity coefficients observed with the nutrition DB con scale may be due to the fact that the nutrition self-efficacy measure categorizes food choice in a slightly different way than the nutrition DB measure. The nutrition self-efficacy measure examines choosing foods lower in fat and *sodium*, whereas the nutrition DB measure examines choosing foods that are lower in fat and *sugar*. Youth's confidence to choose foods low in sodium and fat may have an independent impact on their reasons to choose foods low in sugar and fat. Validity of a measure assumes reliability (Anastasia & Urbina, 1988). Therefore, further examination of the nutrition DB con scale's one week test-retest reliability may help shed some light on this issue (see below, Page 99).

As hypothesized, there were significant, moderate and positive correlations between the activity self-efficacy and the activity DB difference and pro scale scores consistent across grades and the combined sample of participants. As well, there were significant, moderate and negative correlations between activity self-efficacy and activity DB con scale scores across the entire sample, as well as Grades 11 and 7. The correlation between the activity self-efficacy and activity DB con scale scores among Grade 3s, however, was not significant. Taken together, these data suggest that the final DB child activity measure assesses a construct in the same general area as the self-efficacy activity scale, and is not a redundant cognitive-behavioural measure of motivational readiness within the TTM among Grade 11s and 7s. The activity DB con scale score and the activity self-efficacy measure did not have acceptable construct validity amongst students in Grade 3. These results suggest that the activity self-efficacy and/or activity DB con scale are orthogonal constructs among Grade 3s.

In summary, the final nutrition and activity DB scores had good construct validity coefficients among Grade 11s and 7s. Among Grade 3s, however, there were low construct validity coefficients with some of the DB scale scores for both behavioural domains: the nutrition DB difference and con scale score, and activity DB con scale score. Further examination of the DB scores' temporal stability and measurement error, that is, one week test-retest reliabilities, will allow further discussions about these low construct validity coefficients among Grade 3 participants (see below, Page 99).

Table 8.

Mean Differences of the Self-Efficacy Measures across Grade

	Grade	Mean	S.D.	F	
Measure					
Nutrition self-efficacy	11	19.86	5.10	7.06**	7 > 3
	7	20.40	6.83		
	3	17.21	6.86		
Activity self-efficacy	11	23.71	5.91	5.18**	7 > 3
	7	24.26	6.02		
	3	21.49	7.49		

*= p < .05, and **= p < .01

Table 9.

Partial Correlation Matrix of the DB and Self-efficacy Measures

Decisional Balance	Self-Efficacy: All Grades M (SD)	r	Grade 11 M (SD)	r	Grade 7 M (SD)	r	Grade 3 M (SD)	r
Nutrition								
Difference score	19.19 (6.58)	0.15**	19.86 (5.10)	0.28*	20.40 (6.83)	0.26**	17.21 (6.86)	0.07
Pro scale score		0.12*		0.26*		0.23*		0.21*
Con scale score		-0.06		-0.08		-0.12		0.10
Activity								
Difference score	23.18 (6.62)	0.52**	23.71 (5.91)	0.57**	24.26 (6.02)	0.60**	21.49 (7.49)	0.39**
Pro scale score		0.36**		0.44**		0.34**		0.46**
Con scale score		-0.29**		-0.36**		-0.46**		-0.03

*$p < .05$, **$p < .01$

B. Test-retest reliability

Measurement error refers to variance in scores due to random or irrelevant factors that are outside of the construct that the scale is designed to measure. Such factors could include an uncontrolled environmental change (e.g., a change in administrator, or the weather), a lack of understanding of the materials (e.g., cognitive development; Landgraf & Abetz, 1996), and/or an unrelated physical or psychological change within the participant (e.g., tired, anxious). Temporal stability and measurement error of a scale is assessed by administering the scale to a group of participants on two occasions with uniform testing conditions, and then calculating test-retest reliability correlation coefficients to assess their relationship. Test-retest reliability coefficients range between a value of 0 and 1. Coefficients closer to 1 indicate that the scale score is measuring the same thing on two separate occasions, and the variability can likely be attributed to a true shift in the construct in which the scale is designed to measure (Anastasi & Urbina, 1988). A coefficient closer to 0, however, indicates that the variability is due largely to measurement error. This section describes the test-retest reliabilities of the final nutrition and activity DB difference, pro scale and con scale scores among children and adolescents in Grades 11, 7 and 3. To help reduce error variance and to isolate only short term, random changes of the DB measures, re-administration times occurred one week apart.

Amongst previous literature on nutrition and physical activity DB scales, only one study was identified that examined test-retest reliability. On a sample of 143 adults, Myers and Roth (1997) found a 2-week test-retest reliability coefficient of .88 for an exercise benefits scale, and .68 for an exercise barriers scale. Standards of good test-retest reliability coefficients on a group level are indicated to be between .50 and .75 (Aday, 1996; Landgraf & Abetz, 1996). Therefore, among children and adolescents in Grades 11, 7 and 3, test-retest reliabilities greater than .50 (i.e., as a minimum criterion) were expected for the nutrition and activity DB measures.

1. Methods

a. Participants

Participants for the present test-retest study were a subsample of youth from the item reduction study described above (see Table 1, Page 79). Grade 11, 7 and 3 classrooms from the item reduction study were randomly selected by the primary researcher by picking two options from a hat: the test-retest reliability or the criterion validity study (see Chapters 3 and 4). Hence, participants were approximately half of the children and youth from the first classroom visit of the item reduction study.

b. Materials and Procedure

Child and adolescent participants completed the identical nutrition and physical activity DB measures as they did during the first classroom visit (see Page 54) one week later. Identical administration procedures were used for each visit. Debriefing to the participants of this study was conducted at the end of the second classroom visit, after all the studies were complete.

2. Data Analysis

The methods of calculating the final DB difference, pro scale and con scale T-scores were identical to those used in the item reduction and construct validity studies (i.e., the final nutrition and activity DB measures had 28- and 29-items, respectively). Within each grade (11, 7 and 3) and for the entire sample, separate Pearson's bivariate correlation coefficients were calculated for the first and second classroom visit for the following DB scale scores: nutrition DB difference score, nutrition DB pro scale score, nutrition DB con scale score, activity DB difference score, activity DB pro scale score, and activity DB con scale score.

3. Results

Participants were 110 children and adolescents from Grade 11 (n = 15; 53.3% females), Grade 7 (n = 58; 50.0% females), and Grade 3 (n = 37; 43.2% females). Test-retest reliability coefficients for the DB scales were between .56 and .79 for the combined sample, between .77 and .90 for students in Grade 11, between .64 and .80 for students in Grade 7, and between .26 and .81 for students in Grade 3 (see Table 10, Page 108). Two test-retest reliability coefficients fell below the .50 standard: the Grade 3 nutrition DB difference (r = .26) and pro (r = .39) scale scores.

4. Discussion

As was hypothesized, the test-retest reliability coefficients for all DB scores among participants in Grades 11 and 7 meet the criterion of being greater than .50. Hence, for the later grades, the final DB measures had acceptable temporal stabilities, and therefore can be generalized over a week's time. Among Grade 3 students, the nutrition DB con scale score, but not the DB pro scale and difference scores, had acceptable one-week test-retest reliabilities. These results provide a possible explanation for the low construct validity observed among Grade 3s for the nutrition DB difference and con scale scores (see Table 9, Page 98).

There was one possible environmental influence that could have caused the Grade 3 nutrition DB difference and pro scale scores to fluctuate when completing it a second time. The occurrence of a holiday might have selectively influenced the nutrition behaviour of participants in Grade 3, but not Grade 7 or 11. Halloween day (Friday, October 31st, 2002) occurred 6 days before the first classroom visit with Grade 3 students. Data collection occurred from October 9th to 17th for Grade 11s, October 21st to 31st for Grade 7s, and November 5th to 15th for Grade 3s during the 2002 school year. Compared to the other grades, more calorie-dense foods may have been available to Grade 3 students due to Halloween traditions, such as trick-or-treating, that is, children collecting candy from neighboring homes. The availability of the calorie-dense foods was likely lower for the Grade 3s when they completed the measure a second time, one week later. This environmental factor might have caused the Grade 3 participants' theories about their motivations for eating nutrient- and calorie-dense foods, and hence, their DB difference scores to change over the duration of a week. It is possible that Grade 3 nutrition DB difference scores are temporally stable over a week during other times of the year. Therefore, this study needs to be replicated with better control over variations in environmental influences such as Halloween or other holidays.

Grade 3 participants showed acceptable temporal stability coefficients for all of the scores of the activity DB measure. This result suggests that children in Grade 3 who are approximately 8 years of age were reliable at reporting their motivations for choosing physical or sedentary activities, but were not reliable at reporting their reasons for choosing certain foods. The low temporal stability of the nutrition DB difference score among Grade 3 students might have, instead, been due to their unique cognitive style. When it comes to decisions about food, children in Grade 3 may be more "in the moment" or impulsive compared to older students. The idea that children in Grade 3 engage in less deliberated thought about their health behaviour than older children is consistent with previous research. Natapoff (1982) found that children younger than 7 or 8 tended to focus on current desires and goals (e.g., sensory inputs), rather than future health. As well, younger children are known to have higher levels of impulsivity and emotionality, which may limit the extent to which future-oriented strategies get actualized in reflective decision-making (Brynes, 1998; Brynes, 2002; Klaczynski et al., 2001). For example, children may jump to the first urgent option that comes to mind before remembering prior consequences or important future goals. In the item reduction study (see Table 7, Page 85), children in Grade 3 had higher pro scale and con scale scores compared to the older grades. In other words, they endorsed more items on each scale compared to the older grades. A higher level of impulsivity among Grade 3s might explain these high endorsement rates, as well as their inconsistent responses.

The acceptable test-retest reliability coefficients that were observed among Grade 3s for the activity DB scale scores suggest that the low construct validity coefficients among Grade 3s for the activity DB con scale score (see Table 9, Page 98) was not due to the score's low test-retest reliability. The relevance of the items and the individual's responses affect the validity of a scale. Developmental appropriateness of the DB items can be examined at a micro- and macro-level (Landgraf & Abetz, 1996). At a micro-level, it seems that the items are representative of children in Grade 3 as they were generated from diverse sources of information, including other students in Grade 3. However, at a macro-level, the concepts of DB or self-efficacy may not fully apply to children as young as Grade 3, or may apply to them in different ways.

Individual characteristics that might affect the degree to which health behaviour decisions are guided by immediate versus future-oriented consequences, such as impulsivity or emotional control (Brynes, 1998, 2002), are likely to vary with age and to affect the temporal stability of a DB measure. DB is a state, rather than a trait construct. As a person's behaviour fluctuates over time, he or she is predicted to move dynamically through the stages of change (i.e., cycle through the stages, moving in both directions; Norman, Velicer, Fava & Prochaska, 1998). DB measures are designed to detect this change. Adults show more consistent, differentiated and strategic behaviour (Klayman, 1985; Davidson, 1991a, 1991b), use more analytical processing (Klaczynski, 2001), and report more future-oriented consequences (Halpern-Felsher & Cauffman, 2001; Lewis, 1981; although see Quadrel, Fischhoff & Davis, 1993, who failed to find such differences) in decision making compared to children. For a child whose health behaviour is highly guided by immediate sensory or environmental contingencies, one would expect that his or her behaviour and DB scores would fluctuate, perhaps within a month, week, or even a day. For example, conversations about the study topic might have resulted in adults sharing their advice or attitudes about health behaviours. Grade 3 children might have been more susceptible to parent or teacher influences compared to students in older grades. On the other hand, for an older student whose health behaviour is guided more by future-oriented thinking or planning (e.g., long term time perspective; Hall & Fong, 2003), one would expect that his or her behaviour and DB scores would be more stable over time. It might be that the relevancy of the DB measure (i.e., its "shelf-life") decreases with lower age. If this is the case, the low test-retest reliability coefficients among Grade 3 students might indicate that the nutrition DB measure is valid during a period of less than a week for this age group.

The item content, or the percentage of items that refer to short versus long term consequences (Hall & Fong, 2003) might affect the temporal stability of the DB measure. The test-retest reliability of DB items that assess long term consequences is likely to be less susceptible to environmental changes. In contrast, the temporal stability of items that assess short term consequences is likely to be more susceptible to changes in sensory or environmental factors. If a large percentage of items in a DB measure concern short term consequences, one would expect the measure to have lower temporal stability than if it had a larger percentage of its items dedicated to long-term consequences.

When examining the item content of the DB measures (see Table 11, Page 109), 50.0% of the items of the nutrition DB measure and 41.4% of the items of the physical activity DB measure referred to a short term consequence. A consequence was labeled "short term" if it described a benefit or cost that occurs immediately or within a day (e.g., sensory factors). The item was labeled as "long-term" if it described a benefit or cost that occurs beyond 24 hours. Compared to the physical activity DB measure, the nutrition DB measure had 8.6% more short term items. Consequently, the nutrition DB measure may be valid during a shorter time period compared to the physical activity measure. The results of this dissertation support this idea among Grade 3 participants. Among Grade 3 students, only the physical activity and not the nutrition DB scores had acceptable test-retest reliability coefficients.

In contrast to other adolescent DB measures for nutrition and physical activity, none of the items in Rossi and colleages' (2001) dietary fat reduction DB measure and

63% of the items of Marcus and colleague's (1992) exercise DB measure (Hausenblas, et al., 2002; Nigg, 2001; Nigg & Courneya, 1998) concerned long-term consequences. Interestingly, the measures that were specifically designed for youth (current study & Rossi et al., 2001) had more items dedicated to short-term consequences compared to the adapted adult measure (Hausenblas, et al., 2002; Nigg, 2001; Nigg & Courneya, 1998). The greater proportions of items dedicated to long-term consequences among adults compared to youth is consistent with previous research showing that adults report more future-oriented consequences in decision making compared to children (Halpern-Felsher & Cauffman, 2001; Lewis, 1981).

Research that replicates the current dissertation's test-retest reliability study during shorter periods of time (e.g., 3 days and 1 day) is needed to better understand the temporal stability of DB measures among children who are 8 years old. Future research might also consider examining possible mediating variables of DB temporal stability, such as individual differences between emotional control and impulsivity. As well, future research might also consider controlling for proportions of DB items that consider immediate versus future consequences to better understand the temporal stability of DB measures across age groups.

The percentages of "short-term" versus "long-term" items (see Tables 11 and 12, Pages 109 and 110) in each of the DB pro and con scales in the present study are supported by a previous intervention study with university students who generated their own lists of pros and cons for exercising (Hall & Fong, 2003). Similar to the results of the present study, the university students generated more immediate costs of exercising (e.g., embarrassment) than immediate benefits of excising, as well as more long term benefits of exercising (e.g., better health) than long-term costs of exercising. In the present study, the pro scales of both DB measures had fewer "short-term" items compared to the con scales (see Tables 11 and 12, Pages 109 and 110). With regards to the nutrition DB measure of the present study, 20.0% of the pro scale items compared to 66.7% of the con scale items assessed short-term consequences, a difference of 46.7%. Similarly, the activity DB measure of the present study had 27.3% of its pro scale items and 50.0% of its con scale items as those assessing short term consequences, a difference of 22.7%. The perception that health behaviours are costly in the short term, but beneficial in the long-term illustrates why healthy behaviours are usually more difficult to perform compared to unhealthy behaviours, especially if one has a short-term time perspective. In fact, one of the interventions of Hall and Fong's (2003) study was to help participants adopt a longer term time perspective.

In summary, the low test-retest reliability and construct validity coefficients that were found among Grade 3 participants for their nutrition DB difference score, as well as the low construct validity coefficient seen among Grade 3 participants for their activity DB con scale score may suggest that the DB model is not valid among participants as young as Grade 3. Therefore, caution will be taken when interpreting the external validity data generated by the final DB measures among Grade 3 participants in Chapters 3 and 4.

Table 10.

Test-retest Reliability Coefficients of DB Scales across Grade

Decisional Balance (Cronbach's Alpha)	Time 1 M	SD	Time 2 M	SD	r	
			Nutrition			
Difference Score						
All Grades (.86)	-5.67	7.72	-4.93	7.65	0.56	p < .0001
Grade 11 (.85)	-7.76	6.59	-6.08	5.92	0.76	p < .01
Grade 7 (.83)	-5.18	7.86	-5.11	8.00	0.72	p < .0001
Grade 3 (.89)	-4.71	8.09	-4.19	8.09	**0.26**	**p > .05**
Pro Scale Score						
All Grades (.86)	9.97	5.33	10.86	5.36	0.72	p < .0001
Grade 11 (.82)	8.62	4.58	10.86	3.51	0.77	p < .01
Grade 7 (.86)	8.50	4.86	8.92	5.36	0.79	p < .0001
Grade 3 (.84)	12.76	5.32	13.92	4.55	**0.39**	**p > .05**
Con Scale Score						
All Grades (.86)	15.66	7.43	15.78	7.63	0.65	p < .0001
Grade 11 (.82)	16.38	6.36	16.94	6.86	0.88	p < .0001
Grade 7 (.84)	13.68	6.70	14.03	7.14	0.64	p < .0001
Grade 3 (.90)	17.48	8.42	18.12	8.14	0.54	p < .001
			Activity			
Difference Score						
All Grades (.83)	-2.09	7.70	-2.99	7.22	0.79	p < .0001
Grade 11 (.79)	-5.38	7.75	-3.03	7.21	0.92	p < .0001
Grade 7 (.82)	0.00	6.07	1.14	6.89	0.72	p < .0001
Grade 3 (.83)	-6.71	6.65	-5.28	7.53	0.67	p < .0001
Pro Scale Score						
All Grades (.74)	9.97	5.33	10.86	5.36	0.72	p < .0001
Grade 11 (.69)	10.99	4.03	11.31	3.72	0.83	p < .0001
Grade 7 (.72)	14.09	4.07	11.63	4.85	0.69	p < .0001
Grade 3 (.74)	14.33	4.22	12.7	5.48	0.66	p < .0001
Con Scale Score						
All Grades (.85)	15.66	7.43	15.78	7.63	0.65	p < .0001
Grade 11 (.84)	14.01	6.25	16.69	8.25	0.90	p < .0001
Grade 7 (.84)	12.94	6.28	11.59	5.94	0.80	p < .0001
Grade 3 (.84)	19.64	7.46	19.41	7.71	0.81	p < .0001

Table 11.

Final Nutrition DB Items

		Consequence Type
	I choose yellow foods over blue foods because...	
1	they have more fiber, vitamins and nutrients in them *(a)*	Long term
2	they have less fat or sugar in them *(a)*	Long term
3	they have less bad chemicals in them *(a)*	Long term
4	they are in the *Canadian Food Guide (a)*	Long term
5	they are not as bad for my teeth *(a)*	Long term
6	they do not make me feel sleepy after eating them *(d)*	Short term
7	they do not feel heavy in my stomach *(d)*	Short term
8	my friends eat them *(e)*	Both
9	they will not make me gain as much weight *(h)*	Long term
10	they are better for my skin *(h)*	Long term
	I choose blue foods over yellow foods because...	
1	they give me more instant or quick energy *(d)*	Short term
2	they fill me up better *(d)*	Short term
3	they feel better in my mouth (For example, cold, crunchy, sticky) *(b)*	Short term
4	they look better (For example, the package) *(b)*	Short term
5	eating them passes the time away when I am bored *(c)*	Short term
6	they are comforting to eat *(c)*	Short term
7	they are fun to eat *(c)*	Short term
8	they are a reward or treat *(i)*	Short term
9	I am at a special event (For example, a holiday party) *(i)*	Both
10	they are offered to me as a gift (For example, candy at Easter or Halloween) *(i)*	Both
11	my friends eat them *(e)*	Both
12	my parents eat them *(e)*	Both
13	they cost less to buy *(g)*	Long term
14	it is a habit for me to eat blue foods *(f)*	Short term
15	they are easier and faster to make/pack (For example, are packaged) *(f)*	Short term
16	they are around more at home *(f)*	Short term
17	they are around more at school (For example, vending machines, or the cafeteria) *(f)*	Short term
18	they do not go stale, moldy or rotten as fast *(g)*	Both

Note: a-j are theme categories: a=health, b=sensory, c=cognitive, d=somatic, e=social, f=time, g=cost, h=aesthetic, i=reward, j=esteem

Table 12.

Final Activity DB Measure

		Consequence Type
	I choose yellow activities over blue activities…	
1	to use up my energy when I feel hyper *(d)*	Short term
2	to give me energy, so I will not feel tired *(d)*	Both
3	to work hard and prove that I did it *(j)*	Long term
4	to win a prize *(i)*	Long term
5	so I can be outdoors and get fresh air *(a)*	Long term
6	because they are more fun *(c)*	Short term
7	for the excitement I will feel *(c)*	Short term
8	to let out my stress, or deal with things that are bothering me *(c)*	Both
9	because I want to be part of a group (For example, a team) *(e)*	Long term
10	so that people think of me as "an athlete" *(e)*	Long term
11	because I like to compete and win against others this way *(j)*	Long term
	I choose blue activities over yellow activities…	
1	because I do not like playing rough *(d)*	Both
2	because I do not want to get too sweaty or hot *(d)*	Short term
3	because they are easier for me to do *(j)*	Both
4	because they are more fun *(c)*	Short term
5	to learn more, or collect information (For example, magazines or the internet) *(c)*	Long term
6	to practice and get better (For example, at a video game, or a quiz at school) *(j)*	Long term
7	so I can have quiet time to think *(c)*	Both
8	because they are things I can do by myself *(f)*	Short term
9	to talk or chat with others (For example, the phone, email, or ICQ) *(e)*	Both
10	because my family does them *(e)*	Both
11	because my friends do them *(e)*	Both
12	because it is the cool thing to do *(e)*	Long term
13	because yellow activities are not open to everyone *(e)*	Short term
14	because they come more naturally to me (they are a habit) *(f)*	Short term
15	because they are better to do when the weather is bad *(f)*	Short term
16	because I can do them whenever I want *(f)*	Short term
17	because there is no place I can go and do yellow activities (For example, skating park or gym) *(f)*	Short term
18	because I do not have the equipment or money I need to do yellow activities *(g)*	Short term

Note. a-j are theme categories: a=health, b=sensory, c=cognitive, d=somatic, e=social, f=time, g=cost, h=aesthetic, i=reward, j=esteem

IV. Summary of Chapter 2

Two decisional balance (DB) scales were designed to measure children and adolescents' strength of motivation for choosing: (1) foods that are nutrient-dense instead of foods that are calorie-dense; and, (2) activities that are physically active instead of activities that are sedentary. Content validity was built into the DB scales from the outset because they were grounded in psychological theory. The scales were based on the DB construct of the transtheoretical model (TTM) where DB is conceptualized as an individual's insight into the reasons (i.e., pros and cons) he or she engages in a particular health behaviour, as well as the perceived importance he or she places on each of those reasons.

When developing the format for the child DB scales, the tasks needed to complete the adult DB scales were broken into simpler steps appropriate for children. The DB scales were formatted to read like a story book with illustrations and examples to demonstrate the categorization of the health behaviours (eating nutrient-dense and calorie-dense foods; and, doing active and sedentary activities) using neutral colours (yellow and blue), the concept of choice in various situations, and degrees of importance. As well, the Likert-scales were reduced from 5 and 11-point Likert scales to a 3-point scale.

To gather appropriate and representative qualitative data for the DB scale items, five focus groups with children, parent feedback, scientific literature, and expert advice where utilized. Many resources were used to provide a representative sample of the typical reasons (pros and cons) children and adolescents choose nutrient-dense and calorie-dense foods to eat, and physically active and sedentary things to do. A sizeable proportion (63%) of items generated by the present study's focus groups was also found in prior literature, further suggesting the representativeness and relevance of the DB items.

Empirical item analysis was used to select the best items for the DB measures. Two hundred and ninety seven children and adolescents completed 40-item child health DB scales. Five statistical techniques were used to choose the best items: item comprehensibility ratings, item endorsement frequencies, item discrimination ability, item-total correlations, and item factor loadings. The nutrition and activity DB pro and con scale scores had good internal consistencies. In addition, the resulting 29-item nutrition and 28-item activity DB scales showed a 2-factor, pro/con structure, accounting for 30.3% of the variance for nutrition behaviour, and 32.4% of the variance for physical activity, respectively. These low percent variances imply there are no genuine common factors in the newly developed DB measures. This is not surprising given the fact that DB measures function somewhat like a checklist. The pro and con scales are designed to detect individual differences by capturing a range of pros and cons that do not necessary go up and down together as a group. The fundamental assumption of a factor analysis is that there are at least 2 items that go up and down together.

Amongst 110 child and adolescent participants, the nutrition DB measures showed acceptable test-retest reliability coefficients for participants in Grades 7 and 11, but unacceptable test-retest reliability coefficients for participants in Grade 3. For the physical activity DB measure, acceptable test-retest reliabilities were shown for all grades. Therefore, subsequent construct and predictive validity assessments among Grade 3 students using the final nutrition DB measure were interpreted with caution.

To evaluate the construct validity of the final DB measures, the difference, pro scale and con scale scores among 297 children and adolescents were compared to the only available child TTM measure for nutrition and activity, self-efficacy. For the nutrition DB measure, there were significant, weak and positive correlations between the self-efficacy and DB difference and pro scale scores across participants in Grades 11 and 7. The finding that the construct validity of the nutrition DB difference and pro scale score was low among children in Grade 3 is understood within the context of the low test-retest reliabilities for these scores among this age group. The correlations between self-efficacy and nutrition DB con scale scores, however, were not significant for all grades. In other words, the construct validity of the nutrition DB con scale score or the nutrition self-efficacy score were low across all grades. This result also indicates that the nutrition self-efficacy measure has little overlap with the nutrition DB con scale score, but is significantly related to the nutrition DB difference score and pro scale score. The fact that the nutrition self-efficacy scale categorizes food choice in a slightly different way than the nutrition DB scale might explain why the nutrition DB con scale had low construct validity, but the nutrition DB difference and pro scale score had adequate construct validity. Future research might consider examining the overlap between the nutrition DB scales with a self-efficacy measure that assesses confidence in choosing nutrient-dense foods, should one become available.

Within the activity domain, there were significant, moderate and positive correlations between the self-efficacy and activity DB difference and pro scale scores, and significant, weak and negative correlations between the self-efficacy and activity DB con scale score for participants in Grades 11 and 7. Overall, for students in Grades 11 and 7, the final DB measure assessed a construct in a similar area as the corresponding self-efficacy scales, and was not a redundant cognitive-behavioural measure of motivational readiness. Among Grade 3 students, however, the activity DB difference and pro scale score, but not the activity DB con scale score, was significantly related to activity self-efficacy. This indicates that the activity DB con scale score among Grade 3s had acceptable one-week test-retest reliability, but low construct validity.

The DB scales showed good psychometric properties for participants in Grades 11 and 7. However, the psychometric data for the nutrition and physical activity DB measures amongst children in Grade 3 differed from older groups in a number of ways: (1) they tended to have high pro and con scale scores as they endorsed many items on both the pro and con scales; (2) their nutrition DB difference and pro scale scores had low test-retest reliability coefficients; (3) the correlation between their nutrition DB difference and con scale scores with their self-efficacy scale score was not significant; and, (4) the correlation between their activity DB con scale score and their activity self-efficacy scale score was not significant. Taken together, some of the DB scales failed to show good test-retest reliability and content validity amongst the youngest participants. Hence, support regarding the final DB scales' ability to predict actual health behaviour among Grade 3 participants might not be substantiated.

External validity is one of the most important psychometric properties when evaluating a psychological scale. Theoretically, DB is related to intention and actual health behaviour. Therefore, the newly developed final DB measures were hypothesized to predict nutrition behaviour and physical activity. Chapters 3 and 4 examined the DB measures' predictive validity for nutrition behaviour and physical activity, respectively.

These studies evaluated whether the DB measures were externally valid among children and adolescents of 3 age groups (Grades 11, 7 and 3) using 2 informants (i.e., child self-report and parent proxy). The weaker psychometric properties seen among Grade 3 participants indicated that the final self-report DB measures may not be externally valid, and therefore may not generalize to children as young as Grade 3. Therefore, the following additional hypotheses were made:

Hypothesis 3: There will be significant and negative associations between child self-report DB difference scores and percent calories of fat and sugar consumed as measured by a food frequency questionnaire for youth in Grades 11 and 7, but not Grade 3.

Hypothesis 4: There will be significant and negative associations between parent proxy DB difference scores and their child's percent calories of fat and sugar consumed as measured a food frequency questionnaire for youth in Grades 11, 7, and 3.

Hypothesis 5: There will be significant and positive associations between child self-report DB difference scores and physical activity as measured by an accelerometer for youth in Grades 11 and 7, but not Grade 3.

Hypothesis 6: There will be significant and positive associations between parent proxy DB difference scores and their child's physical activity as measured an accelerometer for youth in Grades 11, 7, and 3.

CHAPTER 3

DECISIONAL BALANCE OF NUTRITION BEHAVIOUR IN CHILDREN AND ADOLESCENTS

This chapter examines the external validity of the nutrition decisional balance (DB) measure specifically designed for children and adolescents. The DB difference score of this measure is central to this dissertation as it denotes the dual process of decision making. It is an indicator of an individual's relative balance of positive and negative thinking about particular health behaviour (i.e., pros minus cons). According to the DB model, if greater importance is placed on the advantages of eating calorie-dense foods by an individual than the disadvantages, then calorie-dense foods would be chosen with greater frequency by that individual. In other words, the DB model of the TTM predicts that the DB difference score is related to actual health behaviour.

The external validity of the nutrition DB difference score among youth was examined by estimating its prediction of a measure of dietary behaviour, specifically, the consumption of calorie-dense foods over a subsequent week. The prediction abilities of the difference score were examined among three grade levels (Grades 11, 7 and 3) using two informants (child self-report and parent proxy).

I. Nutrition Behaviour

Although controversial, food frequency questionnaires (FFQs) have proven to be useful tools when estimating the consumption of nutrients, including percent calories from fat and sugar. FFQs ask respondents to report their usual frequency of consumption of a list of foods for a specific period, including the past year, month, or week.

Compared to other dietary assessment measures (e.g., recall interviews or diary records), FFQ are relatively easier to administer and are less expensive (for reviews, see McPherson, Hoelscher, Alexander, Scanlon & Serdula, 2000; Thompson & Byers, 1994). The current study used a FFQ made appropriate for children as young as those in Grade 3 (8 or 9 years of age) to measure nutrition behaviour.

To improve accuracy when assessing child nutrition, a parent-assisted FFQ was employed. A parent-assisted method differs from parent-proxy in that the parent completes the measure with their child, as opposed to the parent separately completing the measure for their child. Information from the parent and child is valued when assessing children's food intake. For example, a parent is one of the primary persons involved in the family's grocery shopping and meal preparation. In fact, a study that compared parent and child accuracy with a FFQ and a food diary record showed a better appraisal of 11- to 12- year old children's intake when completed by a parent rather then a child (Jenner, Neylon, Croft, Beilin & Vandongen, 1989). The overestimate of energy intake was 21% by parents and 36% by children.

Information from the child or adolescent is also valued. For example, youth sometimes eat unmonitored by their parent, such as at school, at a friend's home, or before their parent comes home from work. Findings from previous research support that by age 10, children are able to give accurate dietary information and are aware of the foods they have eaten (Baranowski & Domel, 1994). For these reasons, information from both youth and their parent were utilized to assess youth's consumption of calorie-dense foods.

To further improve accuracy when assessing child nutrition, a FFQ that assessed a one week time period was chosen. One reason is a concern that children may have difficulty recalling events a month or a year in the past (Baranowski & Simons-Morton, 1991). Second, a period of less than a week may not be sufficient to account for daily variations in diet. Children's diets tend to be highly variable from day to day, and food habits can change rapidly, making the assessment of eating behaviour over the time period of at least a week necessary (Hartman, Brown, Palmgren, Pietinen, Verkasalo, Myer & Virtamo, 1990).

The Block Kid's Food Questionnaire meet the requirements of being appropriate for children as young as 8 years of age, being parent-assisted, as well as assessing foods consumed over a one-week interval. The Block Kid's Food Questionnaire was adapted from a well-known and reputable adult FFQ (the Health Habits and History Questionnaire, HHHQ) by Block at Berkeley Nutrition Services/Block Dietary Data Systems (Berkeley, California, USA). The adult HHHQ was developed at the National Cancer Institute under the direction of Block and colleagues (1986) using national data and a 24-hour dietary recall method (Block, et al., 1986). After developing the parent-assisted Block Kid's Food Questionnaire, Block and colleagues (2000) assessed its test-retest reliability between a fall and spring school year, as well as its validity using 24-hour recalls among 74 children as young as 8 years old (Block, Murphy, Roullet, Wakimoto, Crawford & Block, 2000). Block and colleagues (2000) found that the nutrient variables of the FFQ that were measured in the fall were not significantly different from the variables assessed during the spring. As well, log-transformed correlations of the FFQ with a 24-hour recall method ranged from .40 - .50 for energy, fat, carbohydrate, fiber and calcium. In summary, Block's Kid Food Questionnaire was judged to be the best measure for this study to assess children and adolescent's consumption of calorie dense foods.

II. Hypotheses

Research that assessed the psychometric properties of the nutrition DB measures (see Chapter 2, Tables 9 and 10, Pages 98 and 108) revealed that the nutrition DB difference score and pro scale scores had low test-retest reliability coefficients among self-reports of Grade 3 students. The psychometric properties of this measure were acceptable among students in Grades 11 and 7, however. Hence, hypotheses about how the nutrition DB difference score should predict behaviour when using child self-report were different among those in Grade 11 and 7, compared to Grade 3.

> <u>Hypothesis 3:</u> There will be significant and negative associations between child self-report DB difference scores and percent calories of fat and sugar consumed as measured by a FFQ for children and adolescents in Grades 11 and 7, but not Grade 3.

> <u>Hypothesis 4:</u> There will be significant and negative associations between parent proxy DB difference scores and their child's percent calories of fat and sugar consumed as measured a FFQ for children and adolescents in Grades 11, 7 and 3.

Researchers suggest there are multidimensional determinants of nutrition behaviours such as psychological, social, physical environment, and demographic factors (Hursti, 1999). Accordingly, moderate temporal association coefficients (r between .20 and .40) with a .05 significance level are expected between the nutrition DB difference scores and nutrition behaviour. Power calculations for Pearson's r correlations indicated that to obtain power of .80 (i.e., the probability of correctly rejecting a false hypothesis), data on approximately 50 participants are needed to detect a correlation of .40. Therefore, approximately 50 participants per grade were recruited for this study.

