EXAMINING PHYSICAL ACTIVITY, HEALTHY EATING, AND NON-SMOKING BEHAVIOURS DURING ADOLESCENCE: A TEST OF THE EXPECTANCY-VALUE MODEL

by

CATHERINE MICHELLE SABISTON

BScK., Dalhousie University, 1998

M.H.K., University of Windsor, 2001

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ABSTRACT

The general purpose was to explain adolescents' physical activity, healthy eating, and non-smoking behaviours using an expectancy-value (EV) model approach. Possible differences in the model for boys and girls were also examined. The first study (boys: n=211; girls: n=329) used the EV model to examine health behaviours, and the integration of physical self-concept into the motivation framework. The second study (boys: n=419; girls: n=438) further tested the EV model to better understand health-promoting behaviours, and examined the unique effects of parent and best friend influences. For both studies, structural equation modeling procedures found the EV model provided a good fit to the observed physical activity and healthy eating data. The models accounted for an R^2 of 0.41-0.57 for physical activity and R^2 of 0.29-0.59 for eating behaviour, and provided partial support for the EV model. Logistic regression models examining non-smoking behaviour showed support for the EV model tenets across the studies. In both studies, there were a number of mean-level and covariant gender differences for the health behaviour variables. Differences in the strength of the parameters and prediction in the models for boys and girls were also evident.

There are conceptual and practical implications associated with this research. First, gender-specific models may benefit further inquiry into adolescents' health-promoting behaviours and subsequent intervention strategies. Additionally, physical activity, healthy eating, and non-smoking behaviours show only weak interrelationships (r=.01-.26) and the models are unique in the predictive power and independent predictors. These findings suggest that independent strategies focused on enhancing health behaviour motivation during adolescence are necessary.

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Dedication

To my Mom and Dad.

For your natural teaching skills, passion for knowledge, and your unconditional support.

CHAPTER 1

1.1. Introduction

Physical inactivity, unhealthy dietary behaviours, and tobacco use are predictors of illness and disability in North America, and represent the greatest threats to public health across the lifespan (Ezzati, Lopez, Rodgers, & Murray, 2003; Katzmarzyk & Janssen, 2004). Scientific study reveals that adolescence is a critical period for the adoption of health behaviours because it establishes lifestyle habits and attitudes (Igra & Irwin, 1996). There is growing support that adolescents are susceptible to physical and mental health risks predominantly as a result of physical inactivity, poor dietary choices/behaviours, and/or smoking (Kulbok & Cox, 2002). Despite this, many consider participation in health risk behaviours during adolescence to be a functional part of the developmental process (Igra & Irwin, 1996; Jessor, 1982). Researchers have contemplated the antecedents of health risk behaviours, and tend to support the notion that problem behaviours comprise a single condition, which is sometimes labeled a health-compromising lifestyle (Elliott, 1993). The recognition of multiple health risk behaviours and understanding of health-compromising lifestyles are beneficial, especially in prevention and intervention efforts to improve morbidity and mortality among adolescents (Elliott, 1993). Unfortunately, the descriptive knowledge base is not conceptually-grounded, and is insufficient in informing comprehensive assessments of adolescent risk and health (Kulbok & Cox, 2002).

The outstanding issue that arises in the literature on adolescent health behaviours is the focus on 'negative' or 'problem' health behaviours. It may be rewarding to offset and inform the research focus on these health risk behaviours with an understanding of the health-promoting behaviours, such as engagement in physical activity, healthy eating behaviours, and avoiding tobacco use, and their interrelationships and commonalities. So far, attempts to develop a comprehensive model of health behaviours have been unsuccessful, suggesting that the relationships among behaviours such as physical activity, healthy eating, and avoidance of tobacco are weak. Nonetheless, the determinants and mechanisms associated with the engagement in these behaviours are possibly related. The unique and common antecedents associated with physical activity, healthy dietary choices/behaviours, and not smoking among adolescents might be better understood with accommodating motivation-based theoretical frameworks. To date, a number of theoretical frameworks have been employed within various streams of inquiry focused on health-promoting behaviours, yet researchers are still struggling to understand the primary antecedents of health behaviour motivation throughout adolescence.

A variety of participation motivation frameworks have been used with youth samples to better understand factors that influence engagement in physical activity and eating behaviours. Smoking behaviour has often been examined from empirical approaches or with limited theoretical perspectives. Many theories and conceptual approaches emphasize domain-specific competence beliefs, as well as enjoyment and interest, as key determinants of adolescent behaviour (i.e. Baranowski, Weber Cullen, & Baranowski, 1999; Flay, Hu, & Richardson, 1998; Piko, 2001; Sallis, Prochaska, & Taylor, 2000; Weiss & Ferrer-Caja, 2002). Frameworks related to self-concept have also been used to examine physical activity and, in limited capacity, eating and smoking behaviours (Crocker, Kowalski, Kowalski, Chad, Humbert, & Forrester, 2001; Crocker, Sabiston, Forrestor, Kowalski, Kowalski, & McDonough, 2003; Crocker, Sabiston, Kowalski, McDonough, & Kowalski, in press; Hagger, Ashford, & Stambulova, 1998; Hill & Pallin, 1998; Marsh, 1998; O'Dea, 2004). Using both conceptual and practical models, the role of significant others has also been strongly implicated as mechanisms of influence on health behaviours during adolescence (Avenevoli & Merikangas, 2003; Goldstein, Davis-Kean, & Eccles, 2005; Kobus, 2003; Smith, 2003; Weiss & Stuntz, 2004). Therefore, the current state of knowledge suggests that significant others' beliefs and behaviours, self-concept and physical self-perceptions, and competence and value beliefs are integral predictors of health-promoting behaviours. A comprehensive look at these predictors within a nominological network would therefore be of substantive and pragmatic interest to understanding physical activity, healthy eating, and non-smoking behaviours.

There are consistent gender differences in the motivation for and engagement in health-related behaviours (Baranowski et al., 1999; Sallis et al., 2000; Zeman, Hiraki, & Sellers, 2002). Adolescent boys are more likely to engage in physical activity and are less likely to maintain a healthy diet compared to girls. In contrast, it is more probable that adolescent girls have tried a cigarette. Adolescent boys and girls also tend to differ on reports of competence, values, physical self-perceptions, and perceptions of significant other influences associated with health and achievement-related behaviours (Eccles, Barber, Jozefowicz, Malanchuk, & Vida, 1999; Feunekes, Nooij, de Graaf, & van Starveren, 1996; Fredricks & Eccles, 2005; Perkins, 2001). Despite descriptive reports of these gender differences, there is little evidence of the covariation associated with health-promoting behaviours relative to subsamples of adolescent boys and girls. Also, predictive analyses tend to be conducted with synchronous models rather than exploring the potential differences in the models for boys and girls. It would be beneficial to use a theoretical model to examine mean-level and covariant gender differences in predictors of health-promoting behaviours.

There are a number of health-risk and health-promoting behaviours that are of concern with the developmental period of adolescence. The focus on physical activity, dietary patterns, and tobacco use is a result of both conceptual and statistical advancements. First, Baranowski (2004) has recognized that physical activity and diet are complimentary and the behavioural science components can work in concert to better understand the synonymous and interactive relationships between the behaviours. Second, it has been forwarded that advances in tobacco harm reduction and cessation can guide necessary similar advances in understanding physical activity and diet behaviours. At an interdisciplinary cancer meeting held in May 2005, representatives from the Canadian Institute of Health Research (CIHR) Institute of Cancer Research (ICR) and the National Cancer Institute of Canada (NCIC) continuously discussed the need for integrated approaches to health promotion toward further understanding of the major determinants of illness and disease. The health behaviours specific to physical activity, diet, and tobacco use were discussed at length, with suggestions for learning from the advances in the tobacco-related research and practice toward assisting to better understand physical activity and diet. It was forwarded that these health behaviours may have similar predictors and complimentary frameworks could be used to better understand them.

The justification of examining physical activity, diet and tobacco use is also rooted in scientific inquiry. A number of studies conducted in the last five years have examined both the physical self-concept and social relationships as influences of physical activity, healthy eating (and dietary restraint), and smoking behaviours during adolescence (Crocker et al., 2001; Crocker et al., 2003; Crocker et al., in press; Sabiston, Sedgwick, Crocker, Kowalski, & Mack, 2005; Sabiston, Sedgwick, Farrell, Crocker, Kowalski, & Stevens, 2003). Specifically, Crocker and colleagues have examined both cross-sectional and longitudinal covariation among physical self-concept, physical characteristics, body-related anxiety, and physical activity, dietary restraint, and tobacco use in young adolescent girls. The findings suggested that there were unique relationships among the constructs and between the health behaviours, and also highlighted the prevalence of engagement in the behaviours during adolescence.

In another stream of inquiry, focus groups and interviews were conducted to explore the use of health-related behaviours as coping strategies associated with body-related anxiety (Sabiston, Sedgwick, & Crocker, 2004; Sabiston et al., 2005; Sabiston et al., 2003). The engagement in physical activity, dietary behaviours, and/or tobacco use as ways of dealing with body-related perceptions emerged from the data during the focus groups with adolescent boys and girls. In a second related study, interviews with adolescent girls supported the prevalence of physical activity, dietary behaviours, and tobacco use as ways of dealing with body-related perceptions. Links among the health behaviours emerged, along with suggestive differences in the reasons for the engagement in one health behaviour or another. Therefore, the specific behaviours of physical activity, dietary patterns, and tobacco use were omnipresent during adolescence, and further examination of the key predictors associated with engagement in these specific health behaviours was deemed a necessary and adaptive inquiry.

In addition to this research evidence indirectly linking physical activity, dietary patterns, and tobacco use, a main reason for the heightened concern associated with these health behaviours is explained with population health perspectives. Specifically, it has been suggested that six out of the top seven risk factors for chronic illness and disease are founded in physical inactivity, unhealthy eating patterns, and tobacco use (Ezzati et al., 2003; Katzmarzyk & Janssen, 2004). An attempt to explain inter-individual variability in adolescents' engagement in these health behaviours is therefore of practical and conceptual relevance.

1.2. General Purpose

The general purpose of this program of research is to examine the relationships among significant other influences, physical self-concept, perceptions of competence, value beliefs, and physical activity, healthy eating, and non-smoking health-promoting behaviours for adolescent boys and girls. This research is guided by Eccles' expectancy-value framework of motivated behaviour (Eccles, 1983a) and serves to address a number of objectives including: (i) to obtain descriptive evidence of older adolescents' perceptions of significant other influence, physical self-concept, competence, and values associated with physical activity, healthy eating, and non-smoking behaviours; (ii) to examine adolescents' engagement in physical activity, healthy eating, and non-smoking health-promoting behaviours; (iii) to evaluate the interrelationships among the main constructs listed in (i) and (ii); (iv) to test the main tenets of the expectancy-value theory as a multi-factorial structure in explaining health behaviours; and (v) to examine gender differences in the descriptive, conceptual, and structural relationships associated with perceptions of significant other influence, physical self-concept, competence, and values associated with physical activity, healthy eating, and non-smoking behaviours.

Two independent studies are designed to meet the objectives of this program of research. The first study will examine the validity of using the expectancy-value theory to examine physical activity, healthy eating, and non-smoking behaviours among adolescents, and the integration of the physical self-concept into the comprehensive model. The second study provides a further test of the expectancy-value theory as a framework to better understand health-promoting behaviours, and examines the unique effects of significant others such as peers and parents.

1.3. Significance

This research will test the applicability of the expectancy-value model in understanding physical activity, healthy eating, and non-smoking behaviours among adolescent boys and girls aged 15 to 18 years. A major thrust of this research is to provide insight into the role that health behaviours and gender play in the model. To date, there is limited investigation of covariation among expectancy-value constructs in older adolescents. Also, the expectancy-value theory has been utilized primarily in the understanding of academic-based achievement motivation behaviours, and its validity as a model for examining and explaining health behaviours has been restricted to physical activity. With the recommendation for more rigorous and simultaneous investigation of physical activity and dieting behaviours, coupled with the need to integrate predictive models into smoking behaviour research, this research is timely. In health-related research, there is also a recent suggestive paradigm shift in looking at protective factors rather than risk behaviours. In providing a framework to investigate health behaviours uniquely yet similarly, and enabling gender differences to be highlighted, this research has methodological, conceptual, and practical ramifications.

1.4. Key Terms and Definitions

Expectancy-value theory. A developmental, interactional, and mediational theory of motivation suggesting that performance, persistence, and choice are most directly linked to the individual's expectancy-related and subjective value beliefs. This theory is based on the assumption that it is the individual's interpretations and perceptions of reality, rather than reality itself, that influences motivation and behaviour. The expectancy and value components are closely linked to psychological, social, cultural, and biological determinants (Eccles & Wigfield, 2002; Eccles, Wigfield, & Schiefele, 1998; Weiss & Williams, 2004).

Competence beliefs. Broad beliefs of ability in various achievement domains have been defined as competence beliefs (Horn, 2004). Some researchers use the term self-concept of ability or perceptions of competence (see Eccles & Wigfield, 2002; Horn, 2004). For children and adolescents, perceptions of competence in academic, social, and physical domains are salient (Harter, 1999). Competence beliefs are subjective views of ability, and do not necessarily reflect actual ability. However, it is widely accepted that during adolescence, perceptions of competence become realistic accounts of individuals' domain-specific ability (Harter, 1999; Horn, 2004).

Personal efficacy expectations. Individuals' beliefs about their abilities on specific upcoming tasks have been defined as personal efficacy expectations. The upcoming tasks can be either in the short-term or long term (Eccles & Wigfield, 2002). Children and adolescents do not distinguish between competence beliefs and efficacy expectations (Eccles & Wigfield, 1995; Eccles & Wigfield, 2002). Theoretically, the constructs are distinct in that competence beliefs are domain-specific and efficacy expectations are behaviour-specific, however the level of specificity is not distinguished by youth (Eccles & Wigfield, 2002). For the purpose of this research, efficacy expectations were not examined.

Subjective values. Multidimensional construct of task or behaviour-specific interest (intrinsic value), personal importance (attainment value), usefulness (utility value), and relative costs. *Intrinsic value* is the enjoyment an individual gains from engaging in a domain-specific task and behaviour. *Attainment value* is the importance of doing well, or the personal importance of engaging in a behaviour. *Utility value* is the usefulness of a task or behaviour to one's future goals. *Relative costs* are the negative components of engaging in a behaviour, and include financial, emotional, opportunity, effort costs (Eccles & Wigfield, 2002; Wigfield, 1994).

Self-concept. The self-description profile an individual acquires based on a multitude of roles and attributes that make up the self in various domains (Fox, 1997). There are no evaluations associated with self-concept, it is merely a descriptor. Self-concepts become more differentiated with age (Harter, 1999). *Physical self-concept* is a multidimensional construct relating to an individual's description of herself/himself physically. Physical self-concept usually includes physical conditioning, body fat and appearance, and strength and fitness subdomains (Fox, 1997; Marsh, Richards, Johnson, Roche, & Tremayne, 1994).

Significant other influences. The mechanisms in which significant others (such as parents and best friends) manipulate or affect the adolescent's beliefs and behaviours. For the purpose of this research, significant other influence refers to the adolescent's perceptions of their parent/guardian and best friend role-modeled behaviour and emotional support. *Role-modeled behaviour* is defined as the perceptions of extent of significant other's involvement in a behaviour, and the communication of beliefs (i.e., competence and values) about the health behaviour. *Emotional support* is defined as the perceptions of significant other's encouragement and affect towards the adolescent's engagement in health behaviour (Fredricks & Eccles, 2005; McCullagh & Weiss, 2001). Significant parent/guardian was considered the adult with whom the adolescent spent the most time; and best friend was the person in the adolescent's peer group with whom they spent the most time.

CHAPTER II

REVIEW OF LITERATURE

2.1. Adolescence and Health

Declining physical activity, unhealthy dietary choices, and smoking behaviours are impetus to significant psychological and physiological disease states (Paffenbarger, Hyde, & Wing, 1990). Together, these behaviours are linked to six out of seven risk factors for chronic illness across the lifespan (Ezzati et al., 2003), and tend to develop during adolescence. Unfortunately, researchers do not clearly understand the reasons that adolescents adopt these behaviours. According to various perspectives on developmental transitions, the reasons adolescents engage in risk-taking and health-promoting behaviours are rooted in the changes that co-occur during the developmental phase (Igra & Irwin, 1996; Schulenberg, Maggs, & Hurrelmann, 1997). Specifically, adolescence is a period consisting of multiple changes that include social, environmental, biological, and psychological foundations.

Social changes occur during adolescence as a result of negotiating increased autonomy from parents and increased affiliation with peers (Schulenberg et al., 1997; Steinberg, 1990). According to Steinberg (1990), the distancing that occurs between adolescents and their parents is a functional developmental occurrence that fosters the adolescent's autonomy, allows them to experiment and experience new emotions and behaviours, and develop their own competencies, values, and efficacy. Parents who provide guidance and control tend to support their adolescent child's increased affiliation with peers. However, as a result of the importance of social acceptance and affiliation, adolescent's conformity to their peers' beliefs and behaviours peaks early in this developmental period (Ruben, Bukowski, & Parker, 1998). Accordingly, if peers are engaging in health risk or health-promoting behaviours, adolescents are also likely to engage in the behaviour (Ruben et al., 1998; Schulenberg et al., 1997). This perspective has been supported by the observation that adolescents are more likely to seek out similar peers in addition to peers that are more similar to their parents than they are different (Ruben et al., 1998). Some researchers have also differentiated between popularity in peer groups compared to the importance placed on being popular (Rodkin, Farmer, Pearl, & Van Acker, 2000). Specifically, popularity in peer groups has demonstrated relationships with pro- and anti-social behaviour whereas the importance adolescents place on being popular has demonstrated relations with problem behaviour (Rodkin et al., 2000). This distinction could explain some engagement in health-risk and/or health-promoting behaviours, however there is no explicit evidence of this contention specific to behaviours such as physical activity or dietary habits.

In addition to the primary social changes than occur during adolescence, social-environmental changes are associated with transitions from elementary to secondary school (i.e.,Eccles, Wigfield, Harold, & Blumenfeld, 1993; Wigfield, Eccles, Mac Iver, Reuman, & Midgley, 1991). These social-environmental transitions support increased negotiation between health-risk and health-promoting behaviours. Specifically, there are a number of researchers who support a goodness of fit model as a framework to understand developmental transitions that emerge during adolescence (i.e.,Eccles, Midgley, Buchanan, Wigfield, Reuman, & Mac Iver, 1993; Lerner, 1982). The goodness of fit perspective (which is also described as a person-environment fit) suggests that behaviour, motivation, and mental health are influenced by the congruence between the characteristics individuals contribute to their social environments and the characteristics of the environments themselves. Individuals are not likely to be very motivated if the social environment does not fit their psychological needs. According to Schulenberg et al. (1997), developmental transitions could improve a match between the adolescent's needs and desires and what is afforded by their contexts and therefore provide health opportunities. Or, developmental transitions could serve to lessen the match and adversely affect health. As a result of this perspective, the adolescent-context interaction can account for health opportunities as well as health risks, and either directly or indirectly impact engagement in physical activity, dietary, and smoking behaviours.

There are also numerous physical changes that occur during adolescence. First, the onset of puberty involves changing physical characteristics at a time where appearance is extremely important (Davis, Dionne, & Shuster, 2001; Harter, 1999). Appearance management is therefore often motivation for adolescents' engagement in behaviours. Hormonal changes are associated with changes in physical appearance, development, and adolescent behaviour (Buchanan, Eccles, & Becker, 1992). Specifically, several hormones control physical development that result in growth spurts, advancement of primary and secondary sex characteristics, fertility, and increased sexual desires (Buchanan et al., 1992). Girls tend to experience these hormonal changes earlier than boys, which likely results in different physical and social development for the same chronological age (Stattin & Magnusson, 1990). These differences in the onset of hormonal changes may impact health behaviour motivation differently for boys and girls, particularly if the motivation for engagement is rooted in physical appearance and/or social development. The physical changes that occur for girls tend to be less accepted both by adolescent girls and society more generally (i.e., increase fat mass, wider hips) than the physical changes that occur for boys (i.e., increased muscular tone, body hair, deep voice). These biological changes tend to support physical and social development for boys and yet may create difficulty for girls (i.e., Stattin & Magnusson, 1990). Therefore, biological changes that occur during adolescence may indirectly influence health behaviour motivation.

A final group of pubertal development include cognitive changes that involve increases in thought abstraction, sophisticated information processing, and more accurate self-perceptions (Harter, 1999; Horn, 2004; Keating, 1990). According to Harter (1999), adolescents develop in-depth understandings of themselves as a result of changing self-concepts. These types of changes reflect broader changes in cognition that occur during this developmental period, and may influence engagement in health behaviours as adolescents attempt to confirm salient aspects of their self-concept. It is also possible that adolescents' engagement in health-risk and/or health promoting behaviours is associated with advances in information processing (Santrock, 1998). Specifically, adolescents can identify the link between engagement in certain health behaviours and anticipated outcomes that are pervasively discussed and presented in their social environments. As support for this contention, interviews with adolescent girls revealed that they often engaged in numerous diet-related behaviours (i.e., overeating, restriction and restraint) and physical activity as a result of desires for weight loss and reduced perceptions of body-related anxiety (Sabiston et al., 2005). Some adolescents also articulated an understanding that tobacco use would likely lead to increased social relationships. It is the knowledge that a behaviour may lead to a certain outcome that is advanced during adolescence and most likely to impact engagement in health behaviour (Eccles & Wigfield, 1995; Steinberg, 2004; Steinberg & Cauffman, 1996).

Steinberg (2004) also forwards that adolescents are more focused on the present rather than the future, are less able to regulate their emotional states, and have immature self-regulatory systems, and are more capable of making decisions and reasoning abilities. These attributes tend to influence choice and persistence in behaviour, and may also help explain or better understand engagement in health-risk and health-promoting behaviours, such as physical activity, dietary habits, and tobacco use.

In summary, there are a multitude of developmental changes that occur during adolescence and may influence health behaviour motivation. A more in-depth assessment of these changes is beyond the scope of this research. As a way of integrating these developmental changes that occur during adolescence into perspectives for explaining health-related behaviours, Schulenberg and colleagues (1997) suggested that it is a balance of health-risk and health-promoting behaviours that best explain adolescent behaviour. Examining health behaviour using theoretical frameworks has been beneficial to understanding mean-level and covariant physical activity, eating, and smoking (or non-smoking) behaviours. Motivation frameworks have garnered some evidence to suggest that psychological, social, physical, and environmental factors work both independently and conjointly to affect adolescent behaviour.

2.2. Conceptualization of Motivation

Understanding behaviour motivation is key to health-promotion efforts (Bouchard, Shephard, & Stephens, 1994). Motivation can be defined simply as the direction and intensity of one's effort (Sage, 1977). In the bio-psycho-social realms, motivation can be viewed as a broad context that includes whether an individual seeks out, approaches, or is attracted to certain behaviours coupled with the effort the individual puts forth to achieve or engage in certain behaviours. As such, the development of motivation is a continuous process related to the relationships between the individual and their environment (Weiss & Ferrer-Caja, 2002). There are a number of motivation-based models used to investigate health behaviours in isolation. As such, many frameworks have grounded studies examining physical activity, with fewer theories applied to eating and smoking behaviours. It is necessary to identify and develop comprehensive perspectives that will complimentarily and/or simultaneously explain health-promoting behaviours.

2.2.1. Frameworks of Motivation

The frameworks commonly used in social-developmental psychology realms to explain health behaviour motivation include the theory of planned behaviour (TPB; Ajzen, 1985), achievement goal theory (AGT; Ames, 1992; Dweck, 1999; Nicholls, 1984), competence motivation theory (Harter, 1978), physical self-worth theories (Harter, 1987; Sonstroem & Morgan, 1989), self-determination theory (SDT; Deci & Ryan, 1985), social cognitive theory (SCT; Bandura, 1997), the health belief model (HBM; Becker & Maiman, 1975), and the transtheoretical model (TTM; Prochaska, DiClemente, & Norcross, 1992). As a general explanation of these main motivation frameworks, perceptions of competence and behavioural control are integral components. Also, the majority of these models involve mediated relationships between distal constructs that include at least one of behavioural, psychological, social, and/or environmental foundations and health behaviour.

Comprehensive explanations of these theories as they relate to physical activity, eating behaviours, and smoking are reported elsewhere (Baranowski et al., 1999; Higgins & Conner, 2003; MacDonald, Colwell, Backinger, Husten, & Maule, 2003; McMillan, Higgins, & Conner, 2005; Weiss & Ferrer-Caja, 2002; Weiss & Williams, 2004). When evaluating the adequacy of these frameworks in accounting for behaviour, several researchers have pointed out consistent low to moderate effect sizes, model prediction, and limited success in promoting long-term maintenance of health-promoting behaviours (Baranowski, 2004; Baranowski et al., 1999; Dishman & Buckworth, 1996). Furthermore, inconsistencies in the literature often result from both a priori and post hoc modifications to the theoretical frameworks; at times compromising the theoretical basis of the relationships, predictive accuracy, and associated implications. These modifications usually involve either adding behavioural, psychological, social, and/or environmental perspectives that are not inherently discussed in the models or discounting certain relationships within the models. As a result of these observations, the need for a comprehensive motivational model for explaining health behaviours is evident.

One comprehensive framework that has been used primarily to explain achievement motivation in academic settings is Eccles (1983) expectancy-value model. Inherent in the proposed relationships, the theory might be an appropriate model to examine health behaviours. The expectancy-value (EV) model depicts a complex set of developmental, individual, and contextual factors that operate both dynamically and interactively to predict behaviour. The majority of commonly examined predictors of behaviour in bio-psycho-social research are included in the expectancy-value model, which provides theoretically proposed and substantively tested relationships. The EV model is technically a combination of the functional dimensions from previously reported motivation frameworks and includes a developmental lens. For instance, the role of competence in the model is clearly supported in other motivation-based frameworks and draws primarily from the perspectives recommended in the CMT (Harter, 1978) and SCT (Bandura, 1997). The multidimensional subjective value construct demonstrates similarities to the cost-benefit balance espoused by the HBM (Becker & Maiman, 1975) and investment alternatives described in the sport commitment model (Scanlan, Simons, Carpenter, Schmidt, & Keeler, 1993). Also, elements of intrinsic motivation and goal orientations as conceptualized in the SDT (Deci & Ryan, 1985) and AGT (Ames, 1992; Nicholls, 1984) models are also considered to be integral to the operationalization of subjective value. The roles of self-concept, perceptions, identity and goals are in line with the perspectives espoused by Harter's (1987) model of global self-worth and goal theorists. Finally, perceptions of significant other influences, and significant others' beliefs and behaviours are conceptualized in the EV model in a similar manner to the CMT (Harter, 1978), model of global self-worth (Harter, 1987), and the SCT (Bandura, 1997). It is the complex inclusion of a number of important constructs, coupled with the proposed interrelationships among the constructs in the EV model that makes it a unique and likely beneficial model to examine health-promoting behaviours.

To date, the EV model has garnered much support in the academic domain as predictive of educational and vocational choices, achievement tasks, and related behaviours. Despite support for this model as predictive of sport behaviour, this research has been conducted in the confines of educational settings. Limited studies have been conducted to examine the validity of this model as predictive of general physical activity behaviour (i.e., Brustad, 1996; Eccles & Harold, 1991; Kimiecik, Horn, & Shurin, 1996). The results of these studies have informed the literature on potential gender differences in the models, highlighted significant others' as sources of competence beliefs and physical activity, and explored the distinct roles that competence and values play in the prediction of behaviour. The usefulness of the expectancy-value theory as a predictive model to examine other general health-promoting behaviours is evident in the inclusive operationalization of the constructs and relationships, and the similarities to, and synthesis of, widely used motivation models.

2.3. Expectancy-Value Model

The expectancy-value (EV) model (Eccles, 1983a; Eccles & Wigfield, 2002) was developed to explain differences in youths' level of engagement, persistence, and choices associated with academic realms. The model is based on the assumption that perceptions of reality most directly influences activity and behavioural choices (Eccles & Harold, 1991). The overall expectancy-value model is a complex, non-linear model of direct, interactive, and indirect relationships between social, cognitive, affective, individual, and environmental factors that influence behaviour in youth populations.

In the EV model, an individual's behaviour is directly a function of her/his context-specific competence beliefs, personal efficacy expectations, and subjective values (see Figure 2.1; Eccles, 1983a; see Figure 2.1; Meece, Wigfield, & Eccles, 1990; Wigfield, Eccles, Yoon, Harold, Arbreton, Freedman-Doan *et al.*, 1997). According to

Eccles and Wigfield (2002), personal efficacy expectations are indiscernible from competence beliefs among adolescents as a result of developmental considerations that inhibit differentiation between the constructs. As such, competence beliefs and subjective values are the main predictors of behaviour in the model for youth and adolescents.

Competence beliefs and subjective values are the major determinants of achievement-related choices and behaviour and are depicted in Figure 2.1 as the most proximal constructs in the model (Eccles & Wigfield, 2002). The four-component subjective task value comprises attainment value, intrinsic value, utility value, and relative cost. Self-concept, perceptions, schema/identity, and goals are antecedents of both competence beliefs and value in the EV model. These constructs are conceptualized together in Figure 2.1 in the box labeled *adolescent's goals and self-schemata*. Goals are purported to exert independent effects on competence beliefs and subjective values, and are especially connected to the utility dimension of value (Stuart, 2003). Schemas/identities, defined as cognitive frameworks for knowledge and organization about the self, are generated through experience and the interpretation of experience (Eccles & Wigfield, 2002). Self-concept and perceptions are self-referent thoughts and descriptions about aspects of the self (Fox, 1997). Despite the unique descriptions of the constructs housed within the *adolescent's goals and self-schemata*, the EV model suggests that these constructs have similar influence on competence beliefs and values.

Using Figure 2.1 as a guide, there are five distinct constructs proposed to directly affect adolescent's goals and self-schemata, with indirect links to competence beliefs, values, and motivated behaviour. Specifically, youths' affective reactions and memories, stable characteristics (such as gender and birth order), youth's interpretation of experience, significant others' beliefs and behaviours, and the adolescents' perceptions of significant others' beliefs and behaviours, along with gender roles and activity stereotypes are critical factors influencing the main constructs in the model. Affective reactions and memories are directly contingent on the previous experience and behaviour, with youth's interpretation of this previous experience and behaviour acting also as a mediator in the relationship. This interpretation is specific to causal attributions and locus of control. Significant others' beliefs and behaviours are conceptualized to exert direct effects on youths' goals and self-schema and affective reactions and memories, in addition to influencing youths' perceptions of these beliefs and behaviours. This construct is inclusive of, but not limited to, teachers, coaches, parents, and peer beliefs and behaviours. As can be seen in Figure 2.1, the cultural context in which significant others and youth reside directly influences their beliefs and behaviours. The cultural context includes gender role stereotypes and family demographics that have demonstrated influences on both significant other and youths' beliefs and behaviours. Despite the most distal placement of these constructs in the EV model, and the proposed relationships among the constructs, it is important to note that reciprocal and indirect relationships have been reported among various constructs in the model (see Eccles, 1983a; Eccles et al., 1998; Wigfield & Eccles, 1992).

The EV model presented in Figure 2.1 proposes there are several critical variables required to understand achievement-related motivated behaviours. Specifically, social, cognitive, and affective variables are antecedents to competence beliefs and subjective task values (Eccles et al., 1998; Wigfield, 1994; Wigfield & Eccles, 2000). In the academic domain, the main relationships among the constructs in the expectancy-value theory have been tested and supported, whereby competence beliefs (efficacy expectations) and subjective values are integral to motivated behaviour.

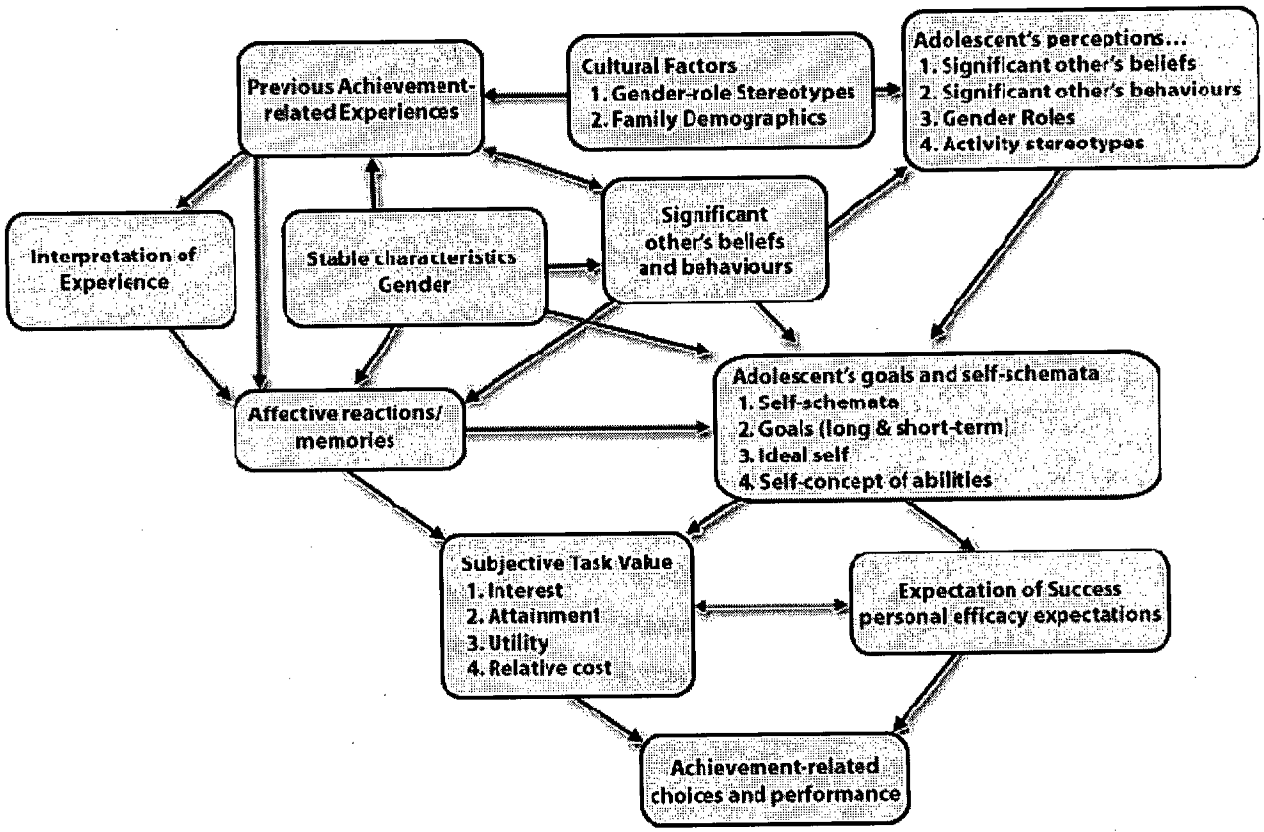

Figure 2.1. The expectancy-value model (Eccles & Wigfield, 2002)

2.3.1. Main components of the Expectancy-Value model

The EV model comprises a number of distal relationships that are proposed to indirectly affect behaviour, and a few proximal relationships that are directly and closely linked to behaviour. This program of research is interested in testing the more functional (and therefore more proximal) relationships in the model, including competence beliefs, values, self-concept (which is housed within the *adolescent's goals and self-schemata* global construct) and significant other influences. Figure 2.2 is a narrowed EV model depiction specific to the main constructs of interest in this study.

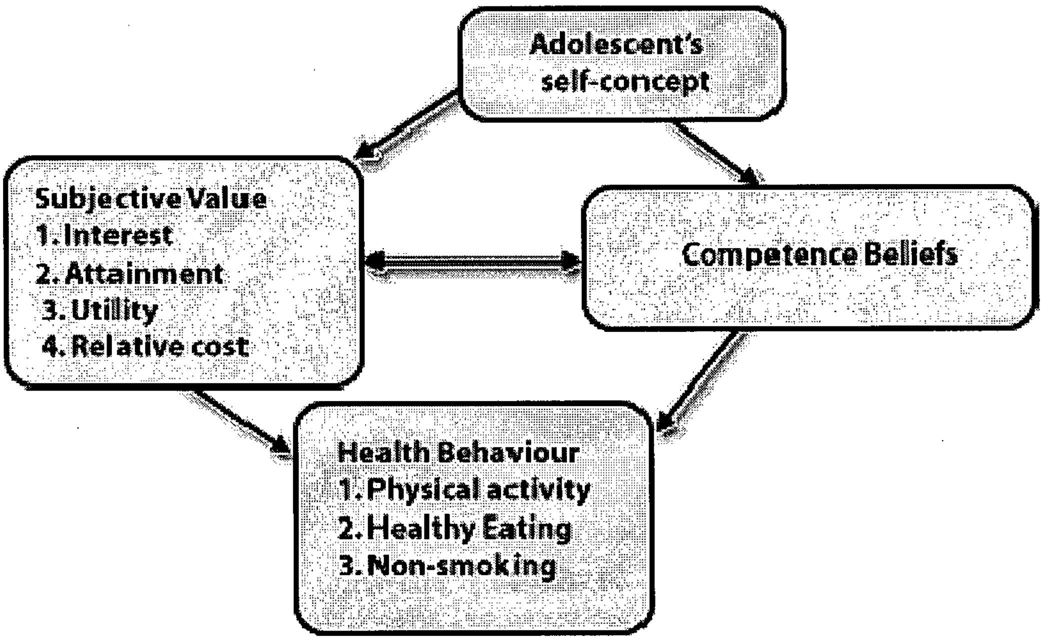

Figure 2.2. The main constructs of the expectancy-value model specific to this study

2.3.1.1. Competence beliefs and personal expectations. The expectancy component of the EV model is described as a combination of (present) perceptions of ability and (future) expectancies for success (Wigfield & Eccles, 2000). Ability beliefs (conceptualized in this study as competence beliefs) are conceived as broad beliefs about competence in a given domain or for a given behaviour, whereas expectancies for success are defined as perceptions of possible achievement on a specific future task (Eccles & Wigfield, 2002). Expectancies for success are analogous to Bandura's (1997) personal efficacy expectations (i.e., self-efficacy). Despite the conceptual differentiation of these constructs, it has been shown that statistical and empirical distinction between ability and expectancy for success beliefs is not achieved with youth populations (Eccles & Wigfield, 2002). Specifically, children and adolescents do not distinguish between the two levels of beliefs (present/broad vs. future/specific). Eccles and Wigfield (2002) suggest that developmental factors play a role in the limited differentiation between the constructs. Competence beliefs are likely more informative than personal expectations when considering the feasibility of the EV model as a method of examining health-promoting behaviours among adolescents.

Development of competence perceptions. Throughout childhood and adolescence, perceptions of competence tend to become more realistic and accurate, and subjective values become differentiated (Harter, 1999; Horn, 2004; Wigfield & Eccles, 1992). Most studies show that young children's perceptions of competence and expectancies for success are optimistic, suggesting that these perceptions are not grounded in the reality of performance (Wigfield & Eccles, 1992). As children develop, their perceptions of competence and expectancies tend to correspond more closely to their previous behaviours and task-related outcomes, and as a result come to correspond more closely with actual behaviour (Wigfield & Eccles, 1992).

The development of sources of competence information has also been examined. According to Harter (1999), young children depend on feedback and reinforcement provided by significant others. As children age, they tend to develop both an internalization system (in which they learn to judge and praise/reinforce themselves for mastery attempts) as well as a social comparison system (in which they judge themselves based on the performances and behaviours of others). Older children and young adolescents develop perceptions of competence based on social-comparative processes and feedback from their peers, with parental support remaining important but not critical. Finally, older adolescents and adults develop a self-referent system in which their perceptions of competence are based primarily on subjective behaviours, goals and objective performance outcomes (see Harter, 1999; Horn & Amorose, 1998).

As can be seen from this literature, competence perceptions become more accurate during adolescence, and also more personally relevant. Researchers suggest that perceptions of competence are integral to an individual's choice, persistence, and engagement in behaviours.

Perceptions of competence and health-related behaviours. Competence beliefs are strong predictors of health-promoting behaviours and have been examined most frequently in sport and physical activity. Findings linked to the EV model have revealed that sport-related competence beliefs decrease throughout adolescence for both boys and girls; however, there are steeper declines for girls (Eccles et al., 1999; Eccles, Wigfield et al., 1993; Fredricks & Eccles, 2002; Rodriguez, Wigfield, & Eccles, 2003). Irrespective of gender differences in perceptions of competence in sport, declining perceptions have been related to adolescents' reducing their participation in physical activity (Eccles et al., 1999; Eccles & Harold, 1991). In a study examining the covariation among physical self-perceptions, health behaviour, and emotion, Crocker and colleagues found that sport competence and physical activity both decreased over three years, and shared moderate residual variance. However, the decrease in reported physical activity among adolescent girls was primarily explained by previous behaviour and only moderately explained by perceptions of conditioning and sport competence (Crocker et al., in press). Autoregressive and cross-lagged effects were also examined for directionality of effects. Looking at physical activity, only perceptions of conditioning (which are operationalized as being contingent on, but distinct from sport competence) were examined for their 'causal' effects. The results revealed that pervious physical activity behaviour was the best explanation of current physical activity, with perception of conditioning having moderate effects. It was also concluded that the impact of self-perceptions was stronger on behaviour than the impact of behaviour on self-perceptions.

Researchers claim that decreases in competence beliefs and subsequent decreased physical activity behaviour are a result of adolescents receiving more comparative information about their performances and behaviour, social pressures and gender-based stereotypes, and changing subjective values (i.e., Eccles & Harold, 1991; Horn & Amorose, 1998; Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Rodriguez et al., 2003). Using a variety of motivation frameworks, there is a plethora of research evidence demonstrating relationships between competence beliefs and youth physical activity (see

Horn, 2004; Weiss & Williams, 2004). For instance, Harter (1999) reports that adolescent's domain-specific perceived competence impacts their choice, persistence, effort, and intentions related to behaviours within that domain. Based on Harter's model of competence motivation, several researchers have reported that physical competence is positively related to physical activity behaviour (see Weiss & Amorose, 2005; Weiss & Ferrer-Caja, 2002). Further, in an epidemiological review of physical activity correlates, Sallis, Prochaska and Taylor (2000) found that competence beliefs were consistently related to adolescent's physical activity behaviour.

The relationship between competence-like constructs (i.e., self-efficacy) and other health behaviours has also been examined empirically. For instance, numerous studies have been conducted on the effects of self-efficacy and smoking cessation (Borrelli & Mermelstein, 1998; Curry, Wagner, & Grothaus, 1990), health and performance reasons for wanting to quit (Thiri Aung, Hickman, & Moolchan, 2003), and frequency of smoking (Fagan, Eisenberg, Frazier, Stoddard, Avrunin, & Sorensen, 2003). In a study examining self-efficacy to avoid cigarette smoking, Fagan and colleagues (2003) found that daily smokers demonstrated lower efficacy expectations to avoid smoking than infrequent and non-smokers. The researchers concluded that smoking frequency, nicotine dependence, and encouragement from significant others to quit were associated with self-efficacy to avoid smoking. Overall, the literature reporting the association between specific competence beliefs and non-smoking behaviour demonstrate direct, positive relationships. However, more general competence beliefs to avoid tobacco or not engage in smoking behaviours have not been examined.

In addition to perceptions of competence for smoking and physical activity behaviour, links to following healthy diets are also evident. The research examining eating behaviour has been primarily conducted in patients with diet-related disorders and diseases (i.e., diabetes, coronary heart disease, and obesity). According to Renner, Knoll, and Schwarzer (2000), efficacy expectations to follow a low fat, high fiber diet increased with age and decreased with the individual's weight. As such, overweight individuals expressed lower ability beliefs in being able to follow a healthy diet than did non-overweight individuals, and older participants perceived higher efficacy expectations than did younger participants. Other studies have shown positive relationships between competence beliefs and healthy eating behaviours (see Baranowski et al., 1999; Bebetsos, Chroni, & Theodorakis, 2002). However, in a study looking at correlates of vegetable and fruit consumption among adolescents, Neumark-Sztainer, Wall, Perry, & Story (2003) found that competence beliefs did not significantly predict fruit/vegetable intake. Therefore, more theoretically-supported research is certainly required to examine the effects of competence beliefs and diet behaviour, especially targeting youth populations.