When multiple tests for statistical significance are performed within a study and a type I error (α) of .05 is used to test the statistical significance, the chance of finding an effect among independent tests is one in 20, if the null hypothesis is true. Statistical corrections that adjust for chance findings, i.e., the Bonferroni correction, were not used when testing the hypotheses. The Bonferroni correction method decreases power, that is, increases the likelihood of type II errors, and is inappropriate when a priori hypothesis are used (see review by Perneger, 1998). As well, the Bonferroni method is concerned with the general null hypothesis, that all null hypotheses are true simultaneously, which is not of interest in this study (Perneger, 1998). It is recognized that results of the present study are preliminary, and corresponding hypotheses should be replicated in future confirmatory studies.

III. Methods

A. Participants

Participants were a subsample of the youth from the item reduction study described in Chapter 2, and one of their primary caregivers (see Table 1, Page 79). Grade 11, 7 and 3 classrooms from the item reduction study were randomly selected by the primary researcher by picking two options from a hat: the test-retest reliability (see Chapter 2, Page 99) or the criterion validity study. Hence, participants were approximately half of youth from Grade 11, 7 and 3 from the first classroom visit of the item reduction study (n = 148) and their parents (n = 147).

B. Materials

Block Kids' Food Questionnaires. The Block Kid's Food Questionnaire asked respondents to report their usual frequency of consumption of a list of foods for the past week. Each food item included five frequency categories (1 day, 2 days, 3-4 days, 5-6 days, and everyday), and four portion sizes (A, B, C, D with a illustration of the various serving sizes on a separate handout, e.g., ¼ cup, ½ cup, 1 cup or 2 cup).

Child Self-Report Nutrition Decisional Balance Measure. The final version of the nutrition DB measure for youth that was used in this study is described in Chapter 2 (see Tables 10 and 11, Pages 108 and 109).

Parent-Proxy Nutrition Decisional Balance Measure. Parent proxy DB measures were virtually identical to the child self-report measures. The only difference between the child self-report form and the parent-proxy form was the cover page title and directions. The directions instructed parents to answer the items for their child and about their child.

C. Procedure

After the subsample of participants had completed the DB measures during the first classroom visit of the item reduction study (see Chapter 2, Page 53), the second part of the research (the behaviour studies) was explained. Youth were asked to bring home to their parents a questionnaire package that contained instructions, parent nutrition and activity DB measures, and a youth FFQ. It was explained that parents were to independently fill out the DB measures on the same day, and that youth were to fill-out the FFQ with their parent on the sixth day of the study. Youth participants were asked not to discuss their DB measure answers with their parents until after the study was complete.

At the end of the first classroom visit, the body weight and height of each youth participant was measured according to the Canadian Physical Activity, Fitness and Lifestyle Appraisal Manual (Canadian Society for Exercise Physiology, 1998). These measurements were taken for the purposes of describing sample characteristics, and for later calculating physical activity using an accelerometer (see Chapter 4). Children's height and weight were then measured individually in the hallway to increase privacy.

On the evening of the first classroom visit, parents were telephoned by a researcher to explain the study and answer potential questions. During this call, verbal instructions were given to parents regarding how to fill out the DB and FFQ measures. At this time, parents were also instructed to fill out the parent proxy DB measure as soon as possible and within 24 hours following the telephone call. A 24-hour deadline was given to parents to help ensure that the parent proxy DB measure was completed as close in time as possible to the time their child completed the youth self-report DB measure.

Parents were asked to not discuss the DB measure with their child until after the study was complete. Child and parent participants were then instructed to complete the parent-assisted FFQ together on the evening before the researcher's second classroom visit, on the sixth day of the study.

On the sixth day, parents received a second telephone call as a reminder to complete the FFQ and return their questionnaire package to school via their child. If study materials were not returned, follow-up telephone calls to parents were made. If parents indicated they had not completed the parent proxy DB measures within 24 hours, or had not assisted their child in completing the FFQ on the sixth day of the study, the data for the corresponding measure was recorded as non-compliant and was not included in the data analyses.

Classrooms were visited one week after the first classroom visit to collect study materials and debrief participants. Debriefing of this study was conducted at the end of this second classroom visit, after all the research was complete.

IV. Data Analyses

Attrition Rates. To examine potential participant selection biases, the percentages of participants who were absent during the first classroom visit and who were excluded from the study due to non-compliance were calculated. If more than 15% of the FFQ data was missing, the participant's FFQ data was recorded as an error. This criterion was recommended by Berkeley Nutrition Services/Block Dietary Data Systems in Berkeley, California, USA. These attrition rates are included in Table 2 (see Page 80).

Body Mass Index Data. To describe the sample characteristics, a body mass index (BMI: $kg/(m^2)$) and a BMI percentile was calculated for each child participant using BMI-for-age percentile growth charts for boys and girls developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion. BMI-for-age is the most pertinent growth parameter for the classification of overweight and obesity (Faith, Saelens, Wilfley, & Allison, 2001). To measure height and weight, youth were asked: (1) to remove their shoes and socks; (2) to stand tall and in front of a metric tape that was positioned vertically against a wall; (3) to put their arms to their sides, feet together, head facing forward, and heels against the wall; and, (4) to take a deep breath.

Nutrition Data. Nutrition data were scored and analyzed by Berkeley Nutrition Services/Block Dietary Data Systems in Berkeley, California, USA. The variable of interest for this study was percent calories from fat and sugar consumed, which was calculated for each child participant. The variable mean, standard deviation, and distribution was described, and its normality tested using the Kolmogorov-Smirnov statistic (Dallal, & Wilkinson, 1986; Thode, 2002).

To further describe sample characteristics, relevant nutrition data were recorded, including average daily energy intake, percent calories from fat and sugar, servings of fruits and vegetables, and grams of dietary fiber consumed. To examine potential differences between grades with regards to percent calories from fat and sugar, one-way analyses of variances (ANOVAs) were calculated. Levene's test was used to examine the homogeneity of variance assumptions. Games-Howell's procedure was used for post hoc difference analysis as there were unequal sample sizes between grades (Games &

Howell, 1976; Keselman & Rogan, 1977; Games, Keselman, & Rogan, 1981; as sited in Howell, 1997).

Self-Report Nutrition DB Difference Scores. Child self-report nutrition DB pro and con scale scores were converted to standardized T-scores ($\underline{M}$ = 50, $\underline{SD}$ = 10) based on the whole sample ($\underline{N}$ = 297; see Chapter 2, Pages 64-66) in order to calculate a DB difference score (Pro minus Cons). To compare the self-report nutrition DB difference scores of the current subsample (behaviour study) with that of the larger sample (item reduction study; see Table 1, Page 79), potential differences between grades on the nutrition DB difference scores were calculated using the same statistical procedures that were described in Chapter 2 (see Page 66).

Parent-Proxy Nutrition DB Difference Scores. Parent-proxy nutrition DB pro and con scale scores were calculated in the same manner as the self-report data. Scale scores were converted to standardized T-scores in order to calculate a DB difference score. Parent T-scores were calculated based on the sample of data collected from parent informants ($\underline{n}$ = 147, see Table 1, Page 79).

Criterion Validity. Pearson's $\underline{r}$ correlations were calculated to measure the associations of the child self-report and parent proxy nutrition DB difference scores and youth's nutrition behaviour for the entire sample and each grade level. Scatterplots were examined to assess outliers. Outliers were discarded if their reason for outlying was external to the study (e.g., broken leg or ill). To help evaluate the relationship between the DB difference scores and behaviour, additional correlations between the DB pro and con scale scores and nutrition behaviour were calculated.

V. Results

Attrition Rates. The absentee rates for the second classroom visits were 11.9% for Grade 11s, 4.9% for Grade 7s, and 1.6% for Grade 3s (see Table 1, Page 79). Of those who were present for the first and second classroom visits (n = 172), 9.8% were excluded due to non-compliance with the FFQ, and 3.3% were excluded due to error (i.e., > 15% missing data). Hence, child participants were 148 children and youth in Grade 11 (n = 46; 48.6% females; Mean age = 16.1, SD = 0.5), Grade 7 (n = 49; 49.0% females; Mean age = 12.0, SD = 0.2), and Grade 3 (n = 53; 49.1% females; Mean age = 8.1, SD = 0.3). Parent participants were 147 primary care-givers of children in Grade 11 (n = 44; 88.6% mothers; Mean age = 44.4, SD = 4.4), Grade 7 (n = 51; 84.3% mothers; Mean age = 40.4, SD = 5.9) and Grade 3 (n = 52; 79.2% mothers; Mean age = 38.1, SD = 5.1).

Body Mass Index. The means and standard deviations for body mass index (BMI) and percent of participants in each BMI classification category for the whole sample, as well as for Grades 11, 7, and 3 are listed in Table 13 (see Page 141). The average body mass index for the whole sample was 21.1 kg/(m^2). Most participants fell in the Normal BMI category (53.1%), and 16.6% fell in the Overweight category (i.e., BMI percentile >95th). Approximately 80% of these participants who fell in the Overweight category were considered obese (13.1%; BMI percentile >97th). This statistic is similar to some of the most recent provincial and national prevalence estimates (9.9% and 18% classified as obese, respectively; Veugelers & Fitzgerald, 2005; Statistics Canada, 2002).

Percent Calories Consumed from Fat and Sugar. The means and standard deviations for percent calories consumed from fat and sugar on the FFQ for the whole sample, as well as for Grades 11, 7, and 3 are listed in Table 14 (see Page 142). Average percent calories consumed from fat and sugar per day was 55.7% (SD = 10.5). The distribution of the 'percent calories from fat and sugar consumed' variable for the whole sample ranged from 24.2% to 91.2%. This variable was positively skewed (.47), and had a kurtosis of 1.59. The distribution of this variable was significantly different from a normal distribution (Kolmogorov-Smirnov statistic = .06, $p < .05$). It had a slight positive skew (.47) and a high kurtosis (1.59; i.e., leptokurtic in shape). There were no significant differences between the 'percent calories from fat and sugar consumed' variable across grade ($F_{2, 148} = 2.61$, $p > .05$). Levene's tests of homogeneity of variance revealed that the population variances were homogeneous ($p > .05$).

A summary of related nutrition data are listed in Table 14 (see Page 142). Participants consumed, per day, an average of 2062.8 calories (SD = 971.8), 34.7% of their calories from fat (SD = 4.9), 20.7% of their calories from sugar (SD = 8.4), 1.8 servings of fruit (SD = 1.0), 2.2 servings of vegetables (SD = 1.6), and 14.0 grams of dietary fiber (SD = 7.2). These statistics are similar to one of the most recent nutritional normative data among children and adolescents in North America (NHANES; Wright, Wang, Kennedy-Stephenson & Ervin, 2003). The NHANES survey measured dietary intake using a 24-hour recall method among various age groups, including 12 to 19 year olds ($n = 2208$), and 6 to 11 year olds ($n = 962$). Regarding average daily caloric intake and percent of calories consumed from fat, the normative data taken from the NHANES survey (Wright et al., 2003) fell within one standard deviation of the present study's whole sample. Compared to the normative NHANES survey group, Grade 11s from the present study consumed 5.95 more calories and 3.74% more calories from fat, and Grade 7s consumed 293.29 less calories and 2.52% more calories from fat. Grade 3s from the present study consumed 194.96 more calories and 1.26 more calories from fat compared to the normative NHANES survey group.

Child Self-Report Nutrition Decisional Balance. The child self-report nutrition DB pro scale, con scale and difference score means for the whole sample, as well as Grades 11, 7 and 3 are listed in Table 15 (see Page 143). The overall DB difference mean score was -1.82 (SD = 11.89) and median score was -2.05. The distribution of scores was normal (Kolmogorov-Smirnov statistic = .03, p >.05) with a skewness of -.02 and a kurtosis of -.22. Consistent with the larger sample (see Table 7, Page 85), this subsample of participants had a significant difference between child self-report nutrition DB difference scores across grade ($F_{2, 164} = 5.04$, $p < .01$). Levene's tests of homogeneity of variance revealed that the population variances were homogeneous ($p > .05$). Games-Howell's post-hoc analyses indicated that Grade 3 scores were significantly different from Grade 11 scores. These post-hoc analyses are similar to those found in the larger study. The only difference was that the larger study also showed a significant difference between Grade 3 and 7 scores (see Table 7, Page 85).

Parent Proxy Nutrition Decisional Balance. The parent proxy nutrition DB pro scale, con scale, and difference score means for the whole sample, as well as Grades 11, 7, and 3 are listed in Table 15 (see Page 143). The overall parent-proxy DB difference mean score was -.21 (SD = 13.73), and median score was -.63. The distribution of scores was normal (Kolmogorov-Smirnov statistic = .05, p >.05) with a skewness of .20 and a kurtosis of -.25. The parent-proxy nutrition DB pro and con scales had good internal consistencies between its 10 (α = .85) and 18 items (α = .81), respectively ($\underline{n}$ = 147; George & Mallery, 2003).

Criterion Validity of Child Self-Report Nutrition Decisional Balance. One of the assumptions of a bivariate correlation is that the variables are normally distributed around their mean. The FFQ variable (percent calories from fat and sugar consumed) was not normally distributed around its mean. It had a slight positive skew (.47) and a high kurtosis (1.59). Hence, a high concentration of the scores was in the center and tails (i.e., leptokurtic in shape). Howell (1997, pg. 329) states that if the data are "more or less symmetrical", then there "is probably nothing to be gained by applying a transformation". A transformation was not used on the FFQ data as it was judged by the primary researcher to be reasonably symmetrical.

The child self-report nutrition DB difference scores were significantly related to the FFQ variable, percentage calories of fat and sugar consumed, for the whole sample, Grade 11s and Grade 7s (see Table 15, Page 143). The DB pro scale scores were significantly related to nutrition behaviour among the whole sample, Grade 11s and Grade 7s.

Criterion Validity of Parent-Proxy Nutrition Decisional Balance. The parent-proxy DB difference scores were significantly correlated with the FFQ variable among the whole sample and Grade 7s, but not among Grade 11s and 3s (see Table 13, Page 141). The DB pro scale score was significantly related to nutrition behaviour among the whole sample and Grade 7s. As well, the parent proxy DB cons scale score was significantly and *positively* related to nutrition behaviour among Grade 3s.

VI. Discussion

A. External Validity of the Nutrition DB Measure using Self-Report

The child DB difference scores were significantly and negatively related to the FFQ scores among the whole sample. This means that when considering the sample as a whole, youths' theories about their motivations for choosing nutrient dense foods and calorie dense foods were related to their self-reported percent calories of fat and sugar consumed. As hypothesized, when grade was examined separately, there were significant associations between the DB difference score and percent calories of fat and sugar consumed among Grade 11s and 7s, but not Grade 3s. The different results among grades highlights the importance of investigating age groups separately when examining a measure's external validity among youth. If replicated, these data support the idea that the newly developed nutrition DB measure have predictive validity among preadolescents and adolescents who are approximately 12 and 16 years old. This conclusion is complimented by Rossi and colleagues' study (2001) with adolescents in Grade 9 (Mean age = 15.2, SD = 0.6). Rossi and colleagues' (2001) showed theoretically predicted relationships between the pro and con scales of a self-report dietary fat reduction DB scale and a measure of stage of change, and replicated the TTM's strong and weak principals of the DB model. Taken together, there is preliminary evidence that nutrition DB measures may be externally valid among youth as young as 12 years old (i.e., Grade 7s).

This study is the first to examine the TTM nutrition DB among children as young as those in Grade 7. The idea that a DB measure could be externally valid among preadolescents is consistent with previous research on decision-making and health beliefs among children and adolescents. Studies on cognitive abilities that are important in reflective decision-making have shown that deductive reasoning, statistical reasoning, meta-memory, and meta-reasoning begin to appear in early childhood, and then develop rapidly through early adolescence (Klaczynski et al., 2001; Moshman, 1999). As well, children older than 9 or 11 are able to understand that disease is preventable (Lau & Klepper, 1988), and are able to formulate and carry-out a plan, such as making health decisions (Inhelder & Piaget, 1964; Michela & Contento, 1986; Palmer & Lewis, 1976).

The finding that the nutrition DB difference score did not predict behaviour among children in Grade 3 was expected given the fact that the score lacked basic psychometric properties, such as test-retest reliability (see Table 10, Page 108). Without reliability, no tool can be considered valid. The nutrition pro scale score, and not the difference and con scale scores, had acceptable test-retest reliability and construct validity coefficients among Grade 3s, however. Hence, it is possible that the prediction abilities of the nutrition DB pro scale score might have been masked with the use of a difference score. To address this issue, correlations were calculated to measure the temporal associations of the child self-report pro and con scale scores with behaviour among Grade 3 participants. Results showed there were no significant relationships between the pro or con scale scores with the FFQ variable. This suggests that the DB difference score did not mask possible predictive effects of the pro scale score of the nutrition DB measure among Grade 3s. Taken together, this dissertation gives preliminary evidence indicating that the self-report nutrition DB measure may not be externally valid among participants who are approximately 8 years old.

The DB difference score considers the dual process of decision making by considering the pro and con scale scores in its calculation and final number. This is a clinically important concept as individuals are often aware of the health benefits of healthy eating, but struggle with powerful personal cons that can dominate the perceived health benefits (e.g., relief of stress or boredom, availability, monetary cost). For adults attempting to change in therapy, it is often helpful to focus on the cons of changing in the context of perceived health benefits.

A focus on the decisional balance of pros and cons gives different information than focusing on either the pros or cons alone. This concept can be illustrated when examining the external validity data of the nutrition DB scores (see Table 15, Page 143). There was no result in which a pro or con scale score was significant, but the corresponding DB difference score was not. Similarly, there was no result in which the DB difference score was significant and a pro or con scale score were not. These results give evidence that the DB difference score did not mask the effects of the pro and con scale scores.

When examining the self-report nutrition DB difference, pro scale and con scale scores external validity coefficients among Grade 11s and 7s, only the difference and pro scale score, and not the con scale score, was significantly related to nutrition behaviour. It is important to examine the DB difference score, in addition to the pro and con scale scores. If one was to only examine the pro and con scale external validity coefficients of this study, one might be tempted to suggest that prevention and intervention efforts to enhance motivation for choosing nutrient-dense instead of calorie-dense foods among 12 and 16 year olds should focus on increasing pros. An example of such an intervention might be to provide education about and awareness of the health benefits of nutrient-dense foods. However, when the difference score is considered, one would also suggest that intervention and prevention efforts among these age groups should also focus on the cons, in the context of their relative balance against the pros. This study provides preliminary evidence that examining the DB difference score is a useful endeavor when attempting to understand the consumption of calorie dense foods among youth 12 and 16 years of age.

B. External Validity of the Nutrition DB Measure using Parent Informant

The parent proxy DB difference score for the whole sample was significantly and negatively related to reported percent calories of fat and sugar consumed among youth using a FFQ. When grade was examined separately, parent proxy DB difference scores were found to be significantly related to the FFQ scores for students in Grade 7, but not for students in Grades 11 and 3. Similar results were seen with the youth's self-report of DB: the pro scale and difference scores, but not the con scale score, were significantly related to nutrition behaviour among Grade 7s. If replicated, these results give support to the idea that when using parents as informants, the nutrition DB measure predicts consumption of calorie-dense foods among preadolescents who are approximately 12 years of age, but not among adolescents who are approximately 16 years of age or children who are approximately 8 years of age.

The parent informant DB data may not be temporally stable. Unfortunately, test-retest reliabilities were not measured among parent informants for practical reasons. Collecting data from parents on a second occasion might have impaired the chances of the present research receiving approval from the Halifax Regional School board, who were cognizant of participant burden. The limitation of not obtaining test-retest reliability data on the parent proxy DB measures was judged by the writer to outweigh the benefit of reducing participant burden. It should be noted that among the adult DB literature, test-retest reliability is rarely examined (see Chapter 2, Page 98).

The difference scores of the parent-proxy nutrition DB measure among Grade 3s and 11s might have masked the predictive abilities of the parent proxy nutrition DB pro and con scale scores. To examine this possibility, Pearson's $\underline{r}$ correlations were calculated to measure the temporal associations of the parent proxy pro and con scale scores. Among Grade 3 participants, there were no significant relationships between pro or con scale scores with percent calories of fat and sugar consumed. The subject numbers used in these analyses were estimated to have sufficient power to detect a significant correlation of .40 among Grade 3s. Therefore, it is likely that the parent proxy DB difference score did not mask possible predictive effects of the pro or con scale of the newly developed nutrition DB measure among Grade 3s when using parents as informants.

Among Grade 11 participants, Pearson's correlations showed no significant relationships between the parent proxy pro or con scale scores and percent calories of fat and sugar consumed measured by a FFQ. It is unlikely that the DB difference score masked the predictive effects of the parent proxy con scale of the newly developed nutrition DB measure among Grade 11s. In fact, the correlation coefficients for each nutrition DB measure score (pro, con, difference) were negative, and very small ($\underline{r}$ = -.02 to -.26) among Grade 11 students. The number of participants ($\underline{n}$ = 46) in these analyses was slightly lower than the number estimated to have sufficient power in detecting a significant ($p < .05$) correlation of 0.40 (i.e., $n = 50$). Future research that replicates this study should use a larger sample of Grade 11 adolescents.

One argument that could explain why the parent proxy nutrition DB measure predicted behaviour among Grade 7s, but not Grade 11s or 3s, is the theory of a curvilinear function of parent-child concordance due to the child's social and cognitive maturation (Holmbeck, Li, Schurman, Friedman, & Coakley, 2002; Kazdin, 1994). Consistent with the notion of a curvilinear function of parent-child agreement is the finding by Verhulst and colleagues (Verhulst, Althaus, & Berden, 1987; Verhulst & Van der Ende, 1992). These researchers found that higher parent-child agreement on a psychological measure of internalizing symptoms increased from childhood to early adolescence, and then decreased during the early adolescent period to late adolescence. The idea of this argument is that there is an expected linear function for parent-child agreement on psychological measures as children's cognitive level becomes closer to the cognitive level of their parents, but that this linear function gets complicated by social maturation issues. Social maturation issues might include the physical and psychological distancing that typically occurs between parent-child pairs during later adolescence years. Compared to younger children, adolescents may communicate less frequently with their parents about their behaviours and events, their parents may have less opportunity to observe the behaviour, and conflict between the parent-child pair may be greater (Collins, Laursen, Mortensen, Luebker & Ferreira, 1997; Crockett & Peterson, 1993; Edelbrok et al., 1986; Verhulst & Van der Ende, 1992). As adolescents grow older and begin the process of separating from their families, there are also changes in their environment relevant to nutrition behaviour (e.g., new foods available at school, influence of peers and the media; Baranowski, 1997; Birch, 1980; Goldberg et al., 1978). At some point in their development, most youth begin to take more personal responsibility for their nutrition behaviour, and their parents begin to take less responsibility. For example, parents of children in Grade 3 may have had less experience observing their child making autonomous food choices compared to parents of older children. As well, it is likely that parents of adolescents in Grade 11 are less involved with meal preparation and monitoring of food intake compared to parents of younger children (e.g., packing lunches for school).

The notion of a curvilinear function representing parent-child agreement elicits speculations that can be tested using the present study's data. Parents of older adolescents may not have complete information about, or be in agreement with, their child's motivations for food choice compared to parents of younger children. Consequently, parents of Grade 11 adolescents and Grade 3 children may find it more difficult to create a predictive motivational theory about their child's nutrition behaviour using a DB measure compared to parents of Grade 7 preadolescents. If the curvilinear function argument is true, parents' theories about their Grade 7 child's motivations for nutrition behaviour (the parent proxy nutrition DB difference score) should be significantly correlated with and *not* be significantly different from their Grade 7 child's theories about their own motivations for nutrition behaviour (the self-report nutrition DB difference score). As well, parents of youth in Grades 3 and 11 should have theories about their child's motivations for nutrition behaviour that are *not* statistically correlated with, and are statistically different from their child's theories about their own motivations for nutrition behaviour.

To test these hypotheses, post-hoc analyses that measured correlations (Pearson's r correlations) and differences between means (paired sample t-tests) of child-parent agreement for the nutrition DB difference scores were conducted for participants in Grades 11, 7 and 3. These agreement results represent the correlations of total DB difference scores between informants, rather than absolute agreement. It is possible to have high correlations, yet little agreement within an informant pair (Jensen, Traylor, Xenakis, & Davis, 1988). For example, the pattern of responses within a pair of informants might be almost identical, yet anchored at different items on a scale.

As hypothesized, Pearson's r correlations between child and parent informants of DB difference scores resulted in a significant and moderate (Cohen, 1988) concordance between self-report and parent proxy for Grade 7s ($n = 49$, $r = 0.31$, $p < .05$), but not Grade 11s ($n = 42$, $r = 0.23$, $p > .05$) or 3s ($n = 49$, $r = 0.03$, $p > .05$). Also as hypothesized, paired sample t-tests which compared DB difference scores between child and parent informants showed significant differences between self-report and parent proxy among Grade 11s ($t_{44} = -2.27$, $p < .05$) and 3s ($t_{52} = 2.52$, $p < .05$). These results suggest that parents of Grade 11 adolescents and Grade 3 children have theories about their child's motivations for food choice that are significantly different and not correlated with their child's theories. If replicated, this study supports the notion that child-parent agreement for nutrition DB is an age dependent curvilinear function.

Among Grade 7 participants, paired sample t-tests comparing DB difference scores between child and parent informants also showed significant differences between self-report and parent proxy ($t_{49} = -2.44$, $p < .05$). This result suggests that parents of Grade 7 preadolescents have theories about their child's motivations for food choice that are significantly correlated, but significantly different from their child's theories. It is likely that the patterns of responses within the child-parent pairs are similar, but anchored at different items on a scale (Jensen et al., 1988). Despite the differences between informants, both youth and parent informants predicted nutrition behaviour among Grade 7 students using the nutrition DB measure. If replicated, the results of this study suggest that both parent and child involvement is important in understanding nutrition behaviour among students who are approximately 12 years old. This suggestion is consistent with previous research supporting the involvement of parents in the behavioural treatment of childhood obesity with school-aged children (i.e., 8-12 years; Epstein et al., 1985; McLean, Griffin, Toney & Hardeman, 2003).

C. Percent Calories Consumed from Fat and Sugar

The self-reported nutrition DB difference scores among students in Grade 11 and 7 in the present study, as well as in the larger sample ($N = 297$) were not significantly different (see Table 8, Page 97). These results suggest that the percent calories consumed from fat and sugar as measured by the FFQ data should be similar among Grade 11 and 7 students. Results from this study indicated that, indeed, percent calories consumed from fat and sugar was not significantly different among Grade 11s and 7s. This gives further support to the external validity of the self-report nutrition DB difference score among youth as young as 12 years old.

For a measure to have good external validity, it is important for it to be generalizable across different occasions and times of the year. As was discussed in Chapter 2 (see Page 103), it is possible that an environmental factor selectively influenced the nutrition behaviour of participants in Grade 3s, but not Grade 7 or 11's.

Halloween day (Friday, October 31st, 2002) occurred 6 days before the data collection phase of this study. Compared to the other grades, more calorie-dense foods may have been available to Grade 3 children due to Halloween traditions.

There was a positive correlation between parent proxy DB con scale scores and percent calories of fat and sugar consumed among Grade 3s. Perhaps parents who support their Grade 3 child's healthy eating are more likely to endorse their child's cons compared to parents of children who consumed foods high in fat and sugar. The parent proxy DB prediction coefficient results among Grade 3s are difficult to interpret given the occurrence of Halloween, which might have selectively increased the means and variability of percent calories from fat and sugar consumed among children in Grades 3, particularly those who saved their candy for a week or longer. This environmental factor may have also been a learning experience for Grade 3 parents. Halloween might have given parents additional information to use when completing the nutrition DB measure about their child. Parents may have become more aware of their Grade 3 child's motivations for consuming calorie-dense foods during the time of the study, which would have given them recent predictive evidence about their Grade 3 children's overall positive and negative thinking about calorie-dense foods (i.e., Halloween treats). Clearly, this study needs to be replicated with better control over variations in environmental influences such as holidays.

D. Summary of Chapter 3

In summary, the newly developed nutrition DB measure showed good externally validity among those in Grades 11 and 7 using self-report, and among those in Grade 7 using parent informants. Chapter 4 examines the external validity of the physical activity

DB measure among participants in Grades 11, 7 and 3, using self-report and parent-proxy informants of DB and an objective physical activity measure, the accelerometer.

Table 13.

BMI Characteristics of the Nutrition Study Sample

	All Grades (n=148)		Grade 11 (n=46)		Grade 7 (n=49)		Grade 3 (n=53)	
	Male (n=76)	**Female** (n=72)	**Male** (n=24)	**Female** (n=24)	**Male** (n=24)	**Female** (n=24)	**Male** (n=24)	**Female** (n=24)
	M (SD)							
BMI Index	21.1 (5.4)		25.1 (5.8)		20.5 (4.2)		18.6 (4.2)	
	21.4 (6.2)	20.7 (4.5)	26.6 (7.2)	23.4 (3.5)	20.8 (4.8)	20.3 (3.8)	18.1 (3.2)	19.2 (5.0)
	Percentage of Participants							
BMI Classification								
Underweight (<5th %ile)	1.4		2.9		2.6		0.0	
	3.3	0.0	5.6	0.0	5.6	0.0	0.0	0.0
Normal (5^{th} to <85^{th} %ile)	53.1		60.0		66.7		62.5	
	55.7	70.5	50.0	70.6	55.6	76.2	60.0	65.2
At Risk (85^{th} to <95^{th} %ile)	13.1		14.3		15.4		16.7	
	16.4	14.8	11.1	17.6	22.2	9.5	16.0	17.4
Overweight (>95^{th} %ile)	16.6		22.9		15.4		20.8	
	24.6	14.8	33.3	11.8	16.7	14.3	24.0	17.4
Obese (>97^{th} %ile)	13.1		14.3		10.3		14.6	
	18.0	8.2	27.8	11.8	11.1	9.5	16.0	13.0

Table 14.

Nutrition Characteristics of the Nutrition Study Sample

	All Grades (n=148)		Grade 11 (n=46)		Grade 7 (n=49)		Grade 3 (n=53)	
	Male (n=76)	**Female** (n=72)	**Male** (n=24)	**Female** (n=22)	**Male** (n=25)	**Female** (n=24)	**Male** (n=27)	**Female** (n=26)
Nutrition Data	**M (SD)**							
Daily Calories Consumed	2062.8 (971.8)		2329.4 (1306.2)		2064.1 (827.0)		1830.8 (668.5)	
	2286.0 (1096.8)	1830.2 (762.2)	2854.7 (1427.0)	1780.2 (907.3)	2268.6 (967.5)	1859.7 (611.8)	1816.8 (557.9)	1845.8 (782.2)
Percentage of Calories from Fat	34.7 (4.9)		35.7 (5.9)		34.6 (4.1)		34.0 (4.4)	
	35.4 (4.5)	34.1 (5.2)	36.8 (4.9)	34.6 (6.8)	35.3 (3.8)	33.8 (4.3)	34.2 (4.4)	33.8 (4.4)
Percentage of Calories from Sugar	20.7 (8.4)		22.5 (10.3)		19.7 (8.6)		20.0 (5.8)	
	21.5 (8.9)	19.8 (7.8)	22.1 (10.5)	23.0 (10.4)	22.2 (9.7)	17.2 (6.7)	20.4 (6.7)	19.5 (4.8)
Daily Servings of Fruit	1.8 (1.0)		1.6 (1.0)		2.1 (1.2)		1.8 (0.9)	
	1.7 (1.0)	1.9 (1.0)	1.5 (0.9)	1.7 (1.1)	1.9 (1.2)	2.2 (1.1)	1.7 (0.9)	1.8 (0.8)
Daily Servings from Vegetables	2.2 (1.6)		2.6 (1.9)		2.3 (1.7)		1.8 (1.2)	
	2.1 (1.6)	2.3 (1.7)	2.7 (1.9)	2.4 (2.0)	2.2 (1.6)	2.5 (1.8)	1.6 (1.1)	2.0 (1.3)
Grams of Dietary Fiber	14.0 (7.2)		15.1 (8.9)		14.9 (6.8)		12.6 (5.4)	
	14.8 (7.9)	13.4 (6.3)	17.4 (9.5)	12.6 (7.8)	15.6 (8.2)	13.8 (5.0)	11.7 (4.8)	13.6 (6.0)

Table 15

Mean Raw Scores for Nutrition Behaviour, Mean T-scores for Nutrition DB Pro Scale, Con Scale and Difference Scores, and Criterion Validity Coefficients across Grade

	% Calories of Fat & Sugar Consumed	Nutrition DB					
		Pro Scale Score		Con Scale Score		Difference Score	
Nutrition Decisional Balance Measure	Raw Mean (SD)	Mean T–Score (SD)	r	Mean T–Score (SD)	r	Mean T–Score (SD)	r
Child Self Report							
All Grades (n = 148)	55.68 (10.53)	48.78 (9.92)	-.26**	50.62 (9.83)	0.01	-1.82 (11.89)	-.22**
Grade 11 (n = 46)	58.20 (12.34)	46.80 (8.77)	-.33*	51.53 (8.71)	0.10	-4.74 (9.94)	-.40**
Grade 7 (n = 49)	54.38 (10.05)	45.91 (8.84)	-.46**	48.87 (8.88)	0.01	-2.96 (12.51)	-.32*
Grade 3 (n = 53)	54.68 (8.96)	53.34 (10.40)	.01	51.41 (11.44)	-0.08	1.96 (12.16)	.11
Parent Proxy Report							
All Grades (n = 147)	55.68 (10.53)	49.94 (9.96)	-0.19*	50.15 (10.03)	0.08	-0.21 (13.72)	-0.20*
Grade 11 (n = 44)	58.20 (12.34)	51.04 (10.65)	-0.26	49.58 (10.79)	-0.22	1.46 (15.81)	-0.02
Grade 7 (n = 51)	54.38 (10.05)	49.95 (9.62)	-0.37*	49.34 (9.73)	0.24	0.61 (12.52)	-0.49**
Grade 3 (n = 52)	54.68 (8.96)	49.01 (9.80)	0.06	51.43 (9.75)	0.29*	-2.42 (12.96)	-0.17

*p < .05, **p < .01

CHAPTER 4

DECISIONAL BALANCE OF PHYSICAL ACTIVITY IN CHILDREN AND ADOLESCENTS

This chapter examines the external validity of a physical activity decisional balance (DB) measure designed for children and adolescents. According to the DB model, if an individual places greater importance on the advantages of engaging in physical activity compared to the disadvantages, that individual would choose physical activities more often than sedentary activities. The predictive validity of the DB difference score was examined by measuring its temporal association with an objective measure of physical activity, the accelerometer, over a subsequent week. This study is the first to correlate a physical activity DB measure with an objective measure of physical activity. Similar to the study design outlined in Chapter 3, the ability of the DB measure's difference score in predicting physical activity is examined among three grade levels (Grades 11, 7 and 3) with two informants of DB (child self-report and parent proxy).