Summary. Overall, perceptions of competence can enhance or impede the motivation for behaviour. Individuals with higher competence beliefs tend to choose more challenging tasks, they set themselves higher goals and follow through, and are more likely to persist in face of adversity (Bandura, 1997; Eccles & Wigfield, 2002). Individuals with high perceptions of competence have been shown to invest more effort and persist longer than those individuals with lower competence beliefs (Horn & Amorose, 1998). Therefore, understanding the predictors and consequences related to perceptions of competence has instrumental implications for current and future health-promoting behaviour. Based on the EV model and numerous other motivation frameworks, specific perceptions of competence are significant predictors of health-promoting behaviours.

2.3.1.2. Subjective task values. The expectancy-value model considers subjective values to be integral to motivated behaviour. Subjective task values are defined generally as: (i) an individual's incentive for doing different tasks or engaging in different behaviours (Fredricks & Eccles, 2002); and (ii) the quality of the activity/behaviour that contributes to the increasing or declining probability that an individual will engage in it (Eccles & Harold, 1991). The potential benefit of Eccles' model is the distinct components involved in the conceptualization of subjective value. The four-component subjective task value comprises attainment value, intrinsic value, utility value, and relative cost. Attainment value is the personal importance of the behaviour or activity (Eccles & Wigfield, 2002). Intrinsic value refers to the level of enjoyment an individual experiences from participating in the activity/behaviour, and has been compared to aspects of Deci & Ryan's (1985) construct of intrinsic motivation (Eccles & Wigfield, 2002). Utility value is defined as the usefulness of the behaviour for future goals and achievement (Stuart, 2003). Finally, relative cost value is conceptualized as the negative aspects associated with engaging in the behaviour, and can include effort needed, lost opportunities by choosing one behaviour or activity over another, fear and anxiety, financial restrictions, and anticipated time requirements (Eccles & Wigfield, 2002).

Development of subjective values. Eccles and colleagues argue that values change both in the structure of the subjective value construct, and in the level of youth's valuing different tasks and behaviours (Eccles, Wigfield et al., 1993; Wigfield, 1994; Wigfield & Eccles, 1992). In longitudinal studies examining the development and change of attainment value reported by children and adolescents, Eccles and colleagues have found that importance of mathematics and sports declined over time while their interest remained stable (Eccles et al., 1993; Fredricks & Eccles, 2002).

Eccles and colleagues have also conducted several cross-sectional and longitudinal research studies that have focused on interest and enjoyment in academics and sport (Eccles & Harold, 1991; Eccles et al., 1993; Fredrick & Eccles, 2002; Stuart, 2003). Their reports have continually demonstrated that interest in these domains does not change much over the course of child and adolescent development, regardless of changes in other subjective value components. For instance, Fredrick and Eccles (2002) found that children's perceptions of sport interest only declined slightly, whereas their perceptions of sport importance showed sharp declines throughout adolescence. They alluded to contextual and individual factors that explain the relationships between the task values over time.

Finally, utility value has been perceived as important even if interest is low (Eccles et al., 1993; Stuart, 2003). The work by Eccles and colleagues has demonstrated domain-specific differences in utility value. For instance, math utility values decline until adolescence and then increase over the course of secondary school (Fredricks & Eccles, 2002; Jacobs et al., 2002). In contrast, individual's level of utility value for sport decreases over time, with sharp declines during adolescence. According to the researchers, this is likely explained by certain individuals' goals of attending university or pursuing career aspirations that depend on math grades, whereas very few (selective) individuals focus solely on sport and athletics for future goals.

The differences in mean levels of subjective values have been attributed, in part, to disidentification (see Eccles et al., 1999; Harter, 1999). Disidentification (which is also defined as discounting) draws on the writings of William James (1892/1963) and suggests that adolescents lower the value they attach to particular activities and behaviours if they lack the confidence to perform or engage in them (Eccles et al., 1999; Harter, 1999; James, 1892). Research findings suggest that high self-esteem is the product of perceptions of competence in areas perceived to be important (Harter, 1999; Marsh, 1994b; Rodriguez et al., 2003). Therefore, individuals who perceive themselves to lack the ability to perform tasks and engage in behaviours may decide that the task or behaviour has little value to them, which would protect or enhance their self-esteems. Similarly, individuals may come to value domains in which they feel competent. There are also individuals who do not discount areas of low competence, and it is suggested that these individuals may have lower self-esteems (Harter, 1999). Based on the discounting hypothesis, it is clear that competence beliefs and values develop strong relationships over time. Longitudinal research suggests that these relationships emerge during early adolescence (Eccles, Wigfield et al., 1993; Jacobs et al., 2002; Wigfield et al., 1997).

Another reason to explain the differences in subjective values is based on social-environmental conditions. For instance, understanding some differences in academic achievement-related values has been thought to relate to the school environment (i.e., transitions into junior and senior high schools from elementary school), and personal goals associated with career aspirations (see Wigfield, 1994; Wigfield & Eccles, 1992).

Peers and significant adults may also provide an environment that overtly or surreptitiously supports or counters the adolescent's values.

In addition to mean level age differences in subjective values, there are also age-related changes in the structure of values. It has been reported that adolescents distinguish between the interest, attainment, and utility components of value. However, children's beliefs about an activity's value load on a single factor, implying that children younger than 10 years do not distinguish between the components of subjective value (Eccles & Wigfield, 1995; Eccles, Wigfield et al., 1993; Wigfield, 1994). These researchers have suggested that a differentiated subjective value structure is in place by the time children reach early adolescence.

Subjective values and health-related behaviours. Relatively limited research has been conducted in linking subjective values and health behaviours. For the most part, studies examining longitudinal trajectories suggest that attainment and utility values for sport tend to decline (Eccles, Wigfield et al., 1993; Fredricks & Eccles, 2002; Meece et al., 1990). Cross-sectional research examining the relationships between value and sport-related behaviour suggest that enjoyment, intrinsic motivation, and importance of sport and physical activity are consistent predictors in motivation models (i.e., Cuddihy, Corbin, & Dale, 2002; Eccles & Harold, 1991; Marsh & Sonstroem, 1995; Sallis et al., 2000; Scanlan et al., 1993). As a summary of this literature, adolescents who find physical activity enjoyable, and/or are interested in playing sports, are more likely to sustain their involvement, persist, and exert more effort (see Weiss & Williams, 2004).

Similar relationships between values and other health-related behaviours are evident in limited capacity. According to the Angus Reid Group (1997), female and male smokers report that smoking is enjoyable, which eventually leads to physiological dependencies. Contrarily, adolescents often report reasons for not smoking as being not interested, not enjoyable, and because it is a useless act (Palmqvist & Martikainen, 2005; Sabiston et al., 2003). For dieting behaviour, a recent qualitative descriptive analysis by Health Canada (2003) reported that interest and enjoyment were related to healthy diet choices among Canadians. And, further to the Health Canada reports on food choices, individuals who report not being interested in or enjoying a healthy diet are more likely to eat a non-balanced diet (see Baranowski et al., 1999). In one study examining family factors and fat consumption in college students, Hertzler and Frary (1996) reported concern with weight and enjoyment of high fat foods were predictors of fat intake. As can be seen from this limited research, enjoyment of healthy dietary choices (such as fruits and vegetables) and enjoyment of unhealthy dietary choices (such as fat) has been reported. This dual role of enjoyment highlights the difficulty of synthesizing research on dietary behaviour, and the importance of accurately conceptualizing the construct of interest.

Relative cost is the only inherently negative component of subjective value. It is not adequately examined in many research initiatives, both in academics and sport and exercise psychology (i.e., Cox & Whaley, 2004; Eccles & Wigfield, 2002). Limited health-related studies have focused on relative costs associated with behaviours. Studies on smoking cessation, dieting behaviours, and physical activity have been conducted with some focus on a cost-benefit balance (Baranowski et al., 1999; Galvin, 1992; Romer & Jamieson, 2001; Scanlan et al., 1993). To summarize the findings, when the benefits of maintaining a certain behaviour exceed the perceived costs associated with changing the behaviour, the individual is less likely to demonstrate motivation towards healthy behaviour.

Research on perceived barriers parallels the aspects of relative cost as defined by Eccles and colleagues. For instance, in a review of the literature on perceived barriers to health behaviour, it was reported that time constraints, willpower, attitudes toward physical activity, and past experiences were significant predictors of physical inactivity and poor dietary habits in various samples (Brawley, Martin, & Gyurcsik, 1998). The major problem with literature on perceived barriers is that the research is not based in theory, lacks consistency in methodological rigor, and operational definitions are ambiguous (Brawley et al., 1998). Therefore, despite the significant relationships between barriers and health behaviour, more research is necessary to determine potential categories of barriers that can be quantified using theoretical and conceptual underpinnings, and relationships among the costs/barriers and other influential factors with theories of motivated behaviour.

Summary. Given the distinct definitions and meaning associated with the components of subjective task value, coupled with the unique and independent relations to health behaviours, it is important to consider value as a multidimensional construct. More research is necessary to examine the combined effects of values on motivated health behaviours such as physical activity, non-smoking, and following a healthy diet.

2.3.2. Physical self

Competence beliefs and values are strong significant predictors of behaviour in the EV model. According to the model, self-concept is a construct that is directly linked to competence beliefs and subjective values, exerting indirect effects on behaviour (see Figure 2.2). In health-related research and sport and exercise psychology, the physical self-concept, which is a domain-specific construct, is often regarded as integral to behaviour. The EV model may provide a viable framework to examine the relationships among physical self-concept, competence, values, and health-promoting behaviours.

2.3.2.1. Defining the physical self. The physical self has become a primary focus in sport and exercise psychology, and broaches primarily on the theoretical foundations related to self-esteem. According to Harter (1999), self-esteem is a global construct, existing at the apex of the overall hierarchical structure, that incorporates an individual's value or worth as a person and is a function of several domains related to the self. These various domains (i.e., academic self, physical self, social self, etc.) contribute to an individual's self-esteem uniquely, depending on individual differences in values, perceptions, and competencies (Fox, 1998; Harter, 1987; Shavelson, Hubner, & Stanton, 1976). The physical domain, and specifically physical self-worth, appears to be a primary contributor to the global construct, followed by aspects of the social self (Fox, 1997; Harter, 1999). Therefore, understanding the physical self has implications for an individual's overall wellbeing (Sonstroem & Potts, 1996). According to Fox (1998), the instrumentation and measurement of the physical self has relied heavily on the theoretical frameworks introduced by Harter (1987), and Shavelson, Hubner, and Stanton's (1976) hierarchical and multidimensional model of the self-concept. What is missing, however, is the integration of the physical self into more complex models of motivation (Fox, 1998). The development of greater knowledge and understanding of the perceptions and motivated behaviours within the physical domain would be valuable, primarily through the application of additional perspectives. Examining the physical self-concept within the EV model might be beneficial in understanding health-related behaviours during adolescence.

2.3.2.2. Physical self-concept and health behaviours. There are three main hierarchical levels at which self-esteem has been conceptualized and examined for its influence on health behaviours. Global self-esteem, at the apex, physical self-concept (a specific subdomain nested below global self-esteem), and physical self-perceptions (nested below physical self-concept). There are a number of research studies examining the influence of global self-esteem on health behaviours. However, for the purpose of this review the focus has been restricted primarily to domain-specific links between the physical self-concept (and/or physical self-perceptions) and health behaviours. This restriction is primarily based on the observation that subdomain and self-perceptions tend to have stronger effects on health behaviour than global self-esteem (see Fox, 1997).

A number of studies suggest that physical self-perceptions are distinctly and differentially linked to physical activity, eating, and smoking behaviours (i.e., Crocker et al., 2001; Crocker et al., 2003; Crocker et al., in press; Flay et al., 1998; Ingledew & Sullivan, 2002; Kimm, Glynn, Kriska, Barton, Kronsberg, Daniels *et al.*, 2002; O'Dea, 2004; Perkins, 2001). This research is predominantly empirical, with the means of explaining the links between physical self-concept and health behaviour not yet clear.

Physical activity behaviour. The relationship between physical activity and physical self-concept is not entirely understood, especially during the critical developmental period of adolescence whereby social, emotional, and physical instability can intensify negative self-perceptions (Crocker et al., 2003; Harter, 1999; Marsh, 1998). Nonetheless, there are consistent reports of positive simple relations and predictions between the physical self-concept and physical activity, with differential strength of relationships reported for various physical self-perceptions (Crocker et al., 2003; Crocker et al., in press; Hagger et al., 1998; Marsh, 1998; Sonstroem, Harlow, & Josephs, 1994) With children and adolescents, the strongest associations have emerged between perceptions of physical conditioning and physical activity behaviour (Crocker, Eklund, & Kowalski, 2000; Crocker et al., 2003; Crocker et al., in press; Hagger et al., 1998). These findings are consistent with older adolescent and young adult populations (Hayes, Crocker, & Kowalski, 1999; Kowalski, Crocker, & Kowalski, 2001), and also vary in intensity by gender.

According to researchers, boys are more likely to report greater perceptions of physical conditioning and the covariance with physical activity is also stronger than the observed associations with girls (Crocker et al., 2000; Hagger et al., 1998; Hayes et al., 1999). Consistently, male adolescents and young adults report more positive physical self-perceptions (Marsh, 1998), yet the mechanisms explaining gender differences are not well understood. It has been suggested that gender-stereotypes are strong agents of influence during adolescence, with gender differences favoring males in domains related to physical and global self-concept (Crain, 1996; Hattie, 1992; Marsh, 1989). Despite reported gender differences in mean physical self-perceptions and the strength of relationships, researchers report the physical self as having direct and unique effects on behaviour for girls and boys.

Eating behaviour. Empirical research linking physical self-concept and self-perceptions with eating behaviour is limited. Nonetheless, there is evidence to suggest that physical self-perceptions are linked to dietary restraint (Crocker et al., 2001; Crocker et al., 2003; Crocker et al., in press) and weight management strategies (Davis et al., 2001; Page & Fox, 1997). For instance, perceptions related to body dissatisfaction were significant predictors of dietary restraint in a sample of adolescent females (Dunkley, Wertheim, & Paxton, 2001). Supporting this finding, Crocker and colleagues demonstrated that body appearance self-perceptions and global self-esteem were inversely correlated to dietary restraint among female adolescents (Crocker et al., 2001; Crocker et al., 2003; Crocker et al., in press). Other researchers have also reported the direct inverse relationship between body-related perceptions and dietary restraint among adolescent girls (Davis, Shapiro, Elliot, & Dionne, 1993; Fox, Page, Armstrong, & Kirby, 1994; Page & Fox, 1997). These findings suggest that girls who perceive themselves to be larger, heavier, or less attractive are more likely to engage in restrictive eating behaviours. Some findings suggest these cross-sectional relationships among dietary restraint and global self-esteem are maintained throughout adolescence (Crocker et al., 2003; in press).

Unfortunately, researchers have focused primarily on predicting physical activity as in the physical domain at the expense of more integrated approaches to health behaviours in general, and eating behaviour specifically. Only the more recent research examining dietary restraint and disordered eating has attempted to understand the association between the physical self and eating behaviours (i.e., Crocker et al., 2003; in press). This research is restrictive because it examines more maladaptive eating behaviour, such as dietary restraint and disordered eating, rather than general food choices and healthy dietary behaviours. The links between physical self-concept and general eating behaviours are not well understood. Furthermore, evidence of determinants associated with boys' eating behaviours is limited. Examining the relationship between physical self-concept and eating behaviour in boys and girls using the expectancy-value model would allow for further understanding of eating behaviour during adolescence. With the use of the theoretical foundation, examining possible consistent relationships with physical activity, eating, and smoking behaviours will also be possible.

Smoking behaviour. There is evidence to suggest links between various measures of physical self-concept and increased risks for smoking among adolescents (McInman & Grove, 1991; Snow & Bruce, 2003; Thornton, Douglas, & Houghton, 1999). Physical self-concept has been related to a variety of smoking during adolescence, including initiating, maintaining, and quitting (Thornton et al., 1999). Snow and Bruce (2003) found that female cigarette smokers tended to demonstrate lower senses of personal efficacy and reported lower physical self-concepts than non-smoking female adolescents. Kimm et al. (2002) determined that adolescent girls were more likely to smoke if they reported body image disturbances. Also, positive body image perceptions have been linked to lower tobacco use during adolescence (Ferron, Narring, Cauderay, & Michaud, 1999). However, there is some evidence to suggest only weak relationships exists between physical self-concept and smoking behaviour among adolescent females (Crocker et al., 2001). Inconsistencies in the conceptualization of physical self-concept and in the measurement of smoking behaviour likely contribute to the ambiguous findings. Also, very few researchers have employed a theoretical framework to investigate the relationships between physical self-concept and adolescents' smoking behaviours.

2.3.2.3. Integrating physical self-concept into motivation frameworks. From the varied literature focused on physical self-concept, it is obvious that there are direct relationships to physical activity, dieting, and smoking behaviours. There is also evidence that mediating variables may affect the relationships. The importance of domain-specific tasks and behaviours has been recognized as a mediator influencing the relationships between self-concept and behaviour (Fox, 1997; Harter, 1999; Marsh, 1994). Perceptions of competence have also been identified as mediators in relationships between self-concept and behaviour (i.e., Harter, 1999; Horn & Amorose, 1998; Weiss & Ferrer-Caja, 2002). With plausible and tangible empirical relationships among physical self-concept, competence, importance, and health behaviour, it would be beneficial to frame the relationships in theoretical foundations. Eccles' expectancy-value (EV) model logically addresses the relationships between self-concept, competence, importance (i.e., subjective value), and behaviour.

Employing a sound theoretical framework would benefit the research linking physical self-concept and health behaviours. Existing empirical studies can guide future predictions and support theoretically grounded research. The benefits of employing theoretical foundations include the ability to test plausible uni- and multi-directional relationships, examine specific variables and their unique contributions to models, conceptually configure research progression and future directions, replicate research findings, and identify strengths and weaknesses in the prediction of behaviour. For these reasons, Eccles' model will guide this program of work examining the links between physical self-concept and physical activity, healthy eating, and smoking behaviour.

2.3.3. Significant others, socialization, and influence

A final central focus in the EV model involves significant others' beliefs and behaviours, and the adolescents' perceptions of these beliefs and behaviours as unique sources of competence beliefs and subjective values. Significant others' beliefs and behaviours play a primary role in adolescent's development of competence and values; however, the adolescent's perceptions of these beliefs and behaviours have been deemed more important (Ebbeck & Stuart, 1993; Kimiecik et al., 1996; Prochaska, Rodgers, & Sallis, 2002). Significant other's own beliefs and behaviours are thought to influence these perceptions. According to the original EV model, significant others influence youth's perceptions of efficacy expectations and value indirectly through constructs such as self-schema, goals, and self-perceptions/competence. However, with the inability to statistically differentiate competence and efficacy expectations with youth samples (see Eccles & Wigfield, 2002), the model relationships are reduced to direct effects between adolescents' perceptions of significant others influence and competence and values. The direct links between the adolescent's perceptions of significant others' influences and their perceptions of competence, value, and behaviour have been supported in research using variations of the expectancy-value framework (Brustad, 1993; Eccles et al., 1998; Fredricks & Eccles, 2004; Kimiecik & Horn, 1998; Kimiecik et al., 1996). In the models, the role of parents as significant others have been highlighted. Although not discussed at length in the current motivation models, the importance of peer influences during adolescence should not be overlooked (Harter, 1999; Hartup, 1996). Therefore, it is important to understand adolescents' perceptions of their parents' and peers' beliefs and behaviours and the effects of these perceptions on their competence, values, and engagement in physical activity, healthy eating, and non-smoking behaviours.

Based on the research examining significant others' beliefs and behaviours, it is accepted that parents and peers have an integral role in influencing youth engagement in achievement and health behaviours. The way in which parents and peers influence youth is not unidimensional nor is it simplistic. Examining research in both academic and physical domains, it is clear that significant other's projection of their beliefs and behaviours are linked to youth's self-perceptions and behaviours in a number of ways. These methods of influence and socialization have been broadly defined as role-modeled behaviours and emotional support (Fredricks & Eccles, 2004, 2005; Taylor, Baranowski, & Sallis, 1994). These mechanisms work both directly and indirectly to influence behaviour, and there are limited reports to suggest that role-modeled behaviour is more or less important than emotional support.

2.3.3.1. Role-modeled behaviour. Role-modeled behaviour is broadly defined as significant others' behaviours that are imitated by youth (i.e., Bandura, 1997). In the health promotion literature, role-modeled behaviour has often been operationalized as significant others' engagement in the behaviour, such as being physically active or a smoker. With respect to physical activity specifically, research examining role-modeled behaviour has led to inconclusive results. In a series of studies by Kimiecik and colleagues, parents' self-reported physical activity was not related to their children's participation in physical activity (Dempsey, Kimiecik, & Horn, 1993; Kimiecik & Horn, 1998; Kimiecik et al., 1996). Alternatively, in a review of correlates of physical activity in youth and adolescents, Sallis and colleagues (2000) identified parents' role-modeled behaviour as a significant predictor of youth physical activity.

Despite the ambiguities in the findings, it is advised that role-modeled behaviour should not be excluded from analyses; however, the narrowly defined construct (i.e., engagement in the activity or behaviour) should be operationalized as the communication of beliefs, attitudes, and values about a particular behaviour or task (McCullagh & Weiss, 2001). These suggestions are applicable to the examination of other health behaviours, such as eating and smoking. Role-modeled behaviour has been identified as a strong predictor of adolescent smoking behaviour (Avenevoli & Merikangas, 2003; Duncan & Tildesley, 1995; Kobus, 2003) and healthy dietary choices (Baranowski et al., 1999; Feunekes et al., 1996; Hertzler & Frary, 1996), with significant others playing differential roles in the influence of behaviour.

2.3.3.2. Emotional support. Significant others also influence youths' perceptions and behaviours through the projection of their beliefs and emotional support. In both academic and physical domains, researchers have consistently documented links between parents' perceptions of their children's ability and the child's own ratings of their abilities (i.e., Bois, Sarrazin, Brustad, Trouilloud, & Cury, 2002; Fredricks & Eccles, 2004; Jacobs & Eccles, 1992; Kimiecik et al., 1996). Parents' own perceptions of competence and values associated with particular domains have also been examined as direct links to youth behaviour, with the limited research concentrated on physical activity and academic achievement (Fredricks & Eccles, 2002, 2005; Jacobs et al., 2002; Kimiecik & Horn, 1998). Children's perceptions of the value of physical activity involvement to their parents have also been linked to their own reports of physical activity (Eccles & Harold, 1991; Kimiecik et al., 1996). Finally, significant others also demonstrate emotional support through reinforcement and encouragement, which is positively associated with children's and adolescent' physical activity involvement (Brustad, 1993, 1996; Welk, Wood, & Morss, 2003). According to Welk and colleagues (2003), social-cognitive based constructs, such as encouragement, direct support, and involvement, are all strongly linked to behaviour.

2.3.3.3. Significant others as agents of influence. The research on socialization influence noted above is primarily based on parents as significant others. Although the research is limited on the role of peer influence, it is conceivable and empirically supported that peers impact adolescents in much the same way that parents' influence youth. As a result, peers can also influence one another through role-modeled behaviour and emotional support, and are likely a strong influence on behaviour and achievement motivation during adolescence (Harter, 1999).

Peers as agents of influence. Social acceptance among peers is an integral predictor of adolescent's self-esteem (Harter, 1999), and as a result adolescents' conformity to their peers tends to peak during early adolescence (Ruben et al., 1998). Peer influences have been linked to adolescent's adoption of certain health behaviours in both encouraging and discouraging ways. However, the influence of peers tends to vary by gender and age. Early adolescents and boys report being more vulnerable to peer influences than older adolescents and girls (Berndt, 1979). In addition to their effects on health behaviours, peer influences are also related to an adolescent's perceptions of competence, importance (value), and motivation in academic and physical domains (Ebbeck & Stuart, 1993; Fuligni, Eccles, Barber, & Clements, 2001; Weiss & Stuntz, 2004). According to Weiss and Ferrer-Caja (2002), these links provide a rationale to expand the knowledge "on individuals' peer groups as contributors to cognitive, emotional, and psychological well-being in the physical domain" (p. 121). The expectancy-value model tenets provide a framework on which advancing the understanding of peer influence is possible.

To date, theoretically-driven research examining peer influences on motivated health behaviour is limited, particularly in the context of physical activity and eating behaviours. The effects of peers on smoking behaviour is more informed (Alexander, Paiazza, Mekos, & Valente, 2001; Aloise-Young, Graham, & Hansen, 1994; Kobus, 2003; Snow & Bruce, 2003), however inconsistencies in the literature coupled with identified confounding variables make it difficult to claim dependable relationships.

Adolescents attach a great deal of importance to peer-related social and athletic activities (Ruben et al., 1998; Wigfield et al., 1991). There is some evidence of the relationship between peer perceptions and physical activity participation in early adolescence (Smith, 1999, 2003), but there is little evidence of these links with older adolescents. Several researchers have conducted studies to investigate the role of physical activity contexts in supporting friendship quality and peer acceptance (Smith, 1999, 2003; Weiss & Smith, 1999; Weiss, Smith, & Theeboom, 1996), but the literature on the mechanism of influence of peers and best friends on physical activity motivation and behaviour is limited. One study reported that peer social network (quantified as the preadolescent's three closest friends) was related to physical activity quantity, with girls who reported more frequent physical activity with friends also reporting greater physical activity (Voorhees, Murray, Welk, Birnbaum, Ribisl, Johnson et al., 2005). In this study, the number of friends who engaged in activity was a significant predictor of physical activity involvement.

The limited research examining peer influence on physical activity is surprising, and warrants further research. Smith (2003) provided promising future research directions focused on peer relationships and physical activity contexts. Smith (2003) suggests that research examining peer relationships can help advance knowledge on developmental transitions, self-presentation and self-perception processes. He also recommends conducting further research to determine the interaction between peer relationships and other social influences in physical activity contexts, and highlights the possible facilitative role that physical activity may play in the development of peer relationships. To extend Smith's (2003) suggestions, understanding the mechanisms of peer influence for physical activity motivation and involvement is warranted. These recommendations may also benefit the understanding of other health behaviours.

Research linking eating behaviour and peer influence has been restrictive. The focus on the negative effects of peers in the development of eating disorders and disturbed eating patterns is substantial, at the expense of advancing the knowledge on the mechanism of peer influence in supporting healthy eating habits. There is minimal evidence that role-modeled behaviour and peer beliefs are integral to the motivation for healthy eating. For instance, findings have suggested that peer concern about healthy eating was inversely related to fast food restaurant use among adolescents (French, Story, Neumark-Sztainer, Fulkerson, & Hannan, 2001), and that a peer-based modeling intervention enhanced the consumption of fruits and vegetables in youths (Lowe, Horne, Tapper, Bowdery, & Egerton, 2004). Finally, in a review of psychosocial correlates related to eating behaviour, Baranowski and colleagues (1999) allude to a variety of peer role-modeled behaviours and support-type mechanisms that influence adolescent's fat, fruit, and vegetable consumption.

Peers are thought to be of major importance for the development of cigarette smoking in youth. There are numerous studies that relate number of friends who smoke to higher smoking prevalence among adolescents in a role-modeled behaviour context (Alexander et al., 2001; Aloise-Young et al., 1994; Kobus, 2003; Urberg, Degirmenciolu, & Pilgrim, 1997). Most of these studies also link peer attitudes and beliefs about smoking to heightened cigarette use among adolescents.

The operationalization of social crowds, close friendships, and peer relations is somewhat ambiguous. Friendship has been differentiated in the literature from social crowds (Urberg, Degirmencioglu, Tolson, & Halliday-Scher, 2000) and peer acceptance (Parker & Asher, 1993), although it maintains a strong relationship to these constructs. Peer groups and social crowds can serve to channel adolescent friendships; however, even poorly accepted youth can experience companionship and support if they have at least one close friend (Parker & Asher, 1993). Friendships are associated with positive psychological adjustment, social relationships, and behavioural outcomes (Hartup, 1996; Parker & Asher, 1993). It has been reported that close friends (i.e., best friends) should be more influential than peer groups and social crowds (Urberg et al., 1997). Close friends are reportedly strong influential agents of achievement tasks and motivated behaviour in academic and physical domains (Berndt & Keefe, 1995; Urberg et al., 1997; Weiss & Stuntz, 2004). For this study, it is not as important *who* the adolescent's friends are as their perceptions of their best friends' beliefs and behaviours regarding tobacco use, physical activity, and eating behaviours. Due to the limited theoretically-based research examining peer influences, the current study seeks to examine the adolescents' perceptions of their best friend's emotional support and role-modeled behaviour, in addition to a general look at the number of friends engaged in smoking, physical activity, and healthy eating behaviours.

Parents as agents of influence. Despite the emergence and importance of peer influence on the socialization of adolescents, parents continue to influence adolescents' perceptions, beliefs, and behaviours. There are inconsistencies in the theoretical frameworks used to investigate parental influence, and difficulty in capturing and assessing parent behaviour. However, there is consensus that parents are strong socialization agents for children and adolescent health behaviour motivation and engagement or avoidance.

Understanding the role of parents and significant others in youth exercise and sport participation is important (Brustad, 1996; Kimiecik & Horn, 1998; Welk et al., 2003). Using variations of the expectancy-value model, findings have indicated that parents' beliefs and behaviours are related to youth's activity levels (Brustad, 1993, 1996; Kimiecik & Horn, 1998; Kimiecik et al., 1996). Results have also inferred that mothers and fathers differ in the reasons for why they want their children to participate in moderate to vigorous physical activity. Mothers highly endorse weight control and physical and mental health compared to fathers (Kimiecik & Horn, 1998).

There are incongruent findings on the differences in actual influence between mothers and fathers. Some studies show that both mothers and fathers are important in the development of children's physical activity patterns (Fredricks & Eccles, 2005; Kimiecik & Horn, 1998). Contrarily, other studies do not differentiate between parental influence (Brustad, 1996; Prochaska et al., 2002; Welk et al., 2003), but show nonetheless that the socialization mechanisms for affecting children's physical activity beliefs and behaviours are strong.

Parent beliefs have also been implicated in the creation of gender differences in youths' competence and value perceptions associated with sport and physical activity. Parents of boys report that their children have more athletic ability compared to parents of girls, and are more likely to report physical activity is important (Eccles et al., 1999; Fredricks & Eccles, 2002; Jacobs & Eccles, 1992). These researchers have documented that parents hold gender role stereotyped beliefs about the appropriateness of certain behaviours for boys and girls, consequently linking physical activity and sport to boys and certain academic and social realms to girls (Eccles, Adler, & Kaczala, 1982; Eccles & Harold, 1991; Jacobs & Eccles, 1992). It is thought that these parental sex-differentiated views are channeled to children's perceptions of competence and values. This reasoning is often used to describe differences in boys' and girls' self-perceptions and behaviour.

A limitation in the majority of research cited is the emphasis on children's physical activity. More research needs to be conducted with adolescent samples to identify and examine the mechanisms of parental influence on physical activity patterns. Also, small sample sizes in previously documented research linking parent influence and physical activity restricts the power to detect meaningful results.

The role of parents in influencing adolescent's eating behaviour has also been examined as role-modeled behaviour and emotional support. This research, primarily with adolescent girls, has been associated with eating disturbances, dietary restraint, and eating disorders. It is thought that parents influence adolescent's eating behaviours by modeling dysfunctional eating attitudes and behaviours (Rieves & Cash, 1996), through encouragement of eating behaviours (Thelen & Cormier, 1995), directly by transmitting health and weight-related attitudes and opinions (Steinberg & Phares, 2001), and parental monitoring and expectations on health-related behaviours (Mellin, Neumark-Sztainer, Story, Ireland, & Resnick, 2002).

Examining healthy eating behaviours, studies have linked parents' role-modeled behaviour and emotional support to adolescent's fat, fruit, and vegetable consumption (see Baranowski et al., 1999). Also, mothers' beliefs and behaviours have been identified as significant agents of influence in adolescent's healthy eating (Backman, Haddad, Lee, Johnston, & Hodgkin, 2002; French et al., 2001; Wertheim, Mee, & Paxton, 1999). However, the way in which parents influence eating behaviour is not entirely clear. It might be that parents' beliefs and behaviour are interpreted and perceived by their children, and these perceptions impact the youth's perceptions of competence and value for eating healthy, which then influences their actual eating behaviours. These indirect and the implicit direct links between parents and youth eating behaviours have not been examined, but are testable in the context of the expectancy-value model.

The role of parents in the initiation and continuation of adolescent smoking behaviours has been examined. Parents' smoking behaviour and support for tobacco use are consistently reported as predictors of adolescent smoking behaviour (Avenevoli & Merikangas, 2003; Biglan, Duncan, Ary, & Smolkowski, 1995; Duncan & Tildesley, 1995). In a review of family influences on adolescent smoking, parents were only a moderate influence compared to other factors (Avenevoli & Merikangas, 2003). Furthermore, it has been reported that adolescents are not at greater risk for smoking when both of their parents smoke compared to when only one parent smokes (Kandel & Wu, 1995). However, some research suggests that mother's smoking may be a stronger predictor of adolescent tobacco use compared to father's smoking (Kandel & Wu, 1995; Melby, Conger, Conger, & Lorenz, 1993).

Adolescents with parents who smoke are more likely to have smoking friends, thus enhancing the role-modeled behaviour that supports the adolescent's tobacco use (Engels, Vitaro, Exter Blokland, den, & Scholte, 2004). A number of other studies report the combined influence of peers and parents (Avenevoli & Merikangas, 2003; Biglan et al., 1995), and it is often suggested that parents play only a minimal role in adolescent smoking behaviours when the influence of peers is jointly considered. However, the findings continue to find that parental role-modeled behaviour, in addition to beliefs and support for tobacco use, are consistent predictors of adolescent smoking behaviours. Despite these negative influences on tobacco use, it isn't clear whether parents play a protective role against smoking use. The notion that parents' beliefs and values associated with non-smoking behaviours has not been explicitly examined as positive factors influencing adolescents avoidance of tobacco use.

There is limited research examining the differential role of mothers and fathers in influencing health-related behaviours, and possible differences in adolescents' perceptions of mother and father influences. Although this information is necessary for an overall understanding of health behaviour motivation and engagement, first it is important to determine the general role of significant others in models of health behaviour. It is understood that the parent with whom the adolescent spends the most time with influences their beliefs and behaviours. Therefore, this study set out to examine the adolescent's perceptions of the role-modeled behaviour and emotional support provided by the parent with whom they have the most contact. An initial testing of the EV model with adolescents' perceptions of parental influence was both logical and necessary to determine if the most proximal relationships within the model hold as strong predictors of physical activity, non-smoking, and eating behaviours.

2.4. Gender Differences and Moderator Effects.

General differences between adolescent boys and girls are frequently identified in the literature. Research demonstrates that there are gender differences in physical activity participation and frequency (Craig, Cameron, Russell, & Beaulieu, 2001; Sallis et al., 2000). Boys are more likely to engage in sport and physical activity, exert more effort, and spend more time compared to girls (Weiss & Williams, 2004). According to Marsh (1993), gender differences in sport participation emerge early and remain relatively stable over time. Other research in health behaviours reveals that the rate of female smokers is on a rise compared to males, and that females have a harder time quitting (Perkins, 2001). Also, girls are less likely to smoke if their peers don't smoke (van Roosmalen & McDaniel, 1992). According to Thornton, Douglas, and Houghton (1999), more girls have tried tobacco than adolescent boys. Furthermore, girls are more likely to restrict what they eat, to diet, and to choose healthier foods compared to boys (Feunekes et al., 1996; O'Dea, 2004; Page & Fox, 1997). Further support for sex differences suggest that girls have more positive beliefs and attitudes about fruit intake, more negative beliefs about the consumption of treats, and rate themselves as more health conscious compared to adolescent boys (Dennison & Shepherd, 1995).

Gender differences in beliefs and behaviours are commonly explained according to theories of identity formation, gender role-orientation, gender intensification, and gender role-stereotypes. Theorists of identity formation have persistently recognized that the struggles for self-formation are distinct for boys and girls (Heilman, 1998). Identification theories suggest that women and men engage in different patterns of behaviour, and therefore girls and boys are motivated to acquire different complexes of beliefs and behaviours and do so through identifying with same-sex parents (Eccles et al., 1982; Eccles et al., 1999). Broaching on this perspective, gender intensification suggests that gender-role beliefs and behaviours become more important to adolescents as they conform to gender-role stereotypes (Hill & Lynch, 1983). Girls tend to become more negative about male-stereotyped domains and boys become more positive in these domains, but more negative in female-typed domains. More recent research evidence has failed to support this hypothesis in achievement domains, including sport (Fredricks & Eccles, 2002; Jacobs et al., 2002). According to the researchers, gendered perceptions tend to converge as adolescents develop. It is the pattern of change in self-perceptions for both boys and girls that is important, with boys perceptions tending to decrease with a steeper slope than girls (Eccles et al., 1999).

Gender stereotypes, which are interpretations of the attitudes and behaviours of others, often favor boys in physical-based domains (such as sport), and girls in social-based domains. Gender stereotypes influence adolescents' beliefs and behaviours (Eccles, 1983b; Fredricks & Eccles, 2002; Jacobs & Eccles, 1992; Jacobs et al., 2002). The influence of parents' stereotypic beliefs about their children's competence and interest in sport has been linked to gender differences in adolescent sport (Eccles & Harold, 1991; Fredricks & Eccles, 2002, 2005; Jacobs & Eccles, 1992). Parents who hold gender role-stereotypes that sport is a male-dominated domain directly influence their children's perceptions of their ability, which could have negative consequences for girls. Consistently, parents of boys report that their sons will have higher competence and interest in sport than parents of girls, which translates into girls actually reporting lower competence and value than boys (Jacobs & Eccles, 1992). Contrarily, some recent studies have found that gender stereotypes were not evident since parents reported similar perceptions of competence for their sons and daughters (Bois et al., 2002; Kimiecik & Horn, 1998).

Another way in which sex differences in behaviour are explained in the literature is based on gender-role orientation. Gender role-orientation is the degree to which individuals view themselves as being masculine or feminine on potentially separate continuums in which they can be endorsing both (Bem, 1974). Attitudes toward sport participants reveal that athletes demonstrate higher masculine and androgynous characteristics than non-athletes, and females have reported avoiding sport and physical activity because they do not want to appear "masculine" (Gill, 2004). With regard to eating behaviour, one study showed that boys were less likely to eat healthy for fear of appearing too feminine (Monge-Rojas, Garita, Sánchez, & Muñoz, 2005)

Finally, self-concept theories have been used to examine sex differences in behaviours. There is evidence that girls display and report lower self-esteem than boys during adolescence (Eccles et al., 1999; Kling, Hyde, Showers, & Buswell, 1999). Several researchers also report that boys have higher physical self-perceptions and physical self-worth compared to girls (Crocker et al., 2000; Hagger et al., 1998; Marsh, 1998). The covariation between self-esteem and behaviours has also been supported. It has been suggested that adolescent girls are less likely to participate in sport and physical activity as a result of their self-esteem and physical self-worth (Fox, 2000; Kimm et al., 2002; McDermott, 2000). Also, girls are more like likely to diet and engage in maladaptive dietary behaviours as a result of lower self-esteem (Davis et al., 2001; Davis, Durnin, Gurevich, LeMaire, & Dionne, 1993; O'Dea, 2004). There is converging evidence that adolescents with lower self-esteem are more likely to smoke (i.e., Crocker et al., 2001; Potter, Person, Chan, Aubut, & Koval, 2004).

The mechanisms explaining the links between self-esteem and behaviour have not been extensively researched. One probable mechanism has been explained according to disidentification and stereotype vulnerability (Eccles et al., 1999). Accordingly, adolescent girls lower the value they attach to particular activities and behaviours in domains where women are stereotyped as less competence than men. Consequently, these behaviours become irrelevant to their self-esteem, and as a result they decrease their engagement in these behaviours.

Overall, mean-level gender differences are evident in a variety of health behaviours and self-perceptions. Jacobs and colleagues (2002) have recommended that explanations about gender differences may have to be as precise as at the domain-level and theoretical models about specific behaviours are more likely to be successful than global models for explaining gender differences. Hinging on these recommendations, research specific to the physical domain, and to health behaviours specifically, is likely to garner a greater understanding of mean-level and covariant gender differences in motivation.

According to the expectancy-value theory, gender differences in tasks and behaviours are linked to differences in competence beliefs and values, which are influenced by numerous self and social perceptions including self-concept and socialization. These relationships have been examined, at least in part, for sport and physical activity behaviour. There are no reports linking gender differences on competence, values, self-concept, and socialization for eating and smoking behaviours. Using a domain-specific theoretical model to explore the specific health-promoting behaviours of physical activity, eating, and non-smoking, mean-level and covariant gender differences will be explored in the current study.

2.5. General Purpose

The purpose of this research is to examine physical activity, eating behaviour, and tobacco use correlates using Eccles' expectancy-value model in an adolescent sample. It is evident from the existing research that perceptions of competence, enjoyment and interest, physical self-concept, and parent and peer beliefs and behaviour are significant predictors of physical activity, various dietary choices and behaviours, and tobacco use throughout adolescence. The expectancy-value model is a theoretical framework that might provide adequate conceptualization of the relationships among competence, values and health behaviours of physical activity, eating, and non-smoking. Specifically, the expectancy-value theory suggests behavior-specific competence and values act as mediators that affect behaviour and are influenced by a number of cognitive, affective, social, cultural, and perceptual factors (see Eccles & Wigfield, 2002). To explore these relationships, it was first necessary to test the adequacy of using the expectancy-value model as a framework to investigate health behaviours. If the relationships within the model hold with an adolescent sample and outcome measures of physical activity, eating, and non-smoking behaviours, further constructs within the model can be examined with the goal of furthering knowledge of health behaviour motivation during adolescence. Therefore, the main research question for this dissertation was whether the expectancy-value model tenets were reliable with constructs specific to physical activity, eating, and non-smoking behaviours in an adolescent sample.

CHAPTER III

Study 1

Testing the expectancy-value model with physical activity, eating, and non-smoking behaviours: The role of physical self-concept, competence, and values.

3.1. Purpose

The purpose of the first study in this program of research was to explore the relationships among physical self-concept, competence, values, and health behaviours of physical activity, healthy eating, and non-smoking using the tenets of the expectancy-value model (see Figure 3.1). Differences in the relationships for boys and girls were also examined.

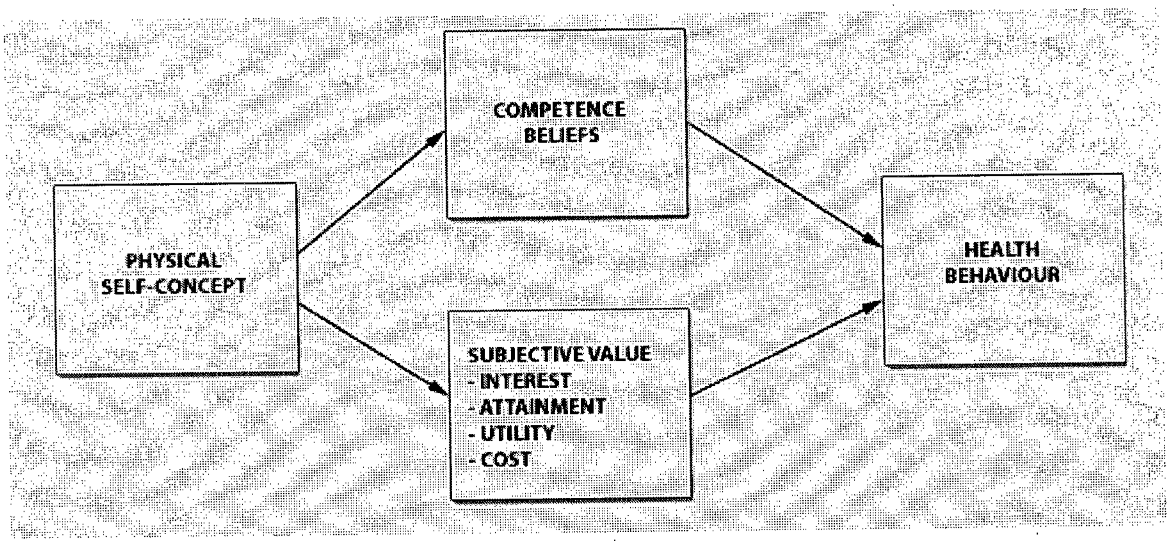

Figure 3.1. Proposed model investigating the relationships among physical self-concept, competence, values, and health behaviour.

3.1.1. Research Question

The hypothesized model depicted in Figure 3.1 was tested for physical activity, eating behaviour, and non-smoking behaviour for both boys and girls.