I. Physical Activity

Physical activity is defined as: "any bodily movement produced by skeletal muscle that results in energy expenditure" (Caspersen, Powell & Christenson, 1985). Compared to adults, children's activity is sporadic and intermittent in nature (Bailey, Olson, Pepper, Porszaz, Barstow, & Cooper, 1995; Baranowski, Hooks, Tsong, Cieslik, & Nader, 1987; Welk, Corbin & Dale, 2000). One study showed that only 8 to 14% of children are active continuously for 20 minutes (Baranowski et al., 1987). Capturing children's short term, changing patterns of physical activity can be difficult, especially when using self-report measures (Sirard & Pate, 2001). There is a general consensus that subjective self-report instruments of children's physical activity tend to overestimate activity levels (due to exaggerated perceptions of time and effort; McMurray et al., 1998; Pate, Long & Heath, 1994; Simons-Morton et al., 1994). Direct observations are considered the gold standard in measuring physical activity, but necessitate long measurement time periods and trained personnel (Sirard & Pate, 2001). When using direct observation as the criterion, the literature suggests that objective measures of physical activity are more accurate than self report in estimating physical activity among youth (Sirad & Pate, 2001).

Pedometers or accelerometers are small, unobtrusive, and reusable motion sensors that estimate total body movement and therefore provide objective measures of physical activity. They require less resources compared to direct observation. Validation studies have shown moderate to high correlations of pedometers and accelerometers with direct observation and oxygen consumption ($\underline{r} = .62$ to .93) and ($\underline{r} = .80$ to .97) in the lab (Trost, Ward, Moorehead, Watson, Riner & Burke, 1998) and field conditions (Eston, Rowlands, & Ingledew, 1998; Fairweather, Reilly, Grant, Whittaker & Paton, 1999; Janz, 1994; Trost et al., 1998; Welk & Corbin, 1995) (For review, see Kohl, Fulton & Caspersen, 2000; Freedson, Melanson, & Sirad, 1998; Hendleman, Miller, Baggett, Debold & Freedson, 2000). Motion sensors' on-line, convenient, and objective nature makes them useful tools for measuring physical activity in large study samples of children and adolescents.

Accelerometers are more sophisticated motion sensors than pedometers in measuring physical activity. Rather than estimating number of steps, accelerometers convert the body's vertical accelerations to a digital signal referred to as counts. Accelerometers are able to capture intermittent activity throughout the day by providing an average daily activity count that represents the mean summed amount and magnitude of vertical accelerations in a day. Another feature that makes the accelerometer a superior research tool is that its physical activity data is not displayed on a monitor, as it is with a pedometer. Instead, the data is stored in the accelerometer device over the course of a week until it is downloaded into a computer. Receiving real-time feedback about physical activity with a pedometer has the potential of producing reactivity in an individual's behaviour. For these reasons, this study employs the accelerometer to examine physical activity levels in children and to provide an external validity measure of the DB instrument.

II. Hypotheses

Research that assessed the psychometric properties of the activity DB measure among students in Grades 11 and 7 revealed good test re-test reliability and construct validity (see Chapter 2, Tables 9 and 10, Pages 98 and 108). Among Grade 3 students, the activity DB measure had, for the most part, acceptable psychometric properties. Specifically, the activity DB pro scale and difference scores showed acceptable test re-test reliability and construct validity coefficients among students in Grade 3. The activity DB con scale score had good test-retest reliability, but low construct validity among Grade 3s. As the activity DB difference score showed acceptable psychometric properties across grade, hypotheses about how the physical activity DB difference score should predict behaviour were made for all students, that is, those in Grade 11, 7, and 3.

The following two hypotheses were tested and are discussed in this chapter:

Hypothesis 5: There will be significant and positive associations between child self-report DB difference scores and physical activity as measured by an accelerometer for children and adolescents in Grades 11, 7 and 3.

Hypothesis 6: As was seen with the nutrition domain (see Chapter 3), an age dependent curvilinear relationship will be demonstrated with parent proxy data. Hence, there will be significant and positive associations between parent proxy DB difference scores and their child's physical activity as measured an accelerometer for children and adolescents in Grades 7, but not Grades 11 and 3.

Similar to nutrition behaviour, researchers suggest there are multidimensional determinants of physical activity, including psychological, social, physical environment, and demographic factors (Kohl & Hobbs 1998; Welk, 1999). Accordingly, moderate temporal association coefficients between .20 and .40 with a .05 significance level are expected for hypotheses 5 and 6. Power calculations for Pearson's r correlations show similar subject numbers as those calculated in Chapter 3 (see Page 120). Therefore, to detect a correlation of .40, 50 participants per grade were recruited for this study in order to obtain power of .80. Statistical corrections that adjust for chance findings were not used for the analyses for the same reasons as those stated in Chapter 3 (see Page 120).

III. Methods

A. Participants and Procedure

Participants and procedures are the same as those described in Chapter 3 (see Pages 121-123). In addition, during the first classroom visit, participants were asked to wear accelerometers for one week to measure their physical activity. Detailed verbal and written instructions were given on how to wear the accelerometers. Students were asked to wear the accelerometer firmly against their body in Velcro pouches secured with a waist strap to ensure consistency and proper positioning. They were instructed to place the accelerometer near their right hip, over or under their clothes, as this site permits detections of whole body movements (as opposed to leg or arm movements) and is the most frequently used site in epidemiological studies. Finally, participants were asked to wear the accelerometer during all waking hours, except when showering or swimming. If the participants were to take off their accelerometer for showering or swimming, they were asked to record the date and time on a log sheet.

B. Materials

Accelerometers. Participants wore a Computer Science and Applications Inc. (CSA) accelerometer (Actigraph model 7164, see Figure 1, Page 171) to measure their physical activity for 7 days following the completion of the physical activity DB measure. The unit is small (5 x 4 x 1.5 cm), lightweight (43 grams) and does not interfere with activities of daily living. It is designed to detect vertical accelerations ranging in magnitude from .05 to 2.00 G's with a frequency response of .25 to 2.50 hertz. These parameters have been shown to allow for normal human motion with the rejection of high frequency vibrations from other sources such as a car, horse, or bike. The acceleration signal is filtered and digitized with the magnitude summed over a user specific interval of time. At the end of each day, the summed value or activity count is stored in memory and the numerical integrator is reset. The activity counts represent the summed magnitude and amount of the accelerations. A one-minute sampling interval was used to collect data over 7 consecutive days. Previous research has shown that a 7-day data collection period provides reliable day-to-day estimates of usual physical activity patterns of children and youth (Trost, Pate, Freedson, Sallis & Taylor, 2000).

The CSA accelerometer has been shown to be a reliable and valid tool for assessing physical activity in children and youth (Janz, 1994; Trost et al., 1998; For review, see Kohl et al., 2000). Reliability studies on accelerometers among children have included tests of inter-instrument ($\underline{r}$ = .89 to .96) and test-retest ($\underline{r}$ = .53 to .80) reliability from 3 days to 2 weeks (Freedson & Evenson, 1991; Janz, 1994; Janz, Witt & Mahoney, 1995; Massey, Lieberman & Batarseh, 1971; Sallis, Buono, Roby, Carlson & Nelson, 1990). Validity studies have included correlations of the accelerometer with other measures of physical activity, including direct observations (Klesges & Klesges, 1987; Mukeshi, Gutin, Anderson, Zybert & Basch, 1990; Noland, Danner, DeWatt, McFadden & Kotchen, 1990), parent records of activity (Freedson & Evenson, 1991), heart rate monitoring (Janz, 1994; Sallis et al., 1990; Welk & Corbin, 1995), whole-body calorimeter (Bray, Wong, Morrow, Butte & Pivarnik, 1994), and measures of oxygen uptake (Ballor, Burke, Knudson, Olson & Montoye, 1989).

Self-Report Physical Activity Decisional Balance Measure. The final version of the activity DB measure for youth was used and is described in Chapter 2 (see Page 110).

Parent-Proxy Physical Activity Decisional Balance Measure. Parent proxy DB measures were virtually identical to the child self-report measures. The only difference between the child self-report form and the parent-proxy form was the cover page title and directions. The directions instructed parents to answer the items for their child and about their child.

IV. Data Analyses

Attrition Rates. To examine potential participant selection biases, the percentages of participants who were excluded from the study due to non-compliance were calculated. Non-compliance with the accelerometer was defined as less than four days of activity data collected with the accelerometer. As well, the number of participants who were excluded from the study due to accelerometer loss or error (e.g., loose battery, damaged activity data file) were recorded. Decline rates and absentee rates were the same as that reported for the nutritional study (see Table 2, Page 80).

Environmental Factors. Some potential environmental factors that might have affected the generalizability of this study, or account for potential grade differences in physical activity levels were noted. For each grade, the weather conditions, temperature, and reasons for cancelled school days were recorded for the days that participants wore the accelerometers.

Body Mass Index Data. To describe some of the sample characteristics, BMI data were calculated for each child participant using the same methods as those described in Chapter 3 (see Page 116).

Average Daily Activity Counts. The stored daily activity counts from the accelerometer were downloaded to an IBM compatible computer. The CSA accelerometer data were reduced using custom software (Campagna et al., 2002). An average daily activity count was calculated for each child participant. Activity counts represent the summed magnitude and amount of vertical accelerations of human movement. Activity counts are considered the accelerometer's raw data. Accelerometer records were reviewed. Only students who met compliance criteria were entered into subsequent analyses. Compliance was defined by four or more days of activity data collected over 7 days (i.e., data collected on most days: ≥ 4 days). Non-compliance was recorded for days that the accelerometer was not worn for periods greater than four hours. The mean, standard deviation, and distribution of the average activity count variable were described. Normality was tested using the Kolmogorov-Smirnov statistic (Dallal & Wilkinson, 1986; Thode, 2002).

The main objective of this thesis is to measure the association between physical activity and DB within subjects, and not across grade. Therefore, raw accelerometer data (activity counts) were utilized in the present study. This variable is useful for statistical purposes, but the value itself is difficult to interpret. To further describe sample characteristics and evaluate the representativeness of the current study's accelerometer data, other activity variables were calculated and reference against a recent an epidemiological, province-wide study that used similar age groups (Grades 11, 7 and 3;

Campagna, et al., 2002). More specifically, average minutes of moderate, hard and very hard activity accumulated per day, and percentage of participants who did <30, 30-60, and >60 minutes of at least moderate activity on most days were calculated for each participant and included in a table.

The software categorized each count per minute value into light (<3 METS), moderate (3-5.9 METS), hard (6-8.9 METS) or very hard (>9 METS) activity. A MET (metabolic equivalent) is an index of the intensity of activities. 1 MET is resting energy expenditure, therefore 4 METs would be equivalent to four times the intensity of resting state. The software calculated 1-minute counts, and categorized these into one of the four intensities. It is expected that older children have larger strides and mass than younger children. Therefore, as children get older, the acceleration magnitude of the activity counts needed to classify moderate or vigorous (i.e., hard or very hard) activity should increase. Freedson and colleagues (1998) published an equation that takes into account age when deriving count ranges that correspond to the above intensity (METS) levels. With similar hip accelerations, older children show less activity than younger children when using the minutes of activity level calculations compared to using the raw accelerometer data. Age specific count ranges corresponding to the above intensity (METS) levels were derived from an equation developed by Freedson et al. (1998), which accommodates for these body size differences. This equation was as follows: METS = 2.757 + (0.0015 * counts/minute) – (0.08957 * age [years]) – (0.000038 * counts/minute * age [years]).

To examine the participant characteristics, potential differences between grades with regards to average daily minutes of moderate and greater activity (i.e., minutes of 3

METS or more) using one-way analyses of variances (ANOVAs) were calculated. Levene's test was used to examine the homogeneity of variance assumptions. Games-Howell's procedure was used for post hoc difference analysis as there were unequal sample sizes between grades (Games & Howell, 1976; Games et al., 1981; Keselman & Rogan, 1977; as sited in Howell, 1997).

Self-Report Activity DB Difference Scores. In order to calculate a DB difference score (Pro minus Cons), child self-report activity DB pro and con scale scores were converted to standardized T-scores ($\underline{M}$ = 50, $\underline{SD}$ = 10) based on the whole sample ($\underline{N}$ = 297; see Chapter 2, Page 64-66). To compare the self-report activity DB difference scores of the current subsample (behaviour study) with that of the larger sample (item reduction study; see Table 1, Page 79), potential differences between grades on the activity DB difference scores were again calculated using the same statistical procedures that were described in Chapter 2 (see Page 66).

Parent-Proxy Activity DB Difference Scores. Parent-proxy activity DB pro and con scale scores were calculated in the same manner as the self-report data. Scale scores were converted to standardized T-scores in order to calculate a DB difference score. Parent T-scores were calculated based on the sample of data collected from parent informants ($\underline{n}$ = 142, see Table 1, Page 79).

Criterion Validity. Pearson's r correlations were calculated to measure the associations of the child self-report and parent proxy activity DB difference scores and youth's activity counts for the entire sample and each grade level. Scatterplots were examined to assess outliers. Outliers were discarded if their reason for outlying was external to the study (e.g., broken leg or ill). To help evaluate the relationship between the DB difference scores and behaviour, additional correlations between the DB pro and con scale scores and physical activity were calculated.

V. Results

Attrition Rates. Of the participants who were present for the first and second classroom visits (n = 172), a total of 23 students were excluded due to loss of the accelerometer device or activity data file (five students in Grade 11, and two students in Grade 3), accelerometer error (e.g., loose battery; two students in Grade 11, three students in Grade 7, and two students in Grade 3), or non-compliance defined by less than four days of activity data collected by the accelerometer (eight students in Grade 7, and one student in Grade 3). The accelerometer non-compliance rate for the entire sample was 5.2%, which is comparable to and better than the rate of a completely separate and larger, province-wide study (i.e., 10 %; Campagna et al., 2002). In the end, there were 149 child and adolescent participants in Grade 11 (n = 45; 46.7% females; Mean age = 16.1, SD = 0.5), Grade 7 (n = 47; 53.2% females; Mean age = 12.1, SD = 0.3), and Grade 3 (n = 57; 49.1% females; Mean age = 8.1, SD = 0.3). Participants also included 142 parents of the youth in Grade 11 (n = 42; 84.4% mothers; Mean age = 39.1, SD = 4.2), Grade 7 (n = 50; 88.0% mothers; Mean age = 40.8, SD = 4.2), and Grade 3 (n = 50; 82.0% mothers; Mean age = 45.1, SD = 5.4).

Environmental Factors. The data collection for each grade took place during the course of one week during the fall of 2002. The one week time period contained a 4-day school week for each grade. Fortunately, the 4-day school weeks were due to Thanksgiving Day landing on the week that data collection with high school students took place (October 14^{th}), a teacher's professional day during data collection with junior high students (October 25^{th}), and a snow storm day when data was collected from elementary students (November 7^{th}). Hence, during this study, each grade had a 3-day weekend.

The weather conditions in the Halifax/Dartmouth region varied during the times that each age group was tested. When the study was being conducted with high school students, the average temperature was 12.8 degrees Celsius with 22% of the days having rain for at least part of the day. For junior high school students, the average temperature was 6.6 degrees Celsius with 27% of the days having some rain. When testing elementary school students, the average temperature was 7.3 degrees Celsius with 37% of the days being rainy and one day of snow.

Body Mass Index. The means and standard deviations for body mass index (BMI) and percent of participants in each BMI classification category for the whole sample, as well as for Grades 11, 7, and 3 are listed in Table 16 (see Page 168). The average body mass index for the whole sample was 21.0 kg/(m^2). Most participants fell in the Normal BMI category (64.3%; BMI percentile $>5^{th}$ and $<85^{th}$) and 18.2% fell in the Overweight category (i.e., BMI percentile $>95^{th}$). Approximately 62% of the participants who fell in the Overweight category were considered obese (11.2%; BMI percentile $>97^{th}$). These prevalence statistics are similar to the most recent provincial (Veugelers & Fitzgerald, 2005) and national (Statistics Canada 2002, 2004) estimates (9.9% and 18% classified as obese, respectively).

Average Daily Activity Counts. The means and standard deviations for average daily physical activity counts for the entire sample, as well as for Grades 11, 7, and 3 are listed in Table 17 and 18 (see Pages 169 and 170). The activity counts are displayed as thousandth's of a count. The scores for average daily counts among the whole sample ranged from 66.7 to 690.3. Among the whole sample, the mean score was 383.8 (SD = 115.5), and the median was 380.8. The distribution of scores was normal (Kolmogorov-Smirnov statistic = .05, $p > .05$) with a skewness of -.10 and a kurtosis of -.03.

A summary of participant activity data is listed in Table 17 (see Page 169). Except among Grade 3 females, the 'average daily minutes of moderate and greater activity' among the 1655 participants of Campagna and colleague's (2002) study were similar and fell within one standard deviation of the present study's corresponding samples, that is, males and females of Grades 3, 7 and 11. Although the two studies showed similar activity values, participants of the present study were generally more active than participants of Campagna and colleagues' (2002) study of similar sex and grade. Compared to the participants of Campagna and colleagues' (2002) study in terms of average daily minutes of moderate or greater physical activity, the present study's Grade 11 males accumulated 35.1 more minutes (M = 73.2, SD = 56.2), Grade 11 females accumulated 12.8 more minutes (M = 43.7, SD = 13.3), Grade 7 males accumulated 21.8 more minutes (M = 101.0, SD = 38.3), Grade 7 females accumulated 12.7 more minutes (M = 75.2, SD = 25.8), Grade 3 males accumulated 132.9 more minutes (M = 316.4, SD = 139.0), and Grade 3 females accumulated 123.0 more minutes (M = 288.8, SD = 119.6) with the accelerometers. Campagna and colleagues' (2002) study contained participants from both urban and rural schools. There is evidence to suggest that children who live in urban areas are more active compared to those who live in rural areas during winter months (Loucaides, Chedzoy & Bennett, 2004). Participants of the present study might have shown higher activity values than those of Campagna and colleagues' (2002) study due to their urban location.

A main effect of grade was found ($F_{2, 149} = 120.1$, $p < .001$) for average daily minutes of moderate and greater activity. Levene's tests of homogeneity of variance reveal that the population variances were homogeneous ($p > .05$). Consistent with Campagna's (2002) study, Games-Howell's post-hoc analyses revealed that average daily minutes of moderate and greater activity among Grade 3 students was significantly higher that than Grade 7 and 11 students, and that average daily minutes of moderate and greater activity among Grade 7 students was significantly higher that than Grade 11 students.

Pate, Trost, and Williams (1998) have argued that 60 minutes of physical activity per day should be recommended for children. Among the whole sample of the present study, 55.6% of participants showed greater than 60 minutes of moderate or greater activity on most days. Grade 3 participants had the highest rates (85.7% of males, 88.0% of females met criteria), followed by Grade 7 students (65.0% of males, 53.8% of females met criteria), and then Grade 11 students (28.0% of males, 0% of females met criteria), who showed the lowest rates. Across each grade, the percentage of females who met the criteria of doing at least 60 minutes of physical activity on most days were lower than males in the same grade. The gender gap regarding the percentage of males and females who met this physical activity criterion was greater with higher age.

Child Self-Report Activity Decisional Balance. The child activity DB pro scale, con scale and difference score means for the whole sample, as well as for Grades 11, 7, and 3 are listed in Table 18 (see Page 170). The overall DB difference mean score was

-.65 (SD = 11.89), and median score was -1.5. The distribution of scores were normal (Kolmogorov-Smirnov statistic = .03, $p > .05$) with a skewness of -.10 and a kurtosis of .75.

Consistent with the larger sample in the item reduction study (see Table 7, Page 85), this subsample of participants had a significant difference between child self-report activity DB difference scores across grade ($F_{2, 149} = 4.22$, $p < .05$). Levene's tests of homogeneity of variance revealed that the population variances were homogeneous ($p > .05$). Games-Howell's post-hoc analyses revealed that Grade 7 activity DB difference scores were significantly higher than Grade 3 and Grade 11 activity DB difference scores. These post-hoc analyses were similar to those found in the larger study (see Table 5, Page 83).

Parent Proxy Activity Decisional Balance. The parent proxy activity DB pro scale, con scale and difference score means for the whole sample, as well as Grades 11, 7, and 3 are listed in Table 18 (see Page 170). Among the whole sample, the DB difference mean score was .00 (SD = 12.21), and the median score was -1.18. The distribution of scores was normally distributed (Kolmogorov-Smirnov statistic = .05, $p > .05$) with a skewness of -.41 and a kurtosis of -.23. The parent-proxy activity DB pro and con scales had adequate to good internal consistencies between its 11 (_ = .77) and 18 items (_ = .82), respectively ($n = 147$; George & Mallery, 2003).

Criterion Validity of Child Self-Report Activity Decisional Balance. None of the child self-report DB pro scale, con scale or difference scores was statistically correlated to average daily activity accounts in the entire sample, or among those in Grades 11, 7 or 3 (see Table 18, Page 170).

Criterion Validity of Parent Proxy Activity Decisional Balance. Among Grade 11 students, the parent proxy DB difference score was statistically correlated to their children's average daily activity counts as measured by the accelerometer (see Table 18, Page 170). The other criterion validity coefficients for the parent proxy activity DB difference score across the whole sample or within the lower grades (Grade 7 and 3) were not statistically significant. Among the parent proxy DB pro and con scale scores, only the DB con scale score was significantly related to physical activity among Grade 11 students.

VI. Discussion

A. External Validity of the Activity DB Measure using Self-Report

This was the first study to examine the external validity of a physical activity DB measure using an objective measure of activity, the accelerometer. Contrary to what was hypothesized, the child self-report DB difference scores were not significantly related to accelerometer counts for the entire sample, or Grades 11, 7 or 3 separately. These results suggest that the newly developed physical activity DB measure using child self report does not predict behaviour, and therefore may not be externally valid among children and adolescents who are 16 years of age or younger. Thus far, only one other study has examined the external validity of a physical activity DB scale among youth (N = 400 adolescents, Grades 9 – 12; Mean age = 14.89, SD = 1.15; Nigg, 2001). This study used a self-report measure of physical activity as the criterion measure, and found that exercise DB pros (and not cons) were significantly related to self-reported strenuous ($r = .14$, $p < .05$) and moderate exercise ($r = .13$, $p < .05$). In addition, Nigg (2001) found that self-reported strenuous exercise remained significantly related to pros in a follow up study three years later ($r = .14$, $p < .05$). The different results observed between Nigg's (2001) and the present study, in terms of significance, was likely due to differences in sample size. The insignificant correlation observed between the DB difference score and average daily activity counts ($r = .23$, $p = .13$) among the 49 Grade 11s in the present study was larger than the significant correlation coefficients in Nigg's (2001) study ($r = 0.13, .14$).

It is possible that DB difference scores may predict self-reported, but not objective measures of behaviour. Supporting this notion is the fact that the nutrition DB difference score predicts nutrition behaviour using a parent-assisted self-report questionnaire among participants in Grades 11 and 7s (see Chapter 3), but not physical activity measured objectively with an accelerometer. The idea that DB better predicts self-reports of behaviour compared to objective measures of behaviour raises a question about past DB validation studies of the TTM among adults and adolescents, which have relied exclusively on self-report of behaviour as their criterion measure. To help address this important methodological issue, future research should compare DB difference score predictive abilities of self-report and objective measures of behaviour across the lifespan, including adults.

There is only some evidence to suggest that physical activity DB measures among adolescents predict stage of change. As is outlined in Chapter 1, Nigg and Courneya (1998) showed theoretically predicted relationships between pro and con scales of an exercise DB scale and a measure of stage of change among high school students (Mean age = 15.0, SD = 1.22). On the other hand, Hausenblas and colleagues' (2002) found no significant differences between leisure exercise DB difference scores and stage of change among youth in grades 6 through 8 (Mean age = 12.61, SD = 1.0). These studies need to be replicated, as Hauseblas and colleague's (2002) study had very low participant numbers in the pre-action stages (n = 41 out of 387 participants), and limited variability in the DB scores.

The prediction abilities of the activity DB pro and con scale scores may have been masked with the use of a difference score. To examine this possibility, Pearson's r correlations were calculated to measure the temporal associations of the child self-report pro and con scale scores with average activity counts as measured by the accelerometer. There were no significant relationships between the self-report DB pro or con scale scores with activity among the entire sample, Grade 11s, Grade 7s, or Grade 3s. Hence, it is concluded that the self-reported DB difference score did not mask possible predictive effects of the pro or con scale of the newly developed activity DB measure.

The finding that the nutrition DB measure, but not the activity DB measure showed significant predictive validity coefficients among participants in Grades 11 and 7 might suggest that external validity of DB measures depend on the health behaviour in question. Why might DB measures be externally valid for children and adolescents in one behavioural domain, but not another? It is possible that children and adolescents do not have the same quality of experience when making decisions about physical activity as they do when making decisions about food choice. Such experiences might include, for example, receiving bodily feedback as a consequence of choosing certain foods or activities. Noticing the consequences of being physically active, such as increased flexibility, strength and cardiovascular endurance, and the consequences of being sedentary, such as decreased flexibility, strength and cardiovascular endurance over time might be absent among youth. Interestingly, the association between activity levels and fitness (i.e., cardiovascular endurance, strength, flexibility) among adults is larger than the association among children (Welk et al., 2000). With regards to nutrition, children may often experience bodily consequences with different types of foods throughout their day during each of their meals and snacks, such as gastrointestinal upset, energy differences or mood changes. Experiencing immediate bodily feedback regarding health behaviour choice may be necessary for children and adolescents in order for them to demonstrate external or predictive validity with DB measures. Future research might consider examining children and adolescent's DB difference score's predictive abilities as a function of their awareness and experience of bodily consequences due to changes in physical activity levels and nutrition behaviour.

B. External Validity of the Activity DB Measure using Parent Informants

It was hypothesized that parent proxy DB difference scores would be significantly related to their children's average daily activity counts for participants in Grade 7, but not Grades 11 and 3 (i.e., an age dependent curvilinear function). However, a significant relationship between the parent proxy DB difference score and physical activity was only found among parents of Grade 11 students, even though there was a low number of parent participants ($\underline{n} = 42$). If replicated, these results suggest that the newly developed physical activity DB measure using a parent informant may be externally valid for adolescents in Grade 11, but not for children who are 12 years of age or younger. At the minimum level of inference, these results suggest that parents of Grade 11 adolescents have theories regarding their son or daughter's internal cognitions about the reasons they choose physical activity that actually predict their child's behaviour. As well, these results suggest that parental DB theories about their younger children in Grades 7 or 3 do not predict their child's behaviour.

When examining the prediction abilities of parent proxy DB pro and con scale and difference scores among Grade 11 participants, only the difference and con scale scores (an not the pro scale score) is significantly related to physical activity. If replicated, these results suggest that prevention and intervention efforts to enhance motivation for physical activity among 16 year olds should involve parent opinion about decreasing the cons of physical activity, in the context of the relative balance against the pros. Interestingly, this preliminary suggestion of involving parents in intervention strategies with adolescents is different from that given for the nutrition domain (see Chapter 3, Page 134). The self-report nutrition DB pro scale score, but not the con scale score, was related to percent calories from fat and sugar consumed. Therefore, it was suggested that intervention efforts to enhance motivation for healthy eating among adolescents should focus on increasing self-perceived pros of eating nutrient-dense foods, in the context of their relative balance against the cons.

The issue of parent involvement in health behaviour interventions for youth is an understudied area. With younger children (8-12 years), there have been a number of studies that support the involvement of parents in the treatment of childhood obesity (Epstein et al., 1985; McLean et al., 2003). However, a recent descriptive systematic review on the effectiveness of family involvement with weight control interventions concluded that adolescents achieved greater weight-loss when treated alone (McLean, et. al., 2003). This dissertation is the first study to assess DB prediction abilities with more than one health behaviour among the same sample of adolescents. It will be important for future research to examine the DB model across various behavioural domains when attempting to understand the generalizability of the DB model across different informants in younger populations.

Some might argue that the prediction abilities of the activity DB pro and con scale scores among parents of students in Grades 7 and 3 may be masked with the use of a difference score, which is a subtraction of the two scale scores (pros minus cons). Again, to address this issue, Pearson's r correlations were calculated to measure the temporal associations of the parent proxy pro and con scale scores with average activity counts as measured by the accelerometer. There were no significant relationships between the parent proxy DB pro or con scale scores with activity among students in Grade 7 or 3. Hence, the parent proxy DB difference score likely did not mask possible predictive effects of the pro or con scale of the newly developed activity DB measure.

To help explain why the parent proxy activity DB measure predicted behaviour among youth in Grade 11, but not Grades 7 and 3, one could argue that parents find it easier to estimate the physical activity and motivation for physical activity with adolescents compared to younger children. Support for this argument is the fact that physical activity among young children is more erratic than adolescent and adult activity (Bailey et al., 1995; Rowland, 1998; Welk et al., 2000). Behaviour is easier to understand and predict if it is stable and routined. There are other possible reasons why parent informants of activity DB have better predictive abilities with older children compared to younger children. Understanding another person's motivations for their behaviour is easier when you can talk to them about it. In general, older children have more sophisticated cognitive abilities and mature communication skills than younger children, and therefore, may provide parents better information to create predictive theories with the DB measures.

The age dependent curvilinear function theory that was used to describe the differential predictive abilities of the parent-proxy nutrition DB difference score across age (see Chapter 3) might also explain the parent-proxy results within the activity domain. In the nutrition study, the parent-proxy nutrition DB difference score significantly predicted youth's nutrition among Grade 7s, but not Grade 11s or 3s. It is possible that the age dependent curvilinear function was shifted to an older age within the physical activity domain. Parent informants may be important in understanding the motivations for physical activity among adolescents who are approximately 16 years old, but may be less informative among younger children and those older than 16 years old (e.g., older adolescents and young adults). Why would this function shift to an older age within the activity domain? Interestingly, average daily activity counts as measured by the accelerometer significantly differed across grade, whereas average daily percentage of calories consumed from fat and sugar did not differ across grade. This suggests that nutrition behaviour might be more stable than physical activity levels. Longitudinal studies, of course, are needed to support this idea. However, it is possible that declining levels in youth's physical activity from Grades 3 to 7 makes it difficult for parents to create theories about their child's motivation for physical activity that would predict their behaviour because their activity levels may not yet be stable until Grade 11. It is also possible that the significant correlation between the parent informant activity DB difference score and accelerometer activity counts was found by chance (1/20), and not because there was a true effect (i.e., a type II error). Clearly, more research in the area of parent proxy physical activity DB among youth is needed before definitive conclusions can be made about its predictive validity.

C. Accelerometer Activity Counts

Differences in weather conditions across grade may have differentially affected the physical activity or activity DB measure results across grade, and therefore the generalizability of this study's results. First, the high school participants experienced warmer temperatures during the study compared to those in elementary and junior high (i.e., a 6 degree difference). This might have encouraged more activity among those in high school compared to those in the younger grades. Second, the amount of precipitation experienced by participants during the study was higher among elementary school participants compared to the older grades (i.e., about 10-15% of days). Higher percentages of precipitation days among Grade 3 participants may have increased the variability in their physical activity data. For example, participants in Grade 3 experienced a surprise snow day, which may have increased physical activity among those who chose to play outside, and decrease the physical among those who chose to stay indoors. Future research that replicates this study should consider using better controls with weather conditions.

There may have also been some measurement issues in assessing physical activity that might have accounted for the lack of associations seen between physical activity DB and behaviour. The accelerometer, although objective, does not capture all physical activity. The monitors were worn on one body area (the hip and not the arms), could not be worn in water, and only detect frequencies of human movement. Therefore, the accelerometer has limited ability to assess activities that primarily use upper body movements, water activities, or locomotion on a gradient or object (e.g., biking, skating or horseback riding). It is possible that the physical activity DB significantly predicts activities that the accelerometer could not measure, such as swimming, playing hockey, or biking. A survey study by Nova Scotia Sport and Recreation Commission conducted along Campagna and colleagues (2002) province-wide study showed that biking, rollerblading, swimming, and skateboarding were some of the most favorite physical activities listed among Nova Scotia children of Grades 11, 7 and 3 (Sport and Recreation Commission Government of Nova Scotia, 2004).

To help address this measurement issue, participants of this study were asked to complete a diary of their physical activity when not wearing the accelerometer (e.g., swimming), or when doing activities that the accelerometer could not assess (e.g., ice skating). When examining these activity diaries, however, few participants entered information about physical activities that were not measured by the accelerometer. It is unknown whether this lack of information was due to low compliance, or if children and adolescent participants actually did not engage in activities that the accelerometer did not measure during this study. Future research is needed that replicates this external validity study using other objective methods of measuring physical activity, such as direct observation.

D. Summary of Chapter 4

The newly developed activity DB measure shows acceptable external validity among adolescents in Grade 11 when using a parent as the informant. The next chapter will summarize and discuss the results of this dissertation in general, give general recommendations for future research, as well as discuss possible clinical implications.

Table 16.

BMI Characteristics of the Activity Study Sample

	All Grades (n=149)		Grade 11 (n=45)		Grade 7 (n=47)		Grade 3 (n=57)	
	Male (n=74)	**Female** (n=75)	**Male** (n=24)	**Female** (n=21)	**Male** (n=22)	**Female** (n=25)	**Male** (n=29)	**Female** (n=28)
	M (SD)							
BMI Index	21.0 (5.2)		24.4 (5.5)		20.5 (4.2)		18.5 (4.0)	
	21.4 (5.8)	20.6 (4.4)	25.5 (6.5)	23.0 (3.4)	20.8 (4.7)	20.2 (3.9)	18.1 (3.0)	18.9 (4.9)
	Percentage of Participants							
BMI Classification								
Underweight (<5th %ile)	1.4		2.2		2.2		0.0	
	2.8	0.0	4.0	0.0	5.3	0.0	0.0	0.0
Normal (5^{th} to <85^{th} %ile)	64.3		64.4		66.7		62.3	
	55.6	73.2	56.0	75.0	52.6	76.9	57.1	68.0
At Risk (85^{th} to <95^{th} %ile)	16.1		13.3		15.6		18.9	
	19.4	12.7	12.0	15.0	26.3	7.7	21.4	16.0
Overweight (>95^{th} %ile)	18.2		20.0		15.6		18.9	
	22.2	14.1	28.0	10.0	15.8	15.4	21.4	16.0
Obese (>97^{th} %ile)	11.2		11.1		8.9		13.2	
	15.3	7.0	20.0	10.0	10.5	7.7	14.3	12.0

Table 17.

Activity Characteristics of the Activity Study Sample

	All Grades (n=149)		**Grade 11** (n=45)		**Grade 7** (n=47)		**Grade 3** (n=57)	
	Male (n=74)	**Female** (n=75)	**Male** (n=24)	**Female** (n=21)	**Male** (n=74)	**Female** (n=75)	**Male** (n=24)	**Female** (n=21)
	M (SD)							
Daily activity counts (1000s)	383.8 (115.5)		349.4 (115.4)		381.5 (107.8)		414.9 (115.6)	
	421.2 (123.1)	345.3 (93.3)	382.3 (128.2)	308.3 (827.2)	418.1 (107.7)	353.3 (101.0)	458.1 (121.7)	366.6 (87.5)
Minutes of moderate activity per day	96.0 (82.0)		51.6 (40.6)		77.2 (30.6)		151.1 (105.7)	
	103.5 (84.4)	88.5 (79.5)	63.5 (51.1)	36.8 (9.3)	89.6 (34.7)	67.4 (23.2)	152.1 (109.9)	150.1 (103.8)
Minutes of hard activity per day	55.5 (67.7)		7.3 (6.6)		8.5 (5.3)		137.6 (41.6)	
	60.4 (72.6)	50.5 (62.5)	8.1 (6.7)	6.3 (6.4)	10.4 (5.8)	7.0 (4.5)	147.3 (44.9)	127.6 (36.1)
Minutes of very hard activity per day	5.9 (7.7)		1.2 (1.6)		1.1 (1.1)		13.7 (7.1)	
	7.2 (9.1)	4.6 (5.7)	1.6 (1.9)	0.7 (0.9)	1.0 (0.9)	1.1 (1.2)	17.1 (7.9)	11.1 (4.5)
Minutes of > light activity per day	157.4 (139.7)		60.1 (44.9)		86.8 (34.0)		302.9 (129.3)	
	171.1 (145.8)	143.5 (132.8)	73.2 (56.2)	43.7 (13.3)	101.0 (38.3)	75.5 (25.8)	316.4 (139.0)	288.8 (119.6)
	Percentage of participants							
< 30 minutes*	27.8		51.1		23.9		11.3	
	24.7	31.0	48.0	55.0	10.0	34.6	14.3	8.0
30-60 minutes*	16.7		33.3		17.4		1.9	
	15.1	18.3	24.0	45.0	25.0	11.5	0.0	4.0
> 60 minutes*	55.6		15.6		58.7		86.8	
	60.3	50.7	28.0	0.0	65.0	53.8	85.7	88.0

* = Minutes of at least moderate (>light) activity on most days

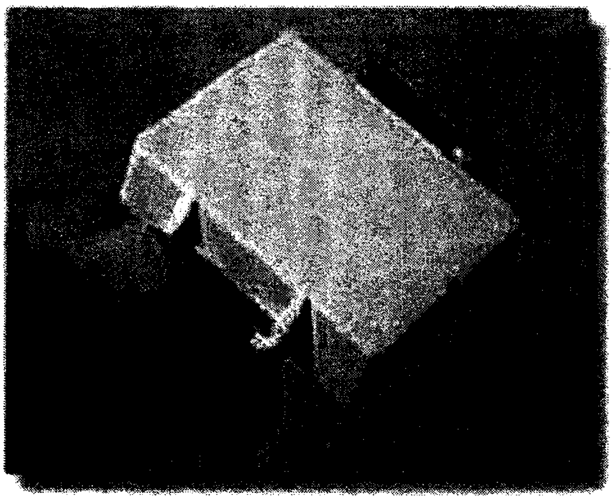
Table 18.

Mean Raw Scores for Physical Activity, Mean T-scores for Activity DB Pro Scale, Con Scale and Difference Scores, and Criterion Validity Coefficients across Grade

	Average Daily Activity Counts (1000s)	Activity DB					
		Pro Scale Score		Con Scale Score		Difference Score	
Activity Decisional Balance Measure	**Raw Mean (SD)**	**Mean T-Score (SD)**	**r**	**Mean T-Score (SD)**	**r**	**Mean T-Score (SD)**	**r**
Child Self-report							
All Grades (n = 148)	383.8 (115.5)	49.86 (10.13)	0.08	50.51 (9.69)	0.13	-0.65 (12.91)	-0.03
Grade 11 (n = 46)	349.4 (115.4)	45.26 (9.65)	0.11	48.34 (7.97)	-0.23	-3.07 (12.57)	0.23
Grade 7 (n = 49)	381.5 (107.8)	51.80 (8.80)	0.12	47.64 (7.58)	0.08	4.15 (11.42)	0.06
Grade 3 (n = 53)	414.9 (115.6)	52.31 (10.44)	-0.08	55.25 (11.16)	0.20	-2.94 (13.47)	-0.21
Parent Proxy							
All Grades (n = 147)	383.8 (115.5)	50.07 (9.99)	0.02	50.08 (9.77)	-0.03	0.00 (12.91)	0.04
Grade 11 (n = 44)	349.4 (115.4)	50.29 (11.35)	0.05	50.19 (9.62)	-0.41*	0.10 (12.69)	0.38*
Grade 7 (n = 51)	381.5 (107.8)	49.67 (8.99)	0.14	49.84 (9.51)	0.14	-0.17 (11.35)	-0.01
Grade 3 (n = 52)	414.9 (115.6)	50.28 (9.87)	-0.16	50.22 (10.31)	-0.03	0.00 (12.83)	-0.10

*$p < .05$

Figure 1. Picture of the CSA Accelerometer



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CHAPTER 5

GENERAL SUMMARY AND DISCUSSION

I. Dissertation Summary

This dissertation was an exploratory, cross-sectional study to explore how young in age, and with what informant (child or parent) decisional balance scales for nutrition behaviour and physical activity could be used in a reliable (internal and test-retest reliability) and valid manner (construct and predictive validity). This involved two steps. First, the development of two new decisional balance (DB) measures designed specifically for children and adolescents' nutrition (DB-NU) and physical activity (DB-PA) behaviours; second, the evaluation of the psychometric properties of these newly developed DB measures.

Existing decisional balance scales are limited in their applicability to children for several reasons. They have been designed and validated among adults, and more recently, adolescents. Nor do they reflect the unique developmental, contextual and measurement issues of youth. This dissertation addressed such limitations by creating scales specifically designed for children and adolescents and by utilizing their parent as an informant. The format and instructions of the youth DB measures were tailored for young people by, for example, the use of visual illustrations, expanded and simplified directions, and 3-point Likert scales. The item content differed in a number of ways from existing adult and adolescent DB measures (see Chapter 2, Page 106 for details). For example, the new youth DB measures considered more immediate and short-term consequences of health behaviour compared to corresponding adult and adolescent DB measures. From a content validity point of view, the newly developed scales can be considered advances to the field by tapping more directly into the lived experiences of children regarding nutrition behaviour and physical activity. As such, these scales provide a starting point from which to evaluate the value of the decisional balance construct as it is associated with healthy eating and activity.

The items on the new measures were statements concerning reasons for and against choosing nutrient-dense and calorie-dense foods on the nutrition DB measure (DB-NU), and choosing physical activities and sedentary activities on the activity DB measure (DB-PA). The behavioural choices differed from available adolescent DB measures that focused on dietary fat reduction (Rossi et al., 2001) and exercise or leisure activity (Hausenblas et al., 2002; Nigg, 2001; Nigg & Courneya, 1998) in some important ways. First, in comparison to these old measures, the DB measures of this dissertation used a broader definition of health behaviour. The behavioural focus of the new nutrition DB measure (DB-NU) is similar to the way food was categorized in a well-established nutrition intervention for youth: Epstien's traffic light diet (i.e., nutrient- and calorie-dense foods; Epstien et al., 1985). The new activity DB measure's (DB-PA) behavioural focus was comparable to what is currently recommended by Health Canada's Physical Activity Guide to Healthy Active Living for Children and Youth (Health Canada, 2002). The current measure emphasized all types of physical activities that an individual could do throughout their day, and was not limited to structured exercise or leisure activities.

Second, a diverse source of resources were used to gather appropriate and representative items for the new youth DB measures: focus groups with children and adolescents, written feedback from parents, literature reviews on empirical studies that examined determinants of food choice and physical activity among youth, and expert advice. Empirical item analyses on a survey of 297 children from Grades 11, 7 and 3 were then conducted to select the best items for two 40-item DB measures. The item reduction analyses included 5 statistical techniques: item comprehensibility ratings, item endorsement frequencies, item discrimination ability, item-total correlations, and item factor loadings.

Exploratory principal component analyses of the items resulted in a 2-factor, pro/con DB dimension for both measures. The orthogonal 2-factor structure accounted for 35% of the variance for the final nutrition DB measure (DB-NU) and 30% of the variance for the final activity DB measure (DB-PA). The percentages of variance accounted for by 2-factor model were lower than those observed within the adult and adolescent literature (40 to 80%; Prochaska et al., 1994). The lowered percent variance observed among youth may be due to varying factor structures across age. Among previous research on DB with adolescent populations, a more complex factor structure has been supported for both smoking and drinking behaviours (Social Pros, Coping Pros and Cons for smoking; Pallonen et al., 1998; Plummer et al., 2001; Pros, Cons-Actual, Cons-Potential for drinking; Migneault et al., 1997). The more typical 2-factor model, however, has also been supported in these areas among adolescents (Chen et al., 2003; Hudmon et al., 1997; Otake & Shimai, 2001; Pallonen, 1998; Stern et al., 1987). Regarding nutrition and physical activity DB measures among both adults and adolescents, previous research revealed a factor structure larger than two on one occasion. Specifically, Myers and Roth (1997) suggested a model containing 4 benefit factors (social, psychological, body image, and health) and 4 barrier factors (time-effort, social, physical effects, and specific obstacles) for a 48-item activity DB measure. This

8-factor model might have been selected instead of the usual 2-factor model (Marcus et al., 1992) due to a larger amount of items (i.e., 48 versus 16). It is also possible that these two factor structures are complementary to one another. The 2-factor model of the one adult activity DB measure (Marcus et al., 1992) could be hierarchical to the 8 factors found with the other activity DB measure (Myers & Roth, 1997). To be able to make more definitive conclusions about the factor structures of the new nutrition and activity DB measures (DB-NU; DB-PA) for youth, it may be important for future research to replicate the present factor analytic study across varying ages. The factor analyses performed in the present study used data from child self-reports of DB. Future research might also consider replicating this factor analytic study utilizing parent proxy reports of DB.

Each of the pro and con scales for the resulting nutrition and activity DB measures (DB-NU; DB-PA) had normal distributions and acceptable to good internal consistencies (Cronbach's α's, or $\underline{r}$'s, were between .74 and .86, $\underline{n} = 297$). These internal consistency coefficients were similar to those reported in previous studies among adolescents for both nutrition DB ($\underline{r} = .79, .78$, $\underline{n} = 224$ students in Grade 9; Rossi et al., 2001) and activity DB ($\underline{r} = .92, .81$, $\underline{n} = 819$ students in Grade 9 -12, Nigg & Courneya, 1998) measures.

Central to this dissertation was the DB difference score (pro scale T-score minus con scale T-score), which measures a person's relative balance of weighted positive and negative thinking about engaging in a particular health behaviour. The assumption of the Prochaska's transtheoretical model (TTM) that the DB difference score is related to nutrition and physical activity behaviour has been rarely tested. Instead, previous research has evaluated the external validity of DB by relating its pro and con scales to the stages of change construct (Prochaska et al., 1994). Apart from this thesis, the only exception was a longitudinal study by Nigg and colleagues (Nigg, 2001; Nigg & Courneya, 1998) that measured correlations between DB and self-reported, but not objectively measured, exercise behaviour in adolescents (see Chapter 1, Page 19). Hence, this dissertation was the first study to examine the ability of a nutrition DB measure (DB-NU) to predict behaviour, and the first study to examine the ability of an activity DB measure (DB-PA) to predict behaviour using an objective measure of physical activity.

The psychometric properties of the resulting DB measures were examined in order to best interpret the DB measures' external validity among three age groups of youth (Grades 11, 7 and 3). For the new nutrition measure (DB-NU) scales, one-week test-retest reliabilities were moderate among students in Grades 11 and 7 ($\underline{r}$ = .76, .72, $\underline{n}$ = 15, 58), but low among students in Grade 3 ($\underline{r}$ = .26, $\underline{n}$ = 37). In other words, children as young as those in Grade 7 (approximately 12 years old) were reliable at reporting their motivations for choosing nutrient-dense and calorie dense foods after one week. Regarding the activity DB measure (DB-PA) scales, moderate to strong test-retest reliability coefficients were observed among participants of all grades ($\underline{r}$ = .67 to .92, $\underline{n}$ = 15 to 58). This suggests that children as young as those in Grade 3 (approximately 8 years old) were reliable at reporting their motivations for choosing physical activities after one week.

Excluding the nutrition DB measure (DB-NU) among Grade 3 students, the newly developed DB measures had acceptable temporal stabilities. The test-retest reliability correlation coefficients observed among Grade 11 and 7 students were similar to those reported in a previous research study. Only one other study among the literature on nutrition and activity DB examined temporal stability. Specifically, Myers and Roth (1997) examined the test-retest reliability of an activity DB measure among 143 adults over a 2-week period and found moderate test re-test reliabilities (i.e., r = .68 to .88). In the current work, the low test re-test reliability coefficient observed among Grade 3 students for the nutrition DB measure (DB-NU), but not the activity DB measure (DB-PA), was understood within the context of a possible confound variable. The occurrence of Halloween, and therefore an environmental change in the availability of calorie-dense foods, during the time Grade 3s and not Grade 11s and 7s took part in the study was concluded to be the best explanation for the low temporal stability of the nutrition DB measure among Grade 3 students (see discussion in Chapter 2, page 104). A replication study with better environmental control over dietary opportunities is needed before conclusions can be made about the temporal stability of the nutrition DB measure among Grade 3 students.

Construct validity was examined by correlating the DB pro and con scales with the only available and validated TTM measure for both nutrition and activity behaviour among youth: self-efficacy. According to the TTM, DB and self-efficacy are distinct and related constructs that mediate movement between the five stages of change. Of the available literature on nutrition DB, the present study was the first to measure direct correlations between nutrition self-efficacy and nutrition DB scales. Instead, previous research has related DB and self-efficacy scales to stages of change measures.

Specifically, Rossi and collegues (2001) found that nutrition DB pro and self-efficacy scales increase across stage, and that nutrition DB con scales decrease across stage.

The nutrition self-efficacy measure utilized in the present study (Edmundson et al., 1996; Parcel et al., 1989) assessed youth's confidence in choosing foods low in fat and salt across various situations. There were significant, positive, but low correlations between the nutrition DB (DB-NU) pro scale and self-efficacy across all grades (r = .21 to .26, n = 75 to 119). The estimated overlap between the two measures was small (4 to 7%), suggesting the nutrition DB (DB-NU) pro scale does not strongly overlap with the nutrition self-efficacy measure among students across each grade, and that they are nearly orthogonal constructs. The expected negative correlations between the nutrition DB (DB-NU) con scale and self-efficacy were not significant across grade level (r = -.08 to -.12, n = 75 to 119). This null finding, as well as the small overlap between the nutrition DB (DB-NU) pro scale and self-efficacy measure, was most likely due to differences between the measures' operational definitions of nutrition behaviour (foods high in fat and sugar, versus foods high in fat and salt), and perhaps low power.

The activity self-efficacy measure (Edmundson et al., 1996; Parcel et al., 1989; Saunders, et al., 1997) assessed youth's confidence in choosing physical activity across various times and situations. For the most part, there were significant, moderate and positive correlations between the activity DB (DB-PA) pro scale and self-efficacy (r = .34 to .46, n = 75 to 119), and significant, moderate and negative correlations between the activity DB (DB-PA) con scale and self-efficacy (r = -.36 to -.46, n = 75 to 119) across grade. The exception was a non-significant correlation between the activity DB (DB-PA) con scale and self-efficacy among Grade 3 participants (r = -.03, n = 103). The latter suggests that one or both of these measures has low construct validity among students who are approximately 9 years old. The estimated overlap between the two TTM activity measures among students in Grades 11 and 7 is small (9 to 25%), but slightly higher than that reported in the only other available study that examined the correlation between activity self-efficacy and DB. Specifically, Nigg and Courneya (1998) found significant, moderate and positive correlations between self-efficacy and DB pro scales ($r = .45$, $n = 819$), and significant, weak and negative correlations between self-efficacy and DB con scales ($r = -.11$, $n = 819$). In summary, it appears that the new nutrition DB scales (DB-NU) and the activity DB scales (DB-PA) operate differently, at least for those in Grade 11 and 7. Among Grade 11 and 7 participants, nutrition DB (DB-NU) showed to be independent from self-efficacy, and activity DB (DB-PA) assessed similar, but non-redundant constructs as self-efficacy.

Predictive abilities of the DB difference scores within both behavioural domains were examined with approximately half of the participants ($n = 148$) who did not participate in the test-retest study. As there are multidimensional determinants of health behaviour (Hursti, 1999; Kohl & Hobbs, 1998; Welk, 1999), correlations between DB and behaviour were expected to be in the moderate range (i.e., effect sizes equivalent to $r = .2$ to $.4$, or 4 to 16% variance accounted for). These effect sizes are considered meaningful in the area of psychology (Ahadi & Diener, 1989; Strube, 1991), and are within the range of those reported in previous research among youth that examined associations between measures of nutrition behaviour and nutrition self-efficacy ($\leq$ 2% variance accounted for; Corwin, Sargent, Rheaume & Saunders, 1999; Resnicow, Davis-Hearn, Smith, Baranowski, Lin, Baranowski et al., 1997), as well as between measures of physical activity and activity self-efficacy (e.g., ≤ 21% variance accounted for; Allison, Makin & Dwyer, 1999; Bungum, Pate, Dowda & Vincent, 1999; Bungum & Vincent, 1997; DiLorenzo, Stucky-Ropp, Vander Wal & Gotham, 1998; Saunders et al., 1997; Trost, Pate, Saunders, Ward, Dowda & Felton, 1997). Self-efficacy measures were considered a good criterion since self-efficacy is a component of TTM, and various independent self-efficacy measures (e.g., Sallis et al., 1992) provided a valuable standard for comparison. In addition, self-efficacy has been described among some researchers as the strongest psychosocial predictor of physical activity among youth (e.g., Sallis et al., 1992). In summary, moderate correlations between DB and behaviour were expected.

The external validity of the nutrition DB (DB-NU) difference score was examined by measuring its temporal association with percent calories of fat and sugar consumed over a subsequent week using a parent-assisted, children's food frequency questionnaire (FFQ; Block et al., 2000). It was hypothesized that the frequency and amount of calorie-dense foods chosen would be negatively related to the extent that youth rated the advantages of eating nutrient-dense instead of calorie-dense foods as more important than the disadvantages (i.e., the nutrition DB difference score). Since one-week test-retest reliability coefficients of the nutrition DB measure (DB-NU) were low among Grade 3 participants, a hypothesis about the predictive validity of the difference score among this age group was absent. As predicted, the nutrition DB measure was externally valid and moderately predicted nutrition behaviour among students in Grade 11 and Grade 7. The percent variance accounted for by the nutrition DB difference score ranged from 10 to 24% ($\underline{r}$ = .32 to .49), which was within and higher than the range of hypothesized effect sizes. Specifically, the nutrition DB difference scores were significantly correlated with average percent calories of fat and sugar consumed per day for a subsequent week as measured by a FFQ among both Grade 11s and Grade 7s when using the self-report DB measure (10 to 16% variance accounted for), and among Grade 7s (and not Grade 11s) when using parents as informants (24% variance accounted for). These results suggest that the newly developed nutrition DB measure (DB-NU), among other major influences that were not measured, predicts behaviour among students who are approximately 12 and 16 years of age.

This dissertation was the first to utilize parents as informants to measure DB among youth, and highlights the importance of informant type when evaluating the external validity of DB among youth. In particular, the value of parent informants in understanding youth's motivation for nutrition behaviour is emphasized. Among Grade 7 students, parent-proxy reports accounted for more of the variance of nutrition behaviour compared to child self-reports (24% versus 16%). This result suggests that receiving parent input about their child's motivations for nutrition behaviour is important when attempting to understand and predict the food choices of youth who are approximately 12 years old. This is not to say that child self-report among this age group is not also valued. Child and parent reports of nutrition DB among students in Grade 7 were found to be significantly correlated with and not significantly different from one another, suggesting that each informant contributed unique and valuable information regarding the prediction of nutrition behaviour (see Chapter 3, Page 134). Comparing and contrasting informant-type was beyond the scope of this dissertation. The purpose of the current studies were to develop DB measures suitable for youth, and then to preliminarily evaluate their reliability and validity using 2 informants. Given the apparent 8% difference across informant type in terms of their predictive validity strength (i.e., variance accounted for), future research might consider replicating the current study using the final 28-item DB measure (DB-NU) and conducting multiple regression analysis. Such analyses could enter nutrition behaviour as the dependent variable and informant-type for DB-NU as the independent variables. This would allow for interpretations regarding the independence of and overlap between each informant in its ability to predict nutrition behaviour.

The findings that parent-proxy reports predicted nutrition behaviour among students in Grade 7, but not Grade 11, support the theory of a curvilinear function of parent-child concordance due to the child's social and cognitive maturation (Holmbeck, et al., 2002; Kazdin, 1994; see Chapter 3, page 135). This theory refers to a higher parent-child agreement from early childhood to early adolescence, and lower agreements before early childhood and during the early to late adolescent period.

The external validity of the activity DB (DB-PA) difference score was examined by measuring its temporal association with an objective measure of physical activity, an accelerometer (Computer Science and Applications Inc.), worn by youth for a subsequent week. It was hypothesized that the frequency and intensity of physical activity would be positively related to the extent that participants rated the advantages of doing physical activities instead of sedentary activities as more important than the disadvantages (i.e., the activity DB difference score) among students of all grades. However, it was found that the DB measures within the physical activity domain were externally valid and moderately predicted behaviour in only one situation: among students in Grade 11 when parents were used as informants ($\underline{r} = .38$; 14% variance accounted for). These results suggest that the newly developed activity DB measure (DB-PA), among other major influences that were not measured, predicts behaviour among students who are approximately 16 years of age when parents are used as informants. Once again, these results highlight the importance of utilizing parent proxy reports when examining DB among youth. The value of parent input for understanding obesity-related behaviours in youth is supported by previous research evaluating the role of parents in childhood obesity treatments (for reviews, see Epstein, Roemmich & Raynor, 2001; McLean et al., 2003; Summerbell, Ashton, Campbell, Edmunds, Kelly & Waters, 2003). As an example, a recent study demonstrated that parent-only treatments groups were significantly more effective for children's weight loss at a 7-year follow-up compared to child-only groups (29% versus 20% weight reduction; Golan & Crow, 2004).

When using the youths' own reports of DB, the physical activity DB (DB-PA) difference scores did not significantly predict average daily activity counts as measured by an accelerometer among youth of any grade ($\underline{r}$ = -.10 to .23; 1 to 5% variance accounted for). These small and non-significant effect sizes were similar and slightly higher than those reported by Nigg and colleges (Nigg, 2001; Nigg & Courneya, 1998) who found significant associations between DB pro and con scales and self-reported exercise among a larger sample size of adolescents (i.e., 0 to 2% variance accounted for; $\underline{r}$ = .01 to .14, $\underline{n}$ = 400). This previous study by Nigg and colleges (1998, 2001) differed from the present dissertation in its much larger sample size ($\underline{n}$ = 400 versus 148, respectively) and its measurement of physical activity (i.e., self-report versus objective monitors). In the present study, the association between the DB-PA difference score and physical activity among adolescents in Grade 11 using self-report ratings of DB approached significance ($\underline{r}$ = 0.23, $\underline{p}$ = .13, 5% variance accounted for). When considering the similarity between effect sizes between each of these studies, it was concluded that the non-significant finding found with self-report DB among Grade 11s was most likely a function of low power in detecting effects within the small sample (n = 46, i.e., less than 50). The low effect sizes, or small correlation coefficients found between self-reported DB and measures of physical activity behaviour in the both the present and previous studies (Nigg, 2001; Nigg & Courneya, 1998) support the notion that activity DB is not externally valid when utilizing youth's self-report.

The usefulness of the DB difference scores (DB-NU; DB-PA) in predicting health behaviour differed across behavioural domains. Among youth in Grades 11 and 7, self-reported DB accounted for 10 to 16% of the variance for average percent calories of fat and sugar consumed per day, and only 1 to 5% of the variance for average daily activity counts. The differences in effect sizes could be due in part to differences in the way health behaviour was measured: self-report versus objective measures. Average percent calories of fat and sugar consumed per day was examined using a combination of child self-report and parent-proxy report on a paper-and-pencil FFQ, whereas average activity counts were measured using an objective monitor, the accelerometer, worn on the youths' hip. The nutrition DB measure (DB-NU) and FFQ share measurement variance, child self-report, which would have augmented the predictive validity correlation coefficients within the nutrition domain.

Differences among effect sizes between the behavioural domains were also observed among parent proxy reports. Parent-proxy DB accounted for 24% of the variance for average percent calories of fat and sugar consumed per day among Grade 7 students, and 14% of the variance for average daily activity counts among Grade 11 students. Again, the nutrition DB measure (DB-NU) and the FFQ shared measurement variance, parent proxy report, a confound that would have also increased the predictive validity coefficients within the nutrition domain.

Parent proxy reports of activity DB (DB-PA) significantly predicted youth's average activity counts among Grade 11s (i.e., 14% variance accounted for), but not Grade 7s (i.e., 0% variance accounted for). However, child self-reports of DB-PA did not predict activity among any grade. The differences found between the parent and child informant predictive abilities of DB within the activity domain support the age dependent curvilinear function theory that was also proposed to explain the differences between parent and child informant predictive abilities of DB within the nutrition domain. Within the activity domain, however, this function may be shifted towards an older age (see Chapter 4, Page 164). This possible shift was understood within the context of differences in the timing of nutrition and activity behaviour consequences (i.e., immediate versus long term), as well as age variations in the ability to process long-term outcomes in decision-making (i.e., self-regulation; Moore, Barresi & Thompson, 1998; Thompson, Barresi, & Moore, 1997). Food choices may provide more immediate and frequent feedback loops from the body to the mind compared to choices about activity. For example, gastrointestinal consequences from food, such as indigestion, are more frequent and immediate than changes in fitness levels due to increased activity, such as improved strength, which occur in the long-term.

In summary, the age at which the DB construct showed acceptable reliability and validity depended on the informant and the health behavioural domain in question. If replicated, the results of this dissertation suggest that the newly developed DB measures are reliable and externally valid among youth as young as approximately 12 years of age when using parents or children as informants for nutrition DB (i.e., DB-NU accounted for 24 and 10% of the variance, respectively), and as young as approximately 16 years of age when using parents as informants for activity DB (i.e., DB-PA accounted for 14% of the variance). Compared to child self-reports, parent informants of DB accounted for more of the variance of youth's behaviour across both behavioural domains. This is an important and unique finding of this dissertation. Moreover, this dissertation suggests that among children younger than 12 years old determinants other than DB predict nutrition behaviour and physical activity. In conclusion, the newly developed nutrition and activity DB measures are promising instruments for future study in the area of child health behaviour in youth 12 years and older, especially when parents are utilized as informants.

II. Study Limitations

There were a number of methodological limitations in the present investigation that upcoming research on DB with youth might address. First, the present study relied on data from cross-sectional, correlational research. Although it is useful to analyze the contribution that DB makes to the prediction of health behaviour, causal inferences cannot be made. As well, the cross-sectional design does not allow for an adequate understanding of the temporality between DB and a desired outcome, that is, improved health behaviour past one week. For a true assessment of the role of DB, longitudinal studies must be conducted among a set of other potential determinants as they relate to physical activity and nutrition behaviour at some future point (e.g., 1 month, 3 months, 6-

months, 1 year, 5 years). Such longitudinal research will allow researchers, clinicians and policy makers to better understand the relationships and subsequently inform interventions for obesity-related health behaviour change among youth.

Second, the self-report nature of the DB measures creates inherent methodological limitations such as social desirability bias. Social desirability is a distorted response style, that is, presenting oneself in a favorable light in the presence of others (Pina et al., 2001). It may be a personality trait (McCrae & Costa, 1983), and is related to children's responses on psychological measures of anxiety (Dadds et al., 1998). This dissertation did not include a measure of social desirability response bias for a number of reasons. First, previous research in the area of psychosocial determinants of health behaviour among youth had not yet flagged social desirability as an important measurement issue during the time this dissertation was designed (Klesges, Baranowski, Beech, Cullen, Murray, Rochon & Pratt, 2004). A recent study by Klesges and colleagues (2004), however, identified social desirability as a potential measurement issue, but failed to find a significant correlation ($r = -.01$, $p = .91$) between the RCMAS Lie Scale (Dadds et al., 1998) and an activity self-efficacy (Saunders et al., 1997). Second, the Halifax Regional School Board had set strict classroom time limits for which this research could be conducted in their schools. A social desirability measure was not essential and would serve to increase burden on the participant. Instead, the author made a number of efforts to minimize social desirability biased responding during the format design and administration phases (see Chapter 2, Page 36). As well, a number of analyses were conducted to partially address this measurement issue (see Chapter 2, Page 76).

Although the empirical data thus far have not supported the notion that social desirability biased responding regarding decision-making about health behaviour significantly influences its associations with behaviour, it is still possible that social desirability may influence the construct of DB. Decision-making about health behaviours includes concerns about social consequences, and there are many social pressures to both eat healthy and increased physical activity. For example, there are currently a number of Nova Scotia government campaigns, programs and strategies devoted to the promotion of healthy eating and physical activity (e.g., "SummerActive", "Active Kids, Healthy Kids", and "Healthy Nova Scotia"). Most notably, a food and nutrition policy was recently released by several government departments, school boards, school administration, as well as teacher, parent, and public health organizations to provide guidelines for the sales of foods in Nova Scotia school cafeterias, vending machines and canteens (Nova Scotia Education and Health Promotion Departments, 2005). Approximately 10% of the nutrition DB measure (DB-NU) and 24% of the activity DB measure (DB-PA) in the present study contained items about social conformity or susceptibility to social influence (see Tables 11 and 12, Pages 109 and 110). Other items on the newly developed DB measures could also be indirectly related to peer pressure and impression management among youth. The definition of what is desirable or undesirable among youth, especially adolescents, may not necessarily be obvious (e.g., rebellious attitudes against parental ideals). If, indeed, significant correlations were found between a social desirability scale and the DB measure, than the DB measure would be measuring, in part, social desirability and not the construct that it was originally intended to measure. If this were the case, the predictive validity of the DB measure would be diminished, and the newly developed DB measures would require the addition of a social desirability scale to partial out its effects. Hence, future research with the newly developed DB measures should consider including a social desirability measure to offer further information about its internal validity.

The Kid's Block FFQ utilized in this dissertation was chosen for a number of practical and empirical reasons (see Chapter 3, Page 116). However, its self-report nature also leaves it vulnerable to possible social desirability biases. Although the Kid's Block FFQ of this dissertation used a combination of informants (i.e., child self-report and parent proxy report) that may have reduced biased responding, it remains possible that social desirability biases among youth and their parents threatened the validity of the FFQ measure, and therefore, confounded the correlations found between nutrition DB and percent calories from sugar and fat consumed. A recent study among 8- to 10- year old African American girls (Klesges et al., 2004) found that social desirability biases as measured by the RCMAS Lie Scale (Dadds et al., 1998) confounded the relationship between psychosocial measures and self-reported measures of nutrition when using 24-hour recalls as the criterion measure. The change-in-estimate increase due to social desirability in this study was approximated to be 19% for energy intake. Similar threats to the validity of the FFQs have been reported among some studies with adults. Specifically, measures of social desirability were shown to be slightly related to FFQs underestimates of caloric intake when compared to a 24-hour recall interview (21.7 to 59.7 kcal/day/point; Hebert, Ebbeling, Matthews, Ma, Clemow, Hurley et al., 2002; Hebert, Peterson, Hurley, Stoddard, Cohen, Field et al., 2001) and a total energy expenditure estimate (by 20.8%, $p = .09$; Horner, Patterson, Neuhouser, Lampe, Beresford & Prentice, 2002), but not the doubly labeled water method (i.e., the gold standard of nutrition measurement; Tooze, Subar, Thompson, Troiano, Schatzkin & Kipnis, 2004). To improve our understanding of the relationship between social desirability and the DB construct's external validity among youth, future research should consider the addition of a social desirability measure and/or supplementary measures of dietary behaviour.

Evaluating the external validity and generalizability of an instrument is an ongoing process. The students who participated in this dissertation were from suburban schools in the Dartmouth/Halifax region of Nova Scotia, Canada. The participants also had body mass indexes in the average range (see Tables 13 and 16, Pages 141 and 168), as well as nutrition and physical activity characteristics comparable to normative samples (see Tables 14 and 17, Pages 142 and 169). It is unknown whether the findings of this dissertation are generalizable to students in other Canadian cities or provinces, which may be more multicultural, diverse (e.g., physical disabilities), or rural. It is also unknown whether these results can be generalized among clinical populations that are attempting to change their behaviour, such as youth who are obese or have health problems related to poor health behaviour (e.g., type 2 diabetes, cardiovascular disease). A recent study within in the adult literature, for example, validated a dietary fat reduction and physical activity DB measure against self-efficacy and stages of change measures among a clinical, outpatient population (e.g., Boudreaux, Wood, Mehan, Scarinci, Taylor & Brantley, 2003). In order to examine the psychometric integrity and generalizability of the newly developed DB measures for youth (DB-NU; DB-PA), future research with more diverse child and adolescent populations is needed, including clinical populations who are attempting health behavioural change.

If the newly developed DB measures are found to be externally valid among youth populations that are attempting to change their nutrition or physical activity behaviour (e.g., pediatric obesity patients), it would be important to place the DB measures within the context of the TTM stage of change variable. Stages of change, or motivational readiness to change, represent an individual's intension to change and current health behaviour at a given moment of time, (DiClemente & Prochaska, 1985). According to the TTM, the stage of change variable moderates the relationship between DB and behaviour. At this time, only two stage of change measures for youth have been developed, namely stage of change for doing exercise three or more times per week (Cardinal, Engels & Zhu, 1998) and stage of change for doing exercise for at least 30 minutes everyday (Walton, Hoerr, Heine, Frost, Roisen & Berkimer, 1999). These studies could be useful guidelines for future research focused on developing stage of change measures appropriate for youth's nutrition and physical activity behaviours that are operationalized in a similar way to the new DB-NU and DB-PA measures.