To attend to the research questions proposed, the objectives of study 1 included examining: (i) the central elements and relationships proposed by the expectancy-value model; (ii) the integration of the physical self into a model of motivated behaviour; (iii) physical self-perceptions, and competence and value beliefs as predictors of adolescent physical activity, eating, and non-smoking behaviours; and (iv) sex differences in reports of mean physical self-perceptions, competence, values, physical activity, eating, and smoking behaviours, relationships among the constructs, and prediction of health behaviour. Based on theoretical propositions and existing research findings, the following hypotheses were offered:

Ha1: The expectancy-value model will be supported for physical activity behaviour, eating behaviour, and non-smoking behaviour for adolescent boys and girls.

Ha2: There will be no differences in the simple structures of the models and the way boys and girls respond to the items in the study.

Ha3: There will be mean-level differences on the study variables for boys and girls.

Ha4: Physical self-perceptions will be strong predictors of health behaviour.

3.2. Methodology

3.2.1. Participants

Secondary school students (boys: n=221; girls: n=337) between the ages of 15 and 18 years participated in the study by completing a questionnaire once during class time. The restricted age range was an attempt to: (i) control for possible age differentiation of the value construct (Eccles & Wigfield, 2002); (ii) restrict pubertal timing and reliance on competence information (Eccles & Harold, 1991; Horn, 2004; Horn & Amorose, 1998); (iii) control for cognitive-developmental differences in self-ability perceptions (Black & Weiss, 1992); (iv) control for transition periods between elementary and secondary school, with demonstrated issues arising in concerns with self-perceptions, competence, social relationships, and achievement orientation and performance (see Eccles & Midgley, 1990; Weiss & Williams, 2004 for reviews); (v) represent adolescents who have physical education requirements versus choices; and (vi) gather an older adolescent sample to advance the literature on correlates of activity in this subpopulation (Baranowski et al., 1999; Sallis et al., 2000).

Sample size was estimated assuming moderate an effect size of .50 (Stevens, 1996). Calculations were based on multiple regression techniques because they yielded the largest estimation, suggesting adequate power and moderate effects if sample size guidelines were followed. Adequate power (80%) with an alpha set at .05 requires 15-20 participants per predictor in the model (Pedhazur, 1997; Stevens, 1996). With 20 participants for each of the 12 manifest variables in the study (6 x physical self-concept (self-perceptions and global self-esteem), 1 x competence, 4 x subjective values, and 1 x behaviour), a sample size of 240 adolescents was deemed necessary.

3.2.2. *Procedures*

Following the University of British Columbia's Behavioural Ethics Research Board and Vancouver and Victoria secondary school district board approvals for the study (see Appendix A and B), secondary school principals were contacted by written letter (see Appendix C) and followed up by telephone to solicit their support. In total, six out of eighteen (33.3%) of the contacted principals agreed to participate. School counselors and teachers were then contacted by telephone to schedule consent form distribution and data collection. The researcher attended classes during regular school hours to make brief introductory presentations about the study, to answer any questions, and to distribute parental consent (see Appendix D) and student assent forms (see Appendix E). The students were instructed to return the consent forms to their teacher or school counselor in sealed envelopes within one week. The researcher returned to the classes approximately ten days later to collect consent forms and distribute questionnaires. The overall response rate for the study was reflective of most behavioural research (26%). The completion of the questionnaire took between 30-40 minutes, and participants were asked to return the completed questionnaire to the researcher. Students who were not completing the questionnaire were given assignments from their teachers or provided crossword puzzles.

3.2.3. *Measures*

A compilation of scientifically supported instruments was developed for the purpose of this study. Information was collected to describe and examine: (i) participant characteristics (Personal Descriptive Information Instrument); (ii) the physical self

(Physical Self-Description Questionnaire; Marsh et al., 1994); (iii) perceptions of competence for participating in regular physical activity, maintaining a healthy diet, and not smoking (Deci & Ryan, 2001); (iv) interest in, importance of, and usefulness associated with participating in physical activity, healthy eating, and not smoking (subjective values; Eccles & Wigfield, 1995; Eccles, Wigfield et al., 1993); physical activity behaviour (Leisure Time Exercise Questionnaire; Godin & Shephard, 1985); eating behaviour (Adolescent Food Habits Checklist; Johnson, Wardle, & Griffith, 2002); and smoking behaviour (Student Smoking Profile; Cameron, Brown, Manske, Jolin, & Madill, 2005; Student Smoking Profile; Cameron, Brown, Manske, Jolin, Murnaghan, & Lovato, 2005). The questionnaire is presented in Appendix F.

3.2.3.1. Participant characteristics. Adolescents reported gender, age, height (meters), weight (kilograms), parent/guardian occupations, postal code for their family residence, and ethnic background. Height and weight were used to calculate body mass index (BMI=kg/m^2). Researchers have suggested that self-report measures of height and weight are accurate representations of actual physical characteristics (Shapiro & Anderson, 2003). Parent/guardian occupations and postal codes were collected to examine family socioeconomic status (Ensminger, Forrest, Riley, Kang, & Green, 2000). Adolescents reported the occupations held by his/her mother (or female guardian) and father (or male guardian). However, the reporting of parent/guardian occupations was vague, with a number of missing data. As a result of the ambiguous data provided for parent/guardian occupation, postal codes were used to assess and report socio-economic status based on the 2002 British Columbia Statistics from the Canada Customs and

Revenue Agency. To report descriptive socio-economic scores, the first three characters of the postal codes were matched to the data files provided by British Columbia Statistics. The files provided a median total income, Provincial Index, and Canadian Index associated with the postal code. The Provincial Index, which used in the current study to describe the sample, was defined as "the median income for the area that is expressed as a percentage of the median income for the province" (British Columbia Statistics, 2002). A score of 1.00 was the median income for the Province (which was just over $22,000 for the 2002 tax year). The Canadian and Provincial Indexes provided relatively similar data.

Ethnicity was reported using a list compiled from the 2002 British Columbia Statistics data. Participants marked all ethnic background options that were applicable to them. Additionally, an "other" category was provided with space for the adolescents to indicate an ethnic category that was not presented in the list. Providing this options was in line with recommendations from developmental literature regarding assessment of ethnicity information (Entwisle & Aston, 1994). Nine general ethnic background categories were derived, including: (i) Aboriginal (First Nations); (ii) Asian (e.g., Chinese, Japanese, Korean); (iii) Black (e.g., African, Haitian, Jamaican, Somali); (iv) Caucasian/White (e.g., British, Dutch, French, German, Greek, Irish, Italian, Jewish, Polish, Scottish, Ukranian); (v) Hispanic/ South American; (vi) South Asian (e.g., East Indian, Pakistani, Punjabi, Sri Lanken); (vii) South East Asian (e.g., Cambodian, Filipino, Indonesian, Vietnamese); (viii) West Asian/ Middle East (e.g., Afgani, Arab, Iranian); and (ix) other.

3.2.3.2. Physical self. The adolescents' perceptions of physical self were assessed with the Physical Self-Description Questionnaire (PSDQ; (Marsh et al., 1994). The PSDQ subscales have demonstrated adequate internal consistency, reliability, and validity with adolescents and young adults (Marsh, 1994a, 1996, 1997, 1998, 2000). For the purposes of this study, only the health, body fat, appearance, strength, endurance, physical self-worth, and global self-esteem subscales of the PSDQ were used. Participants responded to the 46 items on a 6-point Likert scale. The corresponding items for each subscale were reverse-scored as necessary and summed to obtain a total score, where higher values indicated more positive physical perceptions.

3.2.3.3. Perceived competence. The Perceived Competence Scales for participating in regular physical activity, maintaining/following a healthy diet, and smoking behaviour were used as measures of competence (Deci & Ryan, 2001). Each scale had four items that were answered on a 7-point Likert scale. According to the authors, perceived competence items should be specific to the relevant behaviour or domain being studied. Evidence of adequate internal consistency (alpha coefficients above .80) on similar scales has been reported (Williams & Deci, 1996; Williams, Freedman, & Deci, 1998). Upon recommendation from Dr. Jacquelynne Eccles (Personal Communication, October 8, 2003), and support from Dr. Richard Ryan (Personal Communication, November 3, 2003), the response anchors were modified to include the meaning of the questions, rather than the more general response options on the original scales. The modifications were made to reflect how often participants felt confident in their abilities rather than the more ambiguous responses of being true or false for the participant.

3.2.3.4. Subjective values. A modified version of the items from the Michigan Study of Adolescent and Adult Life Transition Questionnaire (Eccles & Wigfield, 1995; Eccles, Wigfield et al., 1993) was used to assess interest, attainment, and utility values. The items were modified to represent physical activity, healthy eating, and smoking behaviours independently. Cost values were measured using items developed with consideration of the construct meaning, and based on suggestions from Dr. Eccles (Personal Communication, October 8, 2003). The items represented time, financial, opportunity losses, and physical discomfort costs associated with physical activity and following a healthy diet.

3.2.3.5. Physical activity behaviour. Physical activity behaviour was assessed using the Godin Leisure-Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985). The instrument has been used with adolescents, and has been consistently reported as an accurate self-report measure of physical activity (Sallis, Buono, Roby, Mickle, & Nelson, 1993). The first item on the scale assessed the quantity of weekly strenuous, moderate, and light activity that occurred outside of regular physical education classes (LTEQ1). A total score was calculated by multiplying the weekly frequencies of strenuous, moderate, and light activities by nine, five, and three, respectively for a total metabolic equivalent intensity value.

The second item on the scale (LTEQ2) asked for the frequency of regular activity in a typical 7-day period that results in a fast heartbeat and sweating, and the responses ranged from *often* to *never/rarely*. This item has demonstrated moderate associations with various objective measures of physical activity (Godin & Shephard, 1985; Kowalski, Crocker, & Faulkner, 1997). For the purpose of this study, the item was reverse-scored so that higher scores represented more frequent activity.

3.2.3.6. Eating behaviour. Adolescent's eating behaviour was assessed using the Adolescent Food Habits Checklist (AFHC; Johnson et al., 2002). The AFHC instrument was designed specifically for adolescents and focuses on areas of the diet that present cause for concern. The items specifically refer to food choice situations in which the adolescents are likely to have a degree of personal control. Participants were asked to answer 23 questions about eating habits, which were scored as *true*, *false*, or *not applicable*. To calculate a scale score, all items representing healthy food choices and behaviours were given a value of 1. The final score was adjusted for the 'not applicable' and missing responses using the formula: AFHC = number of healthy responses x (23/number of items completed) upon recommendations from the authors. The scale has adequate internal consistency and reliability coefficients, and has demonstrated good convergent validity (Johnson et al., 2002).

3.2.3.7. Smoking behaviour. Smoking behaviour is commonly measured as a 30-day recall, whereby adolescents who report smoking cigarettes one or more days in the last 30-day period are considered current smokers (Alexander et al., 2001; Snow &

Bruce, 2003). Depending on the objectives of the research, individuals who have never smoked, and those who are past smokers are sometimes combined into a second group for comparative purposes, or classifications of non-smokers, experimental or occasional smokers, and current smokers have also been used. Self-report smoking behaviour is an accurate method of identifying smoking behaviour (Kentala, Utriainen, Pahkala, & Mattila, 2004).

The measure of smoking behaviour is not consistent in the literature. The quantity and quality of information sought in smoking-related questionnaires is diverse. The Student Smoking Profile (SSP), which contains questions about smoking experiences and attitudes of adolescents, is a scientifically-supported instrument designed to investigate adolescent smoking profiles (Cameron, Brown, Manske, Jolin, Murnaghan et al., 2005). Test-retest reliability has been demonstrated on the smoking behaviour items from the SSP, with kappa statistics ranging from .72 to .95 and few differences for boys and girls (Cameron, Brown, Manske, Jolin, & Madill, 2005). Validity of assessment was investigated by comparing carbon monoxide (CO) readings with self-report non-smoker status. Results revealed that 96% adolescent non-smokers had CO readings less than 6 parts per million (ppm), which is a standard reading to identify non-smokers (Cameron, Brown, Manske, Jolin, & Madill, 2005). The smoking behaviour items from the SSP were used in the current study to identify adolescent smokers, the frequency of smoking behaviour, as well as trial smoking behaviour. Trial smoking was conceptualized as boys and girls who reported having tried a whole cigarette. Smoking behaviour was conceptualized as adolescents who reported smoking at least 1-3 cigarettes in the last 30 days. For consistency in the study, the items were reverse-scored and examined as non-smoker status identifiers to better represent health behaviour.

3.2.4. Questionnaire Assessment

The questionnaire was sent to Dr. Eccles to examine content validity. Additionally, all instruments were pilot tested with adolescents (*N*=31) for clarity of instructions and further content validity assessment. Following the provision of parental consent and participant assent, the adolescents were instructed to complete the questionnaire. The completion of the instruments was followed by a researcher-led discussion pertaining to the instructions on the scales, the clarity of information requested, and the method of requesting the information. During the pilot test, the questionnaire was completed in 12 to 29 minutes.

3.2.5. Data Screening Strategies

Prior to data analytical procedures all variables were screened for accuracy of entry, missing values, distributions, and the assumptions of multivariate analysis (SPSS 11.0 and PRELIS 8.5) using procedures outlined by Tabachnick and Fidell (2001).

3.2.5.1. Data Entry. Initially, any variables that appeared deviant were checked with the original questionnaire and corrected as necessary. Frequency analyses were conducted to examine missing values. If more than 4.5% of the data were missing for any one variable, the variable was not considered in further analyses (Tabachnick & Fidell, 2001). Randomly missing values were replaced with scale median scores for each individual case. If this was not possible, group-specific (i.e., sex) means were used. Replacing values with group means potentially reduced the correlations among the variables.

3.2.5.2. Univariate and Multivariate Outliers. Data screening for outliers, normality, linearity, and multicollinearity were conducted for the total sample initially, and for males and females separately during preliminary analyses. Univariate outliers were examined by investigating residual plots and standardized z-scores, and were identified as any cases that had very large standardized scores (i.e., approaching 4.0; Stevens, 1996). If univariate outliers were identified and considered problematic, analyses were conducted with the outliers remaining in the data set and removed. Leverage statistics were also examined to detect the impact factor of each outlier case. If the outliers had an impact on the results, and high leverage statistics, deletion was considered.

In an attempt to better represent multivariate outliers, analyses were conducted for physical activity, dieting, and smoking behaviours separately. Multivariate outliers were examined with calculated and graphed Malahanobis Distance scores. Possible multivariate outliers were examined further by conducting regressions using dummy-coded variables and exploring the scores on a case-by-case basis. Each case with a significant Mahalanobis Distance was given a score of 1 and all other cases were given a score of 0 on an arbitrary variable. The resultant stepwise regression analyses allowed significant predictors to enter the equation, thus indicating the variables on which this case was deviant. If the mix of predictor scores did not make sense or was inconsistent, the individual case was identified. Analyses were conducted with the outliers removed and with them remaining in the data set, and if the results were significantly altered by the outlier cases, they were deleted from the analyses.

3.2.5.3. Normality. Data were examined for normality by examining the distribution indices for skewness and kurtosis, and graphical representations of the distributions. Frequency histograms and normal probability plots were examined for evidence of normalcy. If deviations from normality were identified in the plots, loglinear and/or square root transformations of the variables were considered. Furthermore, multivariate normality was assessed using PRELIS, where normalized skewness and kurtosis coefficients were reported, along with the relative multivariate kurtosis coefficient (Mardia's coefficient).

3.2.5.4. Linearity. Examination of bivariate scatterplots was performed to attend to the assumption of linearity. Only variables with extremely high skewness values were examined in bivariate scatterplots as extreme cases and were compared against variables with approximately normal distributions. Linear relationships were identified by oval-shaped curves. Transformation of the variables was not performed since the data will be examined in ungrouped format by gender and therefore heteroscedasticity is not an issue. Transformed variables are difficult to interpret in analyses (Tabachnick & Fidell, 2001).

The assumption of linearity for logitistic regression was tested for linear relationships between the logit and the independent variables using the Box-Tidwell Transformation Test. Interaction terms that were the cross-product of each independent variable multiplied by its natural logarithm were entered into the regression model. If the terms were significant, nonlinearity in the logit was evident (Menard, 2002).

3.2.5.5. Multicollinearity. Multicollinearity was examined as very high (i.e., greater than .80) bivariate correlations and collinearity diagnostics produced in regression analyses that were conducted separately for physical activity, healthy eating, and smoking behaviours. Condition indices greater than 30 combined with two variance proportions greater than .50 for a given dimension may signify problems (Miles & Shevlin, 2004). Also, Variance Inflation Factors in excess of 2.0 caution that collinearity issues may be present (Miles & Shevlin, 2004; Tabachnick & Fidell, 2001). If multicollinearity issues were revealed, further considerations of combining the variables with high correlations and collinearity indices were conducted. If this was not possible, excluding the variables from the analyses was necessary to obtain the most parsimonious models. The variables excluded from the analyses had high Variance Inflation Factors and semipartial correlation coefficients that indicated redundancy in the analyses. Multicollinearity in logistic regression analysis was examined as significant changes in the standard errors of the logit coefficients when other variables were entered in the models. Inflated errors identified possible issues with collinearity (Menard, 2002). Linear regression models were conducted and examined for the physical activity and eating behaviours. Logistic regression analyses were employed for smoking behaviour.

3.2.5.6. Instrument psychometrics. Internal consistencies were examined for the physical self, competence, subjective value, and health behaviour instruments with Cronbach's alpha reliability coefficients. Instruments with low scale reliabilities were reviewed, and inter-item correlations were examined. If necessary, specific items were excluded from the scale scores.

3.2.6. Preliminary Analysis Strategies

In order to assess the hypotheses in this study, a variety of univariate and multivariate statistical analysis techniques were used.

3.2.6.1. Correlations. Pearson correlation coefficients were examined for all variables with approximately normal distributions. Spearman's Rho correlation coefficients were reported for nonparametric variables.

3.2.6.2. One-way multivariate analysis of variance. Several multivariate analyses (MANOVA) with follow-up univariate ANOVA's were conducted to examine possible gender differences on the physical self, competence and values, physical activity, eating, and smoking behaviours, and demographic variables. The variables were entered in separate behaviour-based analyses. If significant gender differences emerged from the data, separate analyses were conducted for males and females.

3.2.6.3. Regressions. It was hypothesized that the physical self-perceptions would be more likely to influence behaviour than physical self-worth and global self-esteem. This assumption was examined using hierarchical regression analyses to identify the independent variables that would be used in further analyses. Linear regression analyses were conducted separately for physical activity and eating behaviours, and logistic regression was conducted for smoking behaviours.

Linear regression. In the first regressions, the health behaviour (physical activity, eating, smoking) was the dependent variable and the health, body fat, appearance, strength, and endurance physical self-perception variables were entered on Step 1. The physical self-worth (PSW) variable was entered on Step 2 in order to examine the independent contribution of PSW when the physical self-perceptions were controlled. If PSW predicted a significant unique proportion of the variance in the health behaviour, it would be used in further analyses. The second regression was conducted with physical activity, eating, or smoking behaviour as the dependent variable, and PSW entered on Step 1, followed by the physical self-perception variables entered on the second step. If the physical self-perceptions did not contribute uniquely to the behaviour, beyond the contribution of the PSW, they were not necessary in further analyses. These regression models were repeated with the inclusion of global self-esteem (GSE) instead of PSW. If GSE accounted for unique variance in any model, it was included in further analyses along with the physical self-perceptions. Given the strong conceptual links between GSW, PSW, and the physical self-perceptions, the analyses were robust when only one level of the physical self was considered.

Logistic regression. Several sequential logistic regressions were conducted to examine the physical self-perceptions as covariates in the relationship between physical self-worth, global self-esteem, and smoking behaviour. Two smoking items were used as the dependent variables to examine "trial" smoking behaviour and "smoking" behaviour in the last 30 days. NO TRIAL was equal to 1 if the respondent had never tried smoking and 0 otherwise. NO SMOKE was equal to 1 if the individual had not smoked a cigarette in the last 30 days and was equal to 0 otherwise. In order to maintain consistency throughout the study, these variables were coded in such a way as to represent the healthiest behaviour.

The logistic model was run for a full model with the physical self-perceptions and either physical self-worth or global self-esteem (which were considered the independent variables). The model was then run again with the exclusion of the physical self-worth or global self-esteem variables. The model chi-square difference, which is computed as -2Log Likelihood (LL) for the full model minus -2LL for the partial models being tested, was examined. If the model chi-square was not significant, then it was concluded that the independent variables were controlled by the physical self-perceptions (i.e., independents have no effect when the effect of the covariates is taken into account). The significance of the inclusion of the different predictors was examined both as changes in the model chi-square and by examining any improvement in the classification of individuals.

3.2.7. Main Analyses

To examine the main research questions pertaining to testing the expectancy-value model with physical activity, eating, and non-smoking behaviours, structural equation modeling techniques and logistic regressions were employed.

3.2.7.1. Structural equation modeling. Structural equation modeling (SEM) procedures using maximum likelihood estimation were conducted using LISREL 8.5 (Joreskog & Sorbom, 2001) to validate measurement models and to examine the fit of structural models proposed by theoretical and conceptual considerations of the expectancy-value theory. Eccles' (1983) expectancy-value model proposes that theoretical relationships exist between the (physical) self-concept and competence and values, and between competence, values, and behaviour, in a mediation model. Only physical activity and eating behaviour models were examined using SEM techniques. Smoking variables were not examined using SEM due to the unequal sample distributions between smokers and non-smokers. Also severe kurtosis and skewness values that led to multivariate non-normality were observed and would consequently result in difficult interpretation of the results (West, Finch, & Curran, 1995).

Model identification. The number of parameters to be estimated in the physical activity and eating behaviour models were examined for identification purposes. Prior to structural equation modeling analyses with the eating behaviour data, the items on the Adolescent Food Habits Checklist (AFHC) scale were parceled. Item parceling was deemed necessary due to the large number of dichotomous items on the AFHC instrument. Following recommendations by Thompson and Melancon (1996), the parcels were composed of randomly selected items that were matched by opposite item distribution (i.e, positive and negative skew coefficients). Fewer parcels were considered desirable and therefore 5-6 items were included in each parcel (Nasser & Takahashi, 2003; Thompson & Melancon, 1996). Item parcels were created to account for dichotomous items, and are appropriate when the underlying factor structure is unidimensional (Bandalos & Finney, 2001). Item parceling is advantageous over using the original items because estimating large numbers of items usually results in spurious correlations. Solutions from item-level data are also less likely to yield stable solutions than solutions from parcels of items (Hau & Marsh, 2004; Little, Cunningham, Shahar, & Widaman, 2002).

Measurement models. The measurement models were examined for accuracy of fit and invariance for boys and girls. The model estimations were examined on the covariance matrix using maximum likelihood procedures (Hoyle, 1995). Multiple indices were used to evaluate the model fit (Bollen, 1990; Byrne, 1998), including: (i) chi-square statistic (χ^2), which assesses the discrepancy between the sample and fitted covariance matrices and is sensitive to departures from multivariate normality and sample size; (ii) root mean square error of approximation (RMSEA; Hu & Bentler, 1999), which is a measure of lack of fit per degrees of freedom and accounts for the models complexity; (iii) comparative fit index (CFI; Bentler, 1990), incremental fit index (IFI; Hoyle & Panter, 1995), and non-normed fit index (NNFI; Marsh, Balla, & McDonald, 1988), which are incremental relative fit indices that show how much better the model fits compared to a baseline model with no constraints; and (iv) the standardized root mean residual (Bentler, 1990), which is a standardized summary measure of fitted residuals. It is suggested that low chi-square values, RMSEA values less than .08, incremental and relative fit indices (CFI, IFI, NNFI) greater than .90, and the SRMR less than .05 indicate good fit (Browne & Cudeck, 1993; Byrne, 1998; Hu & Bentler, 1999). Since chi-square values are reported relative to the degrees of freedom, and as a result can become complicated with sample size and non-normal distributions, it was used with caution to make decisions about model fit (Hoyle & Panter, 1995). Using LISREL as a data analysis program, the Satorra-Bentler scaled chi-square is not provided unless data are analyzed using the asymptotic covariance matrix (ACM). Using the ACM requires large sample sizes that are beyond this study and as a result, scaled chi-square estimates were not reported.

Since the purpose of this study was not to identify the best fitting model but rather to examine the theoretical propositions of the expectancy-value model, no model modifications (i.e., Lagrange multiplier tests) were conducted. Examining and reporting the model fit estimates, relationships among latent factors, path coefficients, and predictive equations satisfied the objectives of this study.

Gender invariance. Sequential tests of invariance were conducted to examine gender differences in the measurement and structural parameters of the physical activity and eating behaviour models. It was hypothesized that there would not be gender differences in the measurement models, however structural differences may emerge as a result of differences in the covariances among latent variables. Since the latent factors observed in this study were developed from unique manifest variables and items (rather than established based on theory or research findings), exploring mean differences on the latent factors was not deemed of practical significance. Therefore, given the objectives of the study, coupled with the complexity of conducting mean structure invariance, testing for the difference in the factor mean structures was not performed. To examine gender invariance, simultaneous model fit was examined with the following strategies: (i) configural invariance, setting no constraints; (ii) metric invariance, setting equivalent factor loadings; (iii) factor variance invariance, setting equivalence of factor variance; (iv) factor covariance invariance, setting factor covariance equality constraints; and (v) error variance invariance, setting residual equality constraints (Vandenberg & Lance, 2000). Chi-square difference tests were used to examine change in model fit by adding equality constraints to simultaneous model fitting for females and males (Byrne, 1998). Significant chi-square differences between any of the models suggested that model invariance was not tenable. However some authors caution the reliance on the chi-square difference test due to inherent problems as a result of sample size and non-normal data (Byrne, 1998; Steenkamp & Baumgartner, 1998). The RMSEA, CFI and NNFI fit indices are recommended as assessments of model invariance, with smaller vales of RMSEA and larger values of CFI and NNFI indicating better models.

According to Marsh, Hey, Johnson, and Perry (1997), a non-significant test of invariant factor loadings is the minimum level required to demonstrate a non-difference in simultaneous group analyses. Also, since the objectives of conducting group invariance was to explore the basic meaning and structure of the expectancy-value model between boys and girls (to establish that the model can be conceptualized in the same way), configural invariance (i.e., same pattern of factor loadings) and metric invariance were the minimum requirements (Marsh, Hey, Johnson, & Perry, 1997; Steenkamp & Baumgartner, 1998). Factor loading invariance implied that boys and girls responded to the items in the same way, and that different scores could be meaningfully compared across groups. The variances and covariances among the factors demonstrated the magnitude of the structural effects, with covariance invariance providing information on the factor structure and variance invariance implying homogeneity of factor scores. For basic path modeling and examination of model measurement structures, factor variance and covariance invariance is not a requirement (Steenkamp & Baumgartner, 1998). Lack of error variance invariance is also not a problem when latent variable modeling is performed because differences in measurement error are taken into account.

If chi-square differences and significant model fit improvement was noted for tests of configural and/or metric invariance, univariate constraints were sequentially relaxed and models were re-assessed independently in order to identify which parameters were invariant (Byrne, 1998; Byrne, Shavelson, & Muthen, 1989). Identification of non-significant model parameters using this sequential approach was necessary as a result of using the LISREL framework, and yields similar results to Lagrange multiplier tests (Byrne, 1998).

Path models. Following examination of measurement model fit and sequential tests of invariance, the structural models represented by theoretical relationships among the constructs were examined using latent variable path analysis. Smoking variables were not examined using SEM due to the unequal sample distributions between smokers and non-smokers, and the severe kurtosis and skewness values that would result in difficult interpretation of the results (West et al., 1995). For physical activity and eating behaviours, the relationships among latent factors were identified by regression path coefficients and prediction equations. The structural models were observed for: (i) the signs of the parameters representing paths between the constructs were in the hypothesized direction, (ii) the significance and magnitude of the parameters in the hypothesized relationships, (iii) amount of variance of competence and value accounted for by the physical self; and (iv) the amount of variance of physical activity and eating behaviours that was accounted for by competence, values, and the physical self.

Mediation. The latent path analysis provided information on the fit of the proposed model with the physical self, competence, subjective value, and physical activity/eating constructs. To examine whether the mediation model was the best fitting model, alternative direct effects models were also tested (Holmbeck, 1997), and indirect effects were calculated (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

First, alternate models were examined in a stepwise process to evaluate mediation. These procedures were in line with guidelines proposed by Baron and Kenny (1986) and Holmbeck (1997). Specifically, to test mediation, the following conditions were necessary: (i) a significant relationship between the physical self and physical activity/eating behaviour; (ii) a significant relationship between the physical self and competence, and between the physical self and value; (iii) significant relationships between competence and physical activity/eating, and between value and physical activity/eating; (iv) a reduction in the strength of the relationship between the physical self and physical activity/eating when the effects of competence and value were controlled (Baron & Kenny, 1986; Holmbeck, 1997). To attend to the first three conditions, the interrelations among latent variables were observed for significance. The original measurement and structural models that were conducted to test the hypothesized model provided this information. To examine the fourth condition, two alternate structural models were tested

The first models examined the direct effects of physical self on physical activity/eating behaviour by adding constraints to the effects of competence and subjective value on activity/eating behaviour (i.e., the paths were fixed to zero). The second model examined the simultaneous direct effects of physical self, competence, and subjective value on physical activity/eating behaviour. The change in model fit was examined by observing the signs of the parameters representing paths between the constructs, the significance and magnitude of the parameters in the hypothesized relationships and model fit indices, and the amount of variance of physical activity and eating behaviours that was accounted for in the models. Likelihood ratio chi-square difference tests were examined. If mediation was supported, improved model fit in the alternate models was not observed compared to the original models (Holmbeck, 1997).

As a secondary method of examining the indirect effects of the physical self on physical activity and eating behaviour, a one-step product of coefficient method was conducted (MacKinnon et al., 2002). The second alternate models described above (i.e., simultaneous direct effects of physical self-perceptions, competence, and subjective value on physical activity/eating behaviour) were evaluated for effect decompositions by calculating the total and indirect effects. According to Diamantopoulos and Siguaw (2000), indirect effects represent the influence of independent variables (i.e., physical self-perceptions) on dependent variables (i.e., physical activity/eating behaviour) as mediated by one or more intervening variables (i.e., competence and subjective value). Indirect effects were calculated by multiplying the standardized parameter estimates of the intervening variables. The total effects were computed by adding the indirect and direct effects of a variable. Calculating the indirect effects and expressing them as percentages of the total effects depicted the strength of the indirect relationships compared to the direct relationships and total effects on the dependent variables (Diamantopoulos & Siguaw, 2000; Shrout & Bolger, 2002). These calculations were performed to present the percentage of indirect and direct effects within the models to better substantiate the stepwise mediation analyses described above. For mediation models, the indirect effects should be much stronger than the direct effects (Shrout & Bolger, 2002).

3.2.7.2. Logistic regression. To examine smoking behaviour, binary logistic regression was used as the main analysis due to the uneven dichotomy of smokers and non-smokers, and the resultant heteroskedastic linear model. Smoking behaviour was examined as two outcomes (NO TRIAL and NO SMOKE) in separate analyses for females and males. In logistic regression, coefficients can be significant when the corresponding correlation is not significant. The reverse can also be observed. It is recommended that the most accurate results are noted when the correlation and the logit coefficient are both significant (Kleinbaum, 1994; Menard, 2002). Therefore, only independent variables with significant correlations were entered in the logistic regressions to avoid spurious results.

In separate analyses, the physical self-perceptions, global self-esteem, competence, and values were entered as predictors of NO TRIAL and NO SMOKE smoking behaviour. Sequential logistic regression was used to test the control effects of a set of covariates. The logistic model was run for the full model with independents (physical self and global self-esteem) and covariates (competence and values). The model was then run again with the independents dropped. The model chi-square difference was examined. If the model chi-square was not significant, then it was concluded that the independent variables were controlled by the covariate(s).

The significance of the inclusion of the different predictors was examined both as changes in the model chi-square and by examining the classification tables and the Nagelkerke-R^2 value. The Wald Statistic was used to test the significance of individual logistic regression coefficients. Classification tables were reported for assessing the accuracy of classification based on the independent variables entered into the models. Odds ratios and the 95% confidence intervals were also reported.

3.3. General Results

3.3.1. Data Screening

The data was examined for outliers, distributions, and relationships among variables following the procedures outlines in the data screening strategies and recommendations from Tabachnick and Fidell (2001). A full description of the data screening results is presented in Appendix G. As a result of the data screening strategies, the transformed LTEQ1 (TLTEQ1) variable was used in all further analyses. Further analyses revealed that 6 boys and 7 girls were extreme outliers on the TLTEQ1 and were subsequently removed from all analyses involving physical activity. For smoking behaviour, logistic regression was deemed necessary due to the distribution of the variables and dichotomous nature of the responses. BMI was not included in further main analyses due to the potential inflation of multicollinearity issues as a result of the relationships among BMI and several physical self-perceptions. The relationships among the interest, attainment, and utility also revealed possible multicollinearity. The correlation coefficients were high (r=.71-.73), and the collinearity statistics indicated a large amount of shared variance between the variables. As a result of statistical (Byrne, 1998; Tabachnick & Fidell, 2001) and conceptual (Eccles, Personal Communication, February 15, 2005) recommendations, a latent variable was created with the separate value subscales as indicators of a subjective value factor for physical activity and eating behaviour. The attainment and utility values were summed to create a composite variable "personal importance" for the smoking behaviour data analyses. Due to the low internal consistencies on the cost value subscales for physical activity and eating behaviour, cost value was not included in the main analyses. The Adolescent Food Habits Checklist was composed of 22 items following the exclusion of one item from the scale. Finally, dichotomous outcome variables were created for smoking behaviour. NO TRIAL was a measure of never having tried a whole cigarette (yes=1), and NO SMOKE was a measure of not having smoked a cigarette in the past 30 days (yes=1). This conceptualized was an attempt to represent health behaviours consistently, with "healthier" represented by higher values for physical activity, eating, and smoking.

3.3.2. Preliminary Analyses

Prior to main analyses, descriptive statistics were examined, gender differences on study variables were explored, and initial correlations were conducted to examine the relationships among the health behaviours.

3.3.2.1. Describing the participants. Five hundred and fifty eight adolescents volunteered to participate in the study. Ten individuals were excluded from the study because they failed to provide any descriptive information (i.e., gender, age, height, and weight), and eight individuals were deleted due to a priori age restrictions. In the final sample, there were 329 girls and 211 boys who completed usable questionnaires. Adolescents ranged in age from 15-18 years (M=16.17, SD=.92) and described themselves as primarily Caucasian (51.3%, n=277) and Asian (32%, n=173). Other ethnicities were reported as followed: South Asian (5.7%, n=31), South East Asian

(3.7%, n=20), Hispanic (2.0%, n=11), Aboriginal (1.7%, n=9), West Asian/Middle East (1.3%, n=7), Black (0.4%, n=2), and other/mixed (1.9%, n=10). Based on reported postal codes (n=458), adolescents' parents/guardians were classified as having median incomes 5.0% above the Provincial median. Twenty three percent had family incomes less than 20% of the median, and 26.7% had family incomes that were greater than 20% of the Provincial median.

Adolescent boys reported a mean BMI of 22.01 kg/m^2, and adolescent girls reported average BMI's of 21.21 kg/m^2. Based on Canadian standards of healthy height-to-weight ratios, 76% male and 79.4% female adolescents were within the healthy range (i.e., BMI's between 18.5-25 kg/m^2), with 10% reporting overweight status (BMI > 26 kg/m^2). In this study, 16% boys and 15% girls were classified as smokers based on reports of having smoked at least 1-3 cigarettes in the preceding 30 days. Approximately 43% of the sample had tried a whole cigarette. 12.1% boys and 9.3% girls indicated smoking at least 100 cigarettes in their lifetime. Means and standard deviations for the study variables are reported for the total sample in Table 3.1, for boys in Table 3.2, and for girls in Table 3.3.

Table 3.1.

Score Ranges, Reliability Coefficients, Means and Standard Deviations (SD), and Distribution Statistics for the Total Sample (N=540).

Scale		Score Range	α^a	Mean (SD)	Skewness	Kurtosis
Physical Self-Perceptions						
	Health	9-48	.85	36.89 (7.32)	-.93 (.11)	.94 (.21)
	Body Fat	6-36	.92	27.69 (8.03)	-.77	-.37
	Appearance	6-36	.90	25.55 (6.18)	-.67	.04
	Strength	6-36	.91	23.64 (6.82)	-.23	-.62
	Endurance	6-36	.94	21.30 (8.66)	.03	-1.06
PSW		6-36	.94	25.34 (7.21)	-.46	-.35
GSE		8-48	.91	38.61 (7.55)	-1.03	.69
Physical Activity						
	Competence	4-28	.94	21.30 (5.68)	-.77	.08
	Interest	2-14	.92	11.40 (2.60)	-1.23	1.46
	Attainment	2-14	.76	11.34 (2.40)	-1.09	1.14
	Utility	2-14	.88	11.89 (2.44)	-1.36	1.70
	Costs	5-28	.52	16.11 (3.73)	.11	-.01
	LTEQ1[b]	0-650	-	71.64 (67.27)	3.63	19.47
	TLTEQ1[b]	.60-2.81	-	1.70 (.32)	-.20	1.49
	LTEQ2[d]	1-3	-	2.25 (.71)	-.41	-.96

Eating					
Competence	4-28	.94	20.39 (5.11)	-.53	-.01
Interest	2-14	.82	10.53 (2.79)	-.87	.52
Attainment	2-14	.64	10.74 (2.26)	-.98	1.18
Utility	2-14	.87	12.01 (2.25)	-1.45	2.50
Costs	4-28	.60	18.47 (3.70)	-.63	.70
AFHC[e]	0-22	.83	12.36 (4.90)	-.20	-.74
Smoking					
Competence	4-28	.94	25.86 (4.60)	-2.61	6.61
Interest	2-14	.88	12.40 (2.90)	-1.85	2.45
Personal Importance	3-21	.66	18.37 (3.99)	-1.62	2.24
Costs	4-28	.94	21.30 (6.24)	-1.14	.84
Smoking Frequency	1-5		1.33 (.90)	3.01	8.63
Smoking Quantity	1-7		1.40 (1.09)	3.21	10.88
AGE (years)	15-18		16.17 (.92)	.32	-.79
HEIGHT (m)	1.41		1.70 (.10)	.16	-.33
Weight (kg)	31.82-122.73		62.37 (12.67)	1.10	2.32
BMI (kg/m^2)	14.0-37.9		21.52 (3.29)	1.15	2.43

[a] Scale reliabilities are Cronbach's alpha coefficients

[b] LTEQ1 is the physical activity measure in METS (Godin #1)

[c] TLTEQ1 is the transformed physical activity measure in METS (*n*=528)

[d] LTEQ2 is the frequency physical activity measure (Godin #2)

[e] AFHC is the healthy eating measure

Table 3.2.

Scale and Subscale Ranges, Means and Standard Deviations (SD), and Distribution Statistics for Male Adolescents (n=211).

Scale		Range	α^1	Mean (SD)	Skewness	Kurtosis
Physical Self-Perceptions						
	Health	9-48	.76	38.16 (5.74)	-.45 (.167)	.010 (.333)
	Body Fat	6-36	.92	31.05 (6.57)	-1.60	2.24
	Appearance	6-36	.90	26.02 (6.09)	-.68	-.11
	Strength	6-36	.91	25.35 (6.60)	-.45	-.31
	Endurance	6-36	.94	24.56 (8.61)	-.45	-.83
PSW		6-36	.93	27.24 (6.88)	-.60	-.34
GSE		8-48	.91	39.18 (7.50)	-1.03	.46
Physical Activity						
	Competence	4-28	.94	23.09 (5.10)	-1.27	1.53
	Interest	2-14	.89	12.11 (2.29)	-1.49	2.28
	Attainment	2-14	.76	11.90 (2.24)	-1.38	2.16
	Utility	2-14	.85	12.21 (2.31)	-1.74	3.42
	Costs	5-28	.52	16.18 (3.81)	.10	.21
	LTEQ1 [b]	0-650	-	85.18 (81.94)	2.92	12.53
	TLTEQ1[c]	.60-2.81	-	1.81 (.34)	-.27	1.23
	LTEQ[d]	1-3	-	2.45 (.66)	-.79	-.47
Eating						
	Competence	4-28	.93	21.56 (4.88)	-.93	1.15

Interest	2-14	.82	10.12 (2.97)	-.733	.06
Attainment	2-14	.69	10.38 (2.58)	-.92	.82
Utility	2-14	.85	11.48 (2.60)	-1.33	1.89
Costs	4-28	.64	18.31 (3.92)	-.73	.87
AFHC[e]	0-22	.82	11.19 (4.79)	-.05	-.67
Smoking					
Competence	4-28	.94	25.64 (4.89)	-2.54	6.33
Interest	2-14	.87	12.67 (2.97)	-1.71	1.96
Personal Importance	3-21	.60	17.89 (4.11)	-1.31	1.29
Costs	4-28	.81	20.96 (6.31)	-1.11	.73
Smoking Frequency	1-5		1.35 (.93)	2.86	3.24
Smoking Quantity	1-7		1.45 (1.23)	7.35	10.66
AGE (years)	15-18		16.18 (.91)	.33	-.70
HEIGHT (m)	1.41		1.77 (.08)	-.01	-.19
Weight (kg)	31.82-122.73		69.48 (12.77)	.94	1.82
BMI (kg/m^2)	14.0-37.9		22.01 (3.35)	1.03	1.66

[a] Scale reliabilities are Cronbach's alpha coefficients

[b] LTEQ1 is the physical activity measure in METS (Godin #1)

[c] TLTEQ1 is the transformed physical activity measure in METS (*n*=206)

[d] LTEQ2 is the frequency physical activity measure (Godin #2)

[e] AFHC is the healthy eating measure

Table 3.3.

Scale and Subscale Ranges, Means and Standard Deviations (SD), and Distribution Statistics for Female Adolescents (n=329).

Scale		Range	α^1	Mean (SD)	Skewness	Kurtosis
Physical Self-Perceptions						
	Health	9-48	.88	36.07 (8.08)	-.89 (.134)	.484 (.268)
	Body Fat	6-36	.92	25.53 (8.16)	-.48	-.76
	Appearance	6-36	.90	25.25 (6.23)	-.67	.13
	Strength	6-36	.91	22.55 (6.74)	-.11	-.66
	Endurance	6-36	.93	19.21 (8.03)	.28	-.82
PSW		6-36	.94	24.12 (7.16)	-.41	-.31
GSE		8-48	.91	38.25 (7.56)	-1.04	.85
Physical Activity						
	Competence	4-28	.94	20.15 (5.73)	-.54	-.20
	Interest	2-14	.92	10.93 (2.69)	-1.11	1.18
	Attainment	2-14	.76	10.98 (2.43)	-.97	.87
	Utility	2-14	.90	11.69 (2.51	-1.17	1.03
	Costs	5-28	.51	16.08 (3.69)	.11	-.15
	LTEQ1 [b]	0-567	-	60.35 (53.98)	4.21	28.54
	TLTEQ1 [c]	.60-2.75	-	1.70 (.30)	-.31	1.84
	LTEQ [d]	1-3	-	2.13 (.72)	-.20	-1.03
Eating						
	Competence	4-28	.93	19.63 (5.12)	-.31	-.31

Interest	2-14	.82	10.79 (2.63)	-.94	.92
Attainment	2-14	.57	10.97 (2.01)	-.83	.71
Utility	2-14	.88	12.35 (1.92)	-1.28	1.55
Costs	4-28	.60	18.56 (3.54)	-.53	.46
AFHC[c]	0-22	.83	13.11 (4.82)	-.31	-.70
Smoking					
Competence	4-28	.94	25.99 (4.40)	-2.64	6.77
Interest	2-14	.89	12.50 (2.86)	-1.97	2.88
Personal Importance	3-21	.70	18.69 (3.88)	-1.88	3.20
Costs	4-28	.81	21.51 (6.21)	-1.17	.95
Smoking Frequency	1-5		1.31 (.89)	3.22	9.74
Smoking Quantity	1-7		1.37 (.99)	3.04	9.67
AGE (years)	15-18		16.16 (.94)	.32	-.83
HEIGHT (m)	1.41		1.65 (.08)	.28	.66
Weight (kg)	31.82-122.73		57.80 (10.28)	1.40	4.96
BMI (kg/m^2)	14.0-37.9		21.21 (3.21)	1.27	3.21

[a] Scale reliabilities are Cronbach's alpha coefficients

[b] LTEQ1 is the physical activity measure in METS (Godin #1)

[c] TLTEQ1 is the transformed physical activity measure in METS (*n*=329)

[d] LTEQ2 is the frequency physical activity measure (Godin #2)

[e] AFHC is the healthy eating measure

3.3.2.2. Multivariate and Univariate Analyses. It was hypothesized that responses on the physical self, physical activity, competence, values, and eating behaviour subscales would be difference for boys and girls. To test this hypothesis, several multivariate analyses of variance (MANOVA) with follow-up analyses of variance (ANOVA) were conducted. The analyses were conducted separately for the physical self, physical activity, eating behaviour, and smoking behaviour.

There were significant ($p<.01$) gender differences on the physical self subscales except appearance and global self-worth, health: $F(1,538)=10.63$, $\eta^2=.02$; body fat: $F(1,538)=68.16$, $\eta^2=.11$; strength: $F(1,538)=22.55$, $\eta^2=.04$; endurance: $F(1,538)=53.92$, $\eta^2=.09$; physical self-worth: $F(1,538)=25.22$, $\eta^2=.05$. Boys reported significantly higher self-perceptions and physical self-worth compared to girls. Boys also reported significantly ($p<.02$) higher scores on all physical activity variables except cost values, perceived competence: $F(1,526)=39.81$, $\eta^2=.07$; interest value: $F(1,526)=29.73$, $\eta^2=.05$; attainment value: $F(1,526)=20.49$, $\eta^2=.04$; utility value: $F(1,526)=7.18$, $\eta^2=.01$; physical activity behaviour (LTEQ2): $F(1,526)=25.78$, $\eta^2=.05$; physical activity behaviour (TLTEQ1): $F(1,526)=17.15$, $\eta^2=.03$. These results were similar when the outliers were left in the data set.

For eating behaviour constructs, girls reported significantly higher scores on interest, $F(1,538)=7.46$, $\eta^2=.01$, attainment value, $F(1,538)=8.77$, $\eta^2=.02$, utility value, $F(1,538)=19.84$, $\eta^2=.04$, and eating behaviour, $F(1,538)=20.49$, $\eta^2=.04$. Boys reported higher perceived competence $F(1,538)=18.78$, $\eta^2=.03$.

For smoking behaviour, girls reported significantly higher personal importance, $F(1,538)=5.23$, $\eta^2=.01$. There were no other gender differences on the competence, values, and behaviour constructs, or any of the Smoking Profile items. Due to the significant gender differences that emerged on several of the study variables, main analyses were conducted separately for boys and girls.

3.3.2.3. Correlations. Pearson correlation (physical activity & eating behaviour constructs), and Spearman's Rho coefficients (smoking variables) were examined for the relationships among health behaviours and revealed weak correlations (see Table 3.4). As a result of these weak relationships, the main correlation tables and all remaining analyses are presented separately for physical activity, eating, and smoking behaviours.

Table 3.4.

Pearson and Spearman Rho Correlations for Physical Activity, Eating, and Smoking.

	1.	2.	3.	4.	5.
	Total Sample (N=540)				
1. TLTEQ1[a]	-				
2. LTEQ2	.52*	-			
3. AFHC	.18*	.17*	-		
4. No Trial[b]	.06	.02	-.08	-	
5. No Smoke[b]	.03	.01	-.08	.55*	-
	Boys (n=211)				
1. TLTEQ1[a]	-				
2. LTEQ2	.49*	-			
3. AFHC	.20*	.18*	-		
4. No Trial[b]	.05	.01	-.10	-	
5. No Smoke[b]	.05	.13	-.17*	.55*	-
	Girls (n=329)				
1. TLTEQ1[a]	-				
2. LTEQ2	.52*	-			
3. AFHC	.23*	.17*	-		
4. No Trial[b]	.07	.02	-.08	-	
5. No Smoke[b]	.02	.01	-.08	.55*	-

* p< .01; ** p <.05; [a] TLTEQ1 is the transformed physical activity measure (total sample N=528, boys n=206, girls n=322); [b] Spearman's Rho correlation coefficients.

3.4. Physical Activity Results

3.4.1. Preliminary Analyses

For means and standard deviations of the physical activity constructs, refer to Tables 3.1 through 3.3, for the total sample, boys, and girls.

3.4.1.1. Uniquenesses among physical self-perceptions, physical self-worth, and global self-esteem. To examine whether physical self-perceptions were stronger predictors of physical activity compared to physical self-worth and global self-esteem, hierarchical multiple linear regressions were conducted. The detailed findings are presented in Appendix H. It was determined that physical self-perceptions accounted for significant variance in physical activity independent of the contributions of physical self-worth and global self-esteem for boys and girls. The models demonstrated some evidence of multicollinearity as a result of the simultaneous entry of global self-esteem and the physical self-concept variables. As a result of these findings, the physical self-perceptions were included as main predictors of physical activity behaviour. Health self-perceptions were deemed redundant, and were therefore not used in subsequent main analyses.

3.4.1.2. Correlations. There were several significant correlations among the physical self-perceptions, competence, values, and physical activity (see Table 3.5 for the total sample, boys, and girls, respectively). Several differences in the strength and significance of correlation coefficients were noted between boys and girls.

Table 3.5

Pearson Correlation Coefficients for Physical Self-Perceptions and Physical Activity.

Variables[1]	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
Total Sample (N=528)															
1. Health	-														
2. Body Fat	.19*	-													
3. Appearance	.13*	.45*	-												
4. Strength	.24*	.13*	.45*	-											
5. Endurance	.26*	.38*	.33*	.60*	-										
6. PSW	.30*	.58*	.64*	.52*	.49*	-									
7. GSW	.30*	.33*	.51*	.46*	.37*	.57*	-								
8. Competence	.26*	.28*	.32*	.51*	.60*	.44*	.37*	-							
9. Interest	.26*	.25*	.26*	.50*	.59*	.39*	.33*	.60*	-						
10. Attainment	.22*	.22*	.26*	.54*	.59*	.38*	.33*	.61*	.74*	-					
11. Utility	.15*	.17*	.25*	.41*	.50*	.33*	.29*	.51*	.69*	.74*	-				

12. Cost	-.06	-.08	-.06	-.02	.01	-.11*	-.06	-.02	-.04	-.01	-.01	-			
13. LTEQ1	.12*	.08	.05	.19*	.26*	.10*	.10*	.27*	.23*	.29*	.19*	.01	-		
14. TLTEQ1	.12*	.11*	.10*	.28*	.37*	.14*	.16*	.38*	.32*	.42*	.31*	.02	.83*	-	
15. LTEQ2	.16*	.19*	.16*	.40*	.53*	.24*	.22*	.56*	.49*	.55*	.43*	.05	.38*	.52*	-
16. BMI	.02	-.50*	-.14*	.29	-.02	-.14*	-.01	.05	.28	.05	.03	.01	.04	.06	.05
							Boys (*n*=206)								
1. Health	-														
2. Body Fat	.06	-													
3. Appearance	.11*	.33*	-												
4. Strength	.29*	.07	.51*	-											
5. Endurance	.27*	.35*	.30*	.49*	-										
6. PSW	.29*	.42*	.60*	.56*	.47*	-									
7. GSW	.37*	.30*	.44*	.50*	.37*	.60*	-								
8. Competence	.30*	.24*	.30*	.56*	.55*	.47*	.34*	-							
9. Interest	.28*	.24*	.32*	.47*	.57*	.41*	.27*	.62*	-						

10. Attainment	.23*	.19*	.31*	.54*	.55*	.44*	.35*	.58*	.73*	-					
11. Utility	.20*	.17*	.29*	.41*	.49*	.38*	.28*	.44*	.65*	.72*	-				
12. Cost	-.07	-.06	-.02	.03	.06	-.06	.06	.03	-.05	.04	.03	-			
13. LTEQ1	.09	-.02	.06	.11	.20*	.04	.11	.16*	.24*	.23*	.17*	-.01	-		
14. TLTEQ1	.12	.01	.08	.17*	.31*	.09	.13	.24*	.36*	.37*	.27*	.01	.84*	-	
15. LTEQ2	.20*	.17*	.15*	.34*	.51*	.22*	.20*	.48*	.52*	.50*	.38*	.09	.34*	.49*	-
16. BMI	.17*	-.57*	-.03	.34*	-.07	-.01	.04	.02	.06	.09	.05	.01	.01	.06	.04
						Girls (*n*=322)									
1. Health	-														
2. Body Fat	.19*	-													
3. Appearance	.13*	.51*	-												
4. Strength	.20*	.07	.39*	-											
5. Endurance	.21*	.28*	.34*	.63*	-										
6. PSW	.27*	.63*	.63*	.43*	.45*	-									
7. GSW	.27*	.35*	.56*	.43*	.37*	.55*	-								

8. Competence	.22*	.20*	.33*	.45*	.59*	.38*	.39*	-							
9. Interest	.22*	.18*	.22*	.48*	.56*	.34*	.35*	.55*	-						
10. Attainment	.18*	.15*	.23*	.52*	.59*	.30*	.31*	.59*	.73*	-					
11. Utility	.12*	.13*	.23*	.39*	.49*	.27*	.30*	.54*	.70*	.75*	-				
12. Cost	-.07	-.10	-.10	-.05	-.05	-.15*	-.14*	-.06	-.04	-.04	-.03	-			
13. LTEQ1	.12*	.06	.02	.21*	.23*	.09	.08	.30*	.17*	.31*	.19*	.01	-		
14. TLTEQ1	.09	.08	.10	.31*	.35*	.12*	.17*	.43*	.26*	.43*	.31*	.02	.82*	-	
15. LTEQ2	.11*	.10	.15*	.39*	.49*	.20*	.21*	.57*	.43*	.55*	.43*	.03	.39*	.52*	-
16. BMI	-.08	-.58*	-.22*	.23*	-.05	-.27*	-.06	.03	-.03	-.04	-.02	.03	.04	.03	.03

[1] 1-5=Physical self-perceptions; 6=Physical Self-Worth (PSW); 7=Global Self-Esteem (GSE); 8=physical activity competence; 9-12 = Subjective Values; 13= Physical Activity Frequency in METS (LTEQ1); 14=Transformed Physical Activity Frequency in METS (TLTEQ1); 15=Frequency of moderate-vigorous activity (LTEQ2); 16= BMI = body mass index.

3.4.2. Main Analyses

The main analyses examining the expectancy-value model included the use of structural equation modeling procedures to explore relationships among variables and prediction of physical activity. Tests of direct and indirect effects were also conducted.

3.4.2.1. Structural Equation Modeling. Structural equation modeling analyses using maximum likelihood estimation were conducted to examine the main hypotheses in the study. Prior to testing the main hypotheses in the study, preliminary confirmatory factor analyses using maximum likelihood estimation were conducted to support the conceptualized independent factors of the physical self and competence. These analyses were deemed necessary following comments from Dr. J. Eccles suggesting that subscales from the Physical Self-Description Questionnaire (PSDQ; Marsh et al., 1994) may be redundant in analyses with the inclusion of perceived competence for physical activity. To examine the factorial structure of the items from the endurance and strength subscales of the PSDQ and the perceived competence items, three-factor and one-factor hypothesized models were examined. For adolescent boys, the best fit to the data was a three-factor solution, with the items from endurance loading on one factor, the items for strength loading on a separate factor, and competence perception items loading on a third factor (RMSEA=.08, CFI=.95, GFI=.87, SRMR=.06). The factors were moderately correlated (r_s=.48-.52). When a single factor solution was attempted, the model was not a good fit and the factor loadings clearly showed three factors (RMSEA=.32, CFI=.58, GFI=.42). For adolescents girls, the three-factor model was superior (RMSEA=.06, CFI=.97, GFI=.92, SRMR=.04). The factors were moderately correlated (r_s=.41-.52).

Based on these results, endurance, strength, and competence perceptions are independent but related factors. It is therefore conceptually and statistically reasonable to include the endurance and strength self-perceptions and competence as independent factors in the models.

To examine the main research questions, the hypothesized model is depicted in Figure 3.2. In the hypothesized model, the physical self was identified as a latent variable with body fat, appearance, strength, and endurance self-perception manifest variables as indicators. Health self-perceptions were excluded from the structural equation modeling analyses due to the observed weak relationships with other constructs. Competence was identified as a latent variable with four indicators, subjective value was a latent variable with interest, attainment, and utility value manifest variables as indicators, and physical activity was represented as a latent variable with the two items from the Leisure Time Exercise Questionnaire (TLTEQ1 and LTEQ2) as indicators.

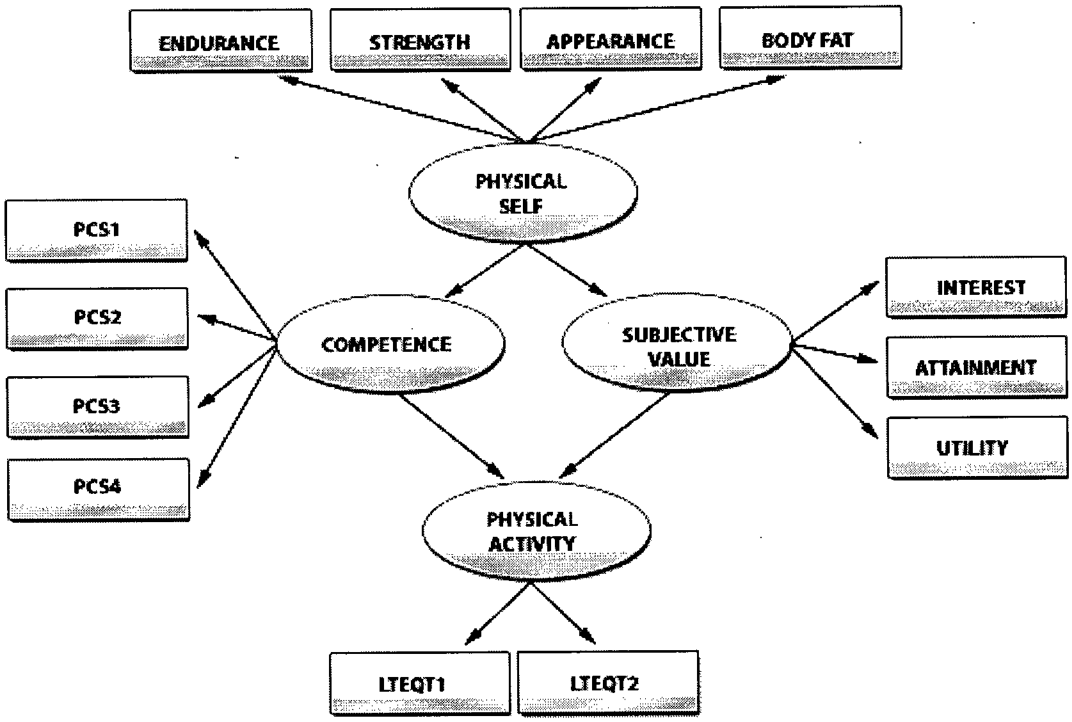

Figure 3.2. Hypothesized model depicting the measurement and structural relationships between the Physical Self, Competence, Subjective Value, and Physical Activity.

Measurement model. The measurement model for the total sample, boys, and girls was first assessed to examine the relationships between the indicators and the factors. For the measurement model analyses, items and subscales were uniquely loaded on the appropriate factors, with the variance of each latent factor fixed to 1.0 for identification, the factors were free to correlate, and item and subscale errors were not allowed to correlate. The measurement equations revealed that all indicators loaded significantly on their respective latent factor, with body fat and appearance showing weak relationships to physical self (see Figure 3.3). In the models for the total sample, boys, and girls, 85% of the factor loadings were above .6 (with minimum loadings of .29-.39

for body fat to physical self). The overall fit of the model was adequate for the total sample, RMSEA=.08, CFI=.95, IFI=.95, NNFI=.94, SRMR=.04, boys, RMSEA=.09, CFI=.93, IFI=.93, NNFI=.91, SRMR=.05, and girls, RMSEA=.08, CFI=.94, IFI=.94, NNFI=.93, SRMR=.05. Competence, value, and physical self were strongly related, with correlation coefficients ranging from .67 to .80 for boys and .68-.73 for girls. The latent factors were also moderate-highly correlated with the physical activity latent factor for boys (r=.53-.66) and girls (r=.63-.70). The distribution of the 78 standardized residuals indicated some misspecification of fitted correlations in the measurement model for the total sample (60.6% $z < |.1|$, 26.5% $z > |.2|$) , boys (44.5% $z < |.1|$, 43.6% $z > |.2|$) and girls (57.4% $z < |.1|$, 32.8% $z > |.2|$). The source of misspecification was apparent when the standardized residuals were examined. Body fat and appearance emerged as weak indicators of the physical self latent variable and contributed to the largest observed residuals. Since the purpose of this study was to examine the relationships proposed by the expectancy-value theory, and not necessarily to identify the best fitting model, no further model modifications were made.

Gender Invariance. The results of the sequential model tests are presented in Table 3.6. In the baseline model, all factor loadings were significant and the fit of the configural invariance model was satisfactory. The hypothesis of full metric invariance was tested by constraining the matrix of factor loadings to be invariant across the sexes. From Table 3.6, it can be seen that there was not a significant increase in chi-square between the model of configural invariance and the model of full metric invariance ($\Delta\chi^2(9)=5.54, p>.05$), thus supporting the minimum requirement for invariance. The simultaneous group analysis demonstrated that the chi-square difference test was not significant between the models of full metric invariance, factor variance invariance, and factor covariance invariance, showing evidence of strong invariance. Therefore, the measurement models and relationships among the latent variables were similar for male and female adolescents.

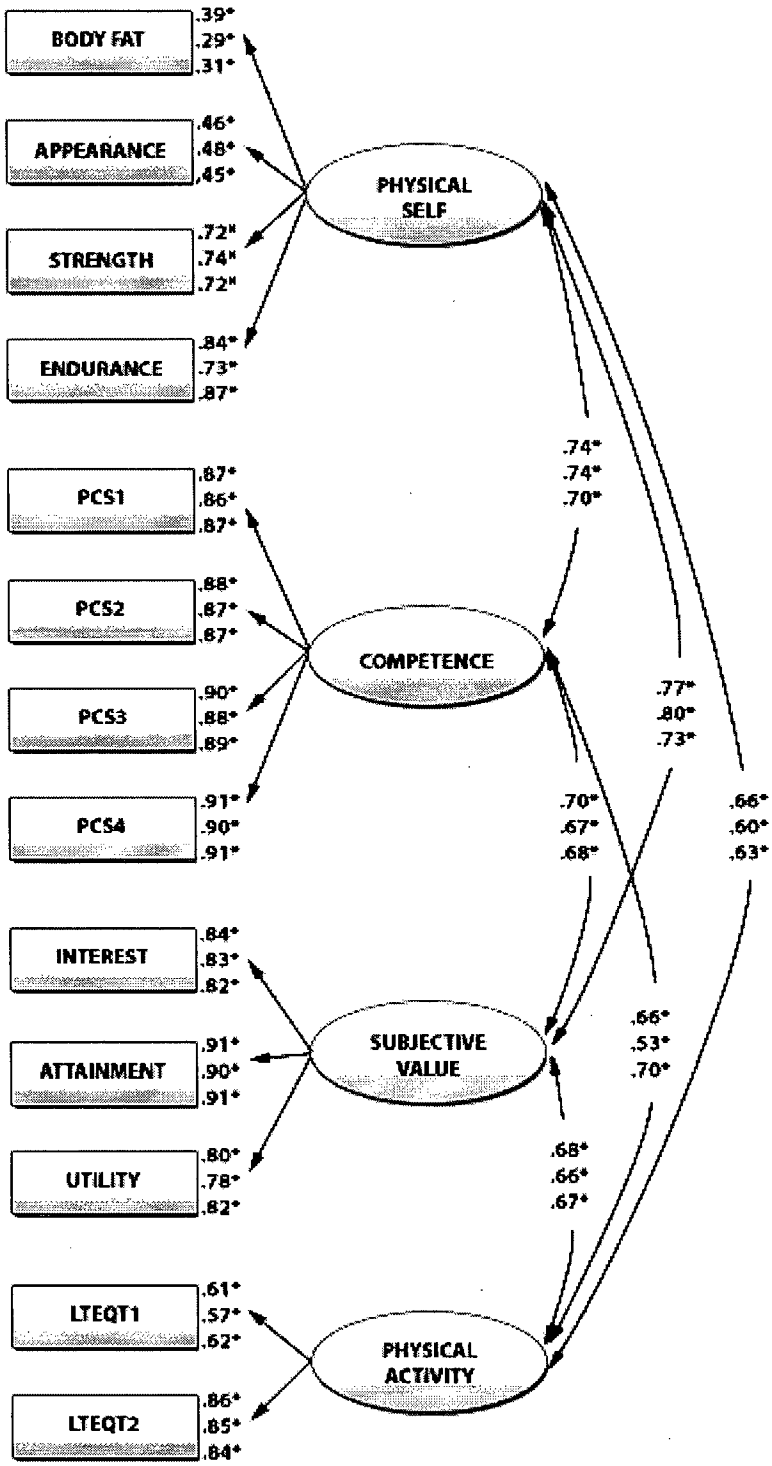

Figure 3.3. Factor loadings and correlation coefficients from the measurement model for the total sample (top), boys (middle), and girls (bottom). All relations are statistically significant.

Table 3.6.

Goodness of Fit Statistics for Measurement Analysis and Gender Invariance of Physical Activity Behaviour for Boys and Girls.

	χ^2	Df	$\Delta\chi^2$	p	RMSEA	CFI	IFI	NNFI	SRMR
Boys (M1)	152.45	59	-	-	.09	.93	.93	.91	.05
Girls (M2)	179.61	59	-	-	.08	.94	.94	.93	.05
M3	333.07	119	-	-	.08	.94	.94	.91	.05
M4	338.61	128	5.54	n.s.	.08	.94	.94	.92	.07
M5	340.59	131	1.98	n.s.	.08	.94	.94	.92	.07
M6	348.10	137	7.51	n.s.	.08	.94	.94	.93	.07
M7	410.71	150	62.61	$P<.01$	.08	.93	.93	.93	.08

Note: χ^2=chi-square; df=degrees of freedom; $\Delta\chi^2$=chi-square difference; RMSEA=root mean square error of approximation; CFI=confirmatory fit index; IFI=incremental fit index; NNFI=non-normed fit index; SRMR=standardized root mean residual; M1=Original model analyzed for boys (*n*=206); M2=Original model analyzed for girls (*n*=322); M3=Configural invariance (*N*=528); M4=Metric invariance; M5=M4 with factor variance invariance; M6=M5 with factor covariance invariance; M7=M6 with error variance invariance.

Path Model. The pathways and relationships between the latent factors in the structural model are presented in Figure 3.4. A critical value of $t \geq 1.96$ was used to determine statistical significance. The relationships among the physical self, competence, and value were examined first. Based on the path coefficients and prediction equations, it was evident that the physical self is a strong predictor of competence and subjective value. For the total sample, the physical self predicted 56% variance in competence and 60% variance in value. Similar results were noted for boys, with 55% of the variance in competence and 65% variance in value predicted by the physical self. For girls, the physical self accounted for 49% of the variance in competence and 54% of the variance in value.

The relationships among competence, value, and physical activity were examined next. Subjective value and competence were strongly predictive of physical activity for girls, supporting the expectancy-value model. Subjective value was a strong predictor of physical activity for boys, showing partial support for the expectancy-value model. However, strong relationships between competence and value were noted in the models, highlighting the possibility of multicollinearity in the data.

For boys, the moderate-high correlation (r=.67) between subjective value and competence could influence the non-significant finding of the path between competence and physical activity. The standard errors for the paths in the model were not excessively large (i.e., SE=.10 and .13 for competence-activity and value-activity, respectively), showing evidence of accuracy in the model estimation. Upon recommendations, an alternative model was examined in which the paths between competence and activity and subjective value and activity were constrained to be equal (Marsh, Dowson, Pietsch, &

Walker, 2004). The competence and subjective value factors were scaled to have a variance of 1.0 to allow the effects to be in relation to a common metric. By imposing this constraint, it was possible to compare the models and examine whether the findings noted above were accurate. If the two paths *were* different, the original model would fit the data significantly better than the constrained model. According to Marsh and colleagues (2004), the constrained model fit cannot be any better that the original model to demonstrate that value and competence differ in their contribution to the prediction of physical activity. The original model fit ($\chi^2(60, n=206)=152.45, p<.01$, RMSEA=.087, NNFI=.90, CFI=.93, IFI=.93, SRMR=.06, $R^2=.45$) was compared to the constrained model fit ($\chi^2(61, n=206)=161.23, p<.01$, RMSEA=.090, NNFI=.89, CFI=.93, IFI=.93, SRMR=.07, $R^2=.52$). The difference in chi-squares ($\Delta\chi^2=8.78$) for the two models was statistically significant ($p<.01$) in relation to the difference in degrees of freedom ($\Delta df=1$), and the model fit indices indicated that the constrained model fit the data slightly more poorly that the original model. The relationship between competence and value was the same in both models, and the standard errors for the path coefficients between competence and activity and value and activity were reduced in the constrained model (SE's=.052). Therefore, it can be concluded that value is a better predictor of physical activity than competence for boys.

Since the paths were similar between competence, value, and physical activity in the model for girls, testing alternative models was not informative.

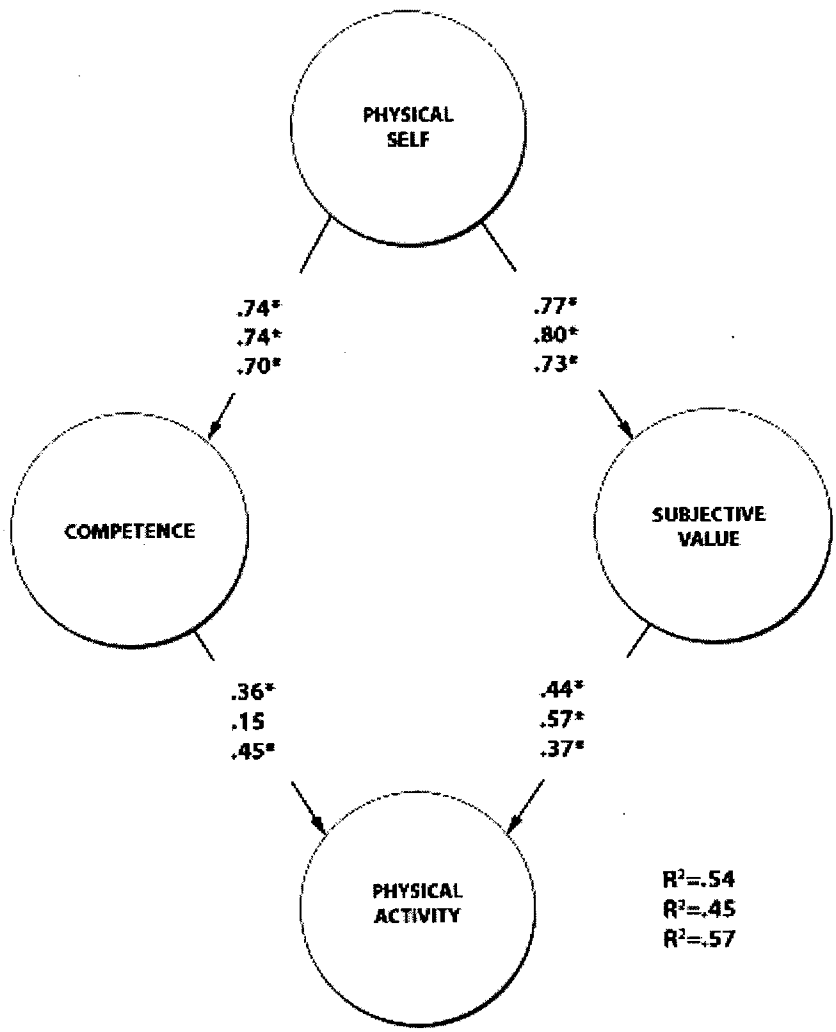

Figure 3.4. Structural equation modeling prediction of physical activity by physical self, competence, and subjective value constructs. Pathway coefficients are standardized estimates of the data for total sample (top), boys (middle), and girls (bottom). All pathways with asterisks are significant ($p < .01$) in the analyses.

Testing mediation. The expectancy-value model proposes that competence and value act as mediators in the relationship between the physical self and health behaviour. Results above demonstrated partial support for this hypothesis. To determine whether the mediation relationships represented the best way of fitting the data to the model, direct effects models were also examined to attend to the assumptions for mediation. Looking at the relationships among the latent variables (refer to Figure 3.3) and significant path coefficients revealed that the latent factors were strongly related and the initial condition for mediation was supported.

A first alternate model was examined in which the direct effects of competence and subjective value on activity were fixed to zero, leaving only the direct effect of the physical self on physical activity (see Figure 3.5). In this model, the physical self exerted significant direct effects on physical activity, and the model was significantly different than the baseline mediation model for boys ($\Delta\chi^2(1)$=-6.22, p<.05) and girls ($\Delta\chi^2(1)$=-35.83, p<.01). The direct effects of physical self on physical activity proved a worse fit to the data than the effects mediated through competence and value.

The second model examined the simultaneous direct effects of physical self, competence, and subjective value on physical activity (see Figure 3.6). The direct effects of the physical self on physical activity were not significant when the effects of competence and value were included in the model. The model was not significantly different than the baseline mediation model for boys ($\Delta\chi^2(1)$=.13, p>.05) and girls ($\Delta\chi^2(1)$=1.37, p>.05). Therefore, the conditions for mediation were supported for girls, with partial mediation evident for boys. The model fit statistics are presented in Table 4.7 for the direct and mediation models.

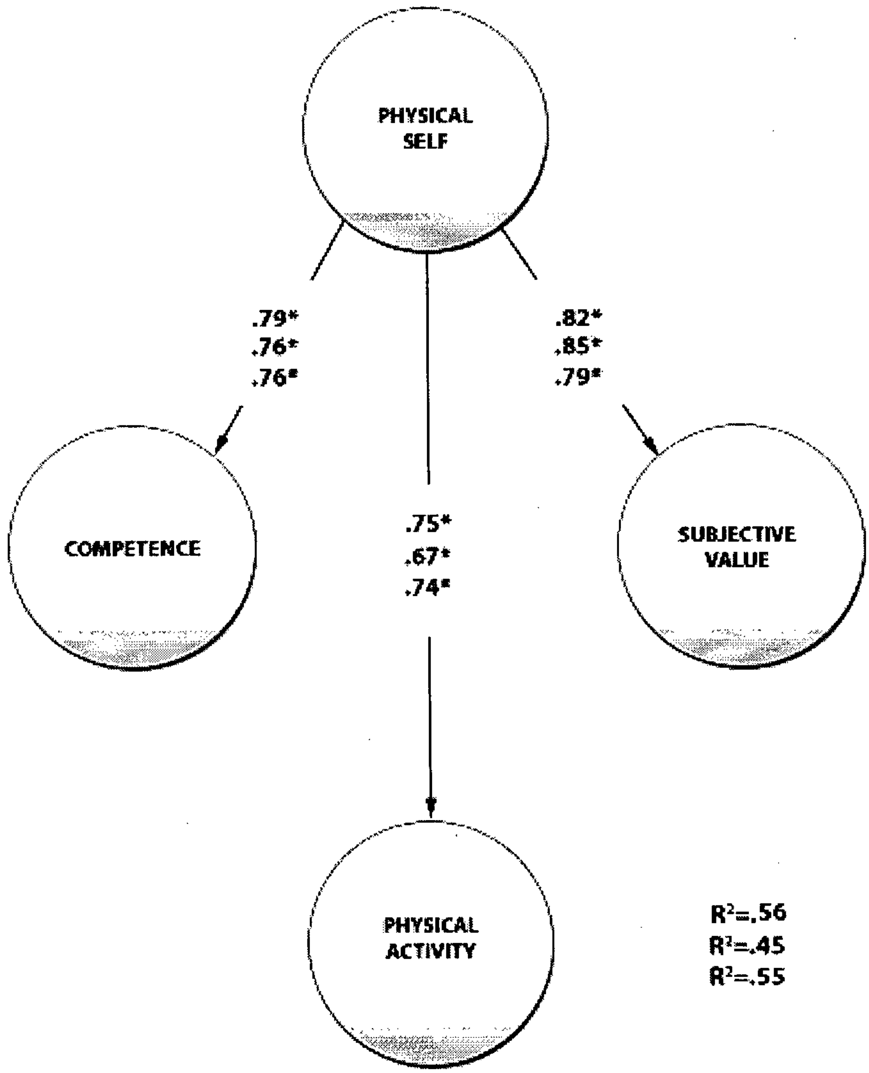

Figure 3.5. Direct effects model of the physical self on physical activity. Path coefficients are standardized parameter estimates for the total sample (top), boys (middle), and girls (bottom). All pathways with an asterisk are significant ($p < .01$).

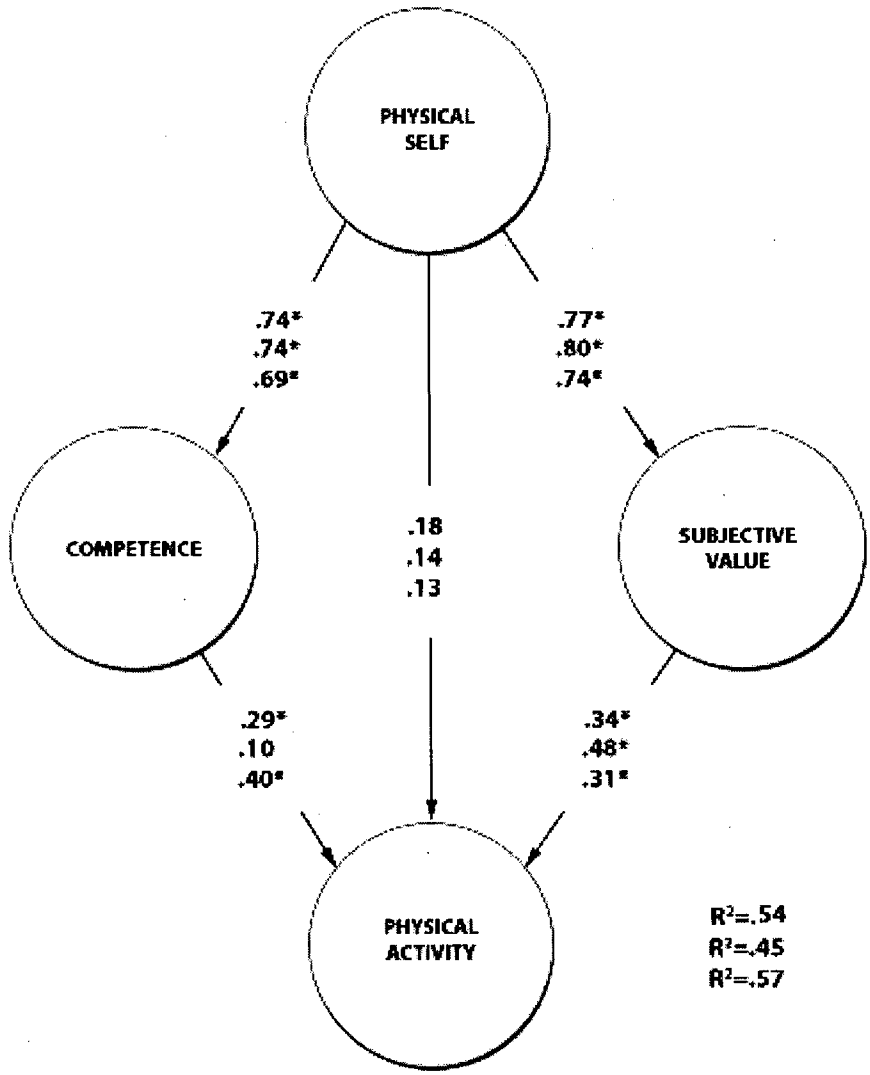

Figure 3.6. Direct effects of physical self, competence, and subjective value on physical activity. Path coefficients are standardized parameter estimates for the total sample (top), boys (middle), and girls (bottom). All pathways with an asterisk are significant ($p < .01$).

Table 3.7.

Goodness of Fit Statistics for Direct Effects and Mediation Models for Physical Activity.

	χ^2	Df	$\Delta\chi^2$	P	RMSEA	CFI	IFI	NNFI	SRMR	R^2
					Total Sample (N=540)					
Direct 1	281.12	61	-33.18	<.01	.083	.94	.94	.93	.052	.56
Mediation	247.94	60	-	-	.077	.95	.95	.93	.046	.54
Direct 2	245.21	59	2.73	n.s.	.77	.95	.95	.93	.046	.54
					Boys (n=206)					
Direct 1	158.67	61	-6.22	<.05	.088	.93	.93	.90	.061	.45
Mediation	152.45	60	-	-	.087	.93	.93	.90	.058	.46
Direct 2	152.32	59	.13	n.s.	.088	.93	.93	.90	.058	.45
					Girls (n=322)					
Direct 1	216.81	61	-35.83	<.01	.089	.93	.93	.91	.058	.55
Mediation	180.98	60	-	-	.079	.94	.94	.93	.052	.57
Direct 2	179.61	59	1.37	n.s.	.080	.94	.94	.92	.052	.57

Note: χ^2=chi-square; df=degrees of freedom; $\Delta\chi^2$=chi-square difference; RMSEA=root mean square error of approximation; CFI=confirmatory fit index; IFI=incremental fit index; NNFI=non-normed fit index; SRMR=standardized root mean residual; Direct 1= direct effect of physical self on physical activity; Mediation=direct effects of competence and subjective value; Direct 2= simultaneous direct effects of physical self, competence, and subjective value on physical activity

To examine the strength of direct and indirect effects in the models, products of coefficients were calculated. For boys, the indirect paths between physical self→competence (standardized parameter estimate (SPE)=.74, p <.01) and competence→physical activity (SPE=.10, p >.05) were multiplied, as were the paths between physical self→subjective value (SPE=.80, p <.01) and subjective value→physical activity (SPE=.48, p <.01) to determine indirect effects (SPE indirect effect (competence)=.07; indirect effect (value)=.38). These indirect effects were compared to the direct effect of physical self→physical activity (SPE=.14, p >.05) and total effects (SPE=.60, p <.01). The indirect effect via subjective value accounted for 63.3% of the total effect, with the direct effect accounting for 23.3%, and the indirect effect via competence accounting for 11.7% of the total effect.

For adolescent girls, the indirect paths between physical self→competence (SPE=.70, p <.01) and competence→physical activity (SPE=.40, p <.01) were multiplied, as were the paths between physical self→subjective value (SPE=.73, p <.01) and subjective value→physical activity (SPE=.31, p <.01) to determine indirect effects (SPE indirect effect (competence)=.28; indirect effect (value)=.23). These indirect effects were compared to the direct effect of physical self→physical activity (SPE=.13, p >.05) and total effects (SPE=.63, p <.01). The indirect effect via subjective value accounted for 35.9% of the total effect, with the indirect effect via competence accounting for 44.4%, and the direct effect of physical self on physical activity accounting for 20.6% of the total effect.

These results further support the findings of partial mediation for boys, with the indirect effects accounting for 75% of the total effect. For girls, the indirect effects are both larger than the direct effect, and account for close to 80% of the total effects, thus supporting mediation.

3.4.3. Summary of Key Findings for Physical Activity Behaviour

Mean-level gender differences revealed that boys reported higher perceptions of physical activity competence and values, greater physical activity, and significantly more positive health, body fat, strength, and endurance physical self-perceptions and physical self-worth compared to girls. Correlations among manifest variables and covariances among latent factors revealed strong relationships in anticipated directions, and show support for the tenets of the expectancy-value (EV) model. Using structural equation modeling techniques, the measurement and latent path models were adequate for boys and girls and show little evidence of differences in the models across sexes. Path analyses demonstrated that physical self-concept accounts for moderate variance in competence and value. For boys, subjective value was a significant independent predictor in the model, showing partial support for the EV model. For adolescent girls, both competence and value made independent contributions to the prediction of physical activity and these findings support the EV model.

3.5. Eating Behaviour

3.5.1. Preliminary Analyses

For means and standard deviations of the eating behaviour constructs, refer to Tables 3.1 through 3.3, for the total sample, boys, and girls.

3.5.1.1. Uniquenesses among physical self-perceptions, physical self-worth, and global self-esteem. To examine whether physical self-perceptions were stronger predictors of eating behaviours compared to physical self-worth and global self-esteem, hierarchical multiple linear regressions were conducted (see Appendix I). It was determined that the physical self-perceptions were strong predictors of eating behaviour, and global self-esteem also contributed significantly to understanding eating behaviour even when the self-perceptions are controlled. Despite this observation, moderate-high correlations among GSE and the other self-perceptions warranted excluding global self-esteem from further analyses. Health self-perceptions were weak predictors of eating behaviour, and were therefore not included in main analyses.

3.5.1.2. Correlations. Eating behaviour (AFHC scores) was significantly positively related to health, strength, and endurance self-perceptions and negatively to body fat perceptions. Moderate correlations were observed among competence, interest, attainment, and utility values, and eating behaviour, with the strongest relationship emerging between attainment value and eating behaviour. See Table 3.8 for the eating behaviour variables for the total sample, boys, and girls. There were negligible differences in the correlations for boys and girls.

Table 3.8.

Pearson Correlation Coefficients for Physical Self and Eating Behaviour.

Variables[1]	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Health	-												
2. Body Fat	.19*	-											
3. Appearance	.13*	.49*	-										
4. Strength	.25*	.14*	.45*	-									
5. Endurance	.26*	.38*	.37*	.60*	-								
6. PSW	.30*	.60*	.64*	.52*	.49*	-							
7. GSE	.30*	.33*	.58*	.46*	.38*	.58*	-						
8. Competence	.23*	.36*	.32*	.35*	.39*	.49*	.42*	-					
9. Interest	.11*	.05	.11*	.17*	.24*	.21*	.21*	.45*	-				
10. Attainment	.11*	-.07*	.07*	.20*	.26*	.10*	.20*	.36*	.61*	-			
11.Utility	.08*	-.02	.09*	.15*	.21*	.12*	.23*	.28*	.54*	.74*	-		
12. Cost	.20*	.11*	.14*	.14*	.11*	.17*	.17*	.17*	.11*	.04	.08	-	

13. AFHC	.12*	-.17*	.03	.16*	.15*	.04	.20*	.31*	.42*	.49*	.36*	.11*	-
14. BMI	.02	-.50*	-.14*	.29	-.02	-.14*	-.01	-.07	.02	.14*	.07	-.03	.23*
						Boys (*n*=211)							
1. Health	-												
2. Body Fat	.06	-											
3. Appearance	.13*	.40*	-										
4. Strength	.30*	.07	.54*	-									
5. Endurance	.28*	.38*	.38*	.49*	-								
6. PSW	.29*	.44*	.65*	.58*	.48*	-							
7. GSE	.37*	.30*	.54*	.50*	.37*	.62*	-						
8. Competence	.23*	.20*	.23*	.36*	.40*	.41*	.45*	-					
9. Interest	.14*	.01	.07	.17*	.31*	.22*	.21*	.46*	-				
10. Attainment	.11*	-.02	.10	.22*	.36*	.17*	.21*	.42*	.69*	-			
11.Utility	.12*	.04	.09	.23*	.35*	.19*	.23*	.41*	.60*	.77*	-		
12. Cost	.34*	.02	.03	.10	.09	.07	.10	.10	.05	-.03	-.03	-	

13. AFHC	.24	-.09	.06	.24*	.24*	.16*	.29*	.46*	.45*	.52*	.42*	.12	-
14. BMI	.17*	-.57*	-.03	.34*	-.07	-.01	.04	-.00	.12	.18*	.18*	-.03	.25*
Girls (*n*=329)													
1. Health	-												
2. Body Fat	.19*	-											
3. Appearance	.12*	.55*	-										
4. Strength	.20*	.07	.38*	-									
5. Endurance	.21*	.28*	.36*	.64*	-								
6. PSW	.27*	.64*	.64*	.45*	.45*	-							
7. GSE	.27*	.35*	.61*	.43*	.38*	.56*	-						
8. Competence	.21*	.38*	.37*	.30*	.33*	.41*	.41*	-					
9. Interest	.12*	.14*	.16*	.22*	.27*	.22*	.23*	.50*	-				
10. Attainment	.14*	-.04	.05	.24*	.29*	.11*	.22*	.38*	.53*	-			
11.Utility	.11*	.06	.12*	.17*	.23*	.15*	.26*	.26*	.47*	.70*	-		
12. Cost	.14*	.19*	.22*	.19*	.15*	.25*	.23*	.17*	.24*	.16*	.15*	-	

13. AFHC	.12*	-.13*	.03	.19*	.21*	.04	.17*	.30	.30*	.39*	.29*	.09	-
14. BMI	-.08	-.58*	-.22*	.23*	-.05	-.27*	-.06	.03	-.16*	.14*	.03	-.12*	.27*

[1] 1-5= Physical self-perceptions; 6=Physical self-worth; 7= Global self-esteem; 8=Healthy eating competence; 9-12= Healthy eating subjective values; 13=Adolescent Food Habits Checklist; 14=body mass index.