III. Other Recommendations for Future Research

A. Refining Age Recommendations for DB

This thesis clearly establishes that it cannot be assumed that decision-making about nutrition and physical activity behaviour is similar among youth in Grades 11, 7 and 3. A small body of literature on the development of decision-making supports the notion that decision-making is a skill that improves with age. Making a decision can range from an unconscious reaction to a stimuli (e.g., a pain grimace; Hadjistavropoulos & Craig, 2002), to a conscious, planned intention to act (e.g., choosing a career). Research has shown that adults adaptively switch between effortful, analytical processing and less effortful, heuristic processing strategies, depending on the importance of a decision (Payne, Bettman & Johnson, 1988). Interestingly, studies with adults and children, particularly those older than 8 years, show comparable trends, with the main difference being that adults show more consistent, differentiated and strategic behaviour than children (Davidson, 1991a; Davidson, 1991b; Klayman, 1985). When it came to a battery of reasoning and decision-making tasks, Klaczynski (2001a) showed that analytical processing is more related to age and intelligence than heuristic processing. Research on cognitive abilities thought to be important in reflective decision-making (e.g., deductive reasoning, statistical reasoning, meta-memory, meta-reasoning) appear early in childhood, and then develop rapidly through early adolescence (Klaczynski et al., 2001; Moshman, 1999). For example, the number of consequences incorporated when weighing pros and cons differs across age (Brynes & McClenny, 1994; Brynes et al., 1999; Davidson, 1991a; Davidson, 1991b; Halpern-Felsher & Cauffman, 2001; Klayman, 1985; Lewis, 1981). Developmental differences in impulsivity are also likely to limit the extent that relevant future-oriented strategies get actualized in the DB step of the decision-making process. Measures of impulsivity that have been shown to vary across the developmental span include delay of gratification (Mischel, Yuichi & Rodriguez, 1989), and future-oriented prudence (Moore et al., 1998; Thompson et al., 1997). Taken together, when making decisions, older persons compared to younger persons are: (1)

more analytical and future-oriented; (2) less impulsive; and, (3) more likely to consciously consider a higher number of pro and con consequences.

One of the most urgent future research studies is to replicate the external validity studies of this dissertation using the final 28- and 29-item nutrition and activity DB measures (DB-NU; DB-PA) on a separate and larger sample of older youth and their parents. Future research might also consider using a larger Likert scale among older youth. These replication studies could test whether the psychometric properties (i.e., the 2-factor model, and the construct validity and test-retest reliability coefficients) can be improved, and more importantly, whether the DB difference scores prediction coefficients found among child and parent informants are reliable. This dissertation utilized the same youth DB measures across three age groups who were four years apart and at different stages of development. A replication study with smaller age ranges would further refine recommendations regarding the ages in which the measures are valid.

Results of this dissertation give clues as to which age groups a future replication study should target. The self-report nutrition DB measure (DB-NU) showed low test-retest reliability among Grade 3s, predicted behaviour among Grade 11s and 7s when using child self-reports, and predicted behaviour among Grade 7s, but not Grade 11s, when using parent-proxy reports. To further refine the age recommendations for which the newly developed nutrition DB measure is valid, replication studies should target youth who are older than Grade 3 (i.e., Grades 4-12), and should be sure to include parents as informants. Within the physical activity domain, the activity DB measure (DB-PA) did not predict behaviour among students of any grades when using child self-reports, and predicted behaviour among Grade 11s when using parent-proxy reports. To provide more refined age recommendations about the validity of the newly developed activity DB measure, a replication study should target youth who are older than Grade 7 (i.e., Grades 8 to 12), and again, include parent reports of DB.

B. Temporal Stability of DB among Young Children

This study was the first to examine the temporal stability of nutrition and physical activity DB scales among youth. Within the literature among adults in this area, only one study examined test re-test reliability of an activity DB measure (Myers & Roth, 1997). A DB measure is designed to detect cognitive and behavioural shifts, and therefore, is considered a state, rather than a trait construct. It is important to know the test-retest reliability coefficients of a DB measure, especially in the following two cases: (1) when examining the measure's ability to predict behaviour; and, (2) when testing the measure among young participants. Measuring the temporal stability of a DB measure gives researchers a guideline as to how long they should measure behaviour when examining external validity. For example, if a DB measure among a particular group of participants had good test-retest reliability coefficients within 3 days, but not longer, then predictive abilities of the measure should only consider behaviour within this time frame. Second, test re-test reliability of a DB measure might vary across age. It is possible that DB measures have shorter temporal stabilities among younger children compared to older children due to developmental differences in cognitive styles (e.g., higher impulsivity, Mischel et. al., 1989; Thompson et al., 1997; shorter term time perspective, Halpern-Felsher & Cauffman, 2001; Lewis, 1981) or behaviour (e.g., more sporadic health behaviour, Bailey et. al., 1995; Baranowski et al., 1987; Hartman et al., 1990; Welk et al., 2000). Qualities of a DB measure, such as the item content, might be important in determining its temporal stability, that is, the percentage of items dedicated to short-term rather than long-term consequences. For practical reasons, this dissertation examined test-retest reliability across one time interval, a week. The time interval of a week was also chosen so it would match the times recommended to reliably measure nutrition behaviour (Hartman et al., 1990) and physical activity (Janz, 1994; Janz et al., 1995) among children. To better understand the temporal stabilities of the nutrition and activity DB measures among youth, future research should measure test re-test reliability at various intervals, while at the same time, control for proportions of DB items that consider immediate versus future consequences.

C. Other Types of Parent-Proxy Report

Parent proxy reports were particularly valuable in terms of the external validity of the current DB-NU and DB-PA measures for youth approximately 16 and 12 years of age. Parents in this study were asked to complete nutrition and activity DB measures about their child's decision-making. To improve the understanding and prediction of obesity-related health behaviours among youth, parent informants could be utilized in another way. Parents often make health behaviour decisions for the young members in their family, especially when children are young. Parent DB measures could be designed to assess parent decision-making about supporting or not supporting their child's health behaviour. Examples of such parent DB items on this type of measure could be, for example: "driving my child to physical activities takes up too much time", or "calorie-dense foods are less expensive to make for my family". This type of parent DB measure would be especially useful for informing parent-based interventions for child health behaviour change, and would likely be more valid among young children compared to older children. To examine the external validity of this type of scale parent scale, researchers might also consider measuring parental behaviours that influence their family's health behaviour choices, such as grocery shopping lists and receipts.

D. Mediators and Moderators of DB

Studies designed to identify possible determinants of nutrition and activity behaviour among youth that mediate the relationship between DB and behaviour would benefit practitioners. Mediators are intervening causal variables that are necessary to complete a cause-effect pathway between two variables (Baron & Kenny, 1986). Possible mediators of the relationship between DB and behaviour among youth have been discussed in previous chapters and include: behavioural and experiential processes of change, youth's body awareness of the consequences of health behaviour, youth's autonomy with health behaviour choices, the quality of the parent-child pair communications about nutrition or physical activity, and parent-involvement with their child's health behaviour. Moderators, on the other hand, do not explain why two variables are associated, but rather provide information about whether a factor reduces or enhances the influence of one variable to another variable (e.g., age). To gain a more complete understanding of how obesity-related health behaviour develops, future research may consider replicating the external validity studies of this dissertation with the addition of scales that measure potential mediators or moderators. Multivariate statistical techniques, such as structural equation modeling and regression analyses with a larger sample sizes, would be useful research tools to build prediction models of the relationships among behavioural determinants and the pathways whereby DB might affect nutrition and physical activity behaviour among youth.

This dissertation was an exploratory study that utilized a fairly heterogeneous sample of youth. In future research, demographic factors that have been shown to be related to nutrition and physical activity behaviour among youth, such as sex and social economic status, could be explored further as possible moderators of DB and behaviour. For example, the activity DB measure may be externally valid at a younger age among boys compared to girls. Boys are more active than girls (Armstrong, Balding, Gentle & Kirby, 1990; Armstrong, Williams, Balding, Gentle & Kirby, 1991; McKenzie, Sallis, Nader, Broyles & Nelson, 1992), and therefore, may gain more experience in making decisions about physical activity at an earlier age. Measuring the differences in DB scores in relation to moderator factors, such as sex, would allow researchers and clinicians to better interpret the generalizability of the nutrition and activity DB measures, and therefore, better inform interventions that target obesity-related health behaviour change in youth.

Impulsivity and emotionality may be other important and relevant variables that could moderate the relationship between DB and health behaviour and that future research might consider. Items on DB measures can involve the deliberation of immediate stimuli, as well as distant future consequences. Research has shown that children and adolescents, like adults, are subjective decision makers who sometimes use judgment heuristics and biased processing shortcuts rather than an analysis of objective facts (e.g., Baron, 1990; Jacobs & Potenza, 1991). Some researchers believe that rationality depends on both heuristic and reflective types of processing (e.g., Klaczynski, 2001a; Klaczynski, 2001b; Evans & Over, 1996). Recent evidence suggests that such preconscious, heuristic decision-making is established early in life, and may peak and stabilize during early adolescence (Jacobs & Narloch, 2001; Klaczynski, 1991a). Klaczynski and colleagues (2001) go on to state that although heuristic processing is a useful strategy in many decision-making circumstances, "many poor decisions are made from an over reliance on the energy-conserving heuristic system". Emotional competence, or emotionality, could also limit an individual's evaluation of decision options by narrowing their attention to one urgent goal, to the exclusion of other important goals (Brynes, 2002; Klaczynski et al., 2001). The ability to regulate emotion in decision-making (e.g., adapting decisions using memory of prior consequences) has been shown to improve as late as early adulthood (Brynes, 1998; Brynes et al., 1999). Taken together, characteristics such as emotionality and impulsivity may limit the extent relevant knowledge about the future, or effective future-oriented strategies get deliberated and actualized in the decisional balance step of the decision-making process about obesity-related health behaviours among children and adolescents (Brynes, 1998; Brynes, 2002). For example, one high in impulsivity may jump to the first choice that comes to mind, or select a choice before considering all the pros and cons. Ultimately, these characteristics may increase the amount of disadvantageous decisions about health behaviour, thereby moderating the relationship between DB and behaviour. Future research that replicates the external validity studies (i.e., Chapters 3 and 4) might delineate the role of impulsivity and emotionality on the relationship between the nutrition and activity DB measures and behaviour among youth.

E. Other Behavioural Indices of DB

Health behaviours are complex set of actions, containing multiple components that are worthy of study. This dissertation chose to study the most urgent aspects of health behaviour that concern research-practitioners in the field of child health psychology. Nutrition behaviour was operationalized as average percent calories consumed from fat and sugar per day as measured by a parent-assisted, self-report FFQ. Physical activity was operationalized as average activity counts per day as measured by an accelerometer. However, there are other valuable indices of behaviour that are important to health psychologists, such as: 1. Average time most calories are consumed in a day; 2. Average number of meals in a day; 3. Whether or not breakfast is consumed on most days; 4. Average number of hours spent in front of a screen per day; 5. Cardiovascular endurance; or 6. Average activity during transportation to and from school. To study the development of decision-making for these other nutrition or physical activity behaviours among youth, new youth DB measures specific to these behaviours would need to be developed and then measured against relevant criterion measures, such as food diaries, direct observation, or laboratory fitness assessments. The methodology of this dissertation could be used as a guideline for this research.

F. Predictive Validity of DB among Adults

Compared to previous studies on nutrition and activity DB among adults, this dissertation was unique in that it utilized measures of behaviour when evaluating the external validity of DB. Unfortunately, adult criterions to compare the predictive validity coefficients found among youth in the present study were unavailable. As well, it is unknown whether available adult DB measures predict nutrition and physical activity behaviour. Therefore, future research might consider using measures of behaviour, such as adult FFQs and accelerometers, against available adult DB measures for nutrition and physical activity behaviours.

III. Clinical Implications

Expanding our understanding of the development of lifestyle behaviours across the lifespan may have valuable clinical implications, and is a useful research endeavor, indeed. Among the adult literature, interventions targeting DB have improved adherence to behavioural change programs (e.g., exercise; Hall & Fong, 2003). The DB construct of the TTM has the potential to also improve our understanding of children and adolescents' decision-making regarding their obesity-related health behaviour choices, especially when parents are utilized as informants. By indicating the pro and con items most frequently endorsed by a valid informant for a particular age group and health behaviour, clinicians and researchers can identify important cognitive, environmental or social factors of the youth's world that could be modified, avoided or emphasized to decrease consumption of calorie-dense foods or increase physical activity on an individual (e.g., psychotherapy) or group level (e.g., policy recommendations). For example, one of the most highly self endorsed items of the nutrition DB pro scale among Grade 11 adolescents reads "because they do not make me feel sleepy after eating them". A motivational enhancement strategy for decreasing consumption of calorie-dense foods among this age group might be to help adolescents learn body awareness by asking them to track the somatic consequences of various foods. Within the activity domain, one of the most highly self endorsed items of the activity DB con scale among Grade 11 students reads "because I do not like playing rough." An example of how one could enhance motivation for physical activity among Grade 11s might be to promote physical education classes that teach non-contact sports and/or individual activities that do not involve rough play. When used in this way, DB measures allow clinicians and policy makers to create relevant interventions to promote health behaviour.

This dissertation also emphasized the importance of employing DB measures as a unitary structure. Results of the present study were unique in that they highlighted the importance of evaluating the predictive abilities of the difference DB score (pros minus cons), in addition to the pro and con scale scores. Previous research that did not report DB difference scores concluded that either the pro or con scales were more important than the other in terms of moving an individual across the stages of change, and therefore influencing health behaviour change (e.g., Prochaska, 1994; Prochaska, Velicer, et. al., 1994). In clinical practice, an individual's weighted pros and cons are processed within the context of each other, that is, they are considered among the many factors in their life that affects their health behaviour. It is fundamental to a scientist-practitioner, who provides clinical and policy recommendations for health behaviour change interventions, that health behaviour research examine the external validity of clinically relevant constructs, that is, DB difference scores.

As expected, the DB difference, pro scale and con scale scores for the DB-NU and DB-PA measures were related to each other. Specifically, the DB difference score had a 35% overlap with each the nutrition pro scale ($\underline{r}$ = .59, $\underline{n}$ = 287) and con scale ($\underline{r}$ = -.59, $\underline{n}$ = 287) scores, and a 40% overlap with the activity pro scale ($\underline{r}$ = .63, $\underline{n}$ = 287) and con scale ($\underline{r}$ = -.63, n = 287) scores. If the present study did not calculate a difference score, conclusions about the importance of pros versus cons would have been made. On the self-reported and parent-proxy nutrition DB measure (DB-NU) among students in Grade 11 and Grade 7, only the difference (10-24% variance accounted for) and pro scale (11-21% variance accounted for) scores, and not the con scale score ($\leq 1\%$ variance accounted for), was significantly related to nutrition behaviour. These findings together suggest that it is informative to understand consumption of fat and sugar among youth by considering the pros, as well as the pros and cons together. Had a difference score not been calculated, the value of the con scale in understanding and predicting the consumption of fat and sugar in youth might have been disregarded. Likewise, on the parent-proxy activity DB measure (DB-PA) among Grade 11 students, only the difference (i.e., 14% variance accounted for) and con scale (i.e, 17% variance accounted for) scores, and not the pro scale score, was significantly related to physical activity. (i.e., $< 1\%$ variance accounted for). Hence, it is informative to understand physical activity in youth by considering the cons, as well as the pros and cons together. Again, had a difference score not been calculated, it would have been concluded that the cons were more important than the pros in understanding activity in youth. Taken together, when applying DB measures to health behavioural change interventions, this dissertation has clearly demonstrated that it is important that both pro and con DB items be considered when planning a comprehensive set of intervention strategies. Deciphering these types of conclusions is vital to the clinician working with those attempting health behavioural change.

The treatment and prevention of childhood obesity must be adapted to the specific developmental stages and capabilities of the child, as well as the degree of parental support that is needed. One of the main purposes of this dissertation was to recommend the appropriate ages and with what informant the newly developed DB measures for nutrition behaviour and physical activity could be validly and reliably applied. If replicated in larger and more diverse samples, the results of this dissertation suggest that the age in which the DB construct is valid depends on the informant, and the health behavioural domain in question. More specifically, this dissertation supports the idea that when planning motivational enhancement strategies to decrease the consumption of calorie-dense foods among 16 year olds, it would be important to pay attention to the nutrition DB scale (DB-NU) items most frequently endorsed by the adolescent. Among 12 year olds, however, the present research suggests that the nutrition DB items most frequently endorsed by the preadolescent *and* parent would give clinicians or researchers important information. For the motivational enhancement of physical activity among 16 year olds, the results of this dissertation suggest that it would be important to focus on the activity DB scale (DB-PA) items most frequently endorsed by parents. In addition to DB, there are other major influences on youth's nutrition and activity behaviour that were not accounted for in this study. Therefore, as with any other psychological construct considered by a clinician, DB should be deliberated within the context of other environmental and biological factors known to influence obesity-related health behaviour.

Given the rising rates of childhood obesity in Canada, it is becoming increasingly important for scientist-practitioners to learn ways to influence health behaviour change among youth. Various children's hospitals across Canada, such as the Children's Hospital of Eastern Ontario (CHEO), have been working hard towards developing multidisciplinary and comprehensive treatment programs that target multiple factors in both children and their parents (Drahovzal, 2005; Drahovzal, LeClair, Goldfield & Hadjiyannakis, 2005). When considered within the context of other relevant familial and individual characteristics that influence and predict health behaviour, the newly developed youth DB measures (DB-NU; DB-PA) have the potential to be useful measurement tools for such hospital programs. Specifically, the newly developed DB measures have the potential to guide prevention strategies, policies, or individually tailor treatment plans for interventions targeting obesity-related health behavioural change, and could become useful outcome measures that scientist-practitioners can use to help evaluate their interventions and better understand the mechanism of their effective or ineffective treatment strategies.

Endnotes

[1] All illustrative examples were designed and drawn by Ms. Claire Blanchette, a cartoon artist from Montreal, Canada.

[2] Conducted by Dr. Phil Campagna from the School of Health & Human Performance at Dalhousie University

[3] A "permission to contact" form (see Appendix E) was approved by the REB on September 25th, 2001 as an amendment to the research project titled "A Research Proposal to Monitor Physical Activity Levels in Children and Youth in the Province of Nova Scotia" (principal investigator: Dr. Phil Campagna), which received ethical approval on July 20, 2001.

[4] A list of names and matching codes were stored in a locked cabinet at the Department of Psychology at Dalhousie University, in which only the researchers have access. All results of data analysis will be reported, presented or published without identifying individual participants.

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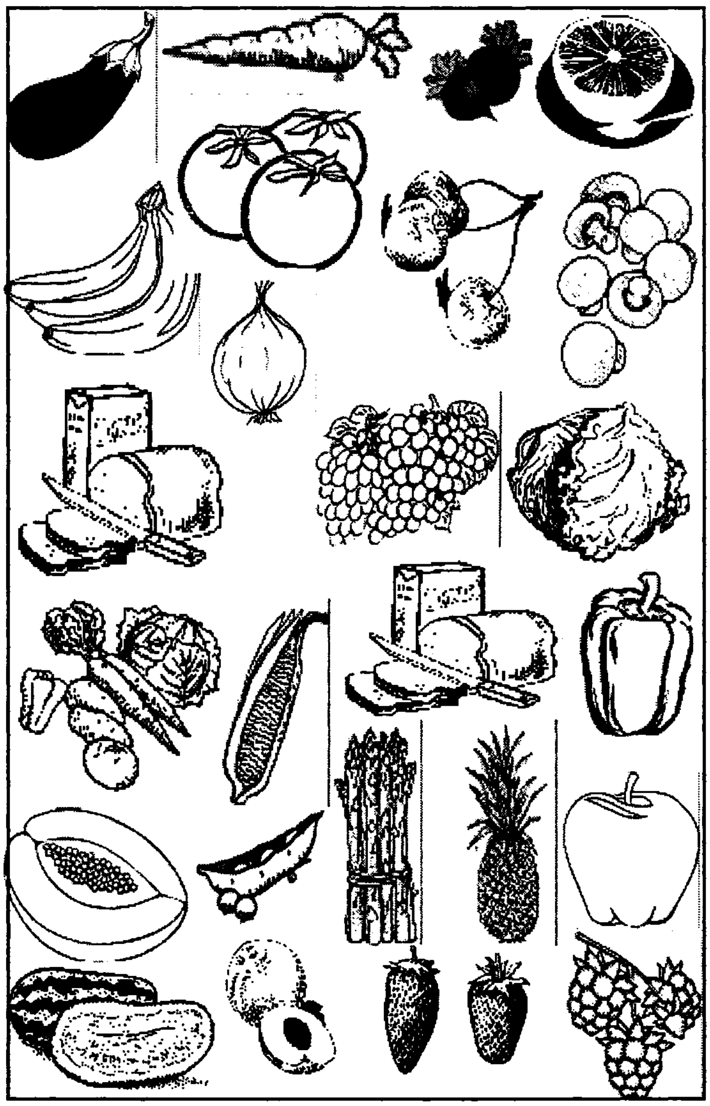
Yellow Foods



Carrots

Asparagus

Whole Wheat Bread

Cherries

Apple

Grapes

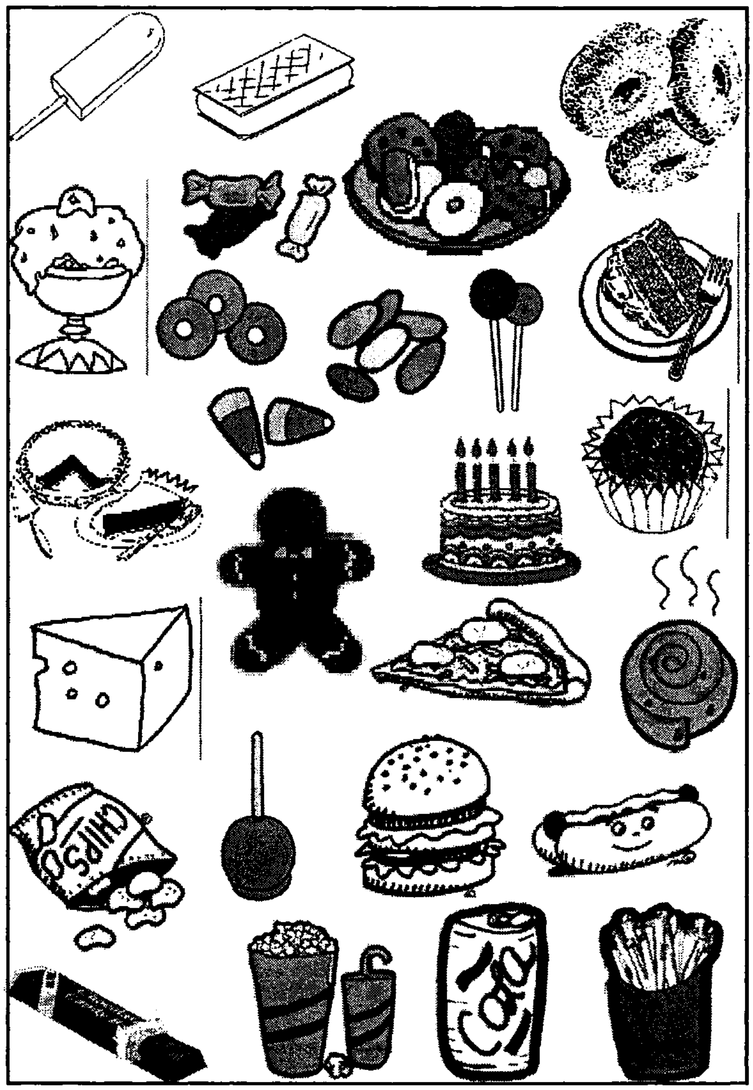
Peas

Melons

Lettuce

Berries

Blue Foods



Potato Chips

Burgers

Chocolate

Candy

Ice Cream

Onion Rings

Donuts

Muffins

Cookies

Cake

Appendix 3: Yellow Activities DB Handout

Yellow Activities

Walking

Biking

Climbing Stairs

Hockey

Baseball

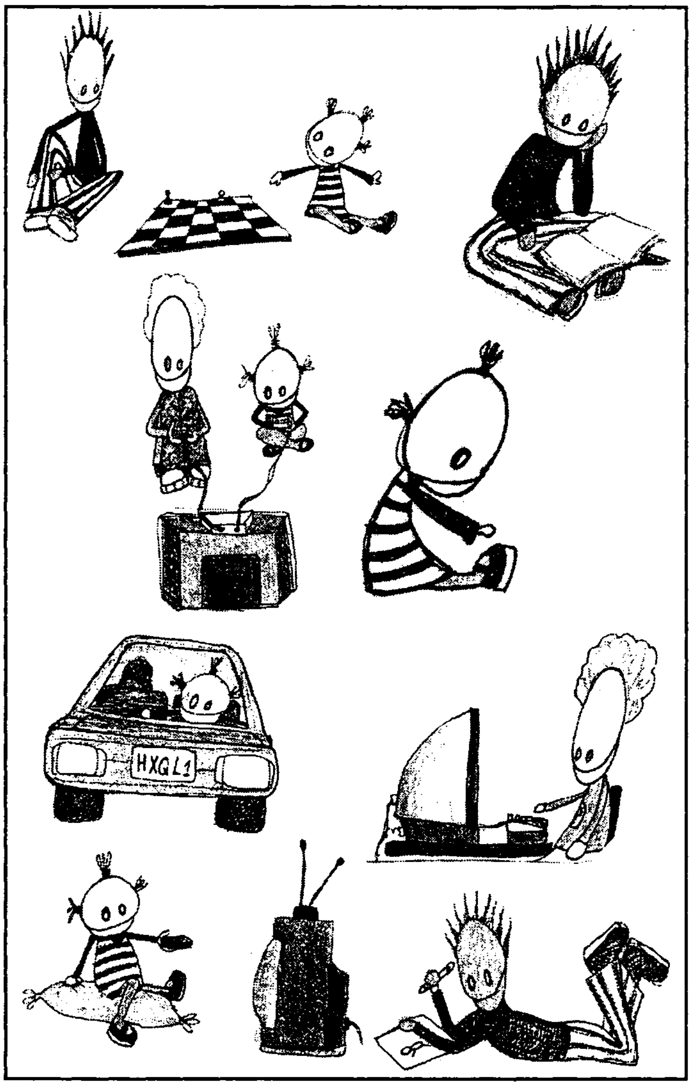
Basketball

Game of Tag

Ballet Dancing

Jungle Gym

Blue Activities



Board Games

Reading

Drawing

Computer

Television

Movies

Elevator

Driving

Video Games

Studying

Appendix 5: "The Reasons I Eat" Nutrition DB Instruction Booklet

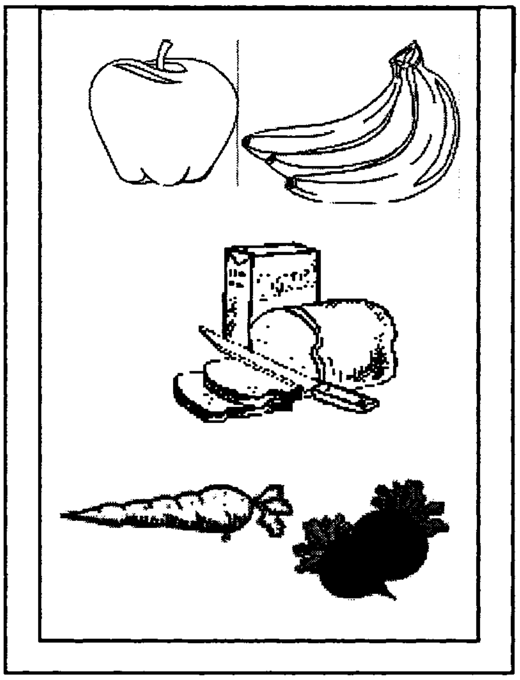
Dalhousie University
Halifax, Nova Scotia

#________________

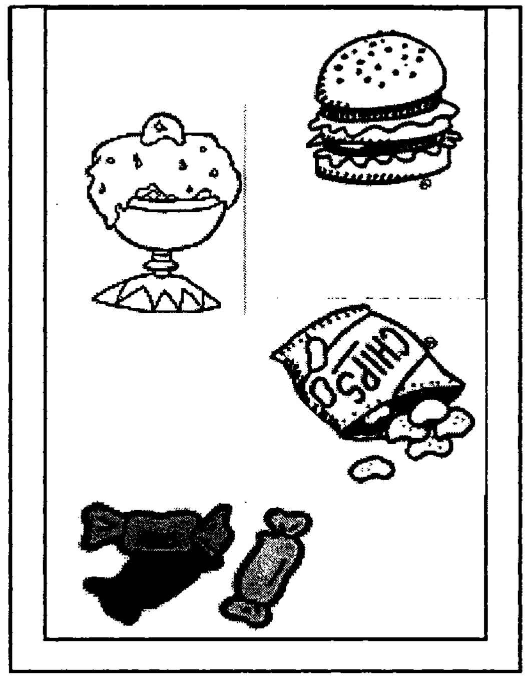
The Reasons I Eat

Decision Questionnaire

Yellow Foods



Blue Foods



There are many different foods we eat. Some foods are full of sugar or fat, like ice cream and potato chips. Let's call these "blue foods". Some foods are full of fibre and vitamins, like fruits, vegetables, or whole grains. Let's call these "yellow foods". Other foods fit somewhere in the middle, like pasta, yogurt, milk, meats, or white bread. But, for right now, let's only talk about yellow and blue foods.

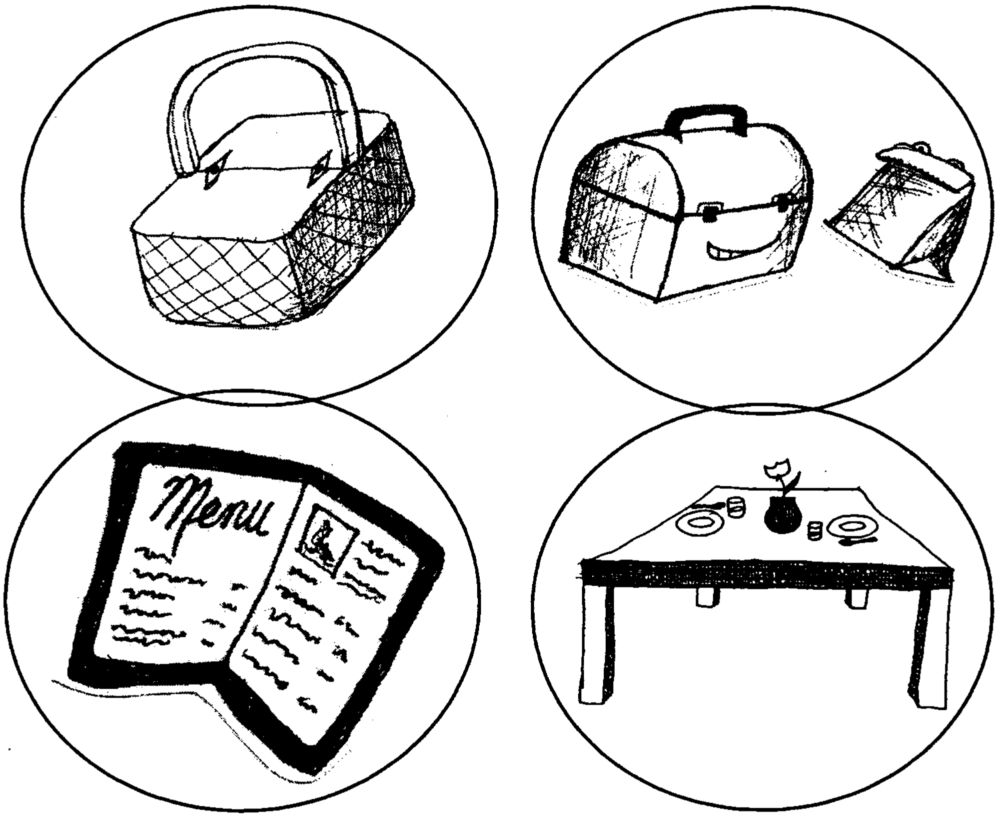
<u>Yellow Foods</u>:

Apples	*Grapes*
Bananas	*Salad*
Carrots	*Berries*

<u>Blue Foods</u>:

French Fries	
Potato Chips	
Ice Cream	*Soda Pop*
Candy	*Chocolate*

Page 1 of 6



There are many different times we have to choose between yellow foods and blue foods, like a snack at home in the evening, a treat from the store, a meal at a restaurant, a lunch at the school cafeteria, a picnic in the park, or a dinner at the kitchen table. There are many times we have to make choices or decisions about what we are to eat.

Breakfast	*Recess*	*Lunch time*
After school snack	*Dinner*	*Evening snack*

Pluses

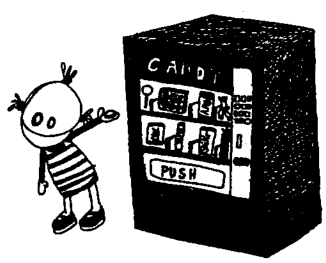
There are different reasons why we eat what we eat. For example, one of the reasons Sam sometimes eats yellow foods is because she likes foods that crunch in her mouth. One of the reasons she sometimes eats blue foods is so she can cool down. Think about some of the reasons you eat yellow foods. Think about some of the reasons you eat blue foods.

<u>*Yellow Foods*</u>:
"I like how they crunch in my mouth"

<u>*Blue Foods*</u>:
"I like how they in cool me down"

[redacted]

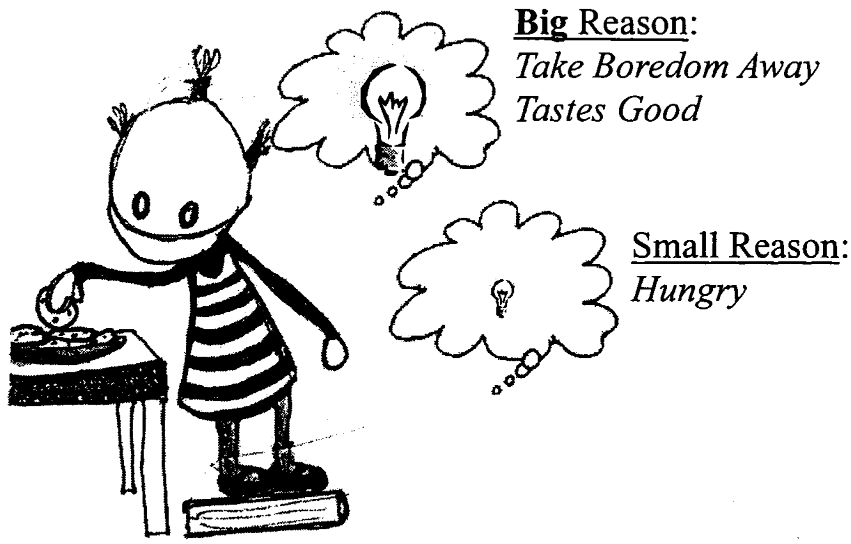
Minuses



There are also different reasons we chose to NOT eat certain foods, too. For example, one of the reasons Sam sometimes does NOT eat yellow foods is because they are not around at school. One of the reasons she sometimes does NOT eat blue foods is because they taste too salty. Think about some of the reasons you do NOT eat yellow foods. Think about some of the reasons you do NOT eat blue foods.

<u>*Yellow Foods*</u>:
"There are none in the vending machine"

<u>*Blue Foods*</u>:
"They taste too salty"



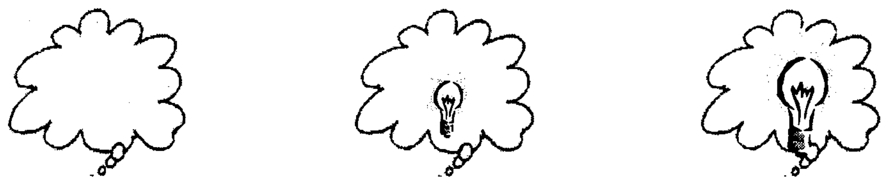
Some of the reasons we eat blue foods are big, or very important reasons. And, some of the reasons are small, or somewhat important reasons.

Sam is having a cookie just after her dinner. A big reason Sam eats blue foods is to take her boredom away and because they taste good. A small reason she eats blue foods is to take her hunger away.

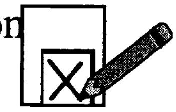
Think about times when you chose to eat blue or yellow food. Think about some of your big reasons to eat that food. Think about some of your small reasons to eat that food

Big reasons:
"To take my boredom away"
"It tastes good"

Small reasons:
"I am hungry"



not a reason a small reason a
big rea- son



Please read the following sheets that ask you about the reasons you eat yellow or blue foods, and mark whether it is...

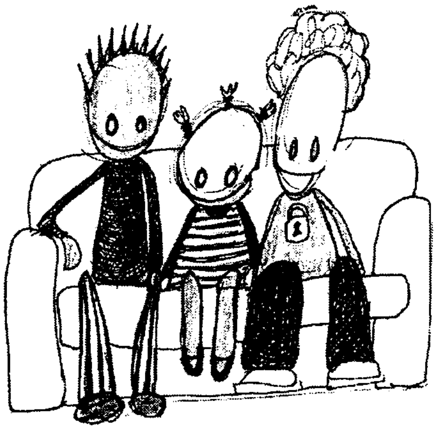

not a reason


a small reason


a big reason for you.


Or, I do not understand

The size of the light bulbs mean how <u>IMPORTANT</u> the reason is to you, and NOT how often you think about the reason

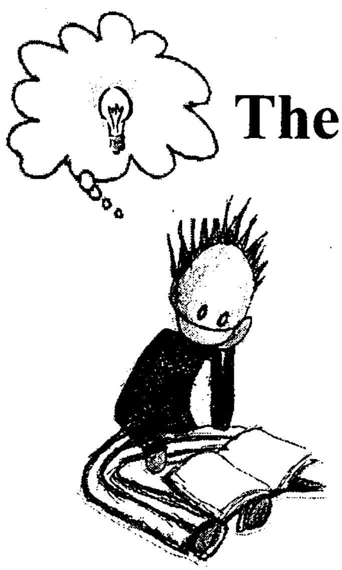


Thank-you!

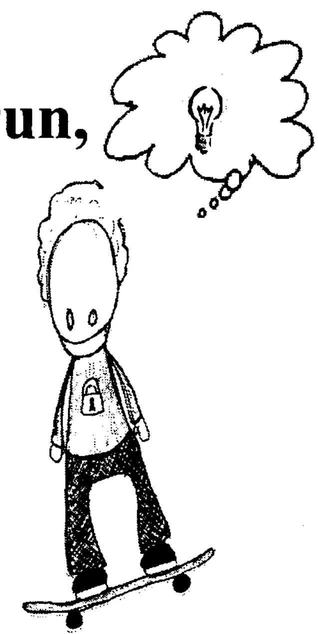
Appendix 6: "The Reasons I Run, Jump, and Play" Activity DB Instruction Booklet

Dalhousie University
Halifax, Nova Scotia

#_______________

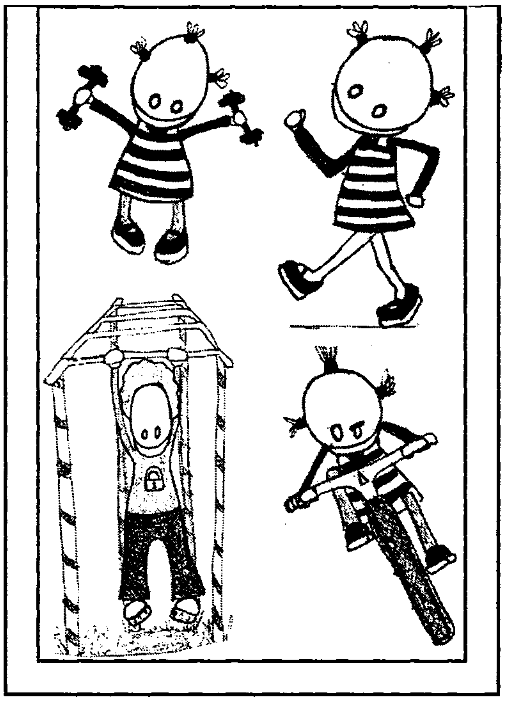


The reasons I run, jump and play

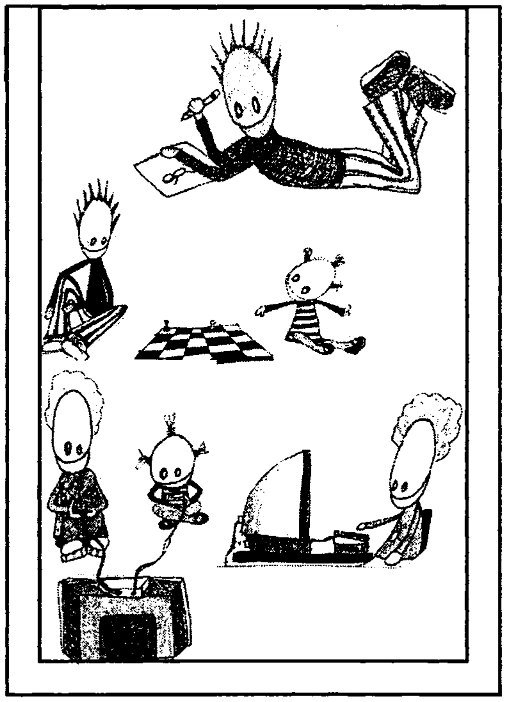


Decision Questionnaire

Yellow Activities

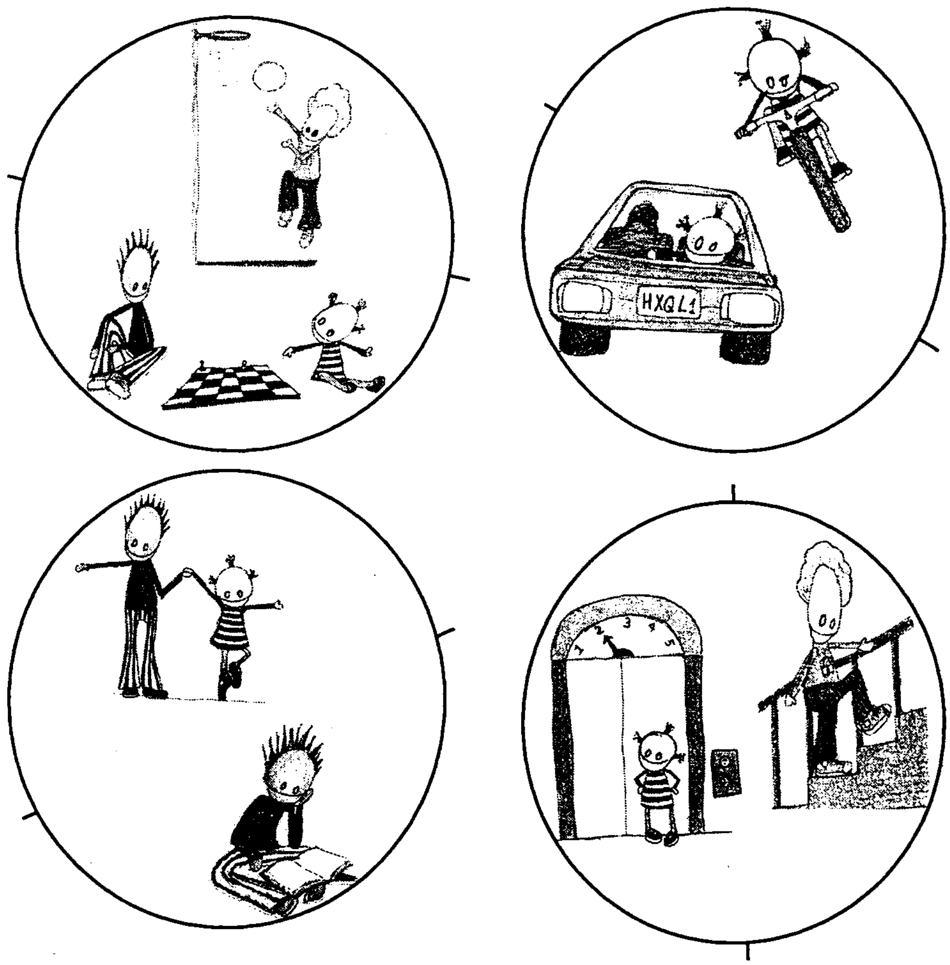


Blue Activities



There are many different things we do during our day. Some things involve exercising, like walking somewhere, riding a bike, or playing in a jungle gym. Let's call these "yellow activities". Some activities do not involve much movement, like watching TV or movies, surfing the web on the computer, or playing board games. Let's call these "blue activities".

Yellow Activities	*Blue Activities*
Walking	*Surfing the internet*
Biking	*Watching television*
Sports	*Playing video games*
Dancing	*Reading*

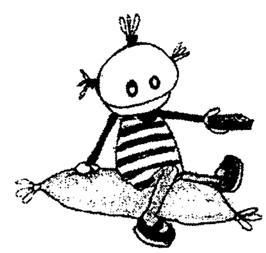


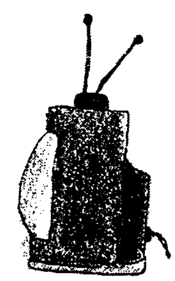
There are many different times we have to choose between yellow activities and blue activities, like walking or biking to places instead of getting a drive, taking an escalator instead of stairs, playing inside rather than outside, or signing up for sports or dance rather than doing things that involve sitting. There are many times we have to make choices or decisions about what we will to do. Think about when you make choices between yellow and blue activities.

At home *At school* *At the mall* *At a friend's house*

Page 2 of 6

Pluses



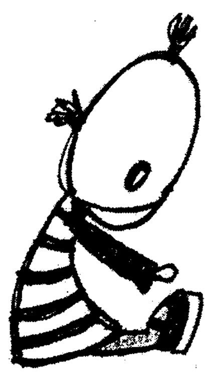


There are many different reasons why we do what we do. For example, one of the reasons Sam sometimes participates in yellow activities is to have fun and to be with her friends. One of the reasons she sometimes does blue activities is to relax and laugh. Think about some of the reasons you do yellow activities. Think about some of the reasons you do blue activities.

<u>*Yellow Activities*</u>	<u>*Blue Activities*</u>
"To have fun"	*"To relax"*
"To be with my friends"	*"To laugh"*

[redacted]

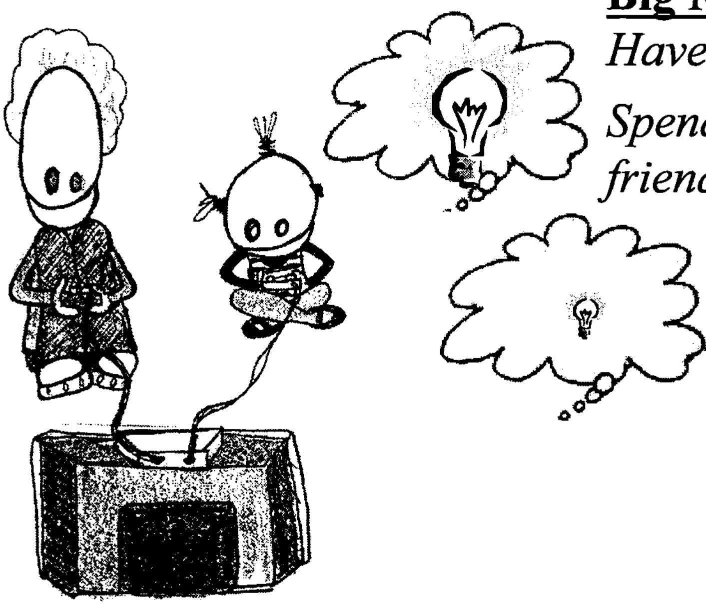
Minuses



There are also many different reasons why we chose to NOT do things. For example, one of the reasons Sam sometimes does NOT do yellow activities is because she feels tired and sleepy. One of the reasons she sometimes does NOT do blue activities is because she feels energetic and can not sit still. Think about some of the reasons you do yellow activities. Think about some of the reasons you do blue activities.

<u>*Yellow Activities*</u>	<u>*Blue Activities*</u>
"I feel tired"	*"I can not sit still"*

<u>**Big**</u> <u>Reason</u>:
Have Fun
Spend Time with a friend

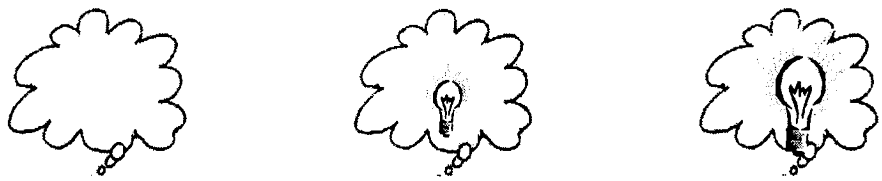


<u>Small Reason</u>:
Win the Game

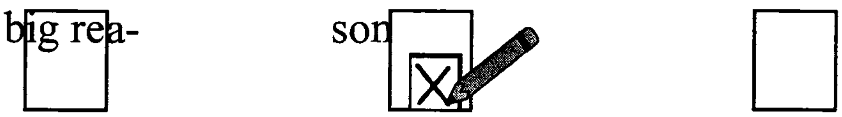
Some of the reasons we do blue activities are <u>big</u>, or very important reasons. And, some of the reasons are <u>small</u>, or somewhat important reasons. Pat is playing a video game with his best friend. A <u>big</u> reason Pat does blue activities is to have fun and spend time with his friend. A <u>small</u> reason is to win the game. Think about times when you made a choice to do a blue or yellow activity. Think about your <u>big</u> reasons to do the activity. Think about your <u>small</u> reasons to do the activity.

<u>*Big reason*</u>	<u>*Small reason*</u>
"To have fun"	*"To win the game"*
"To spend time with my friend"	

Page 5 of 6



not a reason small reason a big rea- son



Please read the following sheets that ask you about the reasons you do yellow or blue activities, and mark whether it is...

 not a reason

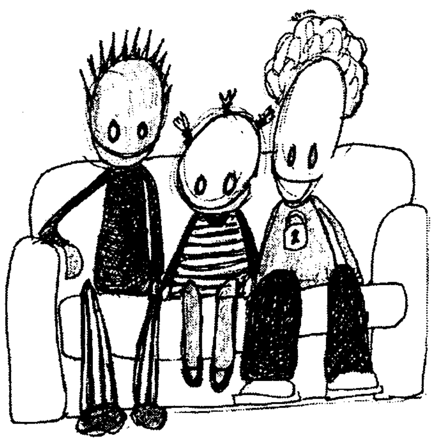
 a small reason

 a big reason for you.

 Or, I do not understand

The size of the light bulbs mean how <u>IMPORTANT</u> the reason is to you, and NOT how often you think about the reason

Page 6 of 6



Thank-you!

Appendix 7: Parent Consent Form from the Focus Group Study

DALHOUSIE
UNIVERSITY
Inspiring Minds

Decision-Making of Physical Activity and Nutrition among Nova Scotia Children and Youth

Contact Persons:
If you have any questions or concerns about the upcoming study or require any further information or clarification about the study procedures at any time please contact:

Principal Investigator:	Deanna Braaksma, BSc Clinical PhD Student, Department of Psychology 1355 Oxford Street, Dalhousie University Halifax, Nova Scotia B3H 1J4 (902) 446-5888; braaksma@is.dal.ca
Co-Investigator:	Phil Campagna Ph.D. Professor, School of Health and Human Performance 6230 South Street, Dalhousie University Halifax, Nova Scotia B3H 3J5 (902) 494-1145 campagna@is.dal.ca
External Supervisor:	Michael Vallis, PhD Adjunct Professor, Dalhousie University Psychologist, Queen Elizabeth II Health Sciences Centre Bethune Building, 1278 Tower Road Halifax, Nova Scotia B3H 2Y9 (902) 473-5526; tvallis@is.dal.ca
Internal Supervisor:	Jeannette McGlone, PhD Professor, Department of Psychology 1355 Oxford Street, Dalhousie University Halifax, Nova Scotia B3H 1J4 (902) 494-5179; jmcglone@is.dal.ca

Introduction:
We invite you and your child to take part in a research study at Dalhousie University. Taking part in this study is voluntary and you or your child may withdraw from the study at any time. The study is described below. This description tells you about the risks inconvenience or discomfort which you or your child may experience. Participating in the study will not benefit you, but researchers may gain new knowledge about children's physical activity and nutrition. You should discuss any questions you have about this study with the people conducting the study.

Purpose of the Study:
The purpose of this research study is to examine decision-making about physical activity and nutrition in a group of children and youth. The study will help us create a decisional-making questionnaire to be used in future research. This questionnaire will help us better understand the reasons why children and youth are active or eat certain foods. It will also help us better understand how parents think about their child's activity and nutrition.

Study Design:
This study consists of focus-group interviews with children and telephone interviews with parents. Approximately 60 students in Grades 3, 7, and 11 (3 classrooms) and 15 parents will be included in this study. This study is expected to run from January to June of 2002.

Who can Participate in the Study:
You may participate in this study if you were selected as one of those who gave permission to be contacted for further study. You and your child have participated in a previous research study on physical activity that was conducted last fall (September 2001 to December 2001), which consisted of approximately 2000 children from across the province. This research study be conducted in only those schools from the Halifax region.

At this point in time, we are only studying those without physical and mental disabilities. However, all children will be given the opportunity to participate as a class, if they so choose.

Who will be Conducting the Research:
Deanna Braaksma, a clinical psychology PhD student from Dalhousie University will be involved in the research.

What you will be asked to do:
You will be contacted by telephone approximately one week after receiving this consent form in the mail. For this study, your son or daughter will be asked to fill out two decision-making charts while they are in class about their physical activity and nutrition. These decision-making charts will ask your child the reasons he/she participates in physical activity, and the reasons he/she eats certain foods. In other words, your child will be asked to list the pros and cons (benefits and costs) of being physically active or eating certain foods. The task will be discussed as a group, and they will later be asked to hand-in their charts. This will take approximately 30 minutes. As well, we will be asking you to participate in a telephone interview that would allow us to fill out similar decision-making charts about *your child.* This will approximately 15 minutes of your time. Study participants and their parents have the right to ask questions about the procedure at anytime before, during, and after the study period. By having you and your child fill out these decision-making charts, we hope to create a decisional balance questionnaire to be used in future research. Having a decisional balance questionnaire will help us better understand the reasons children eat certain foods and are active. As well, it will help us better understand the way parents think about their child's physical activity and nutrition.

Possible Risks and Discomforts:
Speaking out loud in the classroom is not required to participate in this study. However, it is possible that children suffer embarrassment or teasing because of voicing their reasons for

participation in physical activity or for the choices of food that they eat. Children's answers given "out loud" in classroom discussions could be disclosed outside the classroom by their classmates. There are no other known risks or discomforts foreseen in participating in this study. However, there may be harms that we do not know about yet.

Possible Benefits:
There is no benefit for you or your child in participating in this study. However, we hope to further our knowledge in the field of health psychology.

Compensation:
All persons in the classroom will be given government of Canada health information brochures about nutrition and physical activity for children and youth.

Confidentiality:
Confidentiality will be respected. No information that discloses your identity will be released or published. You and your child's name will be assigned a code number. A list of names and matching codes will be stored in the project research office at the Department of Psychology at Dalhousie University. Only the four researchers listed on the front cover, or research assistants supervised by one of them, will have access to the list. The data and all results of data analysis will be reported, presented or published without identifying individual children. Study participants and their parents have the right to request a summary of their individual data upon completion of the study (approximately June 2004).

Questions:
If you have any questions about the study you can contact Deanna Braaksma at 446-5888, Monday to Friday, 9:00-5:00.

When will you hear about the final results:
At the conclusion of the study all participants and their parents will have an opportunity to meet with the Deanna Braaksma at the participant's school. The purpose of the meeting is to share the study results, respond to final questions about the study, and discuss the procedures used in the study. This meeting will occur in the evening at the school. The date of the meeting will be announced after the data has been summarized in a report (approximately May 2003). After this meeting, copies of a written summary of these results will be left at your school, and will be available through your principal.

Voluntary Participation:
Participation in this study is completely voluntary, and participants are free to withdraw at any time for any reason. If your child chooses not to participate, they will be instructed to simply leave their chart unfilled on their desk, and it will be collected with the others of their class at the end of the study.

Problems or Concerns:
In the event that you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Human Research Ethics/ Integrity Coordinator at Dalhousie University's Office of Human Research Ethics and Integrity for assistance: (902) 494-1462.

Signature:

Title: Decision-Making of Physical Activity and Nutrition among Nova Scotia Children and Youth

I have read the explanation about this study. I have been given the opportunity to discuss it and my questions have been answered to my satisfaction. I hereby consent to take part in this study. However I realize that my participation is voluntary and that I am free to withdraw from the study at any time.

_________________________ _________________________

Name of parent or legal guardian Signature of parent or legal guardian

____

Date

You will be given a copy of the consent form for your records.

Contact Information:

Name: ____

Phone: ________________(day) ____________________(evening)

Address: ____

City: ______________ Postal Code: _____________

Appendix 8: Child Assent Form from the Focus Group Study

DALHOUSIE UNIVERSITY
Inspiring Minds

Decision-Making of Physical Activity and Nutrition among Nova Scotia Children and Youth

Researcher: Deanna Braaksma, BSc
Clinical PhD Student, Department of Psychology
1355 Oxford Street, Dalhousie University
Halifax, Nova Scotia B3H 1J4
(902) 446-5888; braaksma@is.dal.ca

Why are we doing this research?

We are doing this research to learn about children and youth's decision-making about activities they do and foods they eat. Your answers will be used to make a questionnaire for studies in the future. This research will help us to learn about the reasons children and youth are active or eat certain foods. As well, it will help us learn about how parents think about their child's activities and nutrition.

What will happen during this research?

This is another study after the study you participated in last fall on physical activity. You have been selected as one of those who gave permission to be contacted again.

You will be asked to fill out two decision-making sheets in class about the reasons you are active and eat certain foods. You will be asked to list the benefits and costs (good things and bad things) of your decisions to eat certain foods, or do certain activities. The sheet will be explained to you in class. It will take about 30 minutes. Your parents will be answering the same questions, but on the telephone. You and your parents can ask questions about the study at anytime before, during, and after the study.

Are there good things and bad things about the research?

No, there are no bad things or good things about being in this research. One good thing may be that you learn more about the reasons you do certain activities or eat certain foods. Also, the study will help researchers learn about the reasons children and youth participate in physical activity and eat certain foods.

Who will know about what I did in the research?

Only the researcher, and the researchers she works with, will know what you did in this study. All the information you give us will be identified with a number, instead of your name, and will be locked in a safe place. This sheet, which has your name on it, will be kept in a different place than the decision-making charts that you fill out for the study. When we report our results of the study, we will not use your name.

Can I decide if I want to be in the research?

Yes, you can decide if you want to be in the research. You can stop participating at any time for any reason. If you chose not to participate, you can do silent work at your desk, and then leave the chart unfilled on your desk. At the end of class, the empty charts will be collected with the others.

Assent:

Title: Decision-Making of Physical Activity and Nutrition among Nova Scotia Children and Youth

I have read this form that tells me about the study, and I agree to participate. My questions about this study have been answered. I understand that I can stop participating in this study at any time for any reason. My signature below shows that I will participate in the study.

____________________________ ____________________________

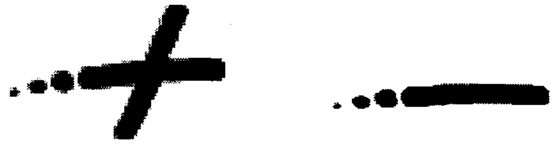
Name of child/youth participant Signature of child/youth participant

____

Date

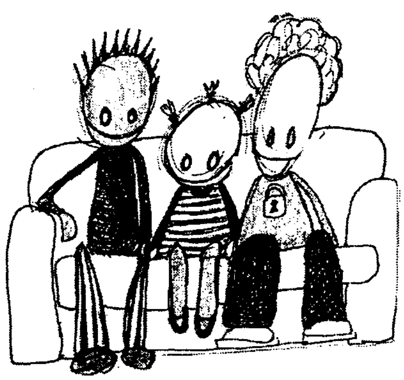
In the event that you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Human Research Ethics / Integrity Coordinator at Dalhousie University's Office of Human Research Ethics and Integrity for assistance: (902) 494-1462

Appendix 9: Nutrition DB Instructions and Worksheet from the Focus Group Study



Pluses Minuses

Everybody has their own reasons for eating or not eating certain foods. Please fill out the following decision sheet about the reasons you eat or do NOT eat yellow or blue foods. For you, what are the pluses and minuses for eating yellow foods? And, what are the pluses and minuses for eating blue foods? There are no right or wrong answers. Please write down as many pluses and minuses that you can think of. After you are finished, please circle the reasons that you think are your big reasons.



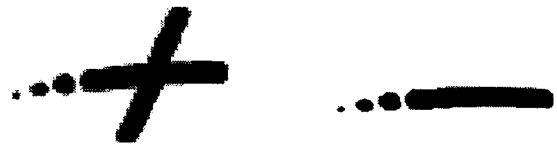
Thank-you!

Page 1 of 2

	Pluses	Minuses
BLUE FOODS		
YELLOW FOODS		

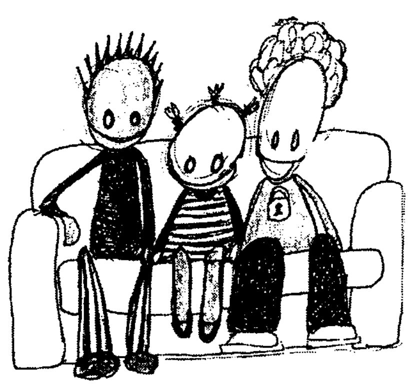
Page 2 of 2

Appendix 10: Activity DB Instructions and Worksheet from the Focus Group Study



Pluses Minuses

Everybody has their own reasons for doing certain activities. Please fill out the following decision sheet about the reasons you do or do NOT participate in yellow or blue activities. For you, what are the pluses and minuses for doing yellow activities? And, what are the pluses and minuses for doing blue activities? There are no right or wrong answers. Please write down as many pluses and minuses that you can think of. After you are finished, please circle the reasons that you think are your big reasons.



Thank-you!

Page 1 of 2

	+ Pluses	− Minuses
BLUE Activities		
Yellow Activities		

Page 2 of 2

Appendix 11: Script used in the Focus Group Study to Prompt Item Generation

Page 1 of 2

For Participants to complete the DB worksheets:

- *Let's start by having each of you brainstorm as many reasons for choosing yellow and blue (foods/activities) as you can. As we talked about before, we all (eat/do) yellow (foods/activities) sometimes, and we all (eat/do) blue (foods/activities) sometimes. Neither is bad or good. Everyone has different reasons for (eating/doing) what they (eat/do). No reason is right or wrong. It is your honest and true answers that will help this research most. So, please write down your point of view, even if it may be different from someone else. We are interested in what everyone thinks.*
- *Pretend that you had to make the choice to (eat/do an activity) right now. What are you thinking about? Imagine what is going through your mind as you are making a choice about what to (eat/do).*
- *If you are having trouble thinking of reasons, that is okay. Later, we are going to later share some of our reasons with the group, and you will be able to get some ideas from other people.*
- *Please write down your own personal reasons for choosing yellow/blue foods/activities using each of the squares on your worksheet. Let's start with...*
- *Pluses for Yellow: What are the pluses of (eating/doing) yellow (foods/activities)? What are some of the good, easy, nice, or positive things about (eating/doing) yellow (foods/activities)? Try to think of all the possible reasons. Make sure the items you write down are reasons for you.*
- *Minuses for Yellow: What are the minuses of (eating/doing) yellow (foods/activities)? What are some of the bad, difficult, yuck, or negative things about (eating/doing) blue foods/activities? Try to think of all the possible reasons. Make sure the items you write down are reasons for you.*
- *Pluses for Blue: What are the pluses of (eating/doing) blue (foods/activities)? What are some of the good, easy, nice, or positive things about (eating/doing) blue (foods/activities)? Try to think of all the possible reasons. Make sure the items you write down are reasons for you.*
- *Minuses for Blue: What are the minuses of (eating/doing) blue (foods/activities)? What are some of the bad, difficult, yuck, or negative things about (eating/doing) blue foods/activities? Try to think of all the possible reasons. Make sure the items you write down are reasons for you.*
- *Now take some time to look over your sheet. There are all types of different reasons your might have on your sheet. Some of the reasons might be about you, and some might be about others. Some of the reasons might be about the moment/ right now, and some might be about the future/ later on.*
- *Can you think of anything else? If so, please write it on your worksheet.*

For the Group to Share Ideas:

- *Now, let's take some time for you to share some of your reasons with each other. We will put the reasons that you share on the board for everyone to read. You do not have to share your ideas if you do not want to. Remember, we don't have to agree on them. There is no right or wrong reasons. We are just brainstorming ideas, and we want to hear from everyone.*
- *Maybe someone in the group will say a reason that you had not thought of yet. If someone says a reason that you think is also about you, please write it down on your paper, too. Be sure that you only write down the reasons that are relevant and apply to you, and that affect your decisions to (eat/do) yellow or blue (foods/activities).*
- *If you would like to share a reason that you did not write on your sheet, you can share that reason with us, too.*
- *Please speak one at a time so that we can hear, and so the recorder can hear you, too. Let's start with...*
- *Pluses for Yellow: What are the pluses of (eating/doing) yellow (foods/activities)?*

Reviewing the Group Board:

- *Okay, now I will read the board out loud. While I am doing this, please write down on your sheet, if you have not already, any more reasons that affect you and your decision. When I am reading through the list, please think about whether or not you also think about or consider the reason when you make a choice about what to eat/do.*
- *Anything else?*

****Repeat for Each:***

- *Minuses for Yellow*
- *Pluses for Blue*
- *Minuses for Blue*

Importance Ratings:

- *Okay, now that you have thought of as many reasons that affect you and your decisions about (food/activities) as you can, and have written them on your sheet, I would like you to read over your sheet, and think about which are your "big" reasons and which are your "small" reasons.*
- *As we talked about before, when we make a choice about what to (eat/do), some of our reasons are more important to us than others – some are big reasons to us, and some are small reasons. Please circle your "big" reasons for choosing yellow (foods/activities). Leave and do not circle the reasons that are your "small" reasons.*

Repeat for the other behaviour domain

Appendix 12: Nutrition DB Pro Scale Items Generated by Focus Groups, Literature Searches, and Expert Advice

#	Nutrition Pro Scale Items	Focus Group	No. of Studies
1	*because they are healthier for me (*e.g.*, prevent cancer, do not clog my arteries)	√	4
2	*because they will make me grow better		2
3	*because they are higher in fiber, vitamins and nutrients	√	
4	*because they have less fat or sugar in them	√	1
5	*because they do not have as many preservatives or chemicals in them	√	
6	*because they are more fresh	√	
7	*because they are in a *Canadian Food Guide* food group	√	
8	*because they are not as bad for my teeth (they will not give me as many cavities)	√	2
9	*because they do not make me feel as sleepy after eating them (they do not give me an "energy crash")	√	
10	*because they give me better energy for physical activities (*e.g.*, sports, dance)	√	2
11	*because I digest them better or faster (*e.g.*, they do not sit in my stomach as long)	√	
12	*because they taste better (*e.g.*, not too salty or sweet)	√	2
13	*because they will help me think better in class		2
14	*because they look better (*e.g.*, the colours)	√	
15	*because my parent(s) or guardian(s) choose them		4
16	*because my friend(s) choose them		2
17	*because they are lower in calories, and will not make me gain as much weight	√	6
18	*because they are better for my skin		2
19	*because they are around more at home	√	3
20	*because they are around more at school (*e.g.*, at the cafeteria)		1
21	because it is easier to move and be active after eating them	√	2
22	because they are more filling (they satisfy my hunger better)	√	
23	because they do not make me feel as sick (*e.g.*, upset stomach)	√	2
24	because they do not keep me up at night	√	
25	because they feel better in my mouth (*e.g.*, crunchy, juicy, hot)	√	
26	because they will make me smarter		2
27	because there are more foods to choose from (they have a larger variety)	√	
28	because others encourage or tell me to (*e.g.*, my parents, teachers, or friends)	√	7
29	because they cost less to buy (they are cheaper)	√	1
30	because they will help me see better at night		2
31	because they are not as addictive	√	
32	because they are already made for me (*e.g.*, my parents make it)	√	4
33	because they are faster or easier to make/eat	√	1
	Total	**25**	**21**

* = The top 20 items chosen by the expert advice study; Note. Item wording was later altered by experts for the final scale.