3.5.2. Main Analysis

The main analyses examining the expectancy-value model included the use of structural equation modeling procedures to explore relationships among variables and the prediction of healthy eating. Tests of direct and indirect effects were also conducted.

3.5.2.1. Structural Equation Modeling. Prior to the main structural equation modeling analysis examining eating behaviour, the items from the instrument were parceled. In this study, four item parcels were created from 22 items on the AFHC. The item parcels were composed of the following AFHC items: HDIP1=14, 15, 16, 17, 20; HDIP2= 10, 3, 18, 19, 22, 23; HDIP3=2, 5, 7, 11, 13; HDIP4=1, 4, 6, 8, 9, 12. Preliminary analyses revealed moderate correlations among the item parcels, r_s=.53-.61, and nonsignificant skewness and kurtosis values.

The hypothesized model for eating behaviour is depicted in Figure 3.7. In this model, the physical self is identified by body fat, appearance, strength, and endurance self-perception manifest variables as indicators. Health self-perceptions were excluded from the model due to weak relationships with other constructs. Competence is identified by four scale items, subjective value is a latent variable with interest, attainment, and utility value manifest variables as indicators, and eating behaviour is identified by the four item parcels.

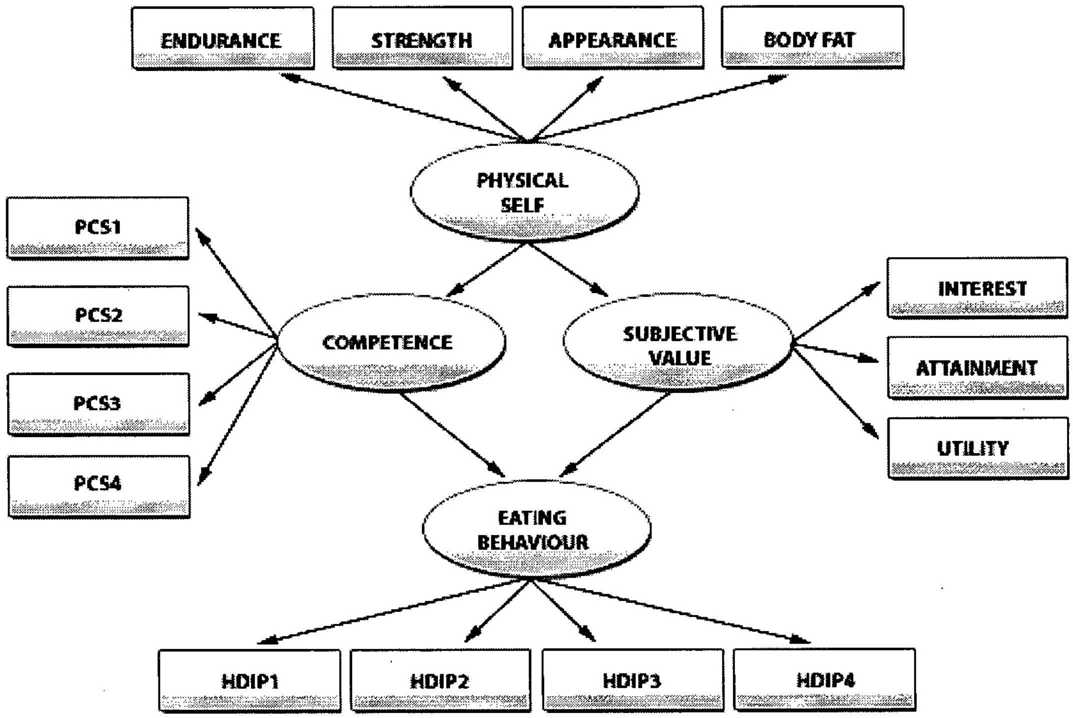

Figure 3.7. Hypothesized structural equation model for eating behaviour.

Measurement model. The measurement models were first assessed to examine the relationships between the indicators and the factors (see Figure 3.8). For the measurement model analyses, items and subscales were uniquely loaded on the appropriate factors, with the variance of each latent factor fixed to 1.0 for identification, the factors were free to correlate, and item and subscale errors were not allowed to correlate.

The measurement equations revealed that all indicators significantly loaded on their respective latent factor. In the model, 87% of the factor loadings were observed to be above .6 for the total sample, boys, and girls (minimum loadings of .35-.47 between body fat and physical self). These loadings were slightly different than those reported for the physical activity data due to differences in sample sizes. The overall fit of the model was adequate for the total sample (RMSEA=.09, CFI=.92, IFI=.92, NNFI=.90, SRMR=.07), and for boys (RMSEA=.07, CFI=.94, IFI=.94, NNFI=.92, SRMR=.07), but did not provide a good fit for girls (RMSEA=.10, CFI=.89, IFI=.90, NNFI=.87, SRMR=.08). The distribution of the 105 standardized residuals indicated some misspecification in the measurement model for boys (36% $z < |.1|$, 41% $z > |.2|$) and girls (36% $z < |.1|$, 45% $z > |.2|$). The source of misspecification was apparent when the standardized residuals and modification indices were examined. Body fat and appearance emerged as weak indicators of the physical self latent variable and contributed to the largest observed residuals. Since the purpose of this study was not to determine the best fitting model, but rather to examine the relationships among variables, no post hoc model modifications were performed.

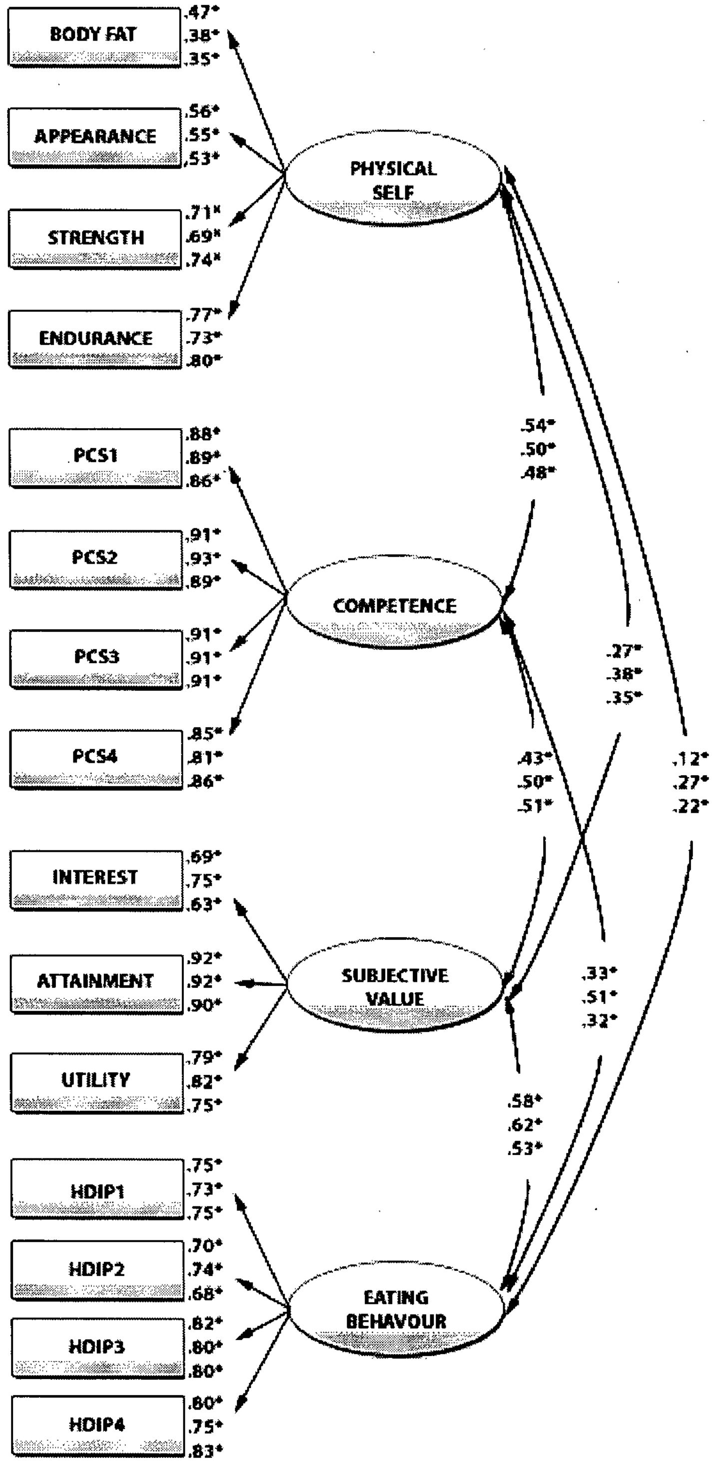

Figure 3.8. Standardized factor loadings and covariances for eating behaviour measurement model for the total sample (top), boys (middle), and girls (bottom). All paths are significant.

Gender Invariance. To examine possible gender differences in the measurement model properties, sequential tests of invariance were conducted. The results of the sequential model tests for eating behaviour are presented in Table 3.9. In the baseline model, all factor loadings were significant but the fit of the configural invariance model was not satisfactory. As a result, the remaining findings were interpreted with caution. The hypothesis of full metric invariance was tested by constraining the matrix of factor loadings to be invariant across the sexes. There was not a significant increase in chi-square between the model of configural invariance and the model of full metric invariance ($\Delta\chi^2(9)=10.56$, $p>.05$), thus supporting the minimum requirement for invariance. Setting equality constraints on the factor loadings also produced the best fitting model. Gender invariance was not supported when factor loadings, variances, and covariances were constrained to be equal. Therefore, the measurement models were similar, with differences emerging at the level of factor structures and latent factor scores.

Given the objectives of this study, factor variance, covariance, and error variance invariance are not required. However, further examinations of the models were conducted to determine where the variant features in the models were located. At the level of factor variances, subjective value was not equal for boys and girls and was relaxed for further model testing. The model fit indicated improvements over the full factor variance invariance model: $\chi^2(182)=557.38$; RMSEA=.088, CFI=.91, IFI=.91, NNFI=.90, SRMR=.090. At the level of factor covariance invariance, the covariances between competence-subjective value, subjective value-eating behaviour, and competence-eating behaviour were relaxed to satisfy invariance guidelines. The model fit indices were: $\chi^2(185)=561.44$; RMSEA=.088, CFI=.91, IFI=.91, NNFI=.90, SRMR=.092. With the variances and covariances mentioned above relaxed, error invariance was also re-examined. In the final model, body fat and endurance self-perception and one item on the competence scale errors were not invariant. Subsequently relaxing these residuals produced the best-fitting model for eating behaviour invariance: $\chi^2(197)=578.51$; RMSEA=.085, CFI=.91, IFI=.91, NNFI=.91, SRMR=.090.

Despite these statistical improvements in model fit and findings for gender invariance, the results are likely not of practical significance. With the baseline model fit for girls, coupled with the misspecification in the models, these results should be interpreted with caution.

Table 3.9.

Goodness of Fit Statistics for Measurement Analysis and Gender Invariance for Eating Behaviour.

	χ^2	df	$\Delta\chi^2$	*P*	RMSEA	CFI	IFI	NNFI	SRMR
Boys (M1)	176.72	84	-	-	.072	.94	.94	.90	.070
Girls (M2)	368.61	84	-	-	.102	.89	.90	.87	.087
M3	545.33	168	-	-	.091	.91	.91	.88	.087
M4	555.89	179	10.56	n.s.	.088	.91	.91	.88	.088
M5	590.54	183	35.65	<.01	.091	.91	.91	.87	.097
M6	597.83	189	7.29	n.s.	.090	.91	.91	.87	.098
M7	652.50	204	54.67	<.01	.090	.90	.90	.86	.100

Note: χ^2=chi-square; df=degrees of freedom; $\Delta\chi^2$=chi-square difference; RMSEA=root mean square error of approximation; CFI=confirmatory fit index; IFI=incremental fit index; NNFI=non-normed fit index; SRMR=standardized root mean residual; M1=Original model analyzed for boys (*n*=211); M2=Original model analyzed for girls (*n*=329); M3=Configural invariance (*N*=540); M4=Metric invariance; M5=M4 with factor variance invariance; M6=M5 with factor covariance invariance; M7=M6 with error variance invariance.

Path model. The structural model relationships among the physical self, competence, value, and eating behaviour latent variables were examined (see Figure 3.9), A t-value $\geq$ 1.96 was used as a critical value for significance. The relationships among the physical self, competence, and value were examined initially. Looking at the path coefficients and the predictive equations, it was apparent that the physical self was a moderate significant predictor of eating behaviour competence and subjective value. For the total sample, the physical self predicted 29% of the variance in competence and 7% of the variance in value. For boys and girls, similar results were observed. In the models, the physical self accounted for 23-25% of the variance in healthy eating competence and 12-14% of the variance in healthy eating value.

The main parameters and interrelations in the model among competence, value, and eating behaviour were also examined. Subjective value and competence were strongly predictive of eating behaviour in the model for boys (R^2=.43). Subjective value was a strong predictor of eating behaviour in the model for girls (R^2=.29). The moderate correlations among the latent variables were not deemed problematic for issues of multicollinearity, and the standard errors were low for the paths between competence, subjective value, and eating behaviour for boys or girls (SE's=.02-.05), therefore it was deemed appropriate to conclude that the findings were accurate.

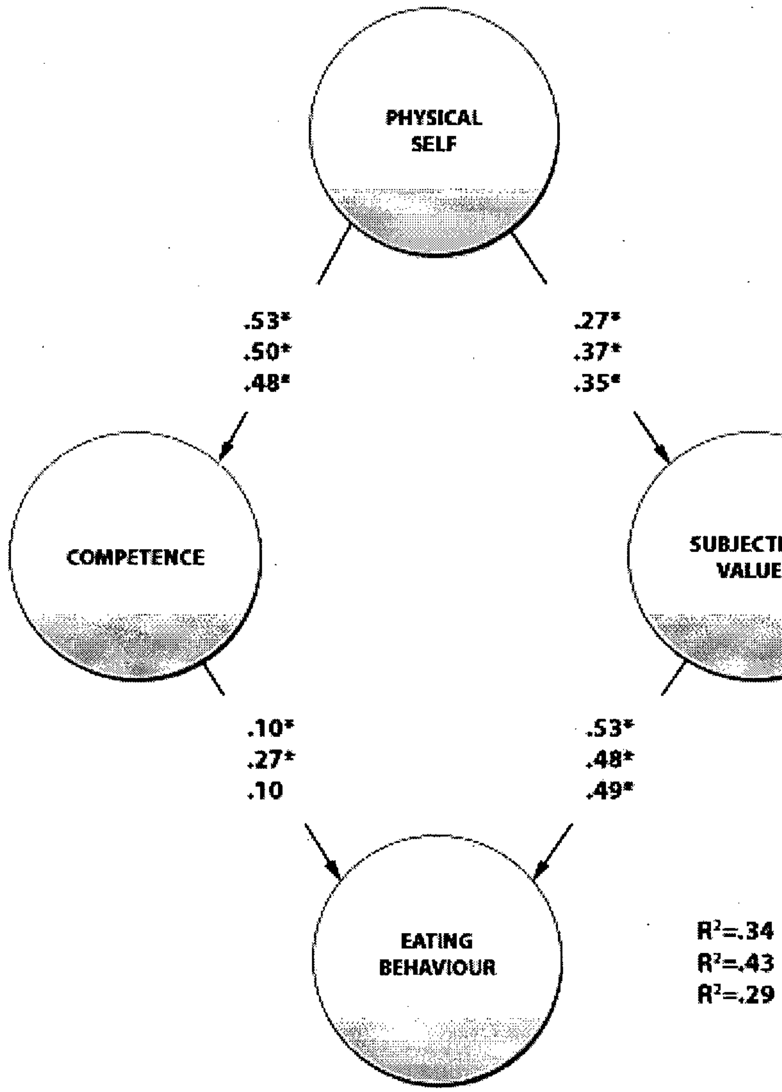

Figure 3.9. Structural equation modeling prediction of eating behaviour by physical self, competence, and subjective value constructs. Pathway coefficients are standardized estimates of the data for total sample (top), boys (middle), and girls (bottom). All pathways with asterisks are significant ($p < .05$) in the analyses.

Testing mediation. The expectancy-value model proposes that competence and value act as mediators in the relationship between the physical self and health behaviour. To examine whether the mediation relationships (as presented above) represented the best way of fitting the data to the model, direct effects models were also conducted. The model fit indices for the direct and mediation models were compared. First, an examination of the relationships among the latent variables (refer to Figure 3.8) and the standardized path coefficients (refer to Figure 3.9) revealed that the initial conditions for mediation were satisfied.

The first alternative model had the direct effects of competence and subjective value on eating behaviour fixed to zero, leaving the direct effect of the physical self on eating behaviour. In this model, the physical self exerted significant direct effects on eating behaviour for boys and girls (see Figure 3.10). This model significantly fit the data worse than the mediation model for boys ($\Delta\chi^2(1)$=-61.97, p<.01) and girls ($\Delta\chi^2(1)$=-53.22, p<.01).

The second alternate model examined the simultaneous direct effects of physical self, competence, and subjective value on eating behaviour. The direct effects of the physical self on eating behaviour were not significant in the model for boys and girls (see Figure 3.11). The chi-square difference between the mediation model and the simultaneous direct effects model was not significant for boys ($\Delta\chi^2(1)$=1.20, p>.05) and girls ($\Delta\chi^2(1)$=.10, p>.05). Refer to Table 3.10 for the model fit indices. These findings provided evidence that the mediation models were superior to the direct effects models.

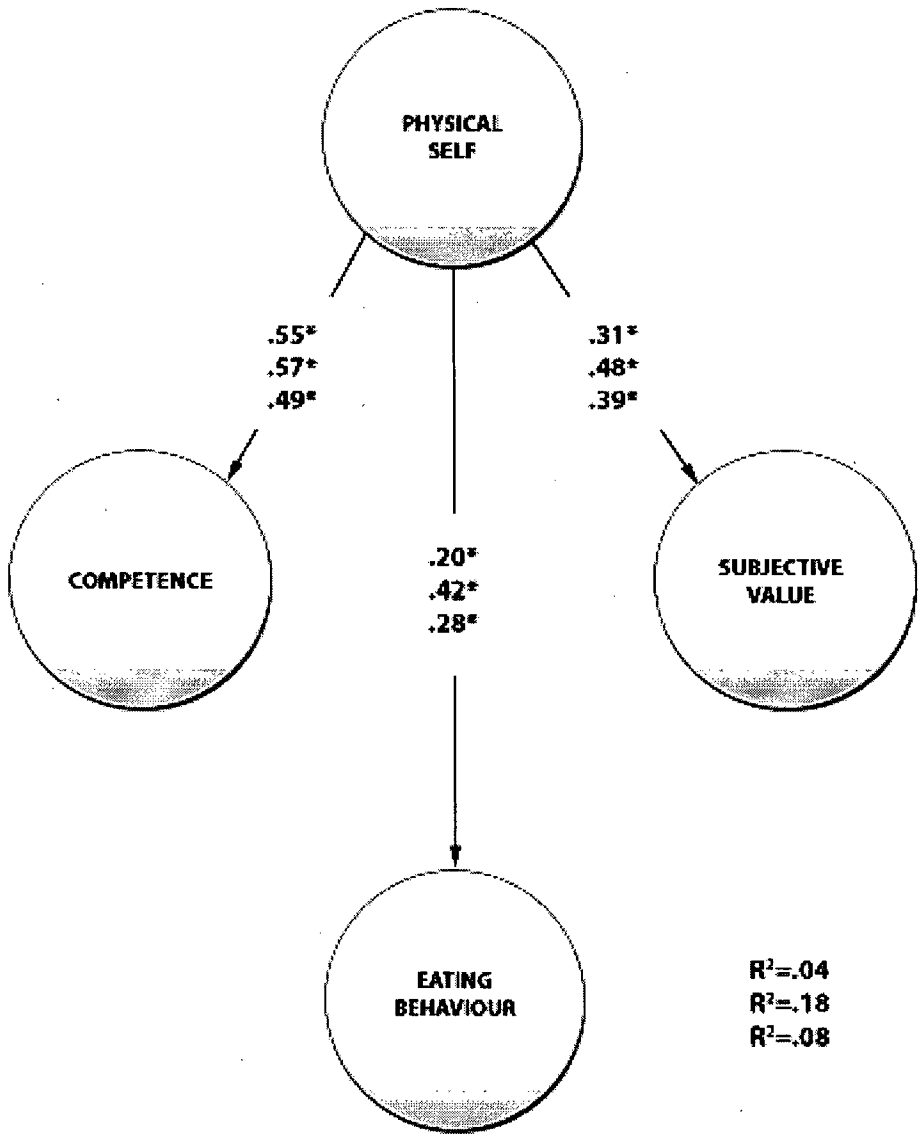

Figure 3.10. Direct effects of the physical self on eating behaviour. Coefficients are standardized parameter estimates for the total sample (top), boys (middle), and girls (bottom). All pathways with an asterisk are significant (p < .01).

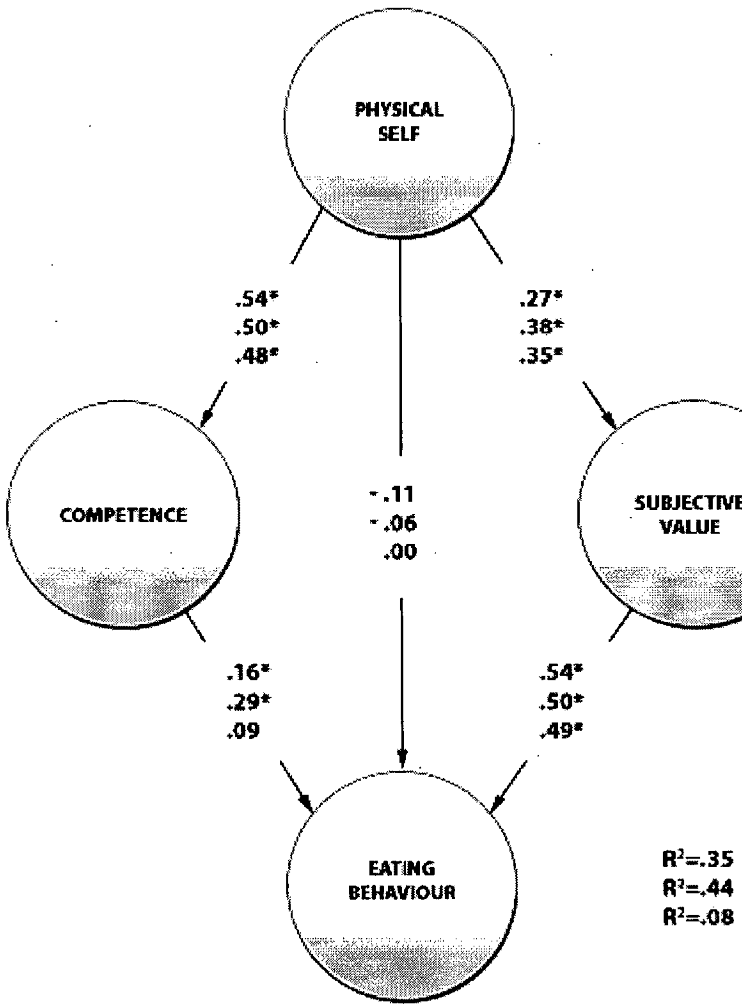

Figure 3.11. Simultaneous direct effects of the physical self, competence, and value on eating behaviour. Coefficients are standardized parameter estimates for the total sample (top), boys (middle), and girls (bottom). All pathways with an asterisk are significant.

Table 3.10

Goodness of Fit Statistics for Direct Effects and Mediation Models for Eating Behaviour.

	χ^2	*df*	$\Delta\chi^2$	*p*	RMSEA	CFI	IFI	NNFI	SRMR	R^2
					Total Sample (N=540)					
Direct 1	578.80	86	-137.88	<.01	.103	.89	.89	.86	.140	.04
Mediation	440.92	85	-	-	.088	.92	.92	.90	.075	.34
Direct 2	439.87	84	1.05	n.s.	.089	.92	.92	.90	.073	.35
					Boys (n=211)					
Direct 1	239.89	86	-61.97	<.01	.092	.90	.90	.86	.130	.18
Mediation	177.92	85	-	-	.072	.94	.94	.90	.070	.43
Direct 2	176.72	84	1.20	n.s.	.072	.94	.94	.90	.070	.44
					Girls (n=329)					
Direct 1	421.93	86	-53.22	<.01	.110	.87	.87	.85	.130	.08
Mediation	368.71	85	-	-	.101	.90	.90	.87	.087	.29
Direct 2	368.61	84	.10	n.s.	.102	.89	.90	.87	.087	.29

Note: χ^2=chi-square; df=degrees of freedom; $\Delta\chi^2$=chi-square difference; RMSEA=root mean square error of approximation; CFI=confirmatory fit index; IFI=incremental fit index; NNFI=non-normed fit index; SRMR=standardized root mean residual; Direct 1= direct effect of physical self on eating behaviour; Direct 2= simultaneous direct effects of physical self, competence, and subjective value on eating behaviour; Mediation=direct effects of competence and subjective value.

To examine the strength of direct and indirect effects in the models, products of coefficients were calculated. For boys, the indirect paths between physical self→competence (standardized parameter estimate (SPE)=.50, p <.01) and competence→eating behaviour (SPE=.29, p <.01) were multiplied, as were the paths between physical self→subjective value (SPE=.38, p <.01) and subjective value→eating behaviour (SPE=.50, p <.01) to determine indirect effects (SPE indirect effect (competence)=.15; indirect effect (value)=.19). These indirect effects were compared to the direct effect of physical self→eating behaviour (SPE= -.06, p >.05) and total effects (SPE=.28, p <.01). The indirect effect via subjective value accounted for 68.0% of the total effect, with the direct effect accounting for 21.0% removed from the total effects, and the indirect effect via competence accounting for 54.0% of the total effect. According to Shrout and Bolger (2002), negative direct effects that are observed in these types of models tend to be spurious suppression effects. As a result, the authors recommend that these spurious effects be set with a upper bound of 100% and suggest therefore that complete mediation is tenable.

For girls, the indirect paths between physical self→competence (SPE=.48, p <.01) and competence→eating behaviour (SPE=.09, p >.05) were multiplied, as were the paths between physical self→subjective value (SPE=.35, p <.01) and subjective value→eating behaviour (SPE=.49, p <.01) to determine indirect effects (SPE indirect effect (competence)=.04; indirect effect (value)=.17). These indirect effects were compared to the direct effect of physical self→eating behaviour (SPE=.00, p >.05) and total effects (SPE=.21, p <.01). The indirect effect via subjective value accounted for 81.0% of the total effect, with the indirect effect via competence accounting for 19.0%, and the direct effect of physical self on eating behaviour accounting for none of the total effect.

These results further support the findings of full mediation for boys and girls, with the indirect effects accounting for 100% of the total effects.

3.5.3. Summary of Findings for Eating Behaviour

Adolescent girls reported significant higher interest, attainment, and utility value, and healthier eating habits compared to boys, who reported higher perceptions of competence. Correlations among manifest variables and covariances among latent factors revealed moderate relationships in anticipated direction and strength to support the tenets of the expectancy-value (EV) model. There was some evidence of sex differences in the pattern of relationships. Measurement analyses indicated an adequate fitting model for boys, with misspecification and less than ideal fit indices in the model for girls. Sequential tests of equality constraints across sexes indicated that the minimum level of invariance was tenable, but there were differences in the factor structure and homogeneity of factor scores for boys and girls. Latent path modeling revealed that the physical self accounted for weak to moderate variance in competence and value, and the effects on eating behaviour were completely mediated in the models for boys and girls. Both competence and value were significant predictors of eating behaviour in the model for adolescent boys, with value emerging as a significant predictor in the eating behaviour model for girls. Therefore, the tenets of the EV model were supported in the models, with the effects of physical self-concept being mediated by competence and value. However, competence was not a significant mediator in the model for girls.

3.6. Non-Smoking Behaviour

3.6.1. Preliminary Analyses

For means and standard deviations on the non-smoking variables, see Table 3.1 (total sample), Table 3.2 (boys), and Table 3.3 (girls).

3.6.1.1. Uniquenesses among physical self-perceptions, physical self-worth, and global self-esteem in predicting non-smoking behaviour. Preliminary logistic regression analyses were performed to examine the independent effects of physical self-perceptions, physical self-worth, and global self-esteem on non-smoking behaviour. The results of the sequential logistic regressions are presented in Appendix J. To summarize, the findings suggested that the physical self-perceptions were significant, albeit weak, predictors of NO TRIAL and NO SMOKE. Global self-esteem (GSE) contributed uniquely to the prediction of NO TRIAL and NO SMOKE for the total sample, and to non-smoking behaviour for boys. Physical self-worth (PSW) contributed uniquely to the model for NO TRIAL for the total sample. Given the limited role that PSW played in the analyses, the construct was not included in the main analyses. GSE and specific self-perceptions were included in the main logistic regression models to predict non-smoking behaviour.

3.6.1.2. Correlations. Spearman's Rho correlation coefficients revealed several significant relationships between the smoking items (see Table 3.11 for the relationships among physical self and smoking items for the total sample, boys, and girls). For the total sample, the dummy-coded NO TRIAL variable (where a score of 1 indicated having never tried a whole cigarette and a score of 0 indicated otherwise) showed weak positive significant relationships to endurance self-perceptions and global self-esteem. NO TRIAL was also significantly negatively related to appearance perceptions. The dummy-coded NO SMOKE variable (where a score of 1 indicated not smoking in the last 30 days) was weakly correlated with endurance and health self-perceptions, physical self-worth, and global self-esteem. For boys, NO TRIAL was not related to the physical self-perceptions, and NO SMOKE was related to global self-esteem. For girls, NO TRIAL was weakly correlated with endurance self-perceptions, physical self-worth, and global self-esteem. No SMOKE was related to body fat and endurance self-perceptions, physical self-worth, and global self-esteem. NO TRIAL and NO SMOKE were moderately correlated (r_s=.45-.51) for boys and girls.

Weak significant relationships were observed among non-smoking perceived competence and health and endurance self-perceptions and global self-esteem. The same results emerged with non-smoking interest value. Personal importance and smoking cost values were associated with global self-esteem. Strong negative relationships were observed between the NO SMOKE and competence, and moderate-high negative relationships emerged between NO SMOKE and the subjective values. There were also moderate associations between NO TRIAL, competence, and subjective values. Similar relationships were noted for boys and girls.

Table 3.11.

Pearson and Spearman's Rho Correlation Coefficients for the Physical Self and Smoking Behaviour.

Variables[2]	1.	2.	3.	4.	5.	6.	7.	8.[1]	9.[1]	10.[1]	11.[1]	12.[1]	13.[1]
						Total Sample (*N*=540)							
1. Health	-												
2. Body Fat	.19*	-											
3. Appearance	.13*	.49*	-										
4. Strength	.25*	.14*	.45*	-									
5. Endurance	.26*	.38*	.37*	.60*	-								
6. PSW	.30*	.60*	.64*	.52*	.49*	-							
7. GSE	.30*	.33*	.58*	.46*	.38*	.58*	-						
8. Competence[1]	.20*	.02	.01	.03	.09*	.13*	.18*	-					
9. Interest[1]	.20*	.02	-.00	.07	.12*	.13*	.21*	.67*	-				
10. Importance[1]	.06	.02	.01	.06	.05	.08	.20*	.41*	-.45*	-			
11. Cost	.04	-.02	-.01	.02	.03	.06	.09*	.35*	.37*	.29*	-		

12. NO TRIAL[1]	.09	.00	-.10*	-.01	.08	.07	.12*	.49*	.45*	.26*	.25*	-	
13. NO SMOKE[1]	.09	.04	-.01	.06	.13*	.12*	.16*	.67*	.61*	.37*	.33*	.47*	-
14. BMI	.02	-.50*	-.14*	.29	-.02	-.14*	-.01	-.01	.02	-.02	-.03	-.03	-.01
						Boys (*n*=211)							
1. Health	-												
2. Body Fat	.06	-											
3. Appearance	.13	.40*	-										
4. Strength	.30*	.07	.54*	-									
5. Endurance	.28*	.38*	.38*	.49*	-								
6. PSW	.29*	.44*	.65*	.58*	.48*	-							
7. GSE	.37*	.30*	.54*	.50*	.37*	.62*	-						
8. Competence[1]	.17*	.04	.01	.07	.13	.16*	.23*	-					
9. Interest[1]	.13	.06	.09	.11	.11	.18*	.31*	.66*	-				
10. Importance[1]	-.07	.14*	.04	.15*	.20*	.18*	.30*	.40*	.45*	-			
11. Cost	.03	-.05	-.02	.02	.07	.05	.06	.33*	.39*	.23*	-		

12. NO TRIAL[1]	.08	-.05	-.10	-.12	.01	-.02	.10	.50*	.40*	.28*	.32*	-	
13. NO SMOKE[1]	.11	-.02	-.06	.05	.13*	.10	.20*	.71*	.57*	.34*	.31*	.51*	-
16. BMI	.17*	-.57*	-.03	.34*	-.07	-.01	.04	.05	.11	-.01	.05	-.04	-.05
						Girls (*n*=329)							
1. Health	-												
2. Body Fat	.19*	-											
3. Appearance	.12*	.55*	-										
4. Strength	.20*	.07	.38*	-									
5. Endurance	.21*	.28*	.36*	.64*	-								
6. PSW	.27*	.64*	.64*	.45*	.45*	-							
7. GSE	.27*	.35*	.61*	.43*	.38*	.56*	-						
8. Competence[1]	.22*	.05	.02	.02	.09	.13*	.14*	-					
9. Interest[1]	.25*	.04	-.06	.06	.16*	.13*	.15*	.68*	-				
10. Importance[1]	.11*	.01	.01	.03	.02	.03	.09	.46*	.44*	-			
11. Cost	.03	.04	-.07	-.01	.02	.00	-.00	.28*	.29*	.21*	-		

12. NO TRIAL[1]	.09	.04	-.10	.06	.11*	.12*	.12*	.48*	.49*	.25*	.21*	-	
13. NO SMOKE[1]	.08	.12*	.04	.08	.15*	.15*	.14*	.64*	.63*	.38*	.34*	.45*	-
16. BMI	-.08	-.58*	-.22*	.23*	-.05	-.27*	-.06	-.08	-.08	-.02	.03	-.02	-.03

1 Spearman's Rho Correlation Coefficients

2 1-5=Physical self-perceptions; 6= Physical self-worth; 7= Global self-esteem; 9- 11=Subjective values; 12= trial smoking, where 1 is never tried a whole cigarette and 0 is otherwise; 13= smoking behaviour, where 1 is not smoking in the last 30 days and 0 is otherwise; 14= body mass index.

3.6.2. Main Analyses

3.6.2.1. Logistic regression. To examine the main hypotheses for smoking behaviour, several sequential logistic regressions were conducted separately for the total sample, boys, and girls. First, preliminary analyses were conducted to examine the unique effects of the physical self-perceptions and global self-esteem (GSE) when competence and subjective values were controlled in the prediction of NO TRIAL and NO SMOKE. Specifically, the differences between a model inclusive of the self-perceptions, GSE, competence, and values (full model), a model inclusive of GSE, competence, and values (partial model 1), and a model with competence and values (partial model 2) were examined. Significant log-likelihood tests indicated partial mediation, whereas nonsignificant differences were indicative of full mediation. For these analyses, only model chi-square and goodness of fit statistics and accuracy of classification were reported.

Main analyses were then conducted to examine the significant predictors and classification of NO TRIAL and NO SMOKE. In these analyses, all significant independents and covariates from the preliminary logistic regressions were examined in the models.

Preliminary models. For the total sample, it was observed that endurance perceptions and GSE had no effect on NO TRIAL (see Table 3.12) and NO SMOKE (see Table 3.13) when the effects of competence and values were controlled. The Hosmer-Lemeshow's Goodness of Fit (H-L) test statistics were greater than .05, indicating that the models' estimates fit the data at an acceptable level. These findings supported evidence of mediation.

Table 3.12.

Sequential Logistic Regression Examining NO TRIAL for Adolescents (N=540).

	$\chi 2$[a]	df	$\Delta\chi 2$[b]	R^{2}[c]	NO TRIAL Classification (%)	TRIAL Classification (%)	Total Classification (%)
Full Model[d]	154.82*	7	-	.34	91.3	50.9	74.1
Partial Model 1[e]	154.75*	5	.07	.34	91.3	51.7	74.4
Partial Model 2[f]	154.37*	4	.55	.33	91.3	52.2	74.6

[a] $\chi 2$ = model chi-square; * $p < .01$

[b] $\Delta\chi 2$ = Chi-square difference between the full model and the partial models

[c] R^2 = Nagelkerke R-square is a measure of effect size

[d] Full Model = Covariates, endurance self-perceptions and global self-esteem

[e] Partial Model 1 = Covariates and global self-esteem

[f] Partial Model 2 = Covariates only

Table 3.13.

Sequential Logistic Regression Examining NO SMOKE for Adolescents (N=540).

	$\chi2^a$	df	$\Delta\chi2^b$	R^{2c}	NO SMOKE Classification (%)	SMOKE Classification (%)	Total Classification (%)
Full Model[d]	276.13*	7	-	.70	97.4	69.9	93.1
Partial Model 1[e]	274.52*	5	1.61	.69	97.6	69.9	93.3
Partial Model 2[f]	272.79*	4	3.34	.69	97.4	69.9	93.1

[a] $\chi2$ = model chi-square; * $p < .01$

[b] $\Delta\chi2$ = Chi-square difference between the full model and the partial models

[c] R^2 = Nagelkerke R-square is a measure of effect size

[d] Full Model = Covariates, endurance self-perceptions, and global self-esteem independents

[e] Partial Model 1 = Covariates and global self-esteem independent

[f] Partial Model 2 = Covariates only

For boys, a preliminary model examining the effects of self-perceptions and GSE was not necessary due to the nonsignificant relationships among the manifest variables. Therefore, only a main effects model examining competence and values as predictors of NO TRIAL was performed. In a preliminary model examining NO SMOKE, endurance self-perceptions and GSE had no effect when competence and the subjective values were taken into account (see Table 3.14). The H-L test statistics indicated that the models' estimates fit the data at an acceptable level. These findings suggested full mediation.

In preliminary sequential logistic regression models for girls, endurance self-perceptions and global self-esteem did not account for additional variance in NO TRIAL, and body fat perceptions and GSE did not account for unique variance in NO SMOKE, when the effects of competence and values were controlled. See Table 3.15 for the sequential logistic regressions for NO TRIAL and Table 3.16 for the results predicting NO SMOKE. Similar to the findings for adolescent boys, these results suggested full mediation models.

Table 3.14.

Sequential Logistic Regression Examining NO SMOKE for Boys (n=211).

	$\chi 2^a$	df	$\Delta\chi 2^b$	R^{2c}	NO SMOKE Classification (%)	SMOKE Classification (%)	Total Classification (%)
Full Model[d]	105.56*	6	-	.67	97.2	67.6	92.4
Partial Model 1[e]	105.36*	5	.20	.67	97.2	67.6	92.4
Partial Model 2[f]	105.29*	4	.27	.67	97.2	67.6	92.4

[a] $\chi 2$ = model chi-square; $p<.01$

[b] $\Delta\chi 2$ = Chi-square difference between the full model and the partial models

[c] R^2 = Nagelkerke R-square is a measure of effect size

[d] Full Model = Covariates, endurance self-perceptions, and global self-esteem independents

[e] Partial Model 1 = Covariates and global self-esteem independent

[f] Partial Model 2 = Covariates only

Table 3.15.

Sequential Logistic Regression Examining NO TRIAL for Girls (n=329).

	$\chi 2^a$	Df	$\Delta\chi 2^b$	R^{2c}	NO TRIAL Classification (%)	TRIAL Classification (%)	Total Classification (%)
Full Model[d]	103.72*	6	-	.36	92.4	52.4	74.8
Partial Model 1[e]	103.68*	5	.04	.36	92.9	52.4	75.1
Partial Model 2[f]	102.90*	4	.82	.36	93.5	52.4	75.4

[a] $\chi 2$ = model chi-square; * $p < .01$

[b] $\Delta\chi 2$ = Chi-square difference between the full model and the partial models

[c] R^2 = Nagelkerke R-square is a measure of effect size

[d] Full Model = Covariates, endurance self-perceptions and global self-esteem

[e] Partial Model 1 = Covariates and global self-esteem

[f] Partial Model 2 = Covariates only

Table 3.16.

Sequential Logistic Regression Examining NO SMOKE for Girls (n=329).

	$\chi 2^a$	Df	$\Delta\chi 2^b$	R^{2c}	NO SMOKE Classification (%)	SMOKE Classification (%)	Total Classification (%)
Full Model[d]	174.68*	7	-	.72	98.2	71.4	94.2
Partial Model 1[e]	173.33*	5	1.35	.72	98.6	75.5	95.1
Partial Model 2[f]	171.96*	4	2.27	.72	98.6	75.5	95.1

[a] $\chi 2$ = model chi-square; * $p < .01$

[b] $\Delta\chi 2$ = Chi-square difference between the full model and the partial models

[c] R^2 = Nagelkerke R-square is a measure of effect size

[d] Full Model = Covariates, body fat and endurance self-perceptions, and global self-esteem

[e] Partial Model 1 = Covariates and global self-esteem

[f] Partial Model 2 = Covariates only

Final analyses. In a final model examining the predictors of NO TRIAL for the total sample, competence and interest value were significant independent predictors (See Table 3.17, left side). For adolescents who reported higher competence and higher interest in not smoking, the odds in favour of never having tried a cigarette were 1.2-1.3 times higher than for individuals who reported lower competence in not smoking. The final model revealed similar findings for NO SMOKE (See Table 3.17, right side). For adolescents who reported higher competence and higher interest in not smoking, the odds in favour of not smoking in the last 30 days were 1.3-1.4 times higher than for individuals who reported lower competence in not smoking.

Table 3.17.

Final Logistic Regression Models Predicting NO TRIAL and NO SMOKE from Competence and Subjective Values for the Total Sample (N=540).

	NO TRIAL			NO SMOKE		
Variable	*B* (S.E.)	Wald Statistic	Odds Ratio (95% C.I.)	*B* (S.E.)	Wald Statistic	Odds Ratio (95% C.I.)
Competence	.26	21.31*	1.30	.34	35.65*	1.40
	(.06)		(1.16-1.46)	(.06)		(1.26-1.57)
Interest Value	.21	12.23*	1.24	.29	16.54*	1.34
	(.06)		(1.10-1.39)	(.07)		(1.16-1.54)
Personal	.03	.79	1.03	.07	2.21	1.07
Importance Value	(.03)		(.97-1.09)	(.05)		(.98-1.17)
Cost Value	.02	1.06	1.02	.06	3.56	1.06
	(.02)		(.99-1.05)	(.03)		(.99-1.12)
Model χ^2[df]		154.37 [4]*			272.79 [4]*	
Classification						
No Trial		52.2%			69.9%	
Trial		91.3%			97.4%	
Total		74.6%			93.1%	
Nagelkerke R^2		.33			.69	

* $p < .05$

In the final logistic regression model examining NO TRIAL for boys (R^2=.35), non-smoking perceived competence was the only significant individual predictor, and competence and values accurately predicted 75.4% of the classifications (See Table 3.18, right side). For adolescent boys who reported higher competence, the odds in favour of never having tried a cigarette were 1.3 times higher than for individuals who reported lower competence in not smoking. In a final model for NO SMOKE (R^2=.67), perceived competence and non-smoking personal importance were significant individual predictors, with competence and values accurately classifying 92.4% of the cases (see Table 3.19, right side). For adolescent boys who reported higher competence and personal importance, the odds in favour of not smoking in the 30 days were 1.14-1.5 times higher than for boys who reported lower competence and personal importance.

For girls, competence and interest were significant independent predictors of NO TRIAL for girls (R^2=.36), and the competence and values accurately predicted 75.4% of the classifications (see Table 3.18, left side). These results suggest that for female adolescents who reported higher competence and interest in not smoking, the odds in favour of never having tried a cigarette were 1.3 -1.4 times higher than for adolescents who reported lower competence and interest value. Non-smoking interest value and perceived competence were significant independent predictors of NO SMOKE (R^2=.72) for female adolescents. The combined competence and values accurately classified 95.1% of the cases (see Table 3.19, left side). These results suggest that for females who reported greater competence and interest, the odds in favour of not smoking in the last 30 days were close to 1.5 times higher than for female adolescents who reported lower competence and interest value. See Figure 3.12 and 3.13 for the odds ratios.

Table 3.18.

Final Logistic Regression Models Predicting NO TRIAL from Competence and Subjective values for Boys and Girls.