Appendix 13: Nutrition DB Con Scale Items Generated by Focus Groups, Literature Searches, and Expert Advice

#	Nutrition Con Scale Items	Focus Group	No. of Studies
1	*because I crave them more, or they are harder for me to resist	√	
2	*because they taste better (*e.g.*, sweet, not too sour)	√	1
3	*because they give me more instant or quick energy	√	2
4	*because they are more filling (they satisfy my hunger better)	√	
5	*because they feel better in my mouth (*e.g.*, cold, crunchy, sticky)	√	
6	*because they look better	√	
7	*because they pass the time away better when I am bored	√	1
8	*because they comfort me	√	
9	*because they make me more hyper and energetic (*e.g.*, a sugar high, fun)	√	
10	*because they are more of a reward or special treat	√	
11	*because I am at a special event (*e.g.*, holiday, party)	√	
12	*because they are offered to me, or given to me as a gift (*e.g.*, chocolates)	√	
13	*because my friends choose them		1
14	*because my parents choose them		1
15	*because they cost less to buy (they are cheaper)	√	
16	*because it is more of a habit for me to eat blue foods	√	
17	*because they are easier or faster to make/eat	√	
18	*because they are around more at home	√	2
19	*because they are around more at school (*e.g.*, vending machines, or the cafeteria)		2
20	*because they do not go stale, moldy or rotten as fast	√	
21	because they are already made for me (*e.g.*, my parents make it)	√	1
22	because they are better for a snack (*e.g.*, smaller)	√	
23	because they are better to pack (*e.g.*, pre-packaged)	√	
24	because they cool me down better (*e.g.*, ice cream or pop)	√	
25	because they do not make me go to the bathroom as much, or give me gas	√	
26	because everyone else does (*e.g.*, popcorn at a movie, cotton candy at the fair)	√	1
	Total	**23**	**9**

* = The top 20 items chosen by the expert advice study; Note. Item wording was later altered by experts for the final scale.

Appendix 14: Activity DB Pro Scale Items Generated by Focus Groups, Literature Searches, and Expert Advice

#	Activity Pro Scale Items	Focus Group	No. of Studies
1	*to be healthier and live longer	√	5
2	*to get more exercise and be more active	√	
3	*to be more physically fit (*e.g.*, strength, balance, cardio, or flexibility)	√	4
4	*to burn more of my energy because I feel hyper, or restless	√	
5	*to give me more energy, so I will not feel as tired or sluggish	√	4
6	*for the challenge of pushing my body to meet my goal	√	1
7	*to win a particular award (*e.g.*, a trophy or scholarship)	√	
8	*so I can be outdoors more, or get more fresh air	√	
9	*because they are more fun (*e.g.*, interesting, entertaining)	√	9
10	*for the excitement I will feel, or for the "adrenaline rush"	√	
11	*to better let out my stress, or deal with my feelings (*e.g.*, cranky, frustrated)	√	3
12	*because others encourage or tell me to (*e.g.*, parent, coach, friend)	√	13
13	*because my friends do them	√	9
14	*because my family does them	√	13
15	*so I do not have to be alone	√	1
16	*to feel more included in a group (*e.g.*, a team, PE class, or friends)	√	4
17	*to be called "an athlete" by others	√	2
18	*because they are a better way for me to compete with, or win against others	√	
19	*to burn more calories, or better manage my weight	√	6
20	*so I can get somewhere (*e.g.*, travel on my bike to school, or walk to a friend's house)	√	
21	to create better memories in my mind, or gain more experiences	√	
22	to help me have a more positive outlook on life	√	
23	because they are a better way to spend time with others (*e.g.*, family, friends)	√	20
24	because they are a better way to make friends or meet new people	√	1
25	so I will not isolate myself, or become unsocial	√	
26	to better learn how to work with others in groups (*e.g.*, co-operation, or sportsmanship)	√	1
27	to look more fit, or in better shape	√	6
28	so that I can sleep better at night		2
29	to practice and get better at moving my body	√	4
30	to get a better feeling of accomplishment, achievement or success	√	5
31	so I can explore the things around me	√	
32	because they are easy for me to schedule in my day (*e.g.*, after school, close to home)		4
33	so I will not lose track of, or waste more of my time	√	1
	Total	**31**	**25**

* = The top 20 items chosen by the expert advice study; Note. Item wording was later altered by experts for the final scale.

Appendix 15: Activity DB Con Scale Items Generated by Focus Groups, Literature Searches, and Expert Advice.

#	Activity Con Scale Items	Focus Group	No. of Studies
1	*to rest my body when it is sore, injured, or sick	√	1
2	*to relax and "*veg out*" when I am feeling tired or sluggish	√	6
3	*because I do not like playing rough	√	2
4	*because I do not want to get too sweaty or hot		3
5	*because I know how to do them better (they are easier to do)	√	5
6	*because they are more fun (*e.g.*, interesting, entertaining, exciting)	√	3
7	*to learn more, or collect information (*e.g.*, magazine, internet)	√	
8	*to practice and get better at a blue activity (*e.g.*, a video game, a quiz at school)	√	1
9	*so I can think and sort out my thoughts better (*e.g.*, quiet time)	√	
10	*because they are activities I can do by myself	√	
11	*to talk or chat with others (*e.g.*, phone, email, ICQ)	√	
12	*because my friends do them		4
13	*because my family does them		5
14	*because I will fit in better with others (it is cool to do)	√	3
15	*because I do not feel welcome in the group doing yellow activities (*e.g.*, the activity is not open to everyone)		2
16	*because blue activities are more of a habit for me to do	√	
17	*because they are better to do inside when the weather is cold or wet, or when it is dark outside	√	5
18	*because they are easy for me to schedule in my day (I can do them whenever I want)	√	2
19	*because I do not have the space or facilities I need to do yellow activities	√	3
20	*because I do not have the equipment or money I need to do yellow activities		3
21	because I do not want to get hurt, or feel sore later	√	2
22	because I do not want to get out of breath, or have my heart beat too fast		4
23	to be able to make something, and be more creative	√	
24	because it is a better way for me to express myself	√	
25	for the challenge of pushing my mind to meet my goal	√	1
26	to do better in school (*e.g.*, get better grades, win a scholarship)	√	
27	because they are not as stressful	√	1
28	because others encourages or tell me to (*e.g.*, teacher, parent or friend)	√	6
29	because they are a better way to spend time with others (*e.g.*, family, friends)	√	5
30	because they are a better way for me to compete with, or win against others	√	
31	because others will make fun me if I do yellow activities	√	2
32	to save time (*e.g.*, drive instead of walk)	√	
33	because it is not safe for me to be outside		1
34	because they do not take up as much time	√	9
	Total	**27**	**24**

* = The top 20 items chosen by the expert advice study; Note. Item wording was later altered by experts for the final scale.

Appendix 16: Articles on the Determinants of Food Choice in Children and Adolescents

Article	Participants	Measures	Relevant Results	Supported Items
Hofschire & Greenberg (2002)	N = 382, 9th & 10th graders (46%F; mean age = 15 yrs.)	Questionnaires: -Media exposure of TV & magazines (estimated time) -Desire to look like media celebrities (4, 5-point Likert scales on 12 celebrities) -Interpersonal sources' of influence on body dissatisfaction (family, peers & friends) -Body dissatisfaction -Frequency of diet & exercise behaviours	-Watching videos and soaps, as well as reading magazines significantly predicted body dissatisfaction and dieting among girls. -Viewing sports decreased dieting behaviours in girls.	*Pros: 27*
Reynolds, Yaroch, Franklin, & Maloy (2002)	N = 1676, 4th graders, and their parents	Questionnaires: -Fruit and vegetable (F&V) consumption – 24-hr dietary recalls -Availability of F&V in the home -Eating meals together -Parent consumption -Knowledge -Positive outcome expectancies -Self-efficacy -Social Norms (family, peer, and teacher)	Positive outcome expectancies may be an important mediator for behaviour change in school-based nutrition-intervention programs. Positive Outcome Expectancies: (12 items) Eating F&V will make me smarter, I will be better at sports if I eat F&V, I will get sick more often if I don't eat F&V, eating F&V will help me grow, I will have healthier skin if I eat F&V, eating F&V will keep me from getting cancer, if I eat F&V, my family will be proud of me, eating F&V will help me see better at night, if I eat F&V at breakfast, I will be able to think better in class, drinking juice will give me quick energy, eating F&V will keep me from getting cavities & if I eat F&V I won't get fat.	*Pros: 1, 2, 3, 10, 12, 13, 16, 20, 21, 24, 25, 26, 27, 28* *Cons: 3*

Weber Cullen, Baranowski, Rittenberry, Cosart, Hebert et al., (2001)	N = 221, 4th – 6th graders	<u>Questionnaires</u>: -Family and peer influences on children's fruit, juice and vegetable (FJV) consumption questionnaire - perceived normative beliefs and expectations (e.g., most kids…) -FJV availability & accessibility in the home questionnaire -FJV modeling by peers and parents -Food records for 2 days in the classroom	Parental modeling, peer normative beliefs and FJV availability were significantly correlated with FJV consumption.	*Pros: 24, 25, 26, 30, 32*
Neumark-Sztainer, Martin, & Story (2000)	N = 203, 7th – 12th graders; 25 Focus groups (mean size = 8; 16F & 9M groups)	Focus groups discussed the development of a program comprising healthy eating, exercise, and weight control	Responses were categorized and coded to identify relevant themes. Adolescents advocated fun and interactive activities, a supportive environment, and activities that were accessible and convenient (*i.e.*, preparation of quick snacks and meals, availability), as well as open to all students.	*Pros: 30, 32, 33*
Schur, Sanders, & Steiner (2000)	N = 62, 3rd – 6th graders (50% F)	Audio taped interviews and questionnaires regarding eating behaviour, attitudes toward dieting, and body dissatisfaction (CHEAT, body figure rating scale)	50% of all children wanted to weigh less. 16% reported attempting weight loss (changing food choices – more fruits and vegetables and less "fat foods" and candy as opposed to restricting intake - and exercising).	*Pros: 27*
Corwin, Sargent, Rheaume, & Saunders (1999)	N = 717, 4th-graders	<u>Questionnaires</u>: -24 hour weekday dietary recall -Self efficacy for fruit and vegetable selection, and low-fat selection at a grocery store -Basic nutritional knowledge -Expectancy belief (e.g., disease prevention and health effects) -Food preparation involvement -Fruit and vegetable availability (home/school) -Perceived social support (encouragement from parents, teachers and peers) -Eating behaviour modeling (family and media)	Self-efficacy, social support, meal preparation involvement, and fruit/vegetable availability were associated with dietary behaviour.	*Pros: 24, 30, 31, 32* *Cons: 12, 19, 20, 22*

Kostanski & Gullone (1999)	N = 431, 2nd – 4th graders (54% F; mean age = 8.8 yrs.)	<u>Questionnaires</u>: 2 sentence-completion tasks, Figure Rating Scale, and the Children's version of the Eating Attitudes Test (EAT)	Children as young as 7 years of age reported dissatisfaction with their current body size and deliberate restrictive eating behaviours (20% indicated they dieted sometimes; and 3% claimed to diet always). Children who perceived themselves as too large reporting the highest levels of restrictive eating behaviours.	*Pros: 27*
Smolak, Levine, & Schermer (1999)	N = 131 mothers and 89 fathers of 4th and 5th graders	<u>Child questionnaires</u>: Body Esteem Scale, and a 5-point Likert Scale Q re: frequency of weight loss attempts (exercise & restrictive eating) <u>Parent questionnaires</u>: A 4-point Likert Scale Q re: frequency of mentioning the child's weight to the child; 3, 4-point Likert Scale Qs re: parents dieting, desire to be thin, & complaints of own weight; and, a 3-point Likert scale Q re: beliefs whether dieting is effective weight loss strategy.	-When both parents commented on the child's weight (especially mothers), children made more attempts to lose weight than when neither parent commented. -Parental modeling of weight concerns and weight control was related to daughter's attempts to lose weight.	*Pros: 24, 25, 27*
Benedikt, Wertheim, & Love (1998)	N = 89 Australian female 10th & 11th graders, and their mothers (age 30-60 yrs.)	-BMI <u>Questionnaires</u>: -6-point Likert scales on weight-loss attempts (including calorie counting and exercising) -Body Figure Perception Q. -Maternal struggling with weight and dieting (5-point Likert scales) -Maternal encouragement of their daughters to loose weight (5-point Likert scales) -Dutch Eating Behaviour Q.	Daughter's moderate weight-loss attempts were significantly associated with body dissatisfaction and mother's encouraging her daughter to lose weight. In contrast, daughter's more extreme weight-loss behaviours (e.g., fasting, skipping meals) were predicted by mother's reports of her own body dissatisfaction and mother's use of extreme weight-loss behaviours. The results were not simply an artifact of daughter's body weight.	*Pros: 24, 25, 27*

De Bourdeaudhuij & Van Oost (1998)	N = 92 family quartets, both parents and 2 adolescents (age 12 - 18 yrs.)	Questionnaires: -Food choice (assesses eating patterns) -Decision making about food purchases and meals -Influence on the introduction of healthy food -Communication of dislike of foods -Parent food rules	In families where parents have more decision-making power, food choices were healthier. More prohibition for eating candy and less permission to eat something else if one does not like the food are associated with more healthy family food choices. The more frequent use of communication of dislike of foods by the adolescent in families was associated with more unhealthy food choices.	*Pros: 24, 32*
Engell, Bordi, Borja, Lambert, & Rolls (1998)	N = 33 preadolescents (52% F; mean age = 10.3 yrs.)	-9-point rating scales, including taste, texture, and healthiness ("good for you") -Labeled vs. non-labeled oatmeal cookies (2), which varied in amount of butter (fat content)	When children were given no information on fat content, children preferred the cookie with the higher fat content; when information was presented, children preferred the reduced-fat cookie. The low-fat label was also associated with an increase in perceived healthiness relative to the high-fat label.	*Pros: 1, 6*
Gibson, Wardle, & Watts (1998)	N = 92 mothers from London, and their children (9-11 yrs.)	Questionnaires & interviews: -Mothers' diets - food frequency questionnaire -Children's diets - 3-day diaries -Nutritional knowledge -Health- and diet-related beliefs and attitudes (e.g., prevention of disease, general health and well-being, taste, cost, speed and convenience, how much they liked to eat the same as other people, and weight control)	Independent predictors of children's fruit intake included mothers' nutritional knowledge, frequency of fruit consumption, and belief that increasing fruit and vegetable consumption by their children could reduce their risk of developing cancer. Children's vegetable consumption was explained by the child's liking for commonly eaten vegetables and the mother's belief in the importance of disease prevention when choosing her child's food.	*Pros: 1, 19, 24, 25*
MacGregor, Currie, & Wetton (1998)	N = 334 students from Scotland (age 8-12 yrs.)	A draw and write scenario to elicit the views of students regarding the qualities they would expect to see in a school which promotes health, and the qualities their own schools need to develop to become more health promoting.	Various categories of responses were generated, including food/drink and exercise/games/play. Some of the children's responses were issues such as the high price of healthy foods, and the non-availability within the school and home.	*Pros: 29* *Cons: 19, 20, 21*

Resnicow, Smith, Baranowski, & Davis-Hearn (1997)	N = 1398, 3rd graders	<u>Questionnaires</u>: -Fruit and vegetable intake - 7-day records -Self-efficacy -Positive outcome expectations (see Reynolds et al., 2002 above) -Preferences (fruits and vegetables) -Social norms (separated into family, friends and peers) -Asking skills (*e.g.*, did you ask someone to put fruits and vegetables on the grocery list) -Knowledge	Fruit and vegetable intake was correlated with asking skills and preferences. In analyses controlling for school-level clustering, only preferences and positive outcome expectations were significantly associated with fruit and vegetable intake.	*Pros: 1, 2, 3, 10, 12, 13, 16, 19, 20, 21, 24, 27, 28* *Cons: 2, 3*

Appendix 17: Articles on the Determinants of Physical Activity in Children and Adolescents

Article	Participants	Measures	Relevant Results	Supported Items
Hofschire & Greenberg (2002)	N = 382, 9th & 10th graders (mean age = 15 yrs.; 46%F)	Questionnaires: -Media exposure of TV & magazines (estimated time) -Desire to look like media celebrities (4, 5-point Likert scales Q's on 12 celebrities) -Interpersonal sources of influence on body dissatisfaction (family, peers & friends) -Body dissatisfaction -Frequency of diet & exercise behaviours	-Identification with media characters significantly predicted body dissatisfaction and exercise among girls. -Magazine readership, viewing sports on TV and friend's opinions regarding appearance significantly predicted exercise in boys.	*Pros: 18, 26, 29, 30*
Thompson, Davis, Gittelsohn, Going, Becenti, Metcalfe et al., (2001)	48 schools, 10 school officials, 76 child-pairs (3rd & 5th graders), 47 caregivers, N = 338 4th graders (51% F), N = 117 3rd & 4th graders (50% F)	Direct observations of schools, interviews with school staff, child-pair interviews (same-sex friend), focus groups with children, interviews with caregivers, and self-administered Knowledge, Attitudes & Behaviors survey (KAB) and Physical Activity Questionnaire (PAQ) with children.	-Barriers to physical activity at schools included a lack of facilities, equipment, and trained staff persons for physical education. -Barriers reported by children and adult caregivers that sometimes influence the children's physical activity were: weather conditions/ darkness, safety concerns, being too tired, being afraid of getting hurt and homework/chores.	*Cons: 2, 3, 4, 19, 29, 30, 31, 33, 34*
Burkhalter & Wendt (2001)	N = 242, 6th-, 7th & 8th graders (57 % F)	Questionnaires: -Physical Education Survey (PES) - alienation from PE (e.g., boring, waste of time) -Perceived competence towards physical fitness (PCf) (e.g., I am very strong) -Perceived competence toward physical activity scale (PCp) (e.g., I don't do well at new outdoor games & sports) Physical performance: grip strength, standing long jump, mile run	-Independent of gender and age, perceived physical competence toward fitness and alienation from physical education were significantly related to physical performance (strength and fitness).	*Pros: 25* *Cons: 4, 5, 6, 7, 8, 24, 31*

Deflandre, Lorant, Gavarry, & Falgairette (2001)	N = 80 French school children (age 11-16 yrs)	Questionnaire and continuous heart-rate monitoring	Active boys had more frequently sport-practicing fathers than inactive boys.	*Pros: 19, 20*
Motl, Dishman, Trost, Saunders, Dowda, Felton et al., (2000)	N = 2752 African-American & White female students in 8^{th} & 9^{th} grade (mean age = 13.6 & 13.7 yrs.) 1-year follow-up: N = 955 students	Unidimensional measurement models applied to: Questionnaires: 1. Attitude Questionnaire 2. Subjective Norm Questionnaire 3. Perceived Behavioural Control Questionnaire 4. Self-efficacy Questionnaire	Attitude Questionnaire (8 items) If I were to be physically active during my free time on most days, it would…help me cope with stress, be fun, help me make new friends, get or keep me in shape, make me more attractive, give me more energy, make me hot and sweaty, make me better in sports, dance, or other activities. Subjective Norm Questionnaire: (8 items) _(fellow students, best friend, PE teacher, other teachers, mother or female guardian, father or male guardian, sister/sisters, brother/brothers)_think I should be physically active during my free time on most days. Self-efficacy Questionnaire (relevant items that mention specific barriers: being busy, having the coordination, bad weather)	*Pros: 6, 7, 9, 17, 21, 24, 29, 30* *Cons: 6, 7, 8, 29, 31,32*
Nigg (2001)	Baseline: N = 819 Canadian students (mean age = 14.89) 3yr follow-up: N = 400 (mean age = 17.62 yrs)	Questionnaires: -Self-reported exercise -Stages of change (SCQ) -Process of change (PCQ) -Self-efficacy (SE) -Decisional Balance (DB) Pros: more energy, relieve tension, more confidence, sleep more soundly, feel good about self, feel less stressed, feel more comfortable with body, more positive outlook on life Cons: too tired to do daily work, bad weather, out of breath and heart beats very fast, too much time, less time for friends and family, too exhausted	Exercise behaviour decreased over time. Along with this, the pros of the DB measure increased, and cons decreased.	*Pros: 4, 6, 7, 9, 15, 17, 29, 30* *Cons: 2, 5, 22, 29, 31*

Neumark-Sztainer, Martin, & Story (2000)	N = 203 students (grades 7-12); 25 Focus groups (mean size = 8; 16F & 9M groups)	Focus groups discussed the development of a program comprising healthy eating, exercise & weight control.	Responses were categorized and coded to identify relevant themes. Adolescents advocated fun and interactive activities within a supportive environment that are accessible and convenient, as well as open to all students (*i.e.*, all fitness levels, access to facilities, feel comfortable, be fun, lack of time).	*Pros: 11, 18, 25, 32* *Cons: 5, 6, 17, 24, 25, 26, 31, 32, 33*
Schur, Sanders, & Steiner (2000)	N = 62 (50% F, grades 3-6)	Audio taped interviews & questionnaires on eating behaviour, attitudes toward dieting & body dissatisfaction (i.e., CHEAT, and body figure rating scale)	50% of all children wished that they weighed less. 16% reported attempting weight loss (most by changing food choices – more fruits and vegetables and less "fat foods" and candy - as opposed to restricting intake and exercising).	*Pros: 29*
Viira & Raudsepp (2000)	N = 375 (age 13-14 yrs.)	<u>Questionnaires</u>: goal orientations, beliefs about sport success, enjoyment/ boredom with sports & physical activity levels.	Task orientation, effort and ability beliefs were the most important correlates of moderate to vigorous exercise for males. For females, cooperation, boredom, and enjoyment were the most important.	*Pros: 7, 8, 9, 11, 20, 25, 27* *Cons: 7, 8, 12, 13*
Allison, Makin, & Dwyer (1999)	N = 1041 Canadian students (9^{th} & 11^{th} graders)	<u>Questionnaires</u>: -Self-report of vigorous physical activity (days per week in PE classes, other school-related activities, & outside-of-school activities) -Self-efficacy -<u>Actual barriers</u>: time spent on other interests, part-time work & TV, as well as life-strain (parents, homework, peer pressure) -<u>Perceived barriers</u>: lack of time, cost, lack of energy, lack of athletic ability, lack of opportunities, lack of support, self-conscious, fear of injury, injury	-Self-efficacy and physical activity participation was significantly and positively correlated with vigorous physical activity in each of the 3 settings. -Perceived barriers were significantly and negatively correlated with physical activity participation in some instances. -Actual barriers were significantly and negatively correlated with physical activity participation in 2 out of the 3 settings.	*Pros: 18, 19, 24, 32* *Cons: 1, 2, 3, 5, 6, 7, 19, 24, 25, 31, 33, 34*

Bungum, Pate, Dowda, & Vincent (1999)	N = 626 African-American & 226 Caucasian females (age 14-18 yrs.)	<u>Questionnaires</u>: -1-week recall of activity, safety and convenience, self-efficacy, sports media influences, friends & family support, normative beliefs (others expectations), peers & parents models of activity, health beliefs (feel less depressed, less bored, look better, meet new people, health for heart and lungs), attitudes (useful, stimulating, healthy, pleasant, interesting), knowledge & barriers (time, equipment)	Variables statistically associated with moderate physical activity: -African-Am. Ss: family support and enjoying physical activities that make one sweat and breath hard -Caucasian Ss: Participation in organized sports, and self-efficacy Variables statistically associated with vigorous physical activity: -African-Am. Ss: Participation in organized sports -Caucasian Ss: Barriers and self-efficacy	*Pros: 11, 19, 20, 24* *Cons: 19, 21, 31, 34*
Sallis, Prochaska, Taylor, Hill, & Geraci (1999)	N = 1504, 4^{th} – 12^{th} graders, & their parents	Telephone interviews – 22 determinants, and an 11-item child physical activity (PA) index	Use of afternoon time for physical activity, enjoyment of PE, and family support for PA had strong and consistent associations with child PA across age groups.	*Pros: 11, 19, 24, 32*
Sallis, Alcaraz, McKenzie, & Hovell (1999)	N = 732 4th & 5th graders (age 9 yrs.; 51% F)	<u>Physical activity</u> -Child and parent report (1 day recall) & child wore accelerometer for 1 day <u>Questionnaires</u>: -Physical activity attitude, physical education attitude (e.g., nice-awful, fun-boring, sad-happy), Sweat attitude, physical activity competence (e.g., I do well at all kinds of sports & games), self concept, body image & behavioural intentions <u>Parent-reported variables</u>: -Parent activity, child TV viewing, neighborhood safety, parent encouragement, parent plays with child, parent transport child, parent paid fee	The psychological variables that were significantly related to change in physical activity (decline of 3% to 6% for boys and 7% to 12% for girls) were physical education attitude, perceived activity competence, and activity preference. The significant social variables were parental transport of the child and parental physical activity.	*Pros: 9, 11, 19, 24* *Cons: 7, 8*

Smolak, Levine, & Schermer (1999)	N = 131 mothers & 89 fathers of 4th & 5th graders	Child measures: -Body Esteem Scale -A 5-point Likert Scale Q re: frequency of weight loss attempts (exercise and calorie-restrictive eating) Parent measures: -A 4-point Likert Scale Q re: frequency of parent mentioning child's weight - 3, 4-point Likert Scale Qs re: parent dieting, desire to be thin, and complaints of own weight. -A 3-point Likert scale Q re: parent belief if dieting an effective strategy.	-When both parents commented on the child's weight (especially mothers), children made more attempts to lose weight than when neither parent commented. -Parental modeling of weight concerns and weight control was related to daughter's attempts to lose weight.	*Pros: 19, 24, 29*
Benedikt, Wertheim, & Love (1998)	N = 89 Australian girls (10th & 11th graders), and their mothers (age 30-60 yrs.)	-BMI Questionnaires: -6-point Likert scales on weight-loss attempts (including calorie counting and exercising) -Body Figure Perception Questionnaire -5-point Likert scales on maternal struggling with weight and dieting -5-point Likert scales on maternal encouragement of daughters to loose weight -Dutch Eating Behaviour Questionnaire	-Daughter's moderate weight-loss attempts were significantly associated with body dissatisfaction and mother's encouraging her daughter to lose weight. -In contrast, daughter's more extreme weight-loss behaviours (e.g., fasting, crash dieting, and skipping meals) were predicted by mother's reports of her own body dissatisfaction and mother's use of extreme weight-loss behaviours herself. The above results were not simply an artifact of daughter's body weight.	*Pros: 19, 24, 29*
DiLorenzo, Stucky-Ropp, Vander Wal, & Gotham (1998)	N = 111 families of 5th & 6th graders for Phase 1, and 8th & 9th graders for Phase 2 (49% F with 111 mothers for both phases and 80 fathers for Phase 2)	In-home interviews and questionnaires including the Physical Activity Interview and child and parent physical activity questionnaires	-Enjoyment of physical activity was the only consistent predictor of physical activity during Phase 1. -At Phase 2, child's exercise knowledge (e.g., exercise helps get rid of fat), mother's physical activity, and child's friend and mother's modeling/support emerged as predictors for girls. -For boys, child's self-efficacy for physical activity, exercise knowledge, parental modeling, and interest in sports media were important.	*Pros: 1, 3, 11, 18, 19, 20, 24, 26* *Cons: 19, 20, 21, 22*

Garcia, Pender, Antonakos, & Ronis (1998)	N = 132, 5th-, 6th-, and 8th-graders during their transition from elementary to junior high school	Questionnaires: Child/adolescent physical activity (PA) log, children's perceived benefits & barriers to PA (Note: unpublished - emailed author with no success), social support (praise and encouragement for being active), social expectations (extent family & friends expected them to be active), role models (who engaged in PA), health perceptions, and self-efficacy.	During the transition period, boys reported significant decreases in physical activity, self-efficacy, social support, and social expectations. Girls reported decreases in physical activity, social support, benefit/barrier differential, and role models. Overall, pretransition activity level was the best predictor of posttransitional level.	*Pros: 18, 19, 20, 24* *Cons: 19, 20, 21, 22*
MacGregor, Currie, & Wetton (1998)	N = 334 students from Scotland (age 8-12 yrs.)	A 'draw and write scenario' to elicit the views of students regarding the qualities they would expect to see in a school which promotes health, and the qualities their own schools need to develop to become more health promoting.	Various categories of responses were generated, including food/drink and exercise/games/play. Some of the children's responses were about having after school clubs, having programs be open to all students, making exercise more frequent, and involving school staff in exercise programs.	*Pros: 32* *Cons: 26*
Nigg & Courneya (1998)	N = 819, grade 9-12 students (age 13-19 yrs.)	Questionnaires: -Stages of change (SCQ) -Process of change (PCQ) -Self-efficacy (SE) -Decisional Balance (DB) –Pros: more energy, relieve tension, more confidence, sleep more soundly, feel good about self, feel less stressed, feel more comfortable with body, more positive outlook on life. Cons: too tired to do daily work, bad weather, out of breath and heart beats very fast, too much time, less time for friends and family, too exhausted.	The pros-minus-cons difference (using t-scores) was significant and in the negative direction for the precontemplation, contemplation, and preparation stages. The DB difference score was not significant for the action stage, but was significant and in the positive direction for the maintenance stage. The pros intersected with the cons in the action stage, supporting the application of the Transtheoretical Model's decisional balance measure for physical activity in adolescents.	*Pros: 4, 6, 7, 9, 15, 17, 30* *Cons: 2, 5, 22, 29, 31*

Bungum & Vincent (1997)	N = 852 females (626 Black, 226 White; age 14-18 yrs.)	<u>Questionnaires</u>: -7-day recall of physical activity (PA), safety and convenience, self-efficacy, sports media influences, friends and family support, normative beliefs (others expectations), and models of PA by peers & parents, health beliefs (feel less depressed, less bored, look better, meet new people, health for heart and lungs), attitudes (useful, stimulating, healthy, pleasant, interesting), knowledge, TV viewing, barriers (time, equipment)	-Overall, support from biological fathers and participation in organized sports was associated with PA. Viewing 2+ hrs of television per night negatively influenced PA. -Among Black Ss, participation in organized sports, friend support, support from biological fathers, and self-efficacy (for 14-15 yr olds only) were significantly associated with PA. Following sports through the media negatively influenced PA. -Among White Ss, positive attitudes and enjoyment of vigorous activity predicted PA for younger Ss, but participation in organized sports was the sole significant predictor for older Ss.	*Pros: 1, 11, 18, 19, 20, 24*
Saunders, Pate, Felton, Dowda, Weinrich, Ward et al., (1997)	N = 422 (5th-graders)	<u>Questionnaires</u>: -After-school physical activity -Social Influences scale (family & friends - encourages, participates) -Self-Efficacy scale (support seeking, barriers, & positive alternatives) -Beliefs scale (social outcomes & physical activity outcomes)	There were significant correlations between social influence, self-efficacy, barriers (busy, tired, homework and weather) and physical activity in one sample, and between social influences and physical activity in the other sample	*Pros: 18, 19, 20, 24* *Cons: 2, 19,20, 21, 22, 29, 31*
Sands, Tricker, Sherman, & Armatas (1997)	N = 61 (43% F; age 10-12 yrs.)	<u>Questionnaires</u>: -Body image scale (silhouettes) -Participation in activity scale -Self-worth scale -Eating and Me scale, adapted from the Eating Disorder Inventory (EDI) & Eating Attitudes Test (EAT)	For girls, physical activity was significantly and negatively correlated with scores on the drive for thinness scale of the Eating and Me scale.	*Pros: 29*
Trost, Pate, Saunders, Ward, Dowda, &	N = 202 African-American children (5th graders)	<u>Questionnaires</u>: -Beliefs re: outcomes (keep in shape, healthy, would be fun/ boring, make me tired), social influence (friend/ family encourages me, believes I should be active,	-For girls, participation in community sports, self-efficacy in overcoming barriers, enjoyment of school physical education, and perception of mother's activity level (active vs. inactive) were significant predictors of vigorous physical	*Pros:1, 3, 11, 18, 19, 20, 22, 24, 30* *Cons:2, 20, 21*

Felton (1997)		or is active with me), self-efficacy, perceived habits of family and peers, access to equipment, like/dislike of PE, participation in community sports, time watching TV/ playing video games & previous day physical activity recall (PDPAR)	activity. For moderate physical activity, participation in community sports and self-efficacy in overcoming barriers were significant predictors. -For boys, self-efficacy in overcoming barriers was the only significant predictor of vigorous physical activity. For moderate physical activity, beliefs regarding activity outcomes and participation in community sports were significant predictors.	
Reynolds, Killen, Bryson, Maron, Taylor, Maccoby et al., (1990)	N = 680, 10^{th} graders (48% F) at baseline; N = 457 (38% F) at 4 months; N = 374 (38% F) at 16 months	Questionnaires: Self-efficacy, intension, direct social influence, stress & activity	Intention to exercise (e.g., I intend to keep my body in top physical shape, to get regular exercise when I get older, and to play organized sports this year) and direct social influence (e.g., Other members in my family exercise regularly, my friends exercise regularly) were significantly associated with physical activity.	*Pros: 1,2, 3, 18, 19, 20, 25*
Shepard & Godin (1986)	N = 698 grade 7-9 students (age 12-14 yrs.)	Questionnaires: -Physical Activity -Attitudes/behavioural beliefs (being healthy, looking better, being tired, feeling better, filling free time, being fun, being physically fit) -Normative beliefs (others believe should do exercise) -Motivation to comply (the way others think) -Behavioural intentions to exercise	Students with high intentions to exercise have strong positive beliefs about the value of physical activity. As well, prior experience with physical activity and parental attitudes towards exercise are significantly related to intention to exercise.	*Pros: 1, 3, 6, 11, 24, 30, 33*

Appendix 18. Letter to Parents from the Cross-sectional Survey Studies

I. Letter to Parents from the Test-Retest Study

DALHOUSIE UNIVERSITY
Inspiring Minds

Dear Parent, Guardian or Caregiver:

Summer break is quickly coming to an end. It is time to prepare for the start of another school year. You will soon be busy getting supplies, new clothes and other things for your child. Before this hectic period we thought that we would write this letter and inform you about a study that will soon start.

This research study is a doctoral dissertation from the Psychology Department at Dalhousie University. The purpose of the study is to investigate the reasons why children eat certain foods and are active in Nova Scotia. Questionnaires will be distributed to your son or daughter and separate questionnaires for yourself. The questionnaires for your child contain questions about activities they like to do, foods they like to eat, and the reasons they eat certain foods and are active. The parent questionnaire contains the same questions as the questionnaires for your child, but asks about *your child* in relation to *their* nutrition and activity. Approximately 150 students in Grades 3, 7, and 11 will be included in the study. This study is expected to run from September to December 2002. This research is a follow-up study from one done last year in the Nova Scotia schools on physical activity.

Please find a copy of the consent form with this letter. This copy is for your records. When you receive the parent questionnaire package, you will be asked to sign a consent form that is included in the package if you agree to participate in this study. Please also find a 'Participation Decline' form with this letter that you can sign and send with your child to his/her school if you wish to *not* participate in this study. Alternatively, if you and your child do not wish to participate in this study, you can contact Deanna Braaksma by telephone (see number below). If we do not receive a telephone call or participation decline form from you within 2 weeks, we will be contacting you by telephone regarding the consent form and parent questionnaires.

If you have any questions about the upcoming study, please contact Deanna Braaksma at (902) 446-5888 during weekdays. There is also an independent contact at the Office of Human Research Ethics and Integrity at Dalhousie University. Their telephone number is (902) 494-1462.

Sincerely,

Deanna Braaksma 902-446-5888
Clinical Psychology PhD Student, Dalhousie University
braaksma@is.dal.ca

Department of Psychology • 1355 Oxford Street • Dalhousie University • Halifax NS B3H 4J1 Canada
Tel: 902.494 3417 • Fax: 902.494.6585 • Website: psychology.dal.ca

II. Letter to Parents from the Behaviour Study

DALHOUSIE
UNIVERSITY
Inspiring Minds

Dear Parent, Guardian or Caregiver:

Summer break is quickly coming to an end. It is time to prepare for the start of another school year. You will soon be busy getting supplies, new clothes and other things for your child. Before this hectic period we thought that we would write this letter and inform you about a study that will soon start.

This research study is a doctoral dissertation from the Psychology Department at Dalhousie University. The purpose of the study is to investigate physical activity and nutrition in children and youth, and the reasons they eat certain foods and are active in Nova Scotia. Questionnaires will be distributed to your son or daughter in class, and separate questionnaires will be given for you. The questionnaires for your child contains questions about activities they like to do, foods they like to eat, and the reasons why they eat certain foods and are active. The parent questionnaire contains the same questions as your child, but ask you about *your* activity levels and nutrition, and the ways you think about *your child's* nutrition and activity. Approximately 150 students in Grades 3, 7, and 11 will be included in the study. This study is expected to run from September to December 2002.

How will levels of physical activity be measured you might ask? The children and youth that are selected for this study will be wearing an activity monitor for one week that will measure the amount and level of their physical activity. Research has shown that the monitor does not interfere with daily activities.

Please find a copy of the consent form with this letter. This copy is for your records. When you receive the parent questionnaire package, you will be asked to sign a consent form that is included in the package if you agree to participate in this study. Please also find a 'Participation Decline' form with this letter that you can sign and send with your child to his/her school if you wish to *not* participate in this study. Alternatively, if you and your child do not wish to participate in this study, you can contact Deanna Braaksma by telephone (see number below). If we do not receive a telephone call or participation decline form from you within 2 weeks, we will be contacting you by telephone regarding the consent form and parent questionnaires.

If you have any questions about the upcoming study, please contact Deanna Braaksma at (902) 446-5888 during weekdays. There is also an independent contact at the Office of Human Research Ethics and Integrity at Dalhousie University. Their telephone number is (902) 494-1462.

Sincerely,

Deanna Braaksma 902-446-5888
Clinical Psychology PhD Student, Dalhousie University
braaksma@is.dal.ca

Department of Psychology • 1355 Oxford Street • Dalhousie University • Halifax NS B3H 4J1 Canada
Tel: 902.494 3417 • Fax: 902.494.6585 • Website: psychology.dal.ca

Appendix 19: Parent Consent Forms and Decline Form for the Cross-sectional Survey Studies

I. Parent Consent Form from the Test-Retest Study

DALHOUSIE UNIVERSITY
Inspiring Minds

Measuring Decision-Making of Physical Activity and Nutrition of Nova Scotia Children and Youth

Contact Persons:
If you have any questions or concerns about the upcoming study or require any further information or clarification about the study procedures at any time please contact:

Principal Investigator:	Deanna Braaksma, BSc Clinical PhD Student, Department of Psychology 1355 Oxford Street, Dalhousie University Halifax, Nova Scotia B3H 1J4 (902) 446-5888; braaksma@is.dal.ca
Co-Investigator:	Phil Campagna Ph.D. Professor, School of Health and Human Performance 6230 South Street, Dalhousie University Halifax, Nova Scotia B3H 3J5 (902) 494-1145 campagna@is.dal.ca
External Supervisor:	Michael Vallis, PhD Adjunct Professor, Dalhousie University Psychologist, Queen Elizabeth II Health Sciences Centre Bethune Building, 1278 Tower Road Halifax, Nova Scotia B3H 2Y9 (902) 473-5526; tvallis@is.dal.ca
Internal Supervisor:	Jeannette McGlone, PhD Professor, Department of Psychology 1355 Oxford Street, Dalhousie University Halifax, Nova Scotia B3H 1J4 (902) 494-5179; jmcglone@is.dal.ca

Introduction:
We invite you and your child to take part in a research study at Dalhousie University. Taking part in this study is voluntary and you or your child may withdraw from the study at any time. The study is described below. This description tells you about the risks inconvenience or

discomfort which you or your child may experience. Participating in the study will not benefit you, but researchers may gain new knowledge about children's physical activity and nutrition. You should discuss any questions you have about this study with the people conducting the study.

Purpose of the Study:
The purpose of this research study is to measure decision-making of physical activity and nutrition and for a group of children and youth using questionnaires. A second purpose is to examine the way parents think about their child's activity and nutrition. This study will help us to learn how children and youth, as well as their parents, think about physical activity levels and nutrition.

Study Design:
This study is a survey study, in which approximately 150 students in Grades 3, 7, and 11 will be asked to fill out questionnaires and wear an accelerometer over a week's time. As well, parents will be asked to fill out similar questionnaires as their child. This study is expected to run from September to December 2002.

Who can Participate in the Study:
You and your child may participate in this study if you were selected as one of the classrooms in the Halifax region to be in this study. At this point in time, we are only studying those without physical and mental disabilities. However, all children will be given the opportunity to participate as a class, if they so choose.

Who will be Conducting the Research:
Deanna Braaksma, a clinical psychology PhD student from Dalhousie University will be involved in the research.

What you will be asked to do:
You will be contacted by telephone within 2 weeks of receiving this consent form if we do not here from you by telephone or by the participation decline form that you do not wish to participate in this study. You will be contacted by telephone approximately two weeks after receiving this consent form. During this telephone call, the study will be explained, and you will be given the opportunity to ask questions. You and your child will be asked to fill brief questionnaires about your child's physical activity and nutrition, which will take approximately 45 minutes. One-week later, you and your child will be asked to fill out two of the questionnaires, again, which will take approximately 15 minutes. The questionnaires for your child will be filled out in their class, and contains questions about the reasons they are active or eat certain foods, how confident they are in choosing certain activities or foods, and whether or not they wish to change which activities they do or foods they eat. These questionnaires will be administered during normal classroom time replacing the teacher's lesson. The parent questionnaires contain the same questions as the child's questionnaires, but are about *your child.* Your child will also be asked to stand on a weight scale without shoes or socks to measure their body composition, height and weight. While standing on the weigh scale a small safe electrical signal (less than a 1.5-volt battery) will be used to measure the resistance or opposition to the flow of current. This

will not cause your child any discomfort. An estimation of a person's body composition can be made since resistance is lowest in muscle tissue. Your child will be asked to bring the parent questionnaire package home to you, and his/her teacher will serve as the liaison between the research team to hand in completed questionnaires at the end of the week.

Possible Risks and Discomforts:
There are no known risks or discomforts foreseen in participating in this study. However, there may be harms that we do not know about yet.

Possible Benefits:
There is no benefit for you or your child in participating in this study. However, we hope to further our knowledge in the field of health psychology.

Compensation:
All persons in the classroom will be given government of Canada health information about nutrition and physical activity for children and youth.

Confidentiality:
Confidentiality will be respected. No information that discloses your identity will be released or published. You and your child's name will be assigned a code number. A list of names and matching codes will be stored in the project research office at the Department of Psychology at Dalhousie University. Only the four researchers listed, or researchers that are supervised by them, will have access to the list. The data and all results of data analysis will be reported, presented or published without identifying individual children.

Questions:
If you have any questions about the study you can contact Deanna Braaksma at 446-5888, Monday to Friday, 9:00-5:00.

When will you hear about the final results:
At the conclusion of the study all participants and their parents will have an opportunity to meet with the Deanna Braaksma at the participant's school. The purpose of the meeting is to share the study results, respond to final questions about the study, and discuss the procedures used in the study. This meeting will occur in the evening at the school. The date of the meeting will be announced after the data has been summarized in a report (approximately May 2003). After this meeting, copies of a written summary of these results will be left at your school, and will be available through your principal.

Voluntary Participation: Participation in this study is completely voluntary, and participants are free to withdraw at any time for any reason. If your child chooses not to participate, they will be instructed to simply leave their chart unfilled on their desk, and it will be collected with the others of their class at the end of the study.

Problems or Concerns:
In the event that you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Human Research Ethics/ Integrity Coordinator at Dalhousie University's Office of Human Research Ethics and Integrity for assistance: (902) 494-1462.

Signature:

Title: Measuring Physical Activity Levels, Nutrition and Decision-making among Nova Scotia Children and Youth

I have read the explanation about this study. I have been given the opportunity to discuss it and my questions have been answered to my satisfaction. I hereby consent to take part in this study. However I realize that my participation is voluntary and that I am free to withdraw from the study at any time.

__________________________ __________________________
Name of parent or legal guardian Signature of parent or legal guardian

____
Date

You will be given a copy of the consent form for your records.

Contact Information:

Name: ____

Phone: _________________(day) ____________________(evening)

Address: ____

City: _______________ Postal Code: _____________

II. Parent Consent Forms from the Behaviour Study

DALHOUSIE UNIVERSITY
Inspiring Minds

Measuring Physical Activity Levels, Nutrition and Decision-Making among Nova Scotia Children and Youth

Contact Persons:
If you have any questions or concerns about the upcoming study or require any further information or clarification about the study procedures at any time please contact:

Principal Investigator:	Deanna Braaksma, BSc Clinical PhD Student, Department of Psychology 1355 Oxford Street, Dalhousie University Halifax, Nova Scotia B3H 1J4 (902) 446-5888; braaksma@is.dal.ca
Co-Investigator:	Phil Campagna Ph.D. Professor, School of Health and Human Performance 6230 South Street, Dalhousie University Halifax, Nova Scotia B3H 3J5 (902) 494-1145 campagna@is.dal.ca
External Supervisor:	Michael Vallis, PhD Adjunct Professor, Dalhousie University Psychologist, Queen Elizabeth II Health Sciences Centre Bethune Building, 1278 Tower Road Halifax, Nova Scotia B3H 2Y9 (902) 473-5526; tvallis@is.dal.ca
Internal Supervisor:	Jeannette McGlone, PhD Professor, Department of Psychology 1355 Oxford Street, Dalhousie University Halifax, Nova Scotia B3H 1J4 (902) 494-5179; jmcglone@is.dal.ca

Introduction:
We invite you and your child to take part in a research study at Dalhousie University. Taking part in this study is voluntary and you or your child may withdraw from the study at any time. The study is described below. This description tells you about the risks inconvenience or discomfort which you or your child may experience. Participating in the study might not benefit

you, but we may gain new knowledge about children's physical activity and nutrition. You should discuss any questions you have about this study with the people conducting the study.

Purpose of the Study:
The purpose of this research study is to measure physical activity, nutrition and decision-making for a group of children and youth using accelerometers and questionnaires. A second purpose is to examine the way parents think about their child's activity and nutrition. An accelerometer is a small device comfortably worn on a belt. This study will help us to learn about physical activity levels and nutrition in children and youth today, as well how children and their parents think about the foods and activities children choose.

Study Design:
This study is a survey study, in which approximately 150 students in Grades 3, 7, and 11 will be asked to fill out questionnaires and wear an accelerometer over a week's time. As well, parents will be asked to fill out similar questionnaires as their child. This study is expected to run from September to December 2002. This research is a follow-up study from those we did last year in the Nova Scotia schools.

Who can Participate in the Study:
You and your child may participate in this study if you were selected as one of the classrooms in the Halifax region to be in this study. At this point in time, we are only studying those without physical and mental disabilities. However, all children will be given the opportunity to participate as a class, if they so choose.

Who will be Conducting the Research:
Deanna Braaksma, a clinical psychology PhD student from Dalhousie University will be involved in the research.

What you will be asked to do:
You will be contacted by telephone within 2 weeks of receiving this consent form if we do not here from you by telephone or by the participation decline form that you do not wish to participate in this study. During this telephone call, the study will be explained, and you will be given the opportunity to ask questions. At school, your child will be asked to fill out questionnaires about how they think about their nutrition and their physical activity levels (*i.e.*, their decision-making, motivation and confidence), which will take approximately 45 minutes. These questionnaires will be administered during normal classroom time replacing the teacher's lesson.

Your child will be given an accelerometer to wear for one week. The accelerometer is approximately the size of a pager and fits comfortably onto a belt. Previous studies have shown that the device is easy to use and does not interfere with normal activities. During the week we ask that your child simply carry on with his or her normal weekly routine. Before placement of the accelerometer your child's body composition, height and weight will be measured. This will require him or her to stand on a weight scale without shoes or socks. While standing on the weigh scale a small safe electrical signal (less than a 1.5-volt battery) will be used to measure the resistance or opposition to the flow of current. This device will not cause your child any discomfort. An estimation of a person's body composition can be made since resistance is lowest in muscle tissue. Giving instructions to your child about the accelerometer and measuring their body composition will take approximately 5 minutes. A questionnaire package will also be given to yourself (your child will be asked to bring it home to you), as well as an additional questionnaire for you and your child regarding you and your child's nutrition. The parent questionnaire package contains the same types of questions as the ones your child is being asked to fill out. The questionnaires ask you about you and your child's nutrition and activity levels, as well as about how you think about *your child's* nutrition and activity (*i.e., your child's* decision-making, motivation and confidence), which will take approximately 30 minutes. A week later, you and your child will be asked to fill out a final questionnaire about your nutrition over the past week. These questionnaires take approximately 10 minutes to fill out.

Please note that participants, parents, and the Regional School Board are not liable for loss or damage of any accelerometer used in the study. However, it is assumed that participants will be careful with the equipment used in the study.

A physical education teacher will serve as the contact person and liaison between the research team, participants and parents. Participants, with the help of their parents and physical education teacher, will be asked to record their physical activities each day of the study's duration. This information will be written in a logbook designed for this purpose.

Possible Risks and Discomforts:
There are no known risks or discomforts foreseen in participating in this study. However, there may be harms that we do not know about yet.

Possible Benefits:
There is no benefit for you or your child in participating in this study. However, we hope to further our knowledge in the field of health psychology.

Compensation:
All persons in the classroom will be given government of Canada health information about nutrition and physical activity for children and youth.

Confidentiality:
Confidentiality will be respected. No information that discloses your identity will be released or published. You and your child's name will be assigned a code number. A list of names and matching codes will be stored in the project research office at the Department of Psychology at Dalhousie University. Only the four researchers listed, or researchers supervised by them, will have access to the list. The data and all results of data analysis will be reported, presented or published without identifying individual children.

Questions:
If you have any questions about the study you can contact Deanna Braaksma at 446-5888, Monday to Friday, 9:00-5:00.

When will you hear about the final results:
At the conclusion of the study all participants and their parents will have an opportunity to meet with the Deanna Braaksma at the participant's school. The purpose of the meeting is to share the study results, respond to final questions about the study, and discuss the procedures used in the study. This meeting will occur in the evening at the school. The date of the meeting will be announced after the data has been summarized in a report (approximately May 2003). After this meeting, copies of a written summary of these results will be left at your school, and will be available through your principal.

Voluntary Participation: Participation in this study is completely voluntary, and participants are free to withdraw at any time for any reason. If your child chooses not to participate, they will be instructed to simply leave their chart unfilled on their desk, and it will be collected with the others of their class at the end of the study.

Problems or Concerns:
In the event that you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Human Research Ethics/ Integrity Coordinator at Dalhousie University's Office of Human Research Ethics and Integrity for assistance: (902) 494-1462.

Signature:
Title: Measuring Physical Activity Levels, Nutrition and Decision-making among Nova Scotia Children and Youth

I have read the explanation about this study. I have been given the opportunity to discuss it and my questions have been answered to my satisfaction. I hereby consent to take part in this study. However I realize that my participation is voluntary and that I am free to withdraw from the study at any time.

__________________________ __________________________
Name of parent or legal guardian Signature of parent or legal guardian

____
Date

You will be given a copy of the consent form for your records.

Contact Information:

Name: ____

Phone: __________________(day) ____________________(evening)

Address: ____

City: ________________ Postal Code: ______________

III. Parent Decline Form

DALHOUSIE UNIVERSITY
Inspiring Minds

Research Study: Measuring Physical Activity Levels, Nutrition, and Decision-Making among Nova Scotia Children and Youth

Principal Investigator: Deanna Braaksma, BSc
Clinical PhD Student, Department of Psychology
1355 Oxford Street, Dalhousie University
Halifax, Nova Scotia B3H 1J4
(902) 446-5888; braaksma@is.dal.ca

Please check the following and sign below if you do not wish to participate in this study:

I *do not* give permission to Deanna Braaksma to contact me by phone to inform me further about this research project.

_________________________ _________________________
Name of parent or legal guardian Signature of parent or legal guardian

____
Date

In the event that you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Human Research Ethics / Integrity Coordinator at Dalhousie University's Office of Human Research Ethics and Integrity for assistance: (902) 494-1462

Appendix 20: Child Assent Forms from the Cross-sectional Survey Studies

I. Child Assent Form from the Test-retest Study

DALHOUSIE
UNIVERSITY
Inspiring Minds

Measuring Physical Activity Levels, Nutrition, and Decision-Making among Nova Scotia Children and Youth

Researcher:

Deanna Braaksma
Department of Psychology
1355 Oxford Street
Dalhousie University
Halifax, Nova Scotia
B3H 1J4
(902) 446-5888
braaksma@is.dal.ca

Why are we doing this research?
We are doing this research to learn about children and youth's decision-making about physical activity and nutrition. It will help us learn about the reasons children and youth are active or eat certain foods. It will also help us learn about how parents think about their child's activities and nutrition.

What will happen during this research?
You and your parent will be asked to fill out questionnaires about your physical activity and nutrition. Your parent will be asked the same questions as you. One-week later, you and your parent will be asked to fill out some of the questionnaires, again. The questionnaires will ask you about the reasons you do certain activities or eat certain foods, how confident you are in choosing certain activities or foods, and if you want to change which activities you do or foods you eat. The questionnaires will be explained to you in class and will take about 45 minutes. We will also ask you to have your height, weight and body composition measured, which will take about 5 minutes. To do this, we will ask you to stand on a weight scale without shoes or socks. You will feel no discomfort from the small electrical signal that is sent from the scale through your body. A questionnaire package will be given to you for you to bring home to your parent. The questionnaires for your parent will ask them the same questions that we asked you, but are about the way they think about your activity and nutrition. One-week later, you and your parent will be asked to fill out two of the six questionnaires, again, which will take about 15 minutes.

Are there good things and bad things about the research?
No, there are no bad things or good things about being in this research. One good thing may be that you learn more about your activity and nutrition, and the reasons you do certain activities or eat certain foods. Also, the study will help researchers learn about children and youth's physical activity and nutrition, the reasons children and youth participate in physical activity and eat certain foods, and how parents think about their child's activities and nutrition.

Who will know about what I did in the research?
Only the researcher, and the researchers that she works with, will know what you did in the research. All the information you give us will be identified with a number, instead of your name, and will be locked in a safe place. This sheet, which has your name on it, will be kept in a different place than the decision-making charts that you fill out for the study. When we report our results of the study, we will not use your name.

Can I decide if I want to be in the research?
Yes, you can decide if you want to be in the research. You can stop participating at any time for any reason. If you chose not to participate, you can leave your chart unfilled on your desk, and it will be collected with the others of your class at the end of the study.

Assent:

Title: Decision-Making of Physical Activity and Nutrition of Nova Scotia Children and Youth

I have read this form that tells me about the study, and I agree to participate. My questions about this study have been answered. I understand that I can stop participating in this study at any time for any reason. My signature below shows that I will participate in the study.

__________________________ __________________________
Name of child/youth participant Signature of child/youth participant

____
Date

In the event that you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Human Research Ethics / Integrity Coordinator at Dalhousie University's Office of Human Research Ethics and Integrity for assistance: (902) 494-1462

II. Child Assent Form from the Behaviour Study

DALHOUSIE UNIVERSITY
Inspiring Minds

Measuring Physical Activity Levels, Nutrition, and Decision-Making among Nova Scotia Children and Youth

Researcher: Deanna Braaksma
Department of Psychology
1355 Oxford Street
Dalhousie University
Halifax, Nova Scotia
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Why are we doing this research?
We are doing this research to learn about children and youth's physical activity, nutrition and decision-making about activities they do and foods they eat. The study will help us to learn how physically active children and youth are today, as well as details about their nutrition. It will help us learn about the reasons children and youth are active or eat certain foods. It will also help us learn about how parents think about their child's activities and nutrition.

What will happen during this research?
You will be asked to answer questions about your nutrition and activity levels, as well as about how you think about your nutrition and activity (*i.e.*, the reasons why you eat certain foods or do certain activities, whether you plan to change your activities of foods you eat, and your confidence in choosing certain activities or foods). The questionnaires will be explained to you in class and will take about 45 minutes. You will then be asked to wear an accelerometer for one week to measure your physical activity. The accelerometer is the size of a pager and fits comfortably on your belt, is easy to use and will not stop you from doing things. You cannot wear the accelerometer when you are swimming or bathing. During this week, we ask that you do not change what you normally do. We will also ask you to have your height, weight and body composition measured, which will take about 5 minutes. To do this, we will ask you to stand on a weight scale without shoes or socks. You will feel no discomfort from the small electrical signal that is sent from the scale through your body. With the help of your parents and teacher, you will be asked to keep a record of your physical activities each day of the study's duration. You will be given a booklet to record this information.

A questionnaire package will be given to you for you to bring home to your parent. The questionnaires for your parent will ask them the same questions that we asked you, but are about *their* activity and nutrition, as well as the way they think about your activity and nutrition. One of the questionnaires in this package will ask you about your nutrition over the past week. You will be asked to fill this questionnaire out at the end of the week, and it will take about 10 minutes. The questionnaire package will be handed back to your teacher. You will not have to pay for the accelerometer if you break it or loose it, but we ask that you be careful with it so that it works for the study.

Are there good things and bad things about the research?
No, there are no bad things or good things about being in this research. One good thing may be that you learn more about your activity and nutrition, and the reasons you do certain activities or eat certain foods. Also, the study will help researchers learn about children and youth's physical activity and nutrition, the reasons children and youth participate in physical activity and eat certain foods, and how parents think about their child's activities and nutrition.

Who will know about what I did in the research?
Only the researcher, and the researchers that work with her, will know what you did in the research. All the information you give us will be identified with a number, instead of your name, and will be locked in a safe place. This sheet, which has your name on it, will be kept in a different place than the decision-making charts that you fill out for the study. When we report our results of the study, we will not use your name.

Can I decide if I want to be in the research?
Yes, you can decide if you want to be in the research. You can stop participating at any time for any reason. If you chose not to participate, you can leave your chart unfilled on your desk, and it will be collected with the others of your class at the end of the study.

Assent:

Title: Decision-Making of Physical Activity and Nutrition among Nova Scotia Children and Youth

I have read this form that tells me about the study, and I agree to participate. My questions about this study have been answered. I understand that I can stop participating in this study at any time for any reason. My signature below shows that I will participate in the study.

____________________________ ____________________________
Name of child/youth participant Signature of child/youth participant

____
Date

In the event that you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Human Research Ethics / Integrity Coordinator at Dalhousie University's Office of Human Research Ethics and Integrity for assistance: (902) 494-1462

Appendix 21: "The Reasons I Eat" Nutrition DB Scale

Dalhousie University
Halifax, Nova Scotia
____

Kid's Nutrition Questionnaire Booklet

The reasons I eat

Dalhousie University
Halifax, Nova Scotia # ________

I choose yellow foods over blue foods ...

	Not a reason	A small reason	A big reason	I do not under-stand
1. to be more healthy	☐	☐	☐	☐
2. to grow faster and stronger	☐	☐	☐	☐
3. because they have more fiber, vitamins and nutrients in them	☐	☐	☐	☐
4. because they have less fat or sugar in them	☐	☐	☐	☐
5. because they have less bad chemicals in them	☐	☐	☐	☐
6. because they are fresher	☐	☐	☐	☐
7. because they are in the *Canadian Food Guide*	☐	☐	☐	☐
8. because they are not as bad for my teeth	☐	☐	☐	☐
9. because they do not make me feel sleepy after eating them	☐	☐	☐	☐
10. because they give me more energy for yellow activities	☐	☐	☐	☐
11. because they do not feel heavy in my stomach	☐	☐	☐	☐
12. because they taste better (For example: not too salty or sweet)	☐	☐	☐	☐

I choose yellow foods over blue foods …	**Not a reason**	**A small reason**	**A big reason**	**I do not understand**
13. because they will help me pay better attention for school.	☐	☐	☐	☐
14. because they look better (For example, the colors).	☐	☐	☐	☐
15. because my parents tell me to.	☐	☐	☐	☐
16. because my friends eat them.	☐	☐	☐	☐
17. because they will not make me gain as much weight.	☐	☐	☐	☐
18. because they are better for my skin.	☐	☐	☐	☐
19. because they are around more at home.	☐	☐	☐	☐
20. because they are around more at school (For example, the cafeteria).	☐	☐	☐	☐
Other:	☐	☐	☐	☐
Other:	☐	☐	☐	☐
Other:	☐	☐	☐	☐
Other:	☐	☐	☐	☐

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I choose blue foods over yellow foods ...	**Not a reason**	**A small reason**	**A big reason**	**I do not understand**
1. because I want them more (they are hard for me to resist)	☐	☐	☐	☐
2. because they taste better (For example, sweet, not too sour)	☐	☐	☐	☐
3. because they give me more instant or quick energy	☐	☐	☐	☐
4. because they fill me up better	☐	☐	☐	☐
5. because they feel better in my mouth (For example, cold, crunchy, sticky)	☐	☐	☐	☐
6. because they look better (For example, the package)	☐	☐	☐	☐
7. because eating them passes the time away when I am bored	☐	☐	☐	☐
8. because they are comforting to eat	☐	☐	☐	☐
9. because they are fun to eat	☐	☐	☐	☐
10. because they are a reward or treat	☐	☐	☐	☐
11. because I am at a special event (For example, a holiday party)	☐	☐	☐	☐
12. because they are offered to me as a gift (For example, candy at Easter or Halloween)	☐	☐	☐	☐

I choose blue foods over yellow foods …	**Not a reason**	**A small reason**	**A big reason**	**I do not understand**
13. because my friends eat them	☐	☐	☐	☐
14. because my parents eat them	☐	☐	☐	☐
15. because they cost less to buy	☐	☐	☐	☐
16. because it is a habit for me to eat blue foods	☐	☐	☐	☐
17. because they are easier and faster to make/pack (For example, are packaged)	☐	☐	☐	☐
18. because they are around more at home	☐	☐	☐	☐
19. because they are around more at school (For example, vending machines, or the cafeteria)	☐	☐	☐	☐
20. because they do not go stale, moldy or rotten as fast	☐	☐	☐	☐
Other:	☐	☐	☐	☐
Other:	☐	☐	☐	☐
Other:	☐	☐	☐	☐
Other:	☐	☐	☐	☐

Appendix 22: "The Reasons I Run, Jump and Play" Activity DB Scale

Dalhousie University
Halifax, Nova Scotia
____

Kid's Activity Questionnaire Booklet

The reasons I run, jump and play

Dalhousie University
Halifax, Nova Scotia # _______

Page 1 of 4

I choose yellow activities over blue activities ...	Not a reason	A small reason	A big reason	I do not under-stand
1. to be more healthy	☐	☐	☐	☐
2. to be more active	☐	☐	☐	☐
3. to be more fit (For example, to be stronger, or more flexible)	☐	☐	☐	☐
4. to use up my energy when I feel hyper	☐	☐	☐	☐
5. to give me energy, so I will not feel tired	☐	☐	☐	☐
6. to work hard and prove that I did it	☐	☐	☐	☐
7. to win a prize	☐	☐	☐	☐
8. so I can be outdoors and get fresh air	☐	☐	☐	☐
9. because they are more fun	☐	☐	☐	☐
10. for the excitement I will feel	☐	☐	☐	☐
11. to let out my stress, or deal with things that are bothering me	☐	☐	☐	☐
12. because adults tell me to (For example, a parent, coach, or teacher)	☐	☐	☐	☐

Page 2 of 4

I choose yellow foods over blue foods …	**Not a reason**	**A small reason**	**A big reason**	**I do not understand**
13. because my family does them	☐	☐	☐	☐
14. because my friends do them	☐	☐	☐	☐
15. so that I will not have to be on my own too much	☐	☐	☐	☐
16. because I want to be part of a group (For example, a team)	☐	☐	☐	☐
17. so that people think of me as "an athlete"	☐	☐	☐	☐
18. because I like to compete and win against others this way	☐	☐	☐	☐
19. to use up calories and loose weight	☐	☐	☐	☐
20. so I can get somewhere (For example, bike or walk to school)	☐	☐	☐	☐
Other:	☐	☐	☐	☐
Other:	☐	☐	☐	☐
Other:	☐	☐	☐	☐
Other:	☐	☐	☐	☐

I choose blue activities over yellow activities …	**Not a reason**	**A small reason**	**A big reason**	**I do not understand**
1. to rest my body when it is sore, injured, or sick	☐	☐	☐	☐
2. to relax when I am feeling tired	☐	☐	☐	☐
3. because I do not like playing rough	☐	☐	☐	☐
4. because I do not want to get too sweaty or hot	☐	☐	☐	☐
5. because they are easier for me to do	☐	☐	☐	☐
6. because they are more fun	☐	☐	☐	☐
7. to learn more, or collect information (For example, magazines or the internet)	☐	☐	☐	☐
8. to practice and get better (For example, at a video game, or a quiz at school)	☐	☐	☐	☐
9. so I can have quiet time to think	☐	☐	☐	☐
10. because they are things I can do by myself	☐	☐	☐	☐
11. to talk or chat with others (For example, the phone, email, or ICQ)	☐	☐	☐	☐
12. because my family does them	☐	☐	☐	☐

I choose blue activities over yellow activities ...	**Not a reason**	**A small reason**	**A big reason**	**I do not understand**
13. because my friends do them				
14. because it is the cool thing to do				
15. because yellow activities are not open to everyone				
16. because they come more naturally to me (they are a habit)				
17. because they are better to do when the weather is bad				
18. because I can do them whenever I want				
19. because there is no place I can go and do yellow activities (For example, a skating park or gym)				
20. because I do not have the equipment or money I need to do yellow activities				
Other:				
Other:				
Other:				
Other:				

Appendix 23: Nutrition Self-efficacy Scale

Directions: Please read the following sentences about what you may think, and mark whether you are: not sure, a little sure, or very sure.

		Not Sure	A Little Sure	Very Sure
1	I think I can ask my parent or other adult to sign me up for a sport, dance, or other yellow activities.	☐	☐	☐
2	I think I can ask my parent or other adult to take me to a yellow activity or sport practice.	☐	☐	☐
3	I think I can ask my best friend to do yellow activities with me.	☐	☐	☐
4	I think I can ask my parents or other adult to do yellow activities with me.	☐	☐	☐
5	I think I can ask my parents or other adult to get me the equipment I need to do yellow activities.	☐	☐	☐
6	I think I have the skills I need to do yellow activities.	☐	☐	☐
7	I think I can do yellow activities most days after school.	☐	☐	☐
8	I think I can do yellow activities no matter how busy my day is.	☐	☐	☐
9	I think I can do yellow activities no matter how tired I feel.	☐	☐	☐
10	I think I can do yellow activities even if it is hot or cold outside.	☐	☐	☐
11	I think I can do yellow activities, even if I have a lot of homework.	☐	☐	☐
12	I think I can do yellow activities after school even if I could watch TV or play video games instead.	☐	☐	☐
13	I think I can do yellow activities even if I have to stay at home.	☐	☐	☐

		Not Sure	A Little Sure	Very Sure
14	I think I can do yellow activities even when I'd rather be doing something else.	☐	☐	☐
15	I think I can do yellow activities even if my friends don't want me to.	☐	☐	☐
16	I think I can do yellow activities after school even if my friends want me to do something else.	☐	☐	☐
17	I think I can do yellow activities at least three times a week for the next 2 weeks.	☐	☐	☐

Appendix 24: Activity Self-efficacy Scale

Directions: The questions in the section ask how sure you are about being able to eat some of the foods below. Please answer by circling either Not Sure, A Little Sure, or Very Sure for each question.

		Not Sure	A Little Sure	Very Sure
1	How sure are you that you can eat food without adding salt from a shaker?	☐	☐	☐
2	How sure are you that you can eat fresh or frozen vegetables instead of canned vegetables?	☐	☐	☐
3	How sure are you that you can ask your parents for popcorn without salt and butter?	☐	☐	☐
4	How sure are you that you can ask for lettuce and tomato instead of pickles on your hamburger?	☐	☐	☐
5	How sure are you that you can drink low fat white milk instead of regular white milk?	☐	☐	☐
6	How sure are you that you can eat cereal instead of a donut?	☐	☐	☐
7	How sure are you that you can eat fresh fruit instead of a candy bar?	☐	☐	☐
8	How sure are you that you can eat toast with margarine instead of real butter?	☐	☐	☐
9	How sure are you that you can take the skin off of chicken (and not eat the skin)?	☐	☐	☐
10	How sure are you that you can ask for frozen yogurt instead of ice cream?	☐	☐	☐
11	How sure are you that you can ask your parents to buy bread sticks instead of salted crackers?	☐	☐	☐
12	How sure are you that you can eat a baked potato instead of French fries?	☐	☐	☐

		Not Sure	A Little Sure	Very Sure
13	How sure are you that you can drink fruit juice instead of a soft drink (soda pop)?	☐	☐	☐
14	How sure are you that you can eat cooked vegetables without adding real butter to them?	☐	☐	☐
15	How sure are you that you can eat a salad from the salad bar at a fast food restaurant instead of ordering a hamburger and fries?	☐	☐	☐

Appendix 25: Additional DB Items Generated from the Cross-sectional Survey Study

	Endorsement Frequency	Comments
"Other" activity pro items		
"Because my boyfriend/girlfriend does them"	4	Researchers judged item as not appropriate for all grades
"To get better and practice skills"	4	Similar to rejected item#7 (see Appendix 14)
"To meet new people"	5	Similar to rejected item#21 (see Appendix 14)
"Because exercise puts me in a better mood"	3	Similar to rejected item#15 (see Appendix 14)
"I like certain activities or all sports in general"	7	Researchers judged item as too vague
"Because I'm good at them"	6	Similar to rejected item#9 (see Appendix 14)
"Other" activity con items		
"Because I feel lazy"	3	Similar to item#2 (see Appendix 15)