	Girls (*n* =329)			Boys (*n* =211)		
Variable	*B* (S.E.)	Wald Statistic	Odds Ratio (95% C.I.)	*B*	Wald Statistic	Odds Ratio (95% C.I.)
Competence	.28 (.09)	9.78*	1.33 (1.11-1.58)	.26 (.07)	12.39*	1.30 (1.12-1.50)
Interest Value	.37 (.09)	14.01*	1.44 (1.19-1.75)	.07 (.08)	.62	1.07 (.91-1.26)
Personal Importance Value	.01 (.04)	.03	1.01 (.93-1.09)	.07 (.04)	2.52	1.07 (.98-1.17)
Cost Value	.01 (.02)	.01	1.00 (.96-1.05)	.05 (.03)	2.83	1.05 (.99-1.10)
Model χ^2[df]		102.90 [4]*			62.25 [4]*	
Classification						
No Trial		90.5			93.5	
Trial		52.9			52.4	
Total		75.4			75.4	
Nagelkerke R^2		.35			.36	

* $p < .05$

Table 3.19.

Final Logistic Regression Models Predicting NO SMOKE from Competence and Subjective Values for Boys and Girls.

	Girls (n =329)			Boys (n =211)		
Variable	B (S.E.)	Wald Statistic	Odds Ratio (95% C.I.)	B	Wald Statistic	Odds Ratio (95% C.I.)
Competence	.30	15.29*	1.36	.39	20.91*	1.47
	(.08)		(1.16-1.58)	(.08)		(1.25-1.73)
Interest Value	.42	16.44*	1.52	.17	2.75	1.18
	(.10)		(1.24-1.87)	(.10)		(.97-1.44)
Personal	.01	.03	1.01	.13	4.12*	1.14
Importance Value	(.07)		(.88-1.17)	(.07)		(1.01-1.30)
Cost Value	.07	3.04	1.08	.05	1.17	1.05
	(.04)		(.99-1.17)	(.05)		(.96-1.15)
Model χ^2[df]		171.96 [4]*			105.29 [4]*	
Classification						
No Smoke		98.6%			97.2%	
Smoke		75.5%			67.6%	
Total		95.1%			92.4%	
Nagelkerke R^2		.72			.67	

* p <.05

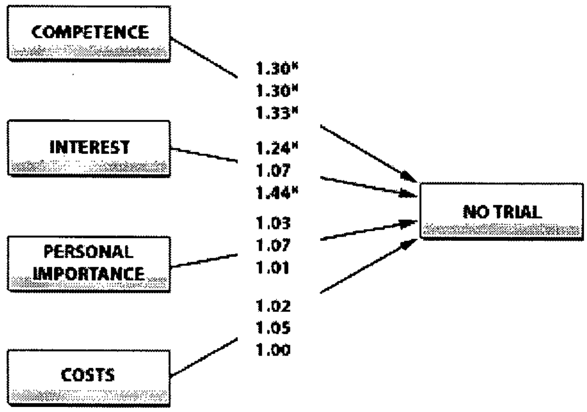

Figure 3.12. Logistic regression predicting NO TRIAL from Competence and Subjective Values for the Total Sample (top), Boys (middle), and Girls (bottom). Coefficients are odds ratios; * $p<.05$.

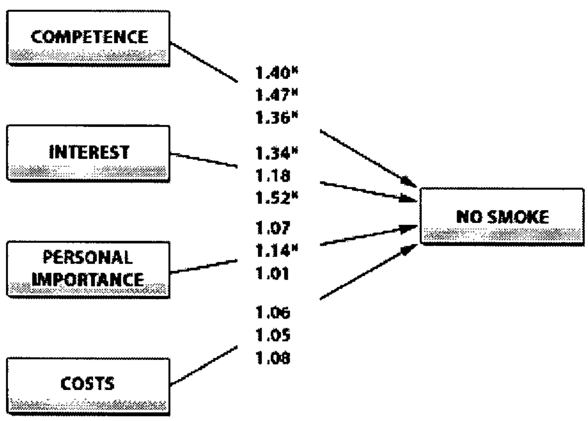

Figure 3.13. Logistic regression predicting NO SMOKE from Competence and Subjective Values for the Total Sample (top), Boys (middle), and Girls (bottom). Coefficients are odds ratios; * $p<.05$.

3.6.3. Summary of Findings for Non-Smoking Behaviour

There were few mean-level sex differences on the non-smoking constructs, with girls reporting higher personal importance compared to boys. Non-parametric correlations among the manifest variables revealed moderate to high relations among the expectancy-value constructs. The preliminary logistic models revealed the physical self as having little to no effect on non-smoking behaviour when competence and values were accounted for in the models. Support for full mediation was evident. In the final models, there were differences in the significant predictors for boys and girls. Competence was a significant predictor in all models, with interest value emerging as an independent predictor in the model for trial and smoking behaviour for girls. Personal importance was a significant additional predictor in the non-smoking model for boys. These findings suggest partial to full support for the EV model in examining non-smoking behaviour among adolescents.

3.7. General Summary for Study 1

The purpose of this study was to examine relationships among the physical self, behaviour-specific perceived competence and subjective values (i.e., interest, attainment, utility, and costs) and physical activity, eating, and smoking behaviours using Eccles' (1983) expectancy-value model. The tenets of the expectancy-value (EV) model were partially supported in a sample of adolescent boys and girls, with differences in the relationships noted for the health behaviours.

Using structural equation modeling techniques, it was observed that the data supported hypothesized relationships in the models for physical activity and eating behaviour. The model fit indices revealed adequate fitting models for physical activity and eating behaviour for adolescents, and the models were deemed invariant across genders. The measurement models were not modified post-hoc, however it was clear from an examination of the standardized residuals that the parameters relating to the physical self factor (i.e., factor loadings, error covariances) were contributing to the model fit. Strong relationships among the latent factors were evidence of support for the tenets of the expectancy-value theory. Despite strong similar relationships among latent variables for boys and girls, there were differences in the parameters in the models and prediction equations.

Based on the results from the sequential logistic regressions, the effects of the physical self-perceptions on non-smoking behaviour were controlled when competence and values were accounted for in the models. Competence emerged as a significant strong predictor in all models for non-smoking behaviour among adolescents. Certain dimensions of subjective value were also consistent predictors in the models, and differed across the sexes. These findings support the mediation propositions of the expectancy-value model.

3.7.1. Relationships among Physical Self-Perceptions, Competence and Subjective Values

Based on the expectancy-value tenets, it was hypothesized that the effects of physical self-perceptions on physical activity, eating, and non-smoking behaviours would be mediated by competence and values. In the first part of the model, physical self-perceptions accounted for moderate-high variance in physical activity competence and values, and low-moderate variance in eating behaviour competence and values.

To date, there are very few examinations of the direction of effects between perceptions of competence and physical self-concept. Using conceptual and theoretical frameworks, researchers interested in the physical domain have often reported perceptions of competence as sources of self-concept and self-esteem (see Fox, 1998; Sonstroem, 1997). However, there is recent evidence to suggest that these relationships may not be hierarchical, and also possibly multidirectional (Kowalski, Crocker, Kowalski, Chad, & Humbert, 2003). Further research is warranted in order to understand and explain the sources of competence and value beliefs. According to the EV model, and supported in the current findings, self-concept is a strong source of competence and value beliefs. In the literature, there are no reports on the relationships among physical self-perceptions, and perceptions of healthy eating competence and values. The findings here suggest that physical self-perceptions are, at best, weak-moderate sources of these competence and value beliefs, and demonstrate similar relationships for adolescent boys and girls.

Unfortunately, with the distribution of the non-smoking data, the relationships among physical self-perceptions, competence and values were restricted to non-parametric correlation coefficients. Linear regression was not feasible due to the high skewness and kurtosis values, and logistic regression necessitated dichotomizing the competence and value variables. Since the central tendency scores were all clustered at the median, dichotomizing the variables was not deemed appropriate since classifications of individuals would have been compromised. Correlation coefficients among the variables suggest that only specific physical self-perceptions were low-moderately related to competence, interest value, and personal importance value. For boys, health self-perceptions were weakly related to competence and body fat and endurance perceptions were weakly related to personal importance. For girls, health self-perceptions were related to competence, interest and personal importance values. Global self-esteem was related to competence and values for adolescent boys, and to interest value for girls.

Based on these relationships, physical self-perceptions are strong sources of competence and value for physical activity, weak-moderate sources for eating behaviour, and are not strongly related to competence and values for non-smoking behaviour. Support for the more distal relationships in the EV model is uniquely identified and is contingent on the health behaviour observed.

3.7.2. Main Tenets of the Expectancy-Value Theory

It was discovered that competence and values are the main factors influencing the health behaviours, that these relationships differ for boys and girls, and the relationships among the manifest and latent factors vary in strength by health behaviour. These findings support the principles of the expectancy-value model and suggest that by understanding competence and values we can account for a significant proportion of variance in physical activity and eating behaviours.

There is substantial evidence to suggest that perceptions of competence are important determinants of physical activity and sport participation for youth (see Horn, 2004; Sallis et al., 2000; Weiss & Ferrer-Caja, 2003 for reviews). Limited evidence also exists to suggest perceptions of competence are strong predictors of healthy eating behaviours and dietary choices among children and adolescents (see Baranowski et al., 1999). The findings from this study support previous research and demonstrate that competence perceptions are integral to understanding physical activity and eating behaviours for adolescents. The findings also go one step further by introducing and examining the influence of subjective values on health behaviour. In support of the expectancy-value model, competence and subjective values demonstrated differential and combined effects on health behaviours.

3.7.2.1. Physical activity. Strong relationships emerged between physical activity competence and values, and non-smoking competence and values, with moderate relationships emerging between the constructs for eating behaviour. The moderate to high associations support developmental theories suggesting the reciprocal notion that individuals value domains, and behaviours housed within those domains, when they feel competent, and vice versa (i.e., Eccles et al., 1999; Harter, 1999; Wigfield, 1994). It is clear from this study that competence and values share a moderate proportion of variance, and are important simultaneous determinants of adolescent health behaviours. The physical self-perceptions did not directly influence the health behaviours when competence and values were accounted for in the models.

Despite the integral roles of competence and value in predicting health behaviours, it cannot be overlooked that the physical self had a strong impact on physical activity behaviour, and to a lesser extent eating behaviour. In alternate models examining mediation, the physical self did not account for additional significant variance in physical activity when a direct path was included in the model. However, when competence and subjective value were controlled in the model, the physical self predicted the same amount of variance in physical activity as the combined effects of competence and value. With this finding, coupled with the strong relationships among competence, value, and physical self, it is possible that these constructs are redundant in the analyses. This highlights possible measurement constraints associated with the physical self-concept construct.

Physical self-concept is operationalized as an individual's self-description, includes physical roles and attributes, and is akin to identity (Fox, 1998). According to seminal self-concept work (Shavelson et al., 1976), the physical self-concept has sub-areas that consistently include physical ability and physical appearance (self-descriptions), which are then linked to evaluations of behaviours (self-competence). The problem is that the way the physical self is conceptualized and the way it is measured are not always consistent. Researchers tend to include measures of physical competence as synonymous to measures of physical descriptions, making the instruments inconsistent with the level of conceptualization. In using only selective subscales of the PSDQ, the goal was to eliminate "competence" subscales and the items that were specific to physical activity (activity, sports competence, coordination, flexibility subscales were excluded) in an attempt to best represent the physical self-concept in an unbiased, uniform manner. However, looking at the items for endurance, they are all assessing ability rather than general descriptions, with 30% of the items in the strength subscale assessing ability and the other 60% assessing a general description. These inconsistencies between conceptualization and measurement likely confound the study findings. Further research is necessary to examine the links between behaviour-specific competence and the physical self both at the level of measurement and operationalization of the key constructs. If the physical self is to be included in models of motivation, as was suggested by Fox (1998), these intricate issues need to be resolved because the majority of commonly used motivation-based theories consider competence to be an integral factor. Based on this study, the physical self is as important as competence and value in predicting physical activity behaviour.

3.7.2.2. Eating behaviour. The physical self did not account for additional variance when the direct effects were examined, and accounted for minimal variance in eating behaviour when the effects of competence and value were controlled. To date, the physical self has been predominantly examined as a predictor of physical activity behaviour, with much less evidence of other health behaviour outcomes. In the existing studies, it was observed that physical appearance perceptions were strongly linked to dieting behaviours, with physical conditioning perceptions linked to physical activity (i.e., Crocker et al., 2001; 2003). Physical self-perceptions are differentially linked to health behaviours, and it would perhaps be beneficial to examine the physical self in terms of the self-perception subscales rather than as a single latent variable. In this study, the model misspecifications for eating behaviour were predominantly nested in the physical self latent variable. It is possible that a two-factor (or more) physical self-concept construct would be warranted to better understand the influence of the physical self on health behaviours.

This study highlights the need to further examine the operational definition of the physical self-concept and the way it is quantified. Researchers need to broaden the perspective of the physical domain of the self to include other possible health-related outcomes, such as eating and smoking behaviours. To date, the research has been focused on physical activity behaviour at the expense of enhancing the knowledge of the relationships among the physical self and other health behaviours. To expand this focus, it is first necessary to re-assess the measurement tools that are currently available to examine the physical self, and attempt to counteract the inherent biases for physical activity in the instruments.

3.7.2.3. Non-smoking behaviour. The EV model is supported with non-smoking behaviour. Physical self-perceptions and global self-esteem make little to no contribution in the models. When the effects of competence and values are entered in the prediction of no trial and no smoke, the effects of the physical self-perceptions are eliminated. The final models suggest that competence and values are moderate to strong correlates of no trial and no smoke behaviour, and differ in their significance for boys and girls. There is limited support for these findings, particularly since the focus in this study was on non-smoking behaviour. However, some empirical studies have reported adolescents tend to report smoking because they find it enjoyable and consider it beneficial to them (see Palmqvist & Martikainen, 2005). Similar reasons for *not* smoking have been covertly implicated in focus group and interview research with adolescents {Sabiston, 2004 #267; Sabiston, 2003 #106}.

3.7.3. Gender Differences

There were a number of expected differences in the mean-level and interrelations among manifest variables and latent factors in this study.

3.7.3.1. Mean-level differences in manifest variables. In this study, it was hypothesized there would be significant gender differences on various self-perceptions, competence and values, and reports of health behaviours. This hypothesis was examined using multivariate analyses of variance, and was supported. The findings revealed significant gender differences for health, body fat, strength, and endurance physical self-perceptions, competence and values for physical activity and healthy eating, and on the physical activity and eating outcome measures. Examining the gender differences at the descriptive level of analysis, girls not only perceived that they have lower ability to participate in regular physical activity, but they were also less likely to find activity enjoyable, important, and useful or valuable compared to their male counterparts. For eating behaviour, it was observed that boys reported higher competence for following a healthy diet, yet girls reported higher interest value, attainment value, utility value, and actual healthy eating behaviour. Girls also reported higher importance associated with not smoking, but there were no other significant differences between boys and girls on smoking behaviour constructs. Finally, boys reported higher perceptions for strength and endurance, perceived themselves as healthier and thinner, and reported higher global self-esteem compared to girls. For the most part, these mean-level comparisons are consistent with previous findings.

3.7.3.2. Relationships among manifest variables and latent factors. There were differences in the pattern of relationships between the health behaviour constructs for adolescent boys and girls. Possible gender differences were also examined at the measurement and latent path modeling level of analysis using structural equation modeling techniques. It was determined that the physical activity and eating behaviour measurement models met the minimum criteria for invariance, suggesting little differences between the sexes. This finding infers that the constructs examined in this study were measured similarly for boys and girls, however there were differences in the relationships among the latent variables, paths between the factors, and overall prediction of physical activity and eating behaviour.

There was no reason to suspect differences in the measurement of the physical self-concept, competence, values, and health behaviour, although very few studies looking at health behaviours have performed sequential tests of invariance to examine possible gender differences. Previous research has found that self-concept and physical self measures are gender invariant (i.e., Crocker et al., 2000; Marsh, 1994). However, some recent findings suggest that some items on the PSDQ may be biased for girls and others biased for boys. Using multidimensional differential item functioning analysis, Fletcher and Hattie (2004) suggested that 40% of the items on the PSDQ were gender-biased, and attributed the source of bias to item composition and frame of reference statements. From their analyses, 9 of the items currently used in this study were favoring females, and 8 items were favoring males (Fletcher & Hattie, 2005). These reported findings could partially explain the mean-level gender differences on physical self-concept subscales, however the finding of configural and metric invariance across genders in the current study implies that the items were responded in the same way.

Gender differences were also observed in the relationships among latent variables and prediction of health behaviours. The path analyses indicated that moderate variance in competence and value was accounted for by perceptions of physical self, implying the more distal relationships in the EV model hold for adolescents' physical activity and eating behaviours. The differences between boys and girls were evident in the prediction of physical activity and eating behaviours.

Physical activity. For boys, the model accounted for 45% of the variance in physical activity, with subjective value emerging as an independent predictor. For girls, the model accounted for 57% of the variance in physical activity, with subjective value and competence emerging as significant strong predictors.

It is possible that gender-based socialization is impetus to the significance of the relationship between subjective values and physical activity. Boys are often socialized to develop a sense of physical mastery to use their bodies through sport involvement, which has been central to male physicality (Eccles et al., 1999: Harter, 1999). Therefore, consistent with gender-stereotypes, male adolescents may be reporting strong relationships between values and physical activity, independent of their perceptions of competence. There has been strong support for competence perceptions as predictors of activity (see Weiss & Williams, 2004), however very few studies include a subjective value construct. Based on the results of this study, competence perceptions are not as important when values are accounted for in predictive models with boys. This finding is in contrast to recent findings where competence was a stronger predictor of adolescents' physical activity (Cox & Whaley, 2004). Support for these findings is evident in Eccles and Harold's (1991) study, whereby utility value was a stronger predictor of youth free time sport participation compared to ability beliefs and interest value. However, these studies do not report models for boys and girls separately. Also, a main difference in the studies is the way in which physical activity is conceptualized. Cox and Whaley (2004) examine effort and persistence in basketball with high school students. Eccles and Harold (1991) report the quantity of youth's free time spent engaged in sport-like activities, which is a similar conceptualization to the current study. It is conceptually plausible that structured sport will have unique predictors compared to leisure-time physical activity, but a contention that requires further research.

Eating behaviour. For boys, the eating behaviour model demonstrated that both competence and subjective value were significant predictors, and the model accounted for 43% of the variance. For girls, the mediocre-fitting model accounted for 29% of the variance in eating behaviour, whereby subjective value was an independent predictor. The finding that subjective value is a significant predictor of healthy eating for girls is indirectly supported in literature. Researchers suggest that girl's value eating behaviour, primarily due to the inherent functions of dietary choices and the links to appearance and body shape (Davis et al., 2001; Page & Fox, 1997). For adolescent girls, appearance is important to their sense of selves, and they will follow any number of means in an attempt to preserve or acquire positive perceptions of appearance and body shapes (Harter, 1999). It is possible that girls, irrespective of their perceptions of competence to maintain a healthy diet, report the value associated with healthy eating due to the strong perceived links to appearance management.

Non-smoking behaviour. For the total sample, competence and interest value were significant predictors of having never tried a whole cigarette and not smoking in the last 30 days, with odds ratios ranging from 1.2 to 1.4. Slightly different results were reported when the models were examined separately for boys and girls. Competence was the only significant predictor of never having tried a cigarette for boys, whereas interest value was also a significant predictor in the model for girls. Competence and personal importance of not smoking were independent significant predictors of smoking behaviour for boys, whereas for girls, competence and interest in not smoking were significant predictors of not smoking in the last 30 days. A number of research studies have identified differences in predictors of smoking for boys and girls. In many of these studies, differences in social and environmental conditions have been the primary discriminators of smoking behaviour (Ellickson, Tucker, & Klein, 2001; Flay et al., 1998). There are limited reports of individual perceptions emerging as different predictors of smoking behaviour. In one study examining adolescents' attitudes and beliefs towards anti-smoking, small but significant differences in prediction of non-smoking behaviour for boys and girls was reported (Piko, 2001). In the studies reported here, the implications target the necessity of sex-based intervention strategies for tobacco reduction and cessation. Consistent with these recommendations, the findings of this study suggest that there are differences in predictors of non-smoking stage (e.g. no trial vs non-smoking behaviour) and for boys and girls.

The results of this study highlight the importance of looking beyond mean-level gender differences when examining motivated health behaviours. Further research is necessary to confirm the relationships and sex-based differences in the models. Also, greater understanding and explanation of theses differences is warranted.

3.7.4. Study 1 Conclusions

The main tenets of the expectancy-value model were tested for health-promoting behaviours for adolescent boys and girls. Partial support for the models was observed for physical activity and healthy eating behaviours, and full support of mediation was observed for non-smoking behaviours. The models differed in predictive power and independent correlates across the sexes. To address the secondary hypotheses, there was little difference in the simple structures of the models for boys and girls, which was an expected outcome. There were also expected mean-level and covariant differences in the health behaviour models for boys and girls.

CHAPTER IV

Study 2

Further testing of the expectancy-value model: the role of significant other influences

4.1. Purpose

The purpose of the second study was to examine adolescents' perceptions of best friend and parent role-modeled behaviour and emotional support as predictors of adolescents' physical activity, eating, and non-smoking behaviours, and whether competence and values mediated these relationships. To this end, the unique addition of significant other influences was taken into account as proposed by expectancy-value theory (see Figure 4.1).

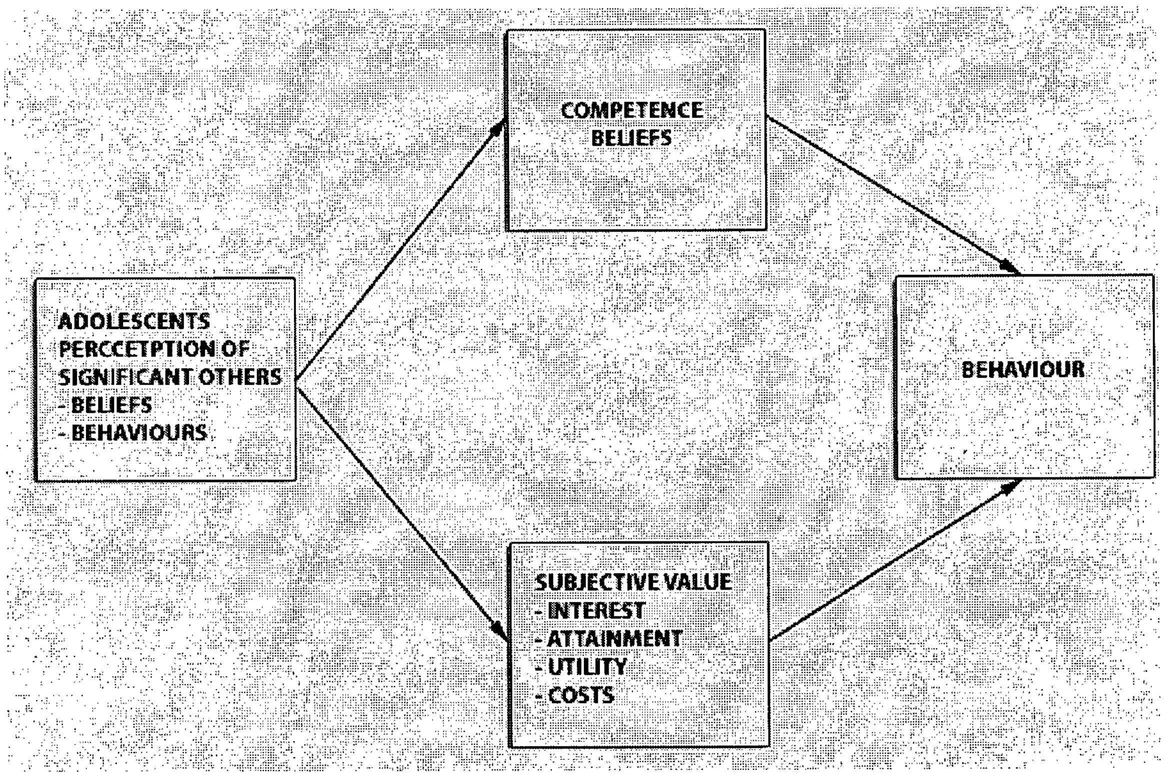

Figure 4.1. Proposed effects of significant others based on the expectancy-value model.

4.1.1. Research Question

The hypothesized model depicted in Figure 4.1 will be tested for physical activity, eating behaviour, and non-smoking behaviour for both boys and girls.

To attend to the research question and attempt to support findings from the first study, the objectives of the second study included examining: (i) the central elements and relationships proposed by the expectancy-value model; (ii) the adolescents' perceptions of parent and best friend role-modeled behaviour and emotional support, competence, and values as predictors of physical activity, eating, and non-smoking behaviour; and (iii) gender differences on manifest variables of best friend and parent influences, gender-stereotypic beliefs, competence, values, physical activity, eating, and non-smoking behaviours, relationships among the constructs, and prediction of health behaviours. Based on theoretical propositions, existing research findings, and results from the first study, the following hypotheses were offered:

Ha1: The expectancy-value model will be supported for physical activity behaviour, eating behaviour, and non-smoking behaviour for adolescent boys and girls.

Ha2: There will be no differences in the simple structures of the models and the way boys and girls respond to the items in the study.

Ha3: There will be mean-level and covariant differences on the study variables for boys and girls.

4.2. Methodology

4.2.1. Participants

Secondary school students (boys: n=439; girls n=463) between the ages of 15 and 18 years participated in the study by completing a questionnaire once during class time. The restricted age range was to maintain consistency with the target population from the first study and advance understanding of older adolescent health behaviour.

4.2.2. Procedures

Following the University of British Columbia's Behavioural Ethics Research Board (see Appendix K), and Abbotsford, Burnaby, New Westminster, Port Coquitlam, and Vancouver secondary school district board approvals (see Appendix L), secondary school principals were contacted by written letter (with follow-up telephone contact) to solicit their support for the study (see Appendix M for the initial contact letter). In total, 8 out of 30 (26.6%) contacted principals agreed to participate. School counselors and teachers were then contacted by telephone to schedule consent distribution data collection. The researcher attended classes during regular school hours to make brief introductory presentations about the study, to answer any questions, and to distribute letters of information for parents (see Appendix N) and participant consent forms (see Appendix O). The students were instructed to give their parents the letters, who then had a chance to decline their son/daughter's participation. The researcher returned to the classes approximately ten days later to collect consent forms and distribute questionnaires. The overall response rate for the study was 55.3%, with 1632 participant consent forms and letters of information distributed and 902 participants completing the questionnaire. The discrepancy in the numbers can be attributed to students being absent from class on the research day, students who chose not to participate, and 6 adolescents whose parents declined their participation. The completion of the questionnaire took between 20-35 minutes, and participants were asked to return the completed questionnaire to the researcher. Students who were not completing the questionnaire were given assignments from their teachers or provided word searches.

4.2.3. Measures

A compilation of scientifically supported instruments was developed for this study. Information was collected to describe and examine: (i) participant characteristics (Personal Descriptive Information Instrument); (ii) adolescents' perceptions of parent and best friend influences (significant other influence; Eccles & Wigfield, 1995); (iii) adolescent's gender stereotypes associated with importance of and ability associated with physical activity, healthy eating, and not smoking; (iv) perceptions of competence for participating in regular physical activity, maintaining a healthy diet, and not smoking (Deci & Ryan, 2001); (v) interest in, importance of, usefulness associated with, and costs related to participating in physical activity, healthy eating, and not smoking (subjective values; Eccles & Wigfield, 1995; Eccles et al., 1993); (vi) physical activity behaviour (Leisure Time Exercise Questionnaire; Godin & Shephard, 1985) and (Physical Activity Screening Measure; Prochaska, Sallis, & Long, 2001); (vii) eating behaviour (Adolescent Healthy Food Checklist; Johnson et al., 2000); and (viii) smoking behaviour (Student Smoking Profile; Cameron et al., 2005). The questionnaire is presented in Appendix P. Instruments different from study 1 are described below.

4.2.3.1. Perceptions of significant others' role modeled behaviour and emotional support. The adolescents' perceptions of parent and peer role modeled behaviour and emotional support were examined with modified items from the Michigan Study of Adolescent and Adult Life Transition Questionnaire (MSALT; i.e., Eccles & Wigfield, 1995; Eccles et al., 1993). Participants were asked to respond to a series of questions about their best friend's and parent's/guardian's support for physical activity, eating, and smoking behaviours (emotional support), as well as their perceptions of best friend's and parent's/guardian's own engagement in the health behaviours. For the purpose of this study, "parent/guardian" was defined as the adult they spend the most time with outside of school. There were 4 items for role modeled behaviour (RMB) and 4 items for emotional support (ES), which were answered on 7-point Likert scales. Adolescents were also asked to indicate the number of their closest friends and number of family members (living in their home) who engaged in physical activity, healthy eating, and smoking behaviours.

4.2.3.2. Behaviour gender-stereotypes. Following advice from Dr. Eccles (Personal communication, June 4, 2004), a measure of gender stereotypes was included in the study as a possible predictor of competence and value. Adolescents were asked to compare the importance of regular physical activity, maintaining a healthy diet, and not smoking for boys and girls. Responses were on a 5-point Likert scale ranging from *girls find [regular physical activity/not smoking/maintaining a healthy diet] more important* to *boys find [regular physical activity/not smoking/ maintaining a healthy diet] more important.* The participants were also asked to rate boys' and girls' abilities to engage in regular physical activity, maintain a healthy diet, and not smoke. Again, responses ranged on a 5-point continuum from *girls are much better at [participating in regular physical activity/not smoking/ maintaining a healthy diet]* to *boys are much better at [participating in regular physical activity/not smoking/ maintaining a healthy diet]*. The items were modified from the Michigan Study of Adolescent and Adult Life Transition Questionnaire (MSALT; i.e., Eccles & Wigfield, 1995) to target the physical activity, eating, and smoking health behaviours.

4.2.3.3. Physical activity behaviour. Physical activity was assessed using the Godin Leisure-Time Exercise Questionnaire (Godin & Shephard, 1985). Following the findings in study 1, an example was included on the scale to assist the adolescents with completion. See Appendix B. Physical activity was also examined using a 2-item moderate-to-vigorous physical activity measure (Prochaska et al., 2001). The items inquire about frequency of 60 minutes or more of moderate-to-vigorous physical activity in the past 7 days as well as in a typical week. The items were developed as a screening measure for acceptable physical activity in youth, and were found to be reliable and valid indicators of activity (Prochaska et al., 2001). The authors recommend calculating the average of the two items and scores less than 5.00 indicate that adolescents are not meeting physical activity guidelines for health benefits.

4.2.3.4. Eating behaviour. Adolescent's eating behaviour was assessed using the Adolescent Food Habits Checklist (AFHC; Johnson et al., 2002). The response format was modified for the second study following pilot testing and difficulties with statistical analyses from study one. The dichotomous response options were not representative of the spectrum of eating behaviour. The responses were modified to a 4-point Likert scale, with 1=Always, 2= Sometimes, 3=Rarely, and 4=Never. Items were reverse-scored as necessary so that healthy behaviours are represented by higher scores/response options. A total scale score was calculated by taking the total and average of the item scores. For use in structural equation modeling, item parcels were created. Despite the items being reported on a 4-point Likert scale (rather than a dichotomous scale as in study 1), the large number of items on the AFHC, coupled with the underlying unidimensional structure of the scale, warranted item parceling (Bandalos & Finney, 2001; Hau & Marsh, 2004).

4.2.4. Questionnaire Assessment

The questionnaire was sent to Dr. Eccles to examine content validity. Additionally, all instruments were pilot tested with adolescents (N=68) for clarity of instructions and further content validity assessment.

4.2.5. Data Analysis Strategies

Prior to data analytical procedures all variables were screened using procedures outlined by Tabachnick and Fidell (2001) and following the same guidelines presented in study 1. In order to assess the hypotheses in this study, a variety of univariate and multivariate statistical analysis techniques were used. The preliminary and main data analysis strategies were consistent with study 1. As a result of the findings from the first study, all analyses were conducted separately for boys and girls.

4.3. General Results

4.3.1. Data Screening

Prior to data analytical procedures all variables were screened for accuracy of entry, missing values, distributions, and the assumptions of multivariate analysis.

4.3.1.1. Accuracy of input and missing values. Nine hundred and two adolescents volunteered to participate in the study. Twenty-seven individuals were excluded from the study because they failed to provide descriptive information (i.e., gender, age, height, and weight), or were identified during the data collection as disruptive individuals who should not be included in the analyses. Eighteen individuals were deleted due to a priori age restrictions. Less than 4.5% of the data was missing for any one variable, so it was acceptable to keep all items (Tabachnick & Fidell, 2001). There were 24 missing values for weight or height, and subsequently BMI. Since this information was for descriptive purposes only, these cases were left in the data set with missing values. All other randomly missing values were replaced with subscale median scores when possible, or the mean values generated from participants with no missing data.

4.3.1.2. Univariate and multivariate outliers. Univariate outliers were identified as cases with very large (i.e., greater than 4.0) standardized residual scores (Stevens, 1996). There were five univariate outliers for the total physical activity score in METS (LTEQ1), seven outliers for BMI, and a number of univariate outliers on smoking behaviour and non-smoking competence, and four outliers for parent emotional support. A number of cases also approached standardized scores of 4.0, including non-smoking interest, attainment, and utility values. Mahalanobis' distance tests statistics revealed multivariate outliers existing on the combination of parent and peer influences, competence, values, and physical activity, eating, and smoking behaviours (in separate analyses). However, the combinations of scores deemed statistical outliers were conceptually plausible and were therefore left in the data set.

4.3.1.3. Normality and linearity. As can be seen from the distribution statistics presented in Table 5.1, several study variables significantly deviated from normality. However, with the large sample size and statistical analyses that are robust to minimal deviations, it is not likely that these distributions affected the outcomes (Tabachnick & Fidell, 2001). The smoking variables are significantly skewed and kurtotic as a result of the unequal and minimal smoking rates in the sample. Frequency histograms and normal probability plots further depicted nonnormality among the smoking variables. For multivariate normality, Mardia's coefficient was calculated using PRELIS. For physical activity, Mardia's coefficient was 1.11 for boys and 1.13 for girls, indicating that the data is relatively multivariate normal. The normalized kurtosis values were 10.61 and 12.13 for boys and girls, respectively. For eating behaviour, Mardia's coefficient was 1.15 and 1.21, and the normalized kurtosis coefficients were 13.55 and 17.08 for boys and girls respectively. PRELIS was not used to examine smoking data.

Bivariate scatterplots indicated some degree of heteroscedasticity among the study variables, however linear relationships were identified by fairly oval-shaped curves. Heteroscedasticity was not a serious violation for further analyses.

4.3.1.4. Multicollinearity. Pearson and Spearman Rho correlation coefficients were examined between manifest variables for possible collinearity issues with the total sample (N=857). It was apparent that the subjective value subscales were all moderate-highly correlated for the health behaviours. These subscales were used as manifest variables to define the latent value variable in structural equation modeling to control for possible multicollinearity. Best friend role-modeled behaviour and emotional support subscales were also moderate-highly correlated for physical activity and eating behaviours (r_s=.68 &.62, respectively). Similar results were noted for parent role-modeled behaviour and emotional support for physical activity and eating behaviour (r_s=.75 & .82, respectively). As a result of these findings, latent variables were created to represent general adolescents' perceptions of best friend influence and parent influence. Moderate to strong relationships were also observed between competence and the subjective values for physical activity, eating, and smoking behaviours. Correlations and possible collinearity issues were further examined during the main analyses for physical activity and eating behaviours.

Logistic regression analyses were conducted to examine multicollinearity in the smoking behaviour items. Standardized errors were examined for inflation between the models predicting NO TRIAL and NON-SMOKING. Competence, values, and parent and best friend role-modeled behaviour and emotional support were entered in separate models to examine the logit coefficient standardized errors. There was evidence of multicollinearity issues between the attainment and utility value predictors in the logistic regression models. As a result of this finding, a composite value was created (by summing the total scores on the attainment and utility values) and labeled 'Personal

Importance' for consistency with study 1. For all remaining smoking data analyses, this new value was used. Furthermore, in an attempt to reduce the possibility of multicollinearity in the smoking data, the final models presented included only independent variables that were significantly correlated to the dependent variable and significant predictors in preliminary sequential logistic analyses (Pedhazur, 1997).

4.3.1.5. Instrument Psychometrics. The parent and best friend role modeled behaviour and emotional support subscales, perceived competence, and interest, attainment, and utility values had acceptable internal consistencies. Physical activity and eating behaviour costs had low internal consistency. Despite attempts to capture the adolescents' own perceptions of time, support, and financial barriers, the multidimensional nature of the cost construct resulted in low internal consistency coefficients. Examining the bivariate relationships among the items, it is clear that there are moderate relationships between the time items, support items, and financial items independently; however time, support, and financial costs are in themselves only weakly related. Since there are limited items within each hypothetical dimension of cost, and no theoretical or conceptual guidelines to suggest which dimension is the most important when examining the health behaviours, cost value was excluded from further analyses.

4.3.2. Preliminary Results

Prior to performing the main analyses in the study, descriptive data was examined and correlations among the health behaviours were observed.

4.3.2.1. Describing the participants. In the final sample, there were 438 girls and 419 boys (95%) who completed usable questionnaires. The adolescents, ranging in age from 15 to 18 years (*M*=16.32, *SD*=.94), described themselves as primarily Caucasian (54.5%; *n*=467) and Asian (24.9%; *n*=213). Other ethnicities were reported as followed: South Asian (8.6%, *n*=31), West Asian/Middle East (3.3%, *n*=28), South East Asian (2.7%, *n*=23), Black (1.0%, *n*=9), Aboriginal (.8%, *n*=7), Hispanic (.4%, *n*=4), and other/mixed (3.7%, *n*=32).

Ninety-four percent (*n*=805) of the adolescents reported living with their mother/female guardian, with 80% (*n*=685) living with their father/male guardian. The majority of the adolescents lived with both parents/guardians (76.3%), with thirteen participants (1.5%) reporting living with neither parents/guardians. Based on reported postal codes (*n*=769), adolescents' parents/guardians were classified as having median incomes that fall 1.7% below the Provincial median income. Fifteen percent of the sample reportedly had family incomes at the median, 24.1% had family incomes less than 20% of the median, and 13.7% had family incomes that were greater than 20% of the Provincial median.

Male adolescents reported a mean BMI of 21.68 kg/m^2, and female adolescents reported average BMI's of 21.17 kg/m^2. Based on Canadian standards of healthy height-to-weight ratios, 78% male and 81% female adolescents were within the healthy range (BMI between 18.5-25 kg/m^2). 8.1% boys were overweight (BMI between 26-29.9 kg/m^2) and 2.5% obese (BMI greater than 30 kg/m^2). For girls, 4.4% reported overweight status and 3.0% were obese. In the sample, 18.8% adolescents had never tried a whole cigarette, 90.9% were classified as "never smokers" (i.e., had not smoked a whole cigarette and have not smoked (even just a few puffs) in the last 30 days), and 96.6% adolescents were reported non-smokers (i.e., had not smoked in the last 30 days and had not smoked more than 100 cigarettes in their lifetime).

4.3.2.2. Relationships among health behaviours. The relationships among health behaviours were examined. As can be seen from the Pearson and Spearman Rho correlation coefficients presented in Table 4.1, physical activity and smoking behaviours were only weakly related to eating behaviour. Physical activity and smoking were not significantly correlated. As a result of these findings, the remaining analyses were conducted separately for physical activity, eating, and smoking behaviour.

Table 4.1.

Pearson and Spearman Rho Correlation Coefficients Among Physical Activity, Eating, and Smoking Behaviours.

	1.	2.	3.	4.	5[g].	6[g].
	Total Sample (N=857)					
1. LTEQ1[a]	-					
2. LTEQ2[b]	.50*	-				
3. MVPA[c]	.57*	.61*	-			
4. AFHC[d]	.10*	.13*	.17*	-		
5.NO TRIAL[e,g]	.06	.05	.07*	.08*	-	
6. NON-SMOKING[f,g]	.01	.02	.03	.07*	.39*	-
	Boys (n=419)					
1. LTEQ1[a]	-					
2. LTEQ2[b]	.53*	-				
3. MVPA[c]	.49*	.55*	-			
4. AFHC[d]	.12*	.14*	.17*	-		
5. NO TRIAL[e,g]	.05	-.01	.06	.07	-	
6. NON-SMOKING[f,g]	.05	.02	.05	.13*	.43*	-
	Girls (n=438)					
1. LTEQ1[a]	-					
2. LTEQ2[b]	.62*	-				
3. MVPA[c]	.62*	.62*	-			
4. AFHC[d]	.19*	.22*	.26*	-		

5. NO TRIAL[e,g]	.03	.07	.05	.10*	-	
7. NON-SMOKING[f,g]	-.03	.03	.03	.01	.36*	-

[a] Leisure Time Exercise Questionnaire Item #1 (in METS)

[b] Leisure Time Exercise Questionnaire Item #2

[c] Moderate to vigorous physical activity

[d] Adolescent Food Habits Checklist

[a] Trial smoking (1=never tried a whole cigarette; 0=have smoked a whole cigarette)

[f] Non-smoker (1= not smoked in last 30 days and not smoked 100 or more cigarettes; 0= have smoked in last 30 days and smoked 100 or more cigarettes)

[g] Spearman rho correlation coefficients

4.4. Physical activity Results

4.4.1. Mean level Adolescents' Perceptions of Significant Other Influence, Competence, Values, and Physical Activity Behaviour

Means and standard deviations for the physical activity variables are presented in Table 4.2. The means for competence, value, and physical activity behaviour constructs are similar, yet slightly lower, compared to the means on the same subscales in study 1. Scores on the physical activity screening measure (MVPA) revealed that many adolescents are not engaging in adequate moderate-to-vigorous physical activity to gain health benefits (Prochaska et al., 2001).

4.4.1.1. Multivariate and univariate analyses of variance. To examine gender and age differences on the physical activity study variables, multivariate analyses of variance with follow-up analyses of variance were conducted. Differences in the manifest variable means were considered more informative than the latent variable mean differences.

Gender Differences. For physical activity, the main effect for gender was significant, Wilks' lambda=.82, $F(16,840)=11.02$. Univariate analyses revealed significant ($p<.05$) gender differences on the following measures: competence, $F(1, 855)=48.21$, $\eta^2=.05$; interest, $F(1,855)=35.68$, $\eta^2=.04$; attainment, $F(1,855)=4.93$, $\eta^2=.01$; utility, $F(1,855)=7.41$, $\eta^2=.01$; number of active peers, $F(1,855)=11.86$, $\eta^2=.01$; best friend role modeled behaviour, $F(1,855)=14.08$, $\eta^2=.02$; parent role modeled behaviour, $F(1,855)=9.12$, $\eta^2=.01$; parent emotional support, $F(1,855)=5.06$, $\eta^2=.01$; LTEQ1, $F(1,855)=43.92$, $\eta^2=.05$; LTEQ2, $F(1,855)=43.59$, $\eta^2=.05$; MVPA, $F(1,855)=25.47$, $\eta^2=.03$; GS-Importance, $F(1,855)=25.99$, $\eta^2=.03$; and GS-Ability,

$F(1,855)=23.94$, $\eta^2=.03$. Boys reported significantly greater physical activity competence and values, number of active peers, best friend role modeled behaviour, and frequency and quantity of physical activity behaviour compared to girls. In the study, boys reported that in general boys found participating in physical activity more important and had higher ability to participate in regular physical activity compared to girls. Girls reported significantly greater parent role modeled behaviour and emotional support compared to boys. Due to the significant gender differences that emerged on several of the study variables, main analyses were conducted separately for boys and girls.

Table 4.2.

Scale Reliabilities, Means, Standard Deviations (SD), Skewness, and Kurtosis coefficients for Adolescents' Physical Activity

		Total Sample (N=857)			Boys (n=419)			Girls (n=438)		
Scale[a]	α[b]	Mean (SD)	Skew[c]	Kurtosis[d]	Mean (SD)	Skew[c]	Kurtosis[d]	Mean (SD)	Skew[c]	Kurtosis[d]
Parent										
RM	.84	17.59 (5.83)	-.27	-.59	16.98 (5.71)	-.17	-.54	18.17 (5.90)	-.37	-.57
ES	.89	19.99 (6.15)	-.81	-.04	19.75 (5.89)	-.78	.05	20.21 (6.40)	-.85	-.09
Number	-	2.64 (1.81)	.24	-.96	2.54 (1.81)	.30	-.91	2.74 (1.81)	.19	-.99
Best Friend										
RM	.88	17.89 (6.67)	-.35	-.85	18.75 (6.13)	-.49	-.52	17.06 (7.05)	-.18	-1.06
ES	.92	13.60 (6.78)	.25	-1.06	13.63 (6.74)	.26	-1.01	13.57 (6.83)	.24	-1.11
Number	-	3.76 (1.49)	-.53	-.33	3.93 (1.44)	-.63	-.01	3.58 (1.52)	-.43	-.55
Competence	.89	20.59 (5.52)	-.71	.03	21.90 (4.80)	-.86	.69	19.35 (5.86)	-.51	-.43
Interest	.91	10.99 (2.89)	-1.15	.94	11.58 (2.53)	-1.34	1.75	10.42 (3.11)	-.95	.34
Attainment	.80	11.01 (2.69)	-1.12	1.00	11.22 (2.53)	-1.15	1.26	10.81 (2.82)	-1.06	.74

Utility	.87	10.95 (2.83)	-1.09	.72	11.21 (2.69)	-1.21	1.20	10.69 (2.94)	-.98	.37
Costs	.46	14.58 (4.22)	.42	-.04	14.36 (4.32)	.55	.12	14.80 (4.11)	.29	-.16
LTEQ1	-	54.47 (31.26)	1.20	3.17	61.61 (30.58)	1.02	2.17	48.55 (29.42)	1.55	5.33
LTEQ2	-	2.21 (.70)	-.38	-.84	2.42 (.60)	-.53	-.62	2.11 (.714)	-.16	-1.03
MVPA	-	3.21 (1.89)	.05	-.90	3.54 (1.78)	-.16	-.20	2.90 (1.93)	.27	-.83
GS Imp.	-	3.64 (1.01)	-.32	-.21	3.81 (.99)	-.45	-.27	3.47 (1.01)	-.22	-.03
GS Ability	-	3.77 (.87)	-.21	-.18	3.92 (.86)	-.28	-.48	3.63 (.85)	.18	.17

[a] RM=role modeled behaviour; ES=emotional support; Number=number of family members/peers engaged in the behaviour; GS Imp.=gender-stereotype for importance of behaviour; GS Ability=gender-stereotype for ability of behaviour; Interest, Attainment, Utility, Costs=subjective values; LTEQ1=Leisure time exercise questionnaire total physical activity in METS; LTEQ2=Leisure time exercise questionnaire physical activity frequency; MVPA=Quantity of moderate to vigorous physical activity; GS-Imp.=Gender-stereotype for importance of physical activity; GS-Ability=Gender-stereotype for ability of physical activity.

[b] Scale reliabilities are Cronbach's Alpha

[c] Skewness standard errors are .08 (total sample), .12 (boys), and .12 (girls)

[d] Kurtosis standard errors are .17 (total sample), .24 (boys), and .23 (girls)

Table 4.3.

Pearson Correlation Coefficients for BMI and Physical Activity-Specific Significant Other Influences, Gender Stereotypes, Competence, Values, and Behaviour for the Total Sample (N=857).

Variables[a]	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. BMI	-															
2. LTEQ1	.03	-														
3. LTEQ2	.07*	.44*	-													
4. MVPA	.08*	.56*	.59*	-												
5. Competence	-.06	.42*	.57*	.56*	-											
6. Interest	-.06	.43*	.48*	.43*	.64*	-										
7. Attainment	-.02	.32*	.48*	.41*	.62*	.71*	-									
8. Utility	.04	.30*	.52*	.45*	.64*	.70*	.78*	-								
9. Cost	.11*	.09*	.14*	.18*	.04	.05	.13*	.17*	-							
10. BF ES	.04	.21*	.28*	.31*	.31*	.30*	.32*	.33*	.22*	-						
11. BF RM	.04	.24*	.26*	.29	.34*	.33*	.35*	.36*	.15*	.68*	-					

12. NP	-.03	.22*	.26*	.27*	.31*	.30*	.29*	.28*	.13*	.36*	.45*	-					
13. PA ES	.09*	.18*	.30*	.26*	.30*	.31*	.37*	.40*	.12*	.29*	.28*	.22*	-				
14. PA RM	-.02	.06	.14*	.14*	.18*	.18*	.23*	.27*	.12*	.25*	.25*	.19*	.62*	-			
15. NF	.05	.12*	.18*	.20*	.24*	.17*	.20*	.21*	.03	.24*	.26*	.30*	.36*	.57*	-		
16. GS Imp	-.03	.03	.04	.02	.09*	.06	.00	.02	-.03	.06	.07	.05	.06	.01	-.02	-	
17. GS Ability	-.01	.00	.00	-.01	.07	.06	.06	.06	-.01	.03	.03	.03	.05	-.02	-.05	.36*	

* p <.05

[a] BMI=Body mass index; LTEQ1=Leisure time exercise questionnaire total physical activity in METS (item #1); LTEQ2=Leisure time exercise questionnaire physical activity frequency (item #2); MVPA=Quantity of moderate-to-vigorous physical activity; Subjective values = Interest, Attainment, Utility, Cost; BF ES = Best friend emotional support; BF RM=best friend role modeled behaviour; NP=number of peers who are physically active; PA ES=Parent emotional support; PA RM=Parent role modeled behaviour; NF=number of family members who are physically active; GS-Importance=gender-stereotype for importance of physical activity; GS-Ability=gender-stereotype for ability of physical activity.

Table 4.4.

Pearson Correlation Coefficients for BMI and Physical Activity-Specific Significant Other Influences, Gender Stereotypes, Competence, Values, and Behaviour for Boys (n=419; top) and Girls (n=438; bottom)

Variables[a]	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
1. BMI	-	.04	**.11***	.09	-.01	-.01	**.10***	**.14***	**.11***	**.10***	.09	-.01	**.15***	.04	-.02	-.02	.02
2. LTEQ1	.03	-	.53*	.47*	.33*	.20*	.24*	.20*	.03	.14*	.19*	.17*	.10*	.04	.09	.07	.04
3. LTEQ2	.06	.62*	-	.53*	.43*	.37*	.36*	.39*	.13*	.18*	.24*	.20*	.17*	.07	.10*	.07	.04
4. MVPA	.08	.59*	.60*	-	.55*	.39*	.43*	.44*	.16*	.28*	.32*	.28*	.25*	.19*	.21*	**.11***	.02
5. Comp.	-.05	.44*	.51*	.54*	-	.62*	.63*	.64*	-.02	.24*	.31*	.30*	.31*	.18*	.20*	**.22***	**.14***
6. Interest	-.05	.35*	.44*	.43*	.62*	-	.68*	.68*	-.01	.28*	.35*	.29*	.34*	.19*	.12*	**.16***	**.11***
7. Attain.	-.04	.32*	.46*	.38*	.62*	.73*	-	.80*	.10*	.29*	.36*	.30*	.41*	.25*	.19*	**.14***	.09
8. Utility	.01	.37*	.52*	.46*	.64*	.71*	.76*	-	.14*	.30*	.36*	.29*	.43*	.31*	.21*	**.15***	.09
9. Cost	.05	.17*	.22*	.21*	.11*	.12*	.17*	.21*	-	.20*	.13*	.14*	.06	.12*	.03	-.06	-.06
10. BFES	.02	.27*	.29*	.34*	.37*	.32*	.34*	.36*	.23*	-	.66*	.35*	.23*	.23*	.23*	**.15***	.01
11. BFRM	.02	.23*	.21*	.25*	.33*	.29*	.33*	.35*	.19*	.72*	-	.42*	.28*	.26*	.21*	**.12***	.03

12. NP	-.01	.21*	.22*	.23*	.29*	.28*	.27*	.25*	.14*	.38*	.46*	-	.20*	.21*	.34*	.09	.09
13. PAES	.05	.24*	.35*	.27*	.32*	.31*	.34*	.38*	.17*	.34*	.29*	.24*	-	.59*	.28*	**.11***	**.11***
14. PARM	-.06	**.11***	**.18***	.14*	.24*	.21*	.24*	.26*	.10*	.27*	.28*	.19*	.65*	-	.56*	.04	.02
15. NF	-.05	**.15***	.23*	.22*	.31*	.24*	.22*	.21*	.03	.25*	.33*	.28*	.42*	.58*	-	-.01	-.01
16. GSImp.	-.08	-.08	**-.10***	**-.10***	-.07	-.08	**-.15***	**-.12***	.01	-.02	-.01	-.03	.02	.01	-.01	-	.38*
17. GSAb.	-.05	**-.10***	**-.10***	-.08	-.06	-.04	.01	.00	.05	-.01	-.01	-.07	.01	-.03	-.08	.31*	-

* $p < .05$

[a] BMI=Body mass index; LTEQ1=Leisure time exercise questionnaire total physical activity in METS (item #1); LTEQ2=Leisure time exercise questionnaire physical activity frequency (item #2); MVPA=Quantity of moderate-to-vigorous physical activity; Subjective values = Interest, Attainment, Utility, Cost; BFES = Best friend emotional support; BFRM=best friend role modeled behaviour; NP=number of peers who are physically active; PAES=Parent emotional support; PARM=Parent role modeled behaviour; NF=number of family members who are physically active; GSImp.=gender-stereotype for importance of physical activity; GSAb.=gender-stereotype for ability of physical activity.

4.4.2. Relationships Among Adolescents' Perceptions of Significant Other Influence, Competence, Values, and Physical Activity Behaviour.

Relationships among the manifest variables were examined as Pearson correlation coefficients. Relationships among the latent variables were examined in the measurement models using structural equation modeling techniques. Latent path analyses were performed to examine the parameter estimates and prediction equations in the expectancy-value models for boys and girls.

4.4.2.1. Correlations. There were several significant correlations among the study variables. Pearson correlation coefficients are presented in Table 4.3 for the total sample, and Table 4.4 for boys (top of the matrix) and girls (bottom of the matrix). Gender differences were found in the pattern of significant correlations. Thirteen of the intercorrelations were significant for boys and did not reach significance for girls. Seven of the relationships among manifest variables were significant for girls and not for boys (refer to Table 4.4, different significant intercorrelations are indicated by boldface type).

4.4.2.2. Structural equation modeling. Structural equation modeling was used to test the hypothesis that competence and subjective value mediated the relationships between the parent and best friend constructs and physical activity and eating behaviours. As a result of the gender differences observed in all previous analyses, the models were tested separately for boys and girls. The total sample was not included in modeling procedures.

The hypothesized model predicting physical activity is depicted in Figure 4.2. In this model, the influence of parent is identified as a latent variable with number of active family members (P1), role modeled behaviour (P2), and emotional support (P3) manifest variables as indicators. The influence of best friend is identified as a latent variable with number of active peers (B1), role modeled behaviour (B2), and emotional support (B3) manifest variables as indicators. Competence is identified as a latent variable with four indicators (C1- C4), subjective value is a latent variable with interest (S1), attainment (S2), and utility (S3) value manifest variables as indicators, and physical activity is represented as a latent variable with the two items from the Godin scale (PA1 & PA2) and the two items from the physical activity screening measure (PA3 & PA4) as indicators. Gender stereotypes were not included in the models due to weak correlations with the other variables.

Measurement model. In the measurement models, factor loadings on the first manifest variable for each latent factor were set to 1.0 for identification, leaving the variances free to be estimated. The measurement equations revealed that all factor loadings were significant ($p < .01$), with 88-94% of the loadings greater than .60. Examination of the distribution of the 136 standardized residuals in the measurement model analyses demonstrated evidence of significant over- and under-estimation of fitted correlations (Boys: 38.9% $z < |.1|$, 41.1% $z > |.2|$; Girls: 51.4% $z < |.1|$, 57.1% $z > |.2|$). Latent factor intercorrelations and factor loadings are presented in Figure 4.3 (boys) and Figure 4.4 (girls). The factors were all significantly correlated, with evidence of high relationships emerging among competence, value, and physical activity latent factors.

The overall fit of the models was good (Boys: χ^2 (109, n=419)=282.31, p <.01; RMSEA=.06, CFI=.95, IFI=.95, NNFI=.93, SRMR=.06; Girls: χ^2 (109, n=438)= 312.37, p <.01; RMSEA=.06, CFI=.95, IFI=.95, NNFI=.93, SRMR=.06).

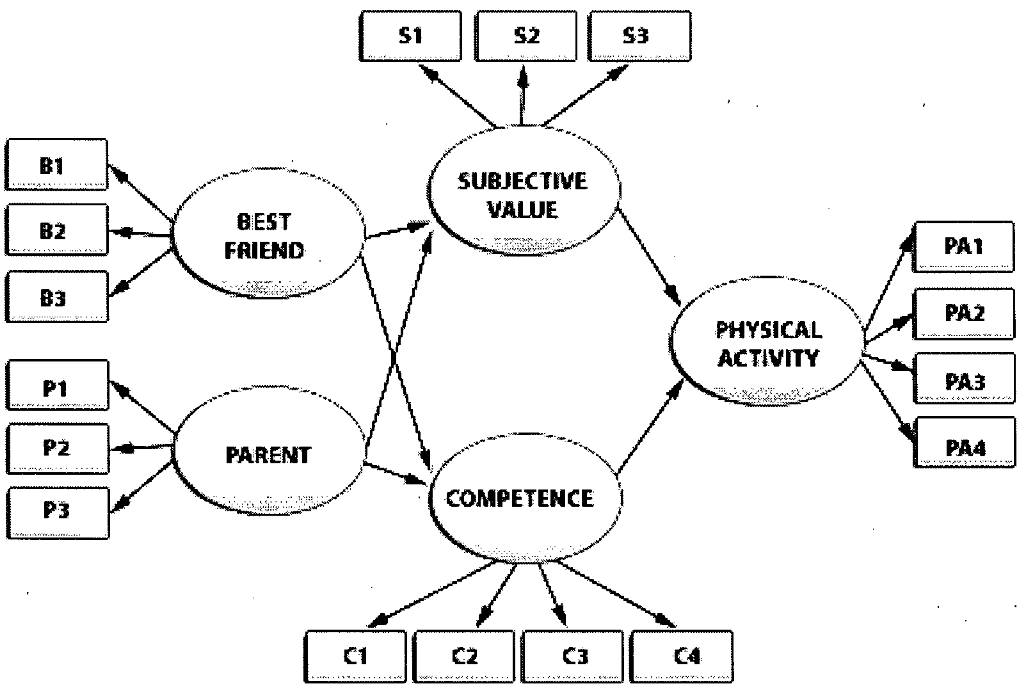

Figure 4.2. Hypothesized model depicting measurement and structural paths for physical activity.

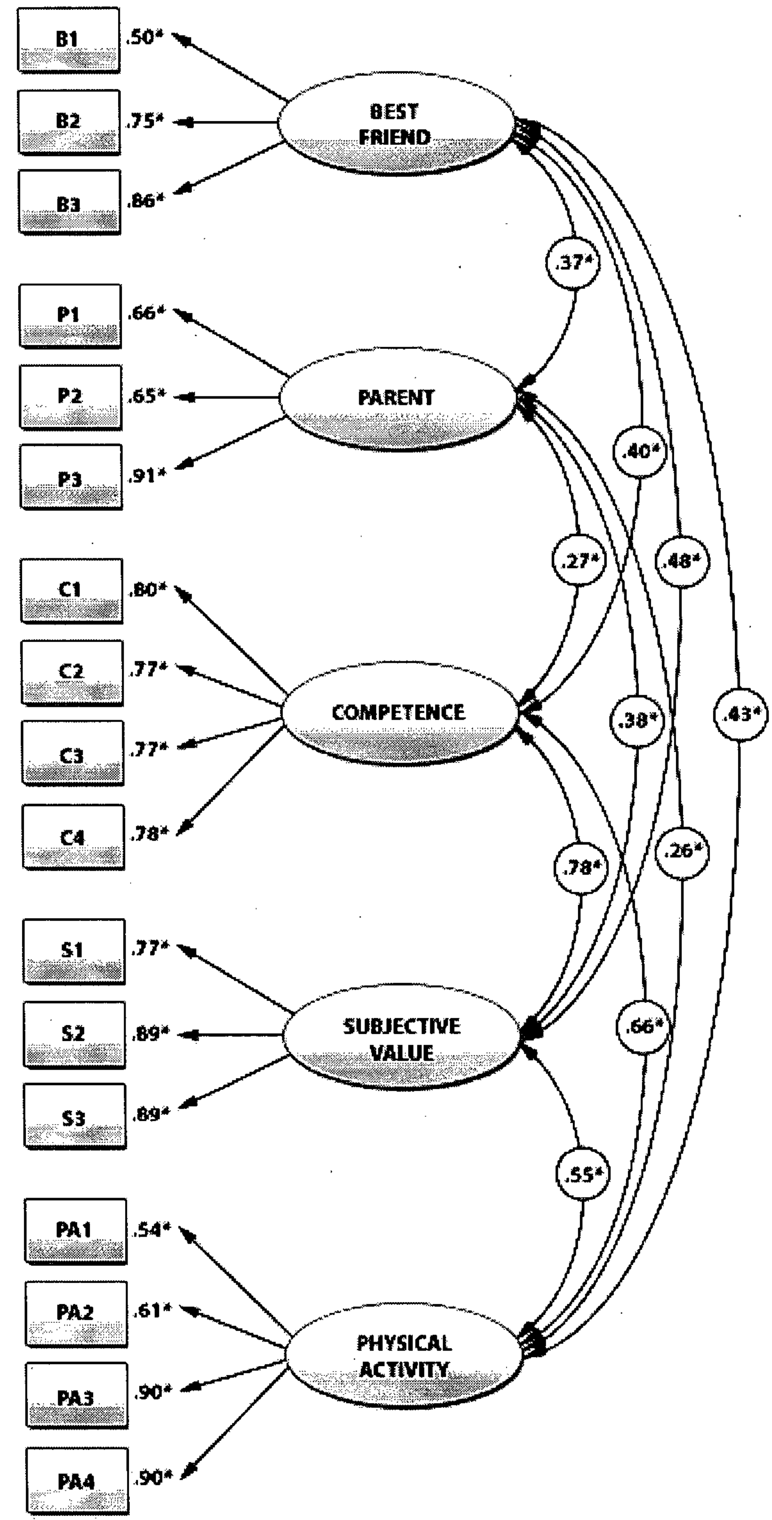

Figure 4.3. Measurement models depicting standardized coefficients for boys (n=419).

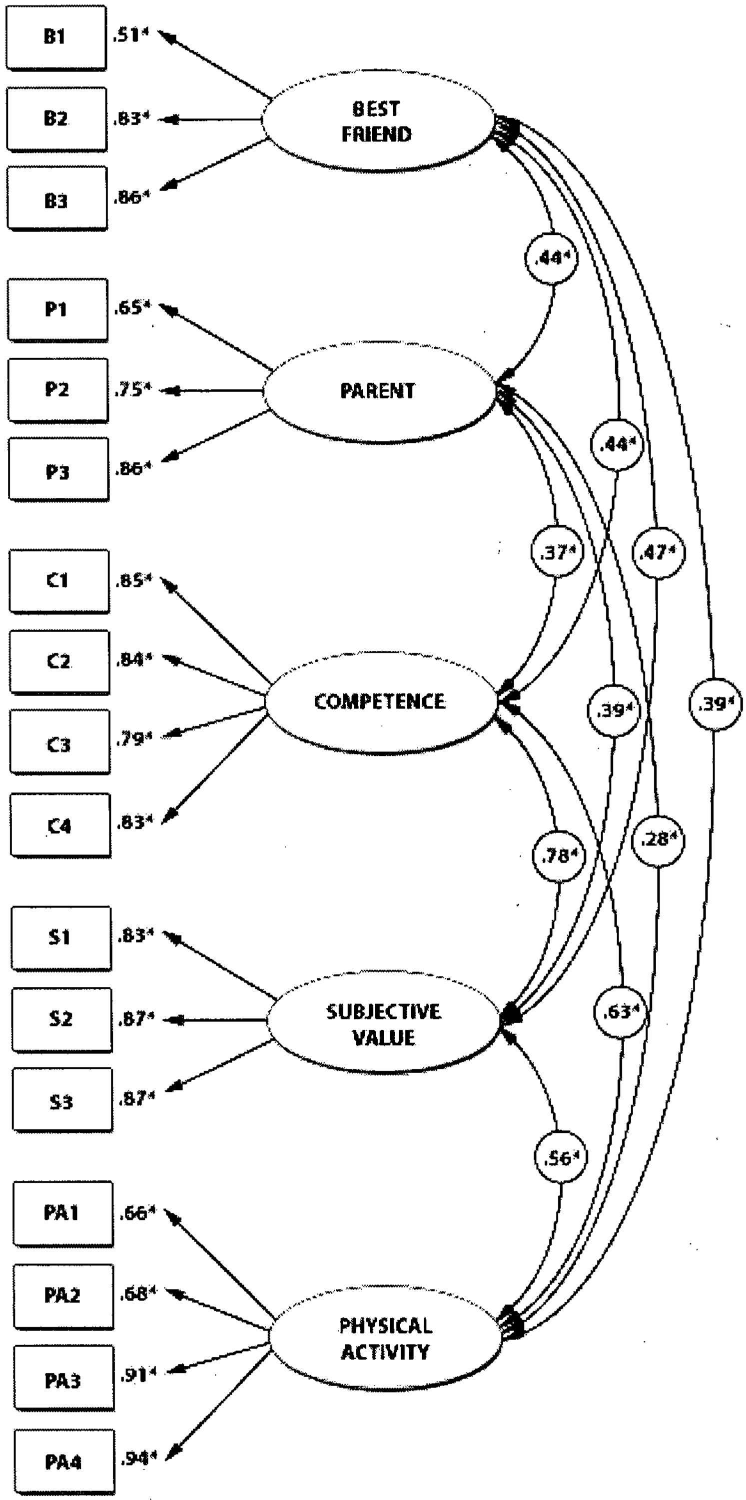

Figure 4.4. Measurement models depicting standardized parameters for girls (n=438).

Gender Invariance. To test the hypothesis of sex moderating the effects of the measurement models, sequential tests of invariance were performed (see Table 4.5). For these analyses, a factor loading for each latent variable was set to 1.0 for identification, allowing the variances to be freely estimated. The simultaneous group analysis demonstrated that the chi-square difference test was significant when the factor loadings and variances were constrained to be equal. Therefore, the measurement models were not the same boys and girls. However, these results should be interpreted cautiously since there is little change in the fit indices at the various levels of constraint. The significant findings could be a result of overestimation of the chi-square statistic when using maximum likelihood estimation. Decisions to accept or reject a model cannot be made on a purely statistical basis since problems associated with the use of the chi-square statistic as a criterion have been noted (i.e., Byrne et al., 1989; Steenkamp & Baumgartner, 1998). The objective of these tests of invariance were merely empirical, thus noting the differences between sexes was satisfactory. However, pinpointing differences in the structural parameters between boys and girls was considered informative, and further model testing was performed.

It is recommended to rely upon substantive consideration when deciding which factor loadings should not be constrained across sexes (Byrne et al., 1989). Unfortunately, this information is not available on the measures used in this study, and it was necessary to rely on empirical criteria (such as modification indices and expected parameter changes) to relax and constrain parameters univariately. Using these methods, a number of models were examined in which the invariance of each parameter in the factor covariance matrix was tested independently. Only the final models are presented, with the parameter constraints that were relaxed identified, and model fit indices provided: (i) Factor loading parameters for LTEQ2, Competence item #2, and emotional support for best friend and parent, $\chi^2(223)=604.78$; RMSEA=.063, CFI=.95, IFI=.95, NNFI=.94, SRMR=.058; (ii) Factor variances for parent, competence, value, and physical activity, $\chi^2(224)=606.78$; RMSEA=.063, CFI=.95, IFI=.95, NNFI=.94, SRMR=.062; (iii) Factor covariances between competence-value, competence-physical activity, competence-best friend, value-physical activity, and best friend-parent, $\chi^2(229)=615.57$; RMSEA=.063, CFI=.95, IFI=.95, NNFI=.94, SRMR=.079; and (iv) Error variances for LTEQ2, all competence items, and interest, attainment, and utility manifest variables, $\chi^2(237)=623.20$; RMSEA=.062, CFI=.95, IFI=.95, NNFI=.94, SRMR=.078. As can be seen from these findings, relaxing invariant constraints reduced the chi-square differences between the sequential steps, however did not improve the model fit indices. It is likely that imposing these further statistical modifications on the models did not result in practical significance of the findings since there are no known theoretical justifications to assume differences in the basic meaning and structure of the constructs for boys and girls. Furthermore, several of these gender difference findings are relatively minor and should not detrimentally affect the remaining analyses and their associated implications.

Table 4.5.

Results of Sequential Multi-group Covariance Analyses to Test Equivalence of the Physical Activity Measurement Model for Boys (n=419) and Girls (n=438).

	χ^2	*df*	$\Delta\chi^2$	*P*	RMSEA	CFI	IFI	NNFI	SRMR
Boys (M1)	282.31	109	-	-	.062	.95	.95	.93	.06
Girls (M2)	312.37	109	-	-	.065	.95	.95	.93	.06
M3	600.37	219	-	-	.064	.95	.95	.94	.06
M4	634.69	231	34.32	<.01	.064	.95	.95	.94	.07
M5	658.03	236	23.34	<.01	.065	.95	.95	.94	.11
M6	672.38	246	14.35	n.s.	.064	.95	.95	.94	.10
M7	728.62	262	56.24	<.01	.065	.94	.94	.93	.10

Note: χ^2=chi-square; df=degrees of freedom; $\Delta\chi^2$=chi-square difference; RMSEA=root mean square error of approximation; CFI=confirmatory fit index; IFI=incremental fit index; NNFI=non-normed fit index; SRMR=standardized root mean residual; M1=Measurement model for boys (*n*=419); M2=Measurement model for girls (*n*=438); M3=Configural invariance (*N*=528); M4=Metric invariance; M5=M4 with factor variance invariance; M6=M5 with factor covariance invariance; M7=M6 with error variance invariance.

Path models. For the path analysis, the latent factor variances were set to 1.0 for identification, and the latent competence and value factors were free to correlate. First, the models were examined for the prediction and relationships among parent and best friend influences and physical activity competence and value. For girls, the prediction equations revealed that parent and best friend influences significantly accounted for 24 and 26% of the variance in competence and subjective value, respectively. For boys, parent and best friend influences accounted for 19% of the variance in competence perceptions, and 28% of the variance in subjective value. In the models, best friend exerted a stronger effect on both physical activity competence and value. Based on these results, the more distal paths in model are supporting the expectancy-value model.

The proximal relationships in the model were examined next. For boys, the path models revealed good fit indices, χ^2 (111, *n*=419)=297.98, p <.01; RMSEA=.06, CFI=.94, IFI=.94, NNFI=.93, SRMR=.06. Parent and best friend were significant predictors of competence and value. The path from competence to activity was significant, and the model predicted 44% of the variance in physical activity (see Figure 4.5a). The structural model fit indices also indicated good fit for girls, χ^2 (111, *n*=438)=319.16, p <.01; RMSEA=.07, CFI=.95, IFI=.95, NNFI=.94, SRMR=.06. In this model, parent and best friend were significant predictors of competence and value, the paths between both competence and subjective value and physical activity were significant, and the model accounted for 41% of the variance in physical activity behaviour (see Figure 4.6a).

With the strong relationship noted (*r*=.78) between subjective value and competence, multicollinearity was considered a potential problem in the models. This relationship was thought to have influenced the non-significant finding of the path between subjective value and physical activity in the model for boys. In this model, the standard errors for the paths were not large (i.e., SE=.10 and .09 for competence-activity and value-activity, respectively), showing evidence of some accuracy in the model estimation. An alternative model was examined in which the paths between competence and activity and subjective value and activity were constrained to be equal (Marsh et al., 2004). The competence and subjective value factors were scaled to have a variance of 1.0 to allow the effects to be in relation to a common metric. By imposing this constraint, it was possible to compare the models and examine whether the findings noted above were accurate. If the two paths *were* different, the original model would fit the data significantly better than the constrained model. According to Marsh and colleagues (2004), the constrained model fit could not be any better that the original model to demonstrate that value and competence differed in their contribution to the prediction of physical activity. The original model fit, $\chi^2(111, n=419)=297.98, p<.01$, RMSEA=.063, NNFI=.93, CFI=.94, IFI=.94, SRMR=.07, $R^2=.44$, was compared to the constrained model fit, $\chi^2(112, n=419)=308.65, p<.01$, RMSEA=.065, NNFI=.93, CFI=.94, IFI=.94, SRMR=.07, $R^2=.41$. The difference in chi-squares ($\Delta\chi^2=10.67$) for the two models was statistically significant ($p<.01$) in relation to the difference in degrees of freedom ($\Delta df=1$), and the model fit indices indicated that the constrained model was a good fitting model, but with a slightly higher RMSEA value (and wider 90% confidence interval) compared to the original model. The relationship between competence and value was the same in both models, and the standard errors for the path coefficients between competence and activity and value and activity were reduced in the constrained model (SE's=.034). Therefore, based on the chi-square difference test, it can be concluded that competence is a better predictor of physical activity than value for boys. Also, the covariance between competence and physical activity was observed to be lower than the covariance between subjective value and physical activity, showing further support for this finding. However, with the constrained model being a good fitting model with lower standard errors for the competence, value, and physical activity paths, caution is offered in interpreting these findings.

Similar findings were revealed when the models were examined for girls. The original model fit (χ^2(111, n=438)=319.16, p<.01, RMSEA=.066, NNFI=.94, CFI=.95, IFI=.95, SRMR=.06, R^2=.41) was compared to the constrained model fit ((χ^2(112, n=438)=327.09, p<.01, RMSEA=.066, NNFI=.94, CFI=.95, IFI=.95, SRMR=.06, R^2=.40). The difference in chi-squares ($\Delta\chi^2$=7.93) for the two models was statistically significant (p<.01) in relation to the difference in degrees of freedom (Δdf=1). It was expected that these two models would have similar characteristics since both competence and value were significant predictors of physical activity for girls. The relationship between competence and value was the same in both models, and the standard errors for the path coefficients between competence and activity and value and activity were reduced in the constrained model (SE's=.026) from the original model (SE's=.09 and .08 for paths between competence and physical activity, and value and activity, respectively). Therefore, based on the chi-square difference test, it can be concluded that the paths between competence, value, and physical activity are exerting independent but similar effects in the prediction of physical activity.

Testing mediation. The expectancy-value model proposes that competence and value act as mediators in the relationship between the adolescent's perceptions of parent and best friend beliefs and behaviours and physical activity. To examine whether the mediation relationships (as presented above) represented the best way of fitting the data to the model, direct effects models were also conducted. An examination of the relationships among the latent variables (refer to Figures 4.3 & 4.4 for boys and girls, respectively) revealed that preliminary conditions for mediation were satisfied. Alternate structural models were also analyzed. The first model was examined whereby the direct effects of competence and subjective value on activity were fixed to zero, leaving only the direct effects of best friend and parent influences on physical activity. In this model (see Figure 4.5b & 4.6b for boys and girls, respectively), the path between best friend and parent latent variables and physical activity were significant for girls. Only best friend influences exerted significant direct effects on physical activity for boys. A second model was examined for the simultaneous direct effects of adolescents' perceptions of parent and best friend influences, competence, and subjective value on physical activity (see Figures 4.5c & 4.6c for boys and girls, respectively). The direct effect of best friend influence on physical activity was significant in the model for boys and girls, and parent influence was not significant. The path from subjective value to physical activity was reduced in both models and was no longer significant in the model for girls. The likelihood chi-square differences revealed that the first alternate models were significantly worse fitting models compared to the mediation models for boys and girls (see Table 4.6). The simultaneous direct effects models were significantly better fitting models compared to the mediation models based on the chi-square difference. However, the prediction and fit indices that are more robust to deviations in sampling distribution suggest little to no improvement when the direct effects of the independents are included.

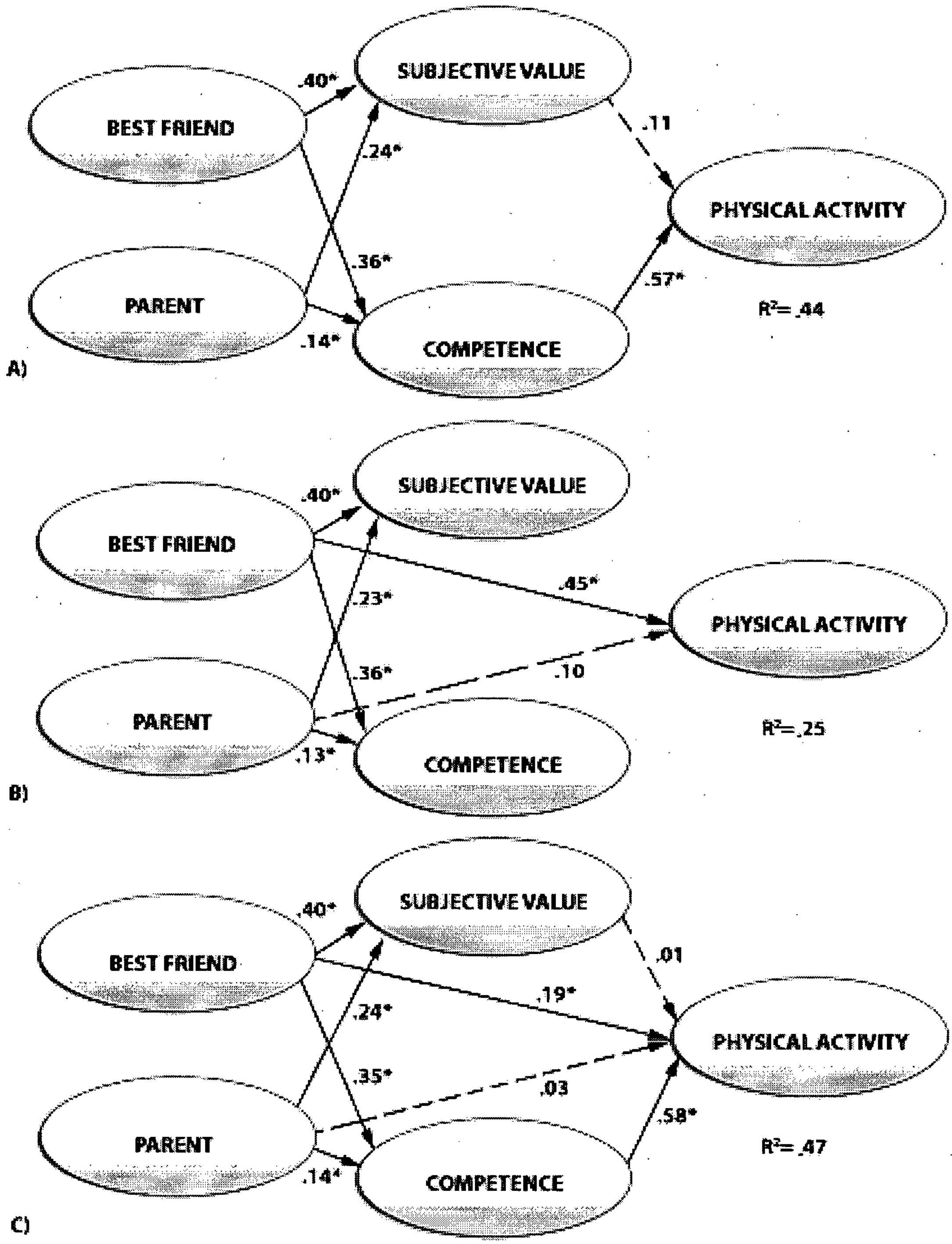

Figure 4.5. Mediation model (a), simultaneous direct effects model (b), and partial direct effects model (c) for boys (n=419). Significant (p <.01) paths are represented by solid lines.

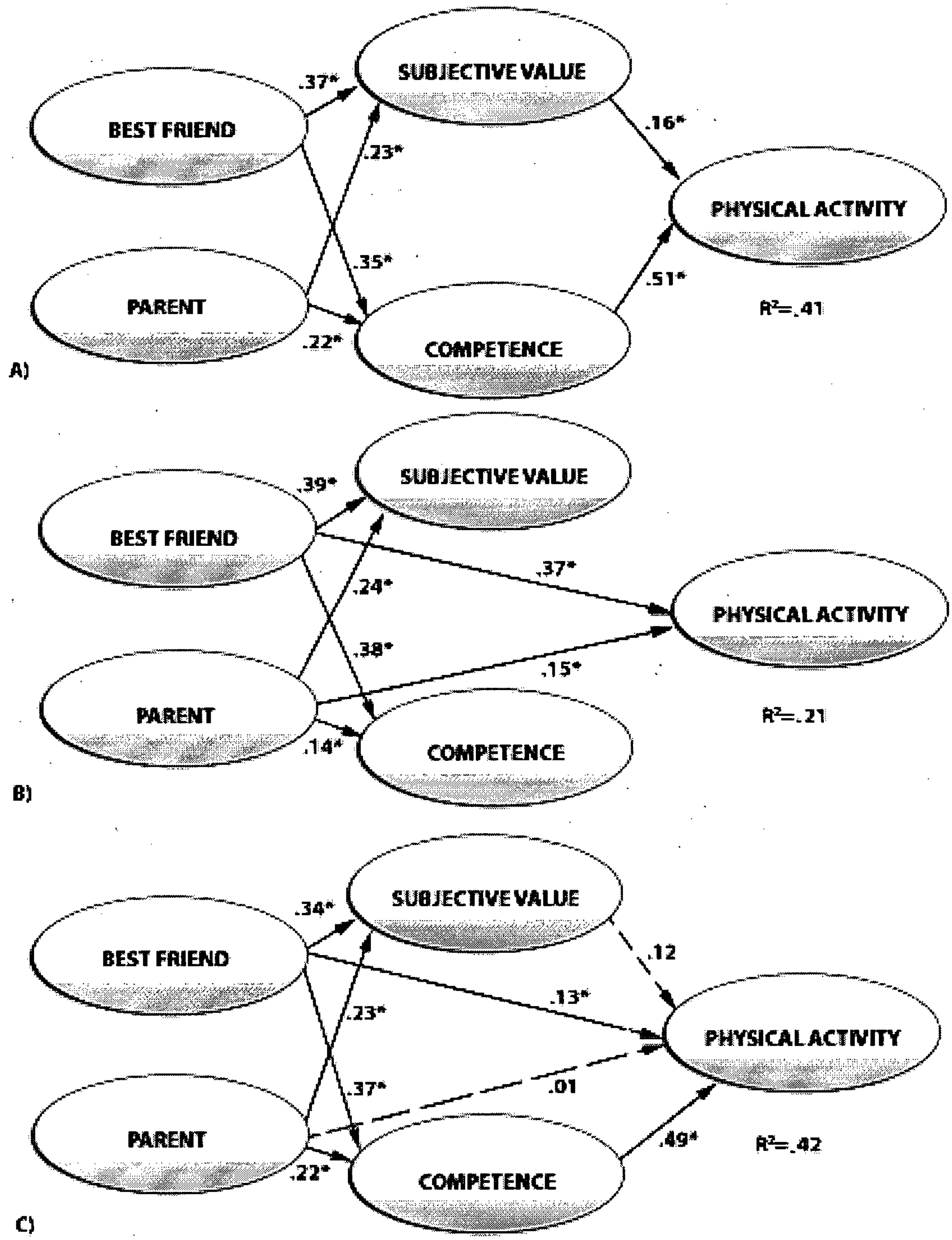

Figure 4.6. Mediation model (a), simultaneous direct effects model (b), and partial direct effects model (c) for girls (n=438). Paths represented by solid lines are significant.

Table 4.6.

Goodness of Fit Statistics for Direct Effects and Mediation Models for Physical Activity

Models	χ^2	df	$\Delta\chi^2$	*p*	RMSEA	CFI	IFI	NNFI	SRMR	R^2
					Boys (*n*=419)					
Direct 1	396.49	111	-98.51	<.01	.078	.90	.92	.90	.11	.25
Mediation	297.98	110	-	-	.063	.94	.94	.93	.07	.44
Direct 2	282.31	109	15.67	<.01	.062	.95	.95	.93	.06	.47
					Girls (*n*=438)					
Direct 1	415.98	111	-96.82	<.01	.079	.93	.93	.91	.13	.21
Mediation	319.16	110	-	-	.066	.95	.95	.94	.06	.41
Direct 2	312.37	109	6.79	<.05	.065	.95	.95	.94	.06	.42

Note: χ^2=chi-square; df=degrees of freedom; $\Delta\chi^2$=chi-square difference; RMSEA=root mean square error of approximation; CFI=confirmatory fit index; IFI=incremental fit index; NNFI=non-normed fit index; SRMR=standardized root mean residual; Direct 1= direct effect of best friend and parent on physical activity; Mediation=direct effects of parent and best friend influence on competence and value and competence and value on physical activity; Direct 2= simultaneous direct effects of best friend, parent, competence, and value on physical activity.

Products of coefficients were also examined to investigate the strength of indirect effects in the models. First the effects were examined separately for parent and best friend influence in the mediation models, followed by an overall assessment of the proportion of effects mediated. For boys, the indirect paths between parent→competence (standardized parameter estimate (SPE) =.14, $p < .05$) and competence→physical activity (SPE=.57, $p < .05$) were multiplied and compared to the direct effects (SPE =.03, $p > .05$) and total effects (SPE=.11, $p > .05$). The paths between parent→subjective value (SPE=.24, $p < .05$) and subjective value→physical activity (SPE=.00, $p > .05$) were also multiplied and compared to the direct and total effects examined. The indirect effect involving competence as the intervening variable was 72.7% of the total effect, with the direct effect being 27.3% of the total effect and the indirect effect with subjective value did not account for any of the total effect. Therefore, the mediation effect of competence was superior compared to the direct effect, and much stronger than subjective value as a mediator.

These results were repeated to examine the relationships between best friend and physical activity. The indirect paths between best friend→competence (SPE=.35, $p < .05$) and competence→physical activity (SPE=.57, $p < .05$) were multiplied and compared to the direct effects (SPE=.19, $p < .05$) and total effects (SPE=.39, $p < .05$). The paths between best friend→subjective value (SPE=.40, $p < .05$) and subjective value→physical activity (SPE=.00, $p < .05$) were also multiplied and compared to the direct and total effects examined. The mediation effect of competence was 51.3% of the total effect, with the indirect effect of subjective value again accounting for no effect. The direct effect of best friend→physical activity was 48.7%.

To examine the total effects in the model, the contribution of the indirect effects for the sum of parent→competence→physical activity and best friend→ competence→ physical activity ($\sum$SPE=.08+.20=.28) were compared to the sum total of the indirect effects parent→subjective value→physical activity and best friend→subjective value→ physical activity ($\sum$SPE=.00+.00=.00) and the direct effects of parent→physical activity and best friend→physical activity ($\sum$SPE=.03+.19=.22), which were divided by the total effects in the model ($\sum$SPE=.11+.39=.50). In the model, 56.0% of the total effect was accounted for by indirect effects through competence, with no contribution of the indirect effects through subjective value, and 44.0% of the total effect was accounted for by direct effects, which were primarily from best friend (as noted above).

For girls, the indirect paths between parent→competence (SPE=.22, $p < .05$) and competence→physical activity (SPE=.48, $p < .05$) were multiplied and compared to the direct effects (SPE=.00, $p > .05$) and total effects (SPE=.13, $p < .05$). The paths between parent→subjective value (SPE=.23, $p < .05$) and subjective value→physical activity (SPE=.13, $p < .05$) were also multiplied and compared to the direct and total effects examined. The indirect effect of parent→ competence→physical activity was 76.9% of the total effect, with the indirect effect of parent→ subjective value→physical activity being 23.0% of the total effect. There was no direct effect of parent→physical activity. Therefore, partial mediation was supported via both competence and subjective value, with competence emerging as a stronger mediator. These results were repeated to examine the relationships between best friend and physical activity. The indirect paths between best friend→competence (SPE=.34, $p < .05$) and competence→physical activity (SPE=.48, $p < .05$) were multiplied and compared to the direct effects (SPE=.12, $p < .05$)

and total effects (SPE=.33, $p < .05$). The paths between best friend→ subjective value (SPE=.37, $p < .05$) and subjective value→physical activity (SPE=.13, $p < .05$) were also multiplied and compared to the direct and total effects examined. The mediation effect of competence was 48.5% of the total effect, with the mediation effect of value accounting for 15.2% of the total effect. The direct effect of best friend→physical activity was 36.4%. As can be seen from these findings, competence and subjective value partially mediated the relationship between best friend and physical activity, however the direct effect was nearly as strong as the indirect effects.

To examine the total effects in the model, the contribution of the indirect effects for the sum of parent→competence→physical activity and best friend→ competence→ physical activity (∑SPE=.10+.16=.26) were compared to the sum total of the indirect effects parent→subjective value→physical activity and best friend→ subjective value→ physical activity (∑SPE=.03+.05=.08) and the direct effects of parent→physical activity and best friend→physical activity (∑SPE=.00+.12=.12), which were divided by the total effects in the model (∑SPE=.13+.33=.46). In the model, 56.5% of the total effect was accounted for by indirect effects through competence, 17.4% contribution of the total effect is through subjective value, and 26.1% of the total effect was accounted for by direct effects, which were completely from best friend (as noted above).

4.4.3. Summary of Findings for Physical Activity Behaviour

The findings revealed many strong correlations and covariances among manifest and latent factors that are consistent with the hypotheses. The measurement and structural models for boys and girls demonstrated good fit, with limited practical evidence that sex moderated the relationships in the measurement model. The structural models indicated that parent and best friend influences significantly accounted for 19-28% of the variance in competence and subjective value, with small differences in the strength of the predictions noted for boys and girls. Examining the main relationships in the model, competence and value accounted for 41-44% of the variance in physical activity. There were gender differences in the pattern of significant path model parameters. For boys, competence was the only significant predictor in the model, and alternate modeling suggested that best friend influence was also a significant predictor of physical activity. For girls, competence and value were significant predictors in the original model, with competence having strong influence. An alternate better fitting model demonstrated best friend and competence as strong predictors of physical activity and subjective value acting as a weak mediator in the model. These findings suggest that the best fitting models are similar for boys and girls, with competence and best friend having strong direct effects on physical activity. The results of the models examining physical activity identify partial support for the expectancy-value model.

4.5. Eating Behaviour Results

4.5.1. Mean level Adolescents' Perceptions of Significant Other Influence, Competence, Values, and Physical Activity Behaviour

The scale reliabilities, means, standard deviations, and distribution statistics for eating variables are presented in Table 4.7.

4.5.1.1. Multivariate and univariate analyses of variance. To examine gender differences, multivariate analyses of variance with follow-up analyses of variance were conducted with the eating behaviour constructs.

Gender Differences. The main effect for gender was significant, Wilks' lambda=.83, $F(14, 842)=12.13$. Follow-up univariate analyses revealed that girls had significantly higher scores on the following measures: interest, $F(1,855)=41.67$, $\eta^2=.05$; attainment, $F(1,855)=58.83$, $\eta^2=.06$; utility, $F(1,855)=57.62$, $\eta^2=.06$; cost, $F(1,855)=16.67$, $\eta^2=.02$; number of peers who follow a healthy diet, $F(1,855)=4.85$, $\eta^2=.01$; best friend role modeled behaviour, $F(1,855)=48.20$, $\eta^2=.05$; best friend emotional support, $F(1,855)=70.56$, $\eta^2=.08$; parent role modeled behaviour, $F(1,855)=11.06$, $\eta^2=.01$; parent emotional support, $F(1,855)=16.83$, $\eta^2=.02$; and eating behaviour (AHFC), $F(1,855)=37.56$, $\eta^2=.05$. Boys reported that in general, maintaining a healthy diet was more important for boys, $F(1,855)=4.02$, $\eta^2=.01$. Boys also reported significantly higher BMI's than girls, $F(1,831)=4.66$, $\eta^2=.01$. Due to the significant gender differences that emerged on several of the study variables, main analyses were conducted separately for boys and girls.

Table 4.7.

Scale Reliabilities, Means and Standard Deviations (SD), Skewness, and Kurtosis values for Eating-related Parent and Best Friend Role-Modeled Behaviour and Emotional Support, Competence, Values, and Behaviour.

		Total Sample (N=857)			Boys (n=419)			Girls (n=438)		
Scale [a]	α [b]	Mean (SD)	Skew [c]	Kurtosis [d]	Mean (SD)	Skew [c]	Kurtosis [d]	Mean (SD)	Skew [c]	Kurtosis [d]
Parent										
RM	.84	20.56 (5.72)	-.78	.08	19.90 (5.95)	-.61	-.33	21.20 (5.42)	-.97	.68
ES	.87	20.41 (6.04)	-.86	.15	19.56 (6.43)	-.69	-.28	21.24 (5.54)	-.98	.68
Number	-	3.32 (1.78)	-.21	-.96	3.31 (1.81)	-.20	-1.00	3.34 (1.76)	-.22	-.92
Best Friend										
RM	.88	15.14 (6.90)	-.04	-1.03	13.51 (6.87)	.22	-1.04	16.69 (6.56)	-.26	-.78
ES	.92	11.95 (6.75)	.45	-.85	10.04 (6.41)	.87	-.28	13.77 (6.56)	.15	-.86
Number	-	2.51 (1.57)	.21	-.66	2.39 (1.60)	.29	-.65	2.63 (1.55)	.14	-.63
Competence	.90	19.97 (5.71)	-.63	-.08	19.91 (5.87)	-.54	-.31	20.02 (5.56)	-.72	.19
Interest	.87	8.64 (3.22)	-.39	-.56	7.93 (3.30)	-.25	-.76	9.32 (2.99)	-.50	-.31

Attainment	.89	10.38 (3.13)	-.91	.28	9.57 (3.36)	-.62	-.38	11.16 (2.68)	-1.20	1.47
Utility	.91	10.57 (3.16)	-.93	.18	9.76 (3.38)	-.65	-.40	11.35 (2.71)	-1.18	1.07
Costs	.69	15.16 (5.07)	.12	-.09	14.44 (5.16)	.17	-.10	15.85 (4.90)	.12	-.04
AHFC	.87	52.30 (10.26)	-.22	.03	50.15 (10.37)	-.14	.00	54.36 (9.72)	-.26	.14
GSImp.	-	2.09 (.97)	.53	-.26	2.15 (.98)	.48	-.26	2.02 (.95)	.58	-.24
GSAbility	-	2.34 (.99)	.25	-.29	2.36 (1.00)	.26	-.32	2.33 (.98)	.24	-.26

[a] RM=role modeled behaviour; ES=emotional support; Number=number of family members/peers engaged in the behaviour; GSImp.=gender-stereotype for importance of behaviour; GSAbility=gender-stereotype for ability of behaviour; Interest, Attainment, Utility, Costs=subjective values; AFHC=Eating behaviour

[b] Scale reliabilities are Cronbach's Alpha

[c] Skewness standard errors are .08 (total sample), .12 (boys), and .12 (girls)

[d] Kurtosis standard errors are .17 (total sample), .24 (boys), and .23 (girls)

4.5.2. Relationships Among Adolescent's Perceptions of Parent and Peer Role-Modeled Behaviour and Emotional Support, Competence, Values, and Eating Behaviour.

Pearson correlations were conducted to investigate the relationships among the manifest variables. Relationships among latent variables were examined using structural equation modeling techniques and presented in the measurement models. The parameter estimates and prediction equations were examined using latent path analysis.

4.5.2.1. Correlations. Moderate significant correlations were observed among eating behaviour (AFHC) and competence, values, and significant other influence variables. Pearson correlation coefficients are presented in Table 4.8 for the total sample, and Table 4.9 for boys (top of the matrix) and girls (bottom of the matrix). There were differences between boys and girls on several (24.8%) intercorrelations (see boldface numbers in Table 4.9 for differences in intercorrelations). It is worthwhile to note that the majority of relationships between significant other influences, competence, values, eating behaviour, and gender stereotypes were stronger for boys than they were for girls.

4.5.2.2. Structural equation modeling. The hypothesized model predicting physical activity is depicted in Figure 4.7. In this model, the influence of parent was identified as a latent variable with number of family members engaged in healthy eating behaviours (P1), role modeled behaviour (P2), and emotional support (P3) manifest variables as indicators. The influence of best friend was identified as a latent variable with number of peers engaged in healthy eating behaviours (B1), role modeled behaviour (B2), and emotional support (B3) manifest variables as indicators. Competence was identified as a latent variable with four indicators (C1- C4), subjective value was a latent variable with interest (S1), attainment (S2), and utility (S3) value manifest variables as indicators, and eating behaviour was represented as a latent variable with four item parcels as indicators. Gender stereotypes were excluded from the models due to weak relationships with other variables.

Table 4.8.

Pearson Correlation Coefficients for BMI and Eating-Specific Significant Other Influences, Gender Stereotypes, Competence, Values, and Behaviour for the Total Sample (N=857).

Variables[a]	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. BMI	-													
2. AFHC	.08*	-												
3. Competence	-.12*	.52*	-											
4. Interest	-.07*	.55*	.53*	-										
5. Attainment	.03	.60*	.55*	.65*	-									
6. Utility	.07*	.56*	.56*	.60*	.85*	-								
7. Cost	.14*	-.04	-.22*	.03	.16*	.17*	-							
8. BF ES	.02	.31*	.26*	.37*	.38*	.39*	.14*	-						
9. BF RM	-.03	.32*	.32	.40*	.45*	.46*	.07	.75*	-					
10. NP	-.07*	.17*	.30*	.32*	.31	.32*	.05	.52*	.56*	-				
11. PA ES	.01	.35*	.36*	.32*	.48*	.48*	.01	.36*	.37*	.30*	-			

12. PA RM	-.09*	.31*	.37*	.32*	.43*	.42*	-.01	.32*	.38*	.32*	.82*	-		
13. NF	-.07	.26*	.37*	.28*	.33*	.32*	-.06	.34*	.35*	.45*	.50*	.58*	-	
14. GS Imp.	.01	.05	.15*	.14*	.08*	.07*	.05	.09*	.08*	.09*	.03	.06	.11*	-
15. GS Ability	.01	.07*	.12*	.15*	.12*	.11*	.06	.10*	.11*	.06	.06	.04	.06	.62*

* p <.05

[a] BMI=Body mass index; AFHC=Adolescent Food Habits Checklist; Subjective values = Interest, Attainment, Utility, Cost; BF ES = Best friend emotional support; BF RM=best friend role modeled behaviour; NP=number of peers following a healthy diet; PA ES=Parent emotional support; PA RM=Parent role modeled behaviour; NF=number of family members following a healthy diet; GS-Imp.=gender-stereotype for importance of a healthy diet; GS Ability=gender-stereotype for ability of following a healthy diet.

Table 4.9.

Pearson Correlation Coefficients for BMI and Eating-Specific Significant Other Influences, Gender Stereotypes, Competence, Values, and Behaviour for Boys (n=419; top of matrix) and Girls (n=438; bottom of matrix).

Variables[a]	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. BMI	-	**.18***	-.01	.07	.17*	.20*	.08	.09	.04	-.03	.09	-.01	-.01	.02	-.04
2. AFHC	.04	-	.56*	.56*	.65*	.60*	.00	.28*	.34*	.19*	.35*	.32*	.27*	.16*	.15*
3. Competence	**-.21***	.51*	-	.55*	.58*	.61*	-.19*	.29*	.37*	.35*	.38*	.40*	.39*	**.21***	**.24***
4. Interest	**-.14***	.49*	.53*	-	.66*	.63*	.02	.39*	.41*	.36*	.36*	.36*	.34*	**.23***	**.26***
5. Attainment	-.11*	.51*	.55*	.58*	-	.85*	.15*	.36*	.47*	.37*	.55*	.50*	.41*	**.18***	**.19***
6. Utility	-.03	.47*	.54*	.52*	.83*	-	.15*	.38*	.47*	.40*	.55*	.49*	.41*	**.18***	**.19***
7. Cost	**.14***	**-.14***	-.26*	-.04	.10*	.12*	-	**.16***	.05	**.12***	.02	.03	-.01	.08	.04
8. BF ES	-.03	.25*	.24*	.28*	.31*	.30*	.05	-	.75*	.54*	.33*	.28*	.35*	**.16***	**.17***
9. BF RM	-.08	.22*	.28*	.32*	.36*	.37*	.02	.72*	-	.58*	.40*	.42*	.40*	**.13***	**.19***
10. NP	-.09	.14*	.24*	.25*	.22*	.21*	-.04	.50*	.55*	-	.35*	.36*	.46*	**.10***	.08
11. PA ES	-.04	.31*	.32*	.23*	.34*	.35*	-.04	.35*	.30*	.22*	-	.82*	.52*	.07	**.11***

12. PA RM	**-.13***	.26*	.34*	.25*	.31*	.31*	-.07	.32*	.30*	.28*	.82*	-	.60*	**.10***	**.11***
13. NF	**-.16***	.25*	.35*	.22*	.25*	.23*	**-.13***	.37*	.32*	.43*	.49*	.57*	-	.12*	.08
14. GS Imp.	-.03	-.03	.09	.07	.00	-.04	.04	.08	.06	.08	.01	.03	.10*	-	.61*
15. GS Ability	.02	-.01	-.01	.04	.04	-.01	.09	.04	.04	.05	.01	-.03	.03	.63*	-

* $p < .05$

[a] BMI=Body mass index; AFHC=Adolescent Food Habits Checklist; Subjective values = Interest, Attainment, Utility, Cost; BF ES = Best friend emotional support; BF RM=best friend role modeled behaviour; NP=number of peers following a healthy diet; PA ES=Parent emotional support; PA RM=Parent role modeled behaviour; NF=number of family members following a healthy diet; GS Imp.=gender-stereotype for importance of a healthy diet; GS Ability=gender-stereotype for ability of following a healthy diet.

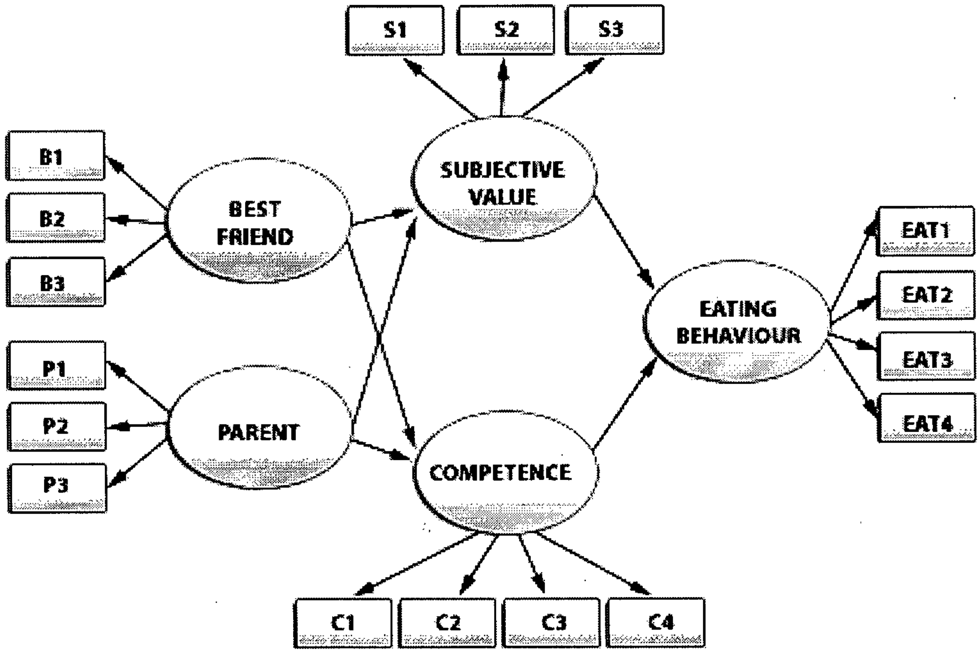

Figure 4.7. Hypothesized model depicting measurement and structural paths for eating behaviour as conceptualized by the expectancy-value model.

Measurement model. The measurement equations revealed that all factor loadings were significant ($p < .01$), and moderate to high relationships among the latent variables were observed. Latent factor intercorrelations and factor loadings are presented in Figures 4.8 and 4.9 for boys and girls, respectively. Examination of the distribution of the 136 standardized residuals in the measurement model analyses demonstrated evidence of significant over- and under-estimation of fitted correlations (Boys: 36.0% $z < |.1|$, 42.6% $z > |.2|$; Girls: 42.1% $z < |.1|$, 38.2% $z > |.2|$). The overall fit of the models was good (Boys: χ^2 (109, n=419)=266.06, p <.01; RMSEA=.06, CFI=.97, IFI=.97, NNFI=.95, SRMR=.05; Girls: χ^2 (109, n=438)= 322.93, p <.01; RMSEA=.07, CFI=.95, IFI=.95, NNFI=.94, SRMR=.05).

Gender Invariance. To evaluate hypotheses concerning the equivalence of the measurement models for boys and girls, sequential multi-group analyses were conducted. The results of the sequential model tests are presented in Table 4.10. Gender invariance was supported in the baseline model, supporting configural invariance, and when the factor loadings were constrained to be equal, supporting metric invariance. Factor variance, covariance, an error variance invariance were not tenable. Based on these results, the measurement of the constructs for eating behaviour was similar for boys and girls, but the factor scores (i.e., variances) and relationships among the latent factors (i.e., covariances) were different. Given the objectives of this study were satisfied with the finding of configural and metric invariance, no further modifications were made. Also, there are no existing theoretical or conceptual reasons to suspect full invariance among the constructs for eating behaviour.

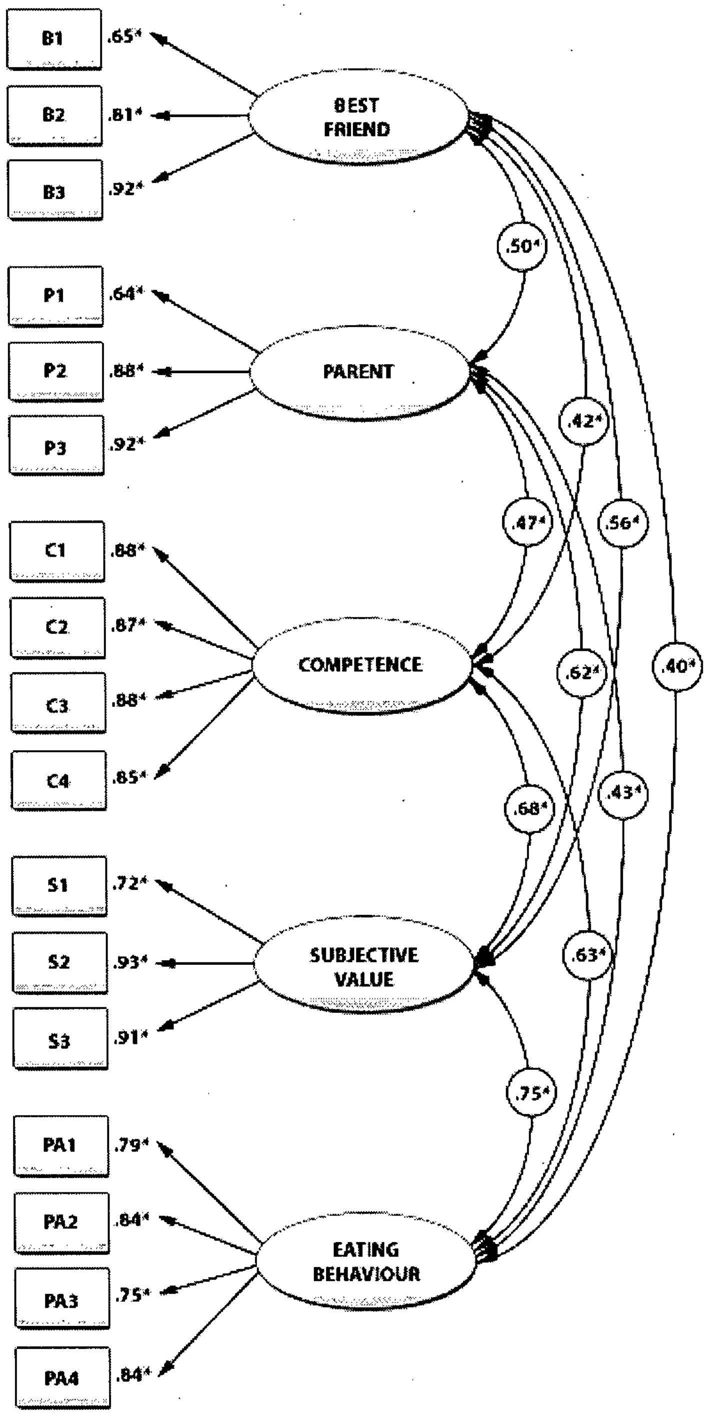

Figure 4.8. Measurement model depicting the standardized factor loadings and covariances among the latent variables and their indicators for boys (n=419).

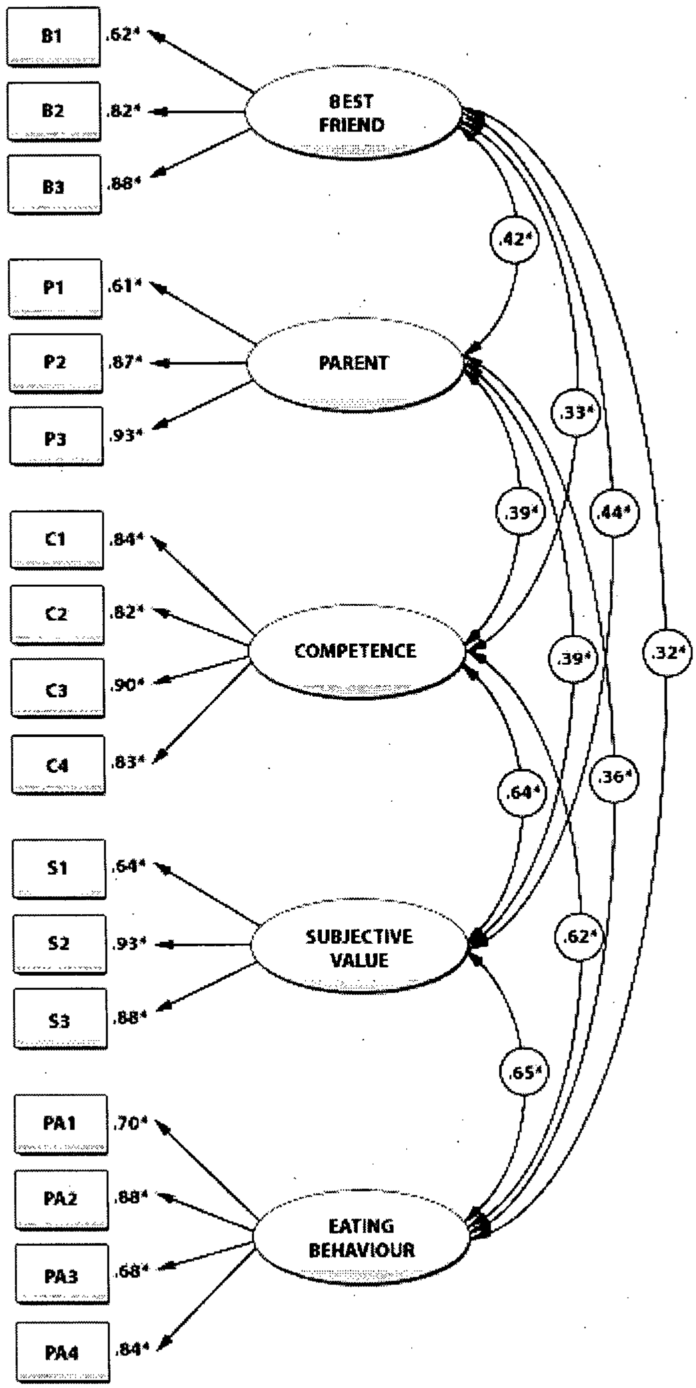

Figure 4.9. Measurement model depicting the standardized factor loadings and covariances among the latent variables and their indicators for girls (n=438).

Table 4.10.

Results of Sequential Multi-group Covariance Analyses to Test Equivalence of the Eating Behaviour Measurement Model for Boys (n=419) and Girls (n=438).

	χ^2	*df*	$\Delta\chi^2$	*p*	RMSEA	CFI	IFI	NNFI	SRMR
Boys (M1)	266.06	109	-	-	.059	.97	.97	.95	.054
Girls (M2)	322.93	109	-	-	.067	.95	.95	.94	.054
M3	589.00	218	-	-	.063	.96	.96	.95	.054
M4	594.94	230	5.94	n.s.	.061	.96	.96	.95	.057
M5	620.19	235	25.25	$p<.01$	.062	.96	.96	.95	.077
M6	640.06	245	19.87	$p=.05$	.061	.96	.96	.95	.061
M7	699.42	262	59.36	$p<.01$	.062	.96	.96	.95	.085

Note: χ^2=chi-square; df=degrees of freedom; $\Delta\chi^2$=chi-square difference; RMSEA=root mean square error of approximation; CFI=confirmatory fit index; IFI=incremental fit index; NNFI=non-normed fit index; SRMR=standardized root mean residual; M1=Measurement model for boys (*n*=419); M2=Measurement model for girls (*n*=438); M3=Configural invariance (*N*=528); M4=Metric invariance; M5=M4 with factor variance invariance; M6=M5 with factor covariance invariance; M7=M6 with error variance invariance.

Path model. For the path analysis, the latent factor variances were set to 1.0 for identification and the competence and value latent factors were free to correlate. First, the prediction equations and path coefficients were examined between the latent variables. In the more distal part of the model, parent and best friend influences accounted for 19%

and 26% of the variance in competence perceptions and 25% and 46% of the variance in subjective value for girls and boys, respectively. The standardized path coefficients indicated that parents were a stronger influence on both competence and subjective value for boys. Examining the standardized path coefficients for girls, perceptions of best friend exerted stronger effects on subjective value compared to perceptions of parent influence, however parents exerted stronger effects on competence.

Following the observations of support for the distal relationships and prediction among constructs in the model, the structural model was examined. The path models for the hypothesized relationships among the latent variables indicated good fit (Boys: χ^2 (111, n=419)=270.27, p <.01; RMSEA=.06, CFI=.97, IFI=.97, NNFI=.96, SRMR=.05; Girls: χ^2 (111, n=438)=323.56, p <.01; RMSEA=.07, CFI=.95, IFI=.95, NNFI=.94, SRMR=.06). Based on the findings above, parent and best friend were significant predictors of competence and value for boys (see Figure 4.10a). The paths from competence and value to eating behaviour were significant, and the model predicted 59% of the variance in eating behaviour. For girls, parent and best friend were significant predictors of competence and value, the paths between both competence and subjective value and eating behaviour were significant, and the model accounted for 49% of the variance in eating behaviour (see Figure 4.11a).

Testing mediation. The expectancy-value model proposes that competence and value act as mediators in the relationship between the adolescent's perceptions of parent and best friend beliefs and behaviours and eating behaviour. As revealed in the analyses above, these relationships are represented in the data. To examine whether the mediation relationships represent the best way of fitting the data to the model, direct effects models were also conducted. For eating behaviour, an examination of the relationships among the latent variables (refer to Figures 4.8 & 4.9 for boys and girls, respectively) reveals that preliminary conditions for mediation are satisfied.

Alternate structural models were also analyzed. The first model was examined whereby the direct effects of competence and subjective value on eating behaviour were fixed to zero, leaving only the direct effects of best friend and parent influences on eating behaviour. In this model (see Figures 4.10b & 4.11b for boys and girls, respectively), the path between best friend and parent latent variables and eating behaviour were significant for boys and girls, and chi-square difference revealed significantly worse fitting models compared to the mediation models.

A second model was examined for the simultaneous direct effects of adolescents' perceptions of parent and best friend influences, competence, and subjective value on eating behaviour (see Figures 4.10c & 4.11c for boys and girls, respectively). The direct effects of best friend and parent influence on eating behaviour were not significant in the model for boys and girls. The chi-square difference between the direct effects and mediation model for boys was significant, however little change in the observed fit indices and prediction of eating behaviour was observed and the standardized parameters for the direct effects were not significant (see Table 4.11). Also, in this model for boys, suppression effects emerged as observed by the change in the signs of the parameters between parent, best friend and eating behaviour. However, based on the EV model prediction that these paths should be near zero, it is argued that these data are consistent with the null hypothesis. As suggested by Shrout and Bolger (2002), spurious suppression effects are expected to occur frequently in analyses that support complete mediation as a result of sampling fluctuations. Since the effects were not significant, and there were no theoretical reasons to assume suppression was to occur, it was accepted that the observed effects were spurious.

Products of coefficients were also examined to investigate the strength of indirect effects in the models for boys and girls. These analyses were conducted separately for best friend and parent, and then in a combined look at the total model effects.

For boys, the indirect paths between parent→competence (standardized parameter estimate (SPE) =.34, $p < .05$) and competence→eating behaviour (SPE=.22, $p < .05$) were multiplied and compared to the direct effects (SPE =-.08, $p > .05$) and total effects (SPE=.31, $p < .05$). The paths between parent→subjective value (SPE=.46, $p < .05$) and subjective value→ eating behaviour (SPE=.67, $p < .05$) were also multiplied and compared to the direct and total effects examined. The indirect effect of parent→competence→eating behaviour was 22.5% of the total effect, with the indirect effect of parent→subjective value→eating behaviour accounting for 100% for the total effects, and the direct effect being 25.8% reduced from the total effect. Due to the spurious suppression effects, it is recommended that the effects be set with a 'perfect' upper bound of 100% and complete mediation is displayed (Shrout & Bolger, 2002).

These results were repeated to examine the relationships between best friend and physical activity. The indirect paths between best friend→competence (SPE=.25, $p < .05$) and competence→eating behaviour (SPE=.22, $p < .05$) were multiplied and compared to the direct effects (SPE=-.03, $p > .05$) and total effects (SPE=.24, $p < .05$). The paths between best friend→subjective value (SPE=.33, $p < .05$) and subjective value→eating behaviour (SPE=.67, $p < .05$) were also multiplied and compared to the direct and total effects examined. The indirect effect best friend→competence→eating behaviour was 25.0% of the total effect, with the indirect effect of best friend→subjective value→eating behaviour accounting for 92% of the total effects. The direct effect of best friend→eating behaviour was 12.5% removed from the total effects. Again, due to the nonsignificant suppression effects, an upper bound of 100% of the total effect was assumed and total mediation was observed.

To examine the total effects in the model, the contribution of the indirect effects for the sum of parent→competence→eating behaviour and best friend→ competence→ eating behaviour (∑SPE=.07+.06=.13) were compared to the sum total of the indirect effects parent→subjective value→ eating behaviour and best friend→subjective value→ eating behaviour (∑SPE=.31+.22=.53) and the direct effects of parent→ eating behaviour and best friend→ eating behaviour (∑SPE=-.08+.-03=-.11), which were divided by the total effects in the model (∑SPE=.31+.24=.55). In the model, 23.6% of the total effect was accounted for by indirect effects through competence, with a large (96.4%) contribution of the total effect through subjective value, and a reduction of 20.0% of the total effect was accounted for by direct effects. As noted above, these results suggested that complete mediation was evident, with stronger effects emerging via subjective value.

For girls, the indirect paths between parent→competence (SPE=.30, $p < .05$) and competence→ eating behaviour (SPE=.34, $p < .05$) were multiplied and compared to the direct effects (SPE=.07, $p > .05$) and total effects (SPE=.28, $p < .05$). The paths between parent→subjective value (SPE=.25, $p < .05$) and subjective value→ eating behaviour (SPE=.40, $p < .05$) were also multiplied and compared to the direct and total effects examined. The indirect effect of parent→ competence→ eating behaviour was 36.4% of the total effect, with the indirect effect of parent→ subjective value→ eating behaviour being 35.7% of the total effect. The direct effect of parent→ eating behaviour was 25.0% of the total effect. Therefore, partial mediation accounting for more than 70% of the total total effect was supported via both competence and subjective value.

These results were repeated to examine the relationships between best friend and eating behaviour. The indirect paths between best friend→competence (SPE=.20, $p <$ .05) and competence→ eating behaviour (SPE=.34, $p < .05$) were multiplied and compared to the direct effects (SPE=.00, $p > .05$) and total effects (SPE=.20, $p < .05$). The paths between best friend→ subjective value (SPE=.33, $p < .05$) and subjective value→ eating behaviour (SPE=.40, $p < .05$) were also multiplied and compared to the direct and total effects examined. The indirect effect best friend→ competence→ eating behaviour was 35.0% of the total effect, with the indirect effect of best friend→subjective value→ eating behaviour accounting for 66.0% of the total effect. There was no direct effect of best friend→ eating behaviour. As can be seen from these findings, competence and subjective value mediated the relationship between best friend and physical activity.

To examine the total effects in the model, the contribution of the indirect effects for the sum of parent→competence→eating behaviour and best friend→ competence→ eating behaviour (∑SPE=.10+.07=.17) were compared to the sum total of the indirect effects parent→subjective value→ eating behaviour and best friend→subjective value→ eating behaviour (∑SPE=.10+.13=.23) and the direct effects of parent→ eating behaviour and best friend→ eating behaviour (∑SPE=.07+.00=.07), which were divided by the total effects in the model ($\sum$SPE=.28+.20=.48). In the model, 35.8% of the total effect was accounted for by indirect effects through competence, with 48.3% contribution of the total effect through subjective value, and 14.6% of the total effect was accounted for by direct effects. Therefore, partial mediation via competence and subjective value was observed, with small direct effects emerging despite nonsignificant parameter estimates.

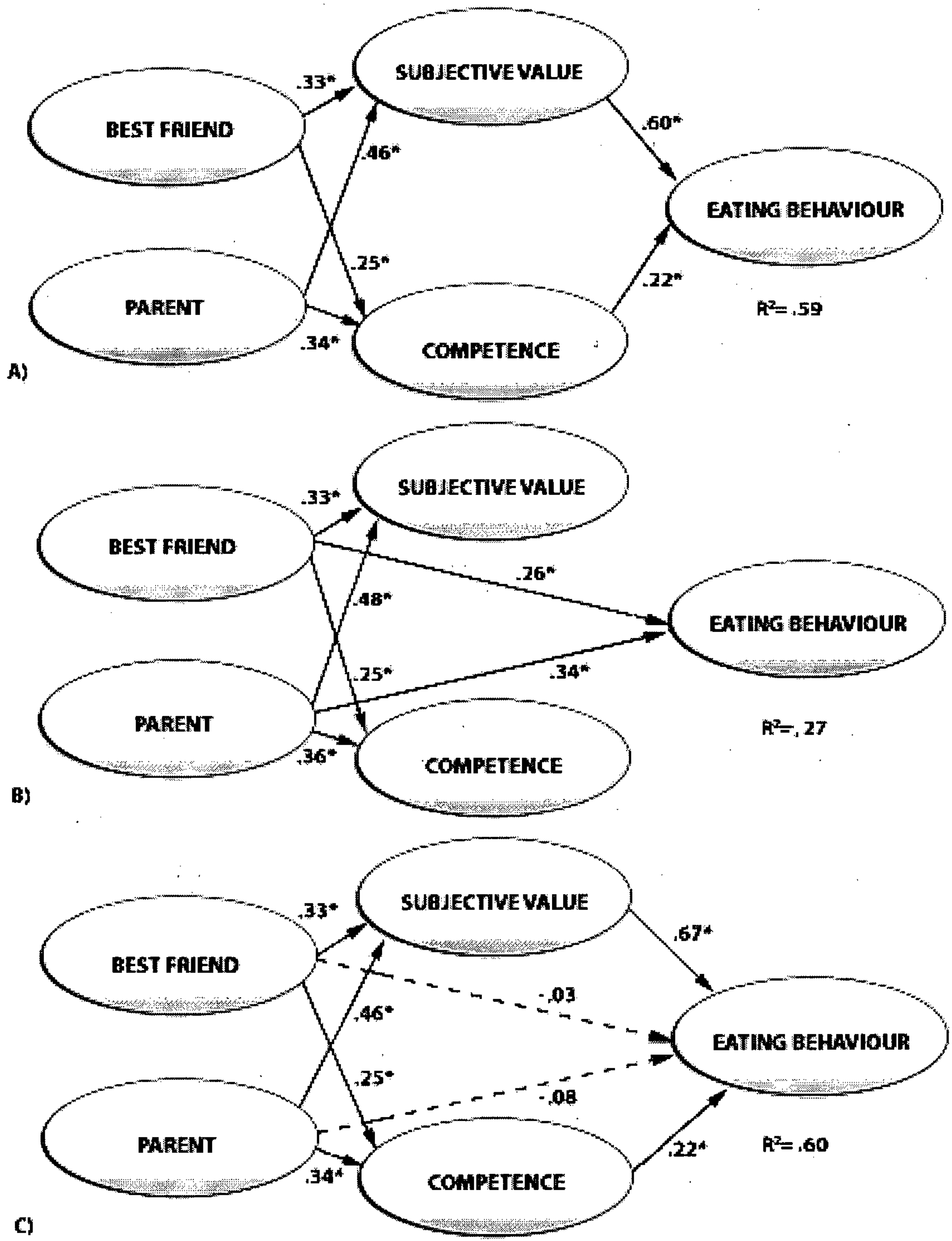

Figure 4.10. Mediation model (a), simultaneous direct effects model (b), and partial direct effects model (c) for boys (n=419). Significant (p <.01) paths are represented by solid lines.

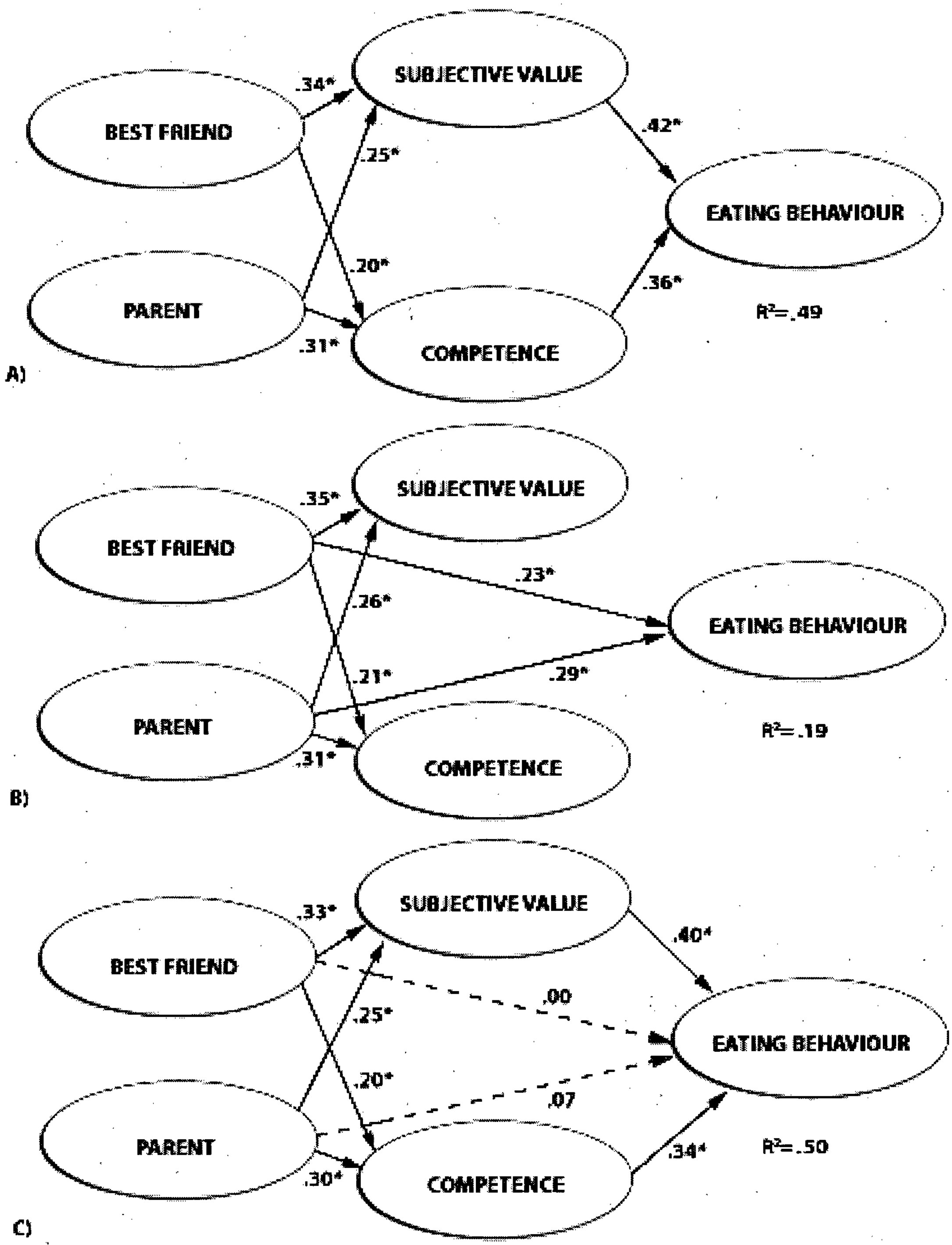

Figure 4.11. Mediation model (a), simultaneous direct effects model (b), and partial direct effects model (c) for girls (*n*=438). Paths represented by solid lines are significant.

Table 4.11.

Goodness of Fit Statistics for Direct Effects and Mediation Models for Eating Behaviour

Models	χ^2	df	$\Delta\chi^2$	*p*	RMSEA	CFI	IFI	NNFI	SRMR	R^2
				Boys (n=419)						
Direct 1	412.24	111	-141.97	$<$ .01	.081	.93	.93	.92	.12	.27
Mediation	270.27	110	-	-	.059	.97	.97	.96	.048	.59
Direct 2	266.06	109	4.21	$<$ .05	.059	.97	.97	.96	.047	.60
				Girls (n=438)						
Direct 1	454.18	111	-130.62	$<$ .01	.084	.91	.91	.90	.13	.19
Mediation	323.56	110	-	-	.066	.95	.95	.94	.056	.49
Direct 2	322.94	109	.62	n.s.	.067	.95	.95	.94	.054	.50

Note: χ^2=chi-square; df=degrees of freedom; $\Delta\chi^2$=chi-square difference; RMSEA=root mean square error of approximation; CFI=confirmatory fit index; IFI=incremental fit index; NNFI=non-normed fit index; SRMR=standardized root mean residual; Direct 1= direct effect of best friend and parent on eating behaviour; Mediation=direct effects of competence and subjective value on eating behaviour; Direct 2=simultaneous direct effects of best friend, parent, competence, and subjective value on eating behaviour.

4.5.3. Summary of Key Findings for Eating Behaviour

There were moderate to strong relationships and covariances among manifest variables and latent factors, with some differences in the patterns between boys and girls. This finding supports the hypotheses. The measurement and structural models indicated good fitting models and tests of equivalence revealed that the minimum requirement for gender invariance was tenable. The final structural models were similar for boys and girls, with competence and subjective value emerging as strong significant predictors of healthy eating. Subjective value was a stronger mediator in the model for boys, and parent and best friend did not exert any direct effects. For girls, competence and subjective value exerted similar effects, and parent and best friend influences had minimal direct effects on healthy eating. These findings support the tenets of the expectancy-value model.

4.6. Non-Smoking Results

4.6.1. Preliminary Analyses

The means, standard deviations, and distribution characteristics for the smoking behaviour manifest variables are presented in Table 4.12. A number of smoking items were significantly skewed and kurtosed. The dependent variables were dichotomized for further analyses. The NO TRIAL smoking variable was a dichotomous reflection of adolescents who had not tried a whole cigarette. Smoking behaviour was examined as two separate calculated responses. NON-SMOKING was calculated as adolescents who had smoked 100 or more cigarettes in their lifetime and who had smoked in the last 30 days being assigned a score of '0', and everyone else assigned a score '1'. This dichotomous coding allowed the "healthier" behaviour to be scored higher[1]. Analyses were conducted separately to investigate the predictors of these outcomes. The independent variables (i.e., significant other influence, competence, and values) were not dichotomized since logistic regression analyses are robust to non-normal data.

For simplicity in the analyses, the items for number of family members and peers who smoke were reverse-coded. This was possible because the adolescents responded to the items on 7-point Likert scales ranging from "none of family members/peers smoke" to "all of family members/peers smoke". Therefore, reverse-coding the items allowed the "healthier" response to be represented by higher values, and is consistent with the other constructs in the study.

[1] A third dichotomous dependent variable was also conceptualized as "never smoker", where adolescents who reported they had smoked a whole cigarette AND had smoked in the last 30 days were given a score of '0' and everyone else were scored as a '1'. However it was highly related to no trial (r_s=.64-.68 for the total sample, boys, and girls) and moderately related to non-smoking (r_s=.56-.63 for the total sample, boys, and girls). The analyses were run with this third dependent variable, and are presented in Appendix Q.

Table 4.12.

Scale Reliabilities, Means, Standard Deviations (SD), Skewness and Kurtosis Coefficients for Non-smoking Behaviour, Parent and Best Friend Role-Modeled Behaviour and Emotional Support, Competence, and Values.

		Total Sample (N=857)			Boys (n=419)			Girls (n=438)		
	α	Mean (SD)	Skew	Kurtosis	Mean (SD)	Skew	Kurtosis	Mean (SD)	Skew	Kurtosis
Parent										
RM	.77	24.65 (5.20)	-1.65	2.01	24.60 (5.08)	-1.56	1.68	24.70 (5.31)	-1.73	2.31
ES	.56	25.99 (3.61)	-2.24	5.13	25.80 (3.59)	-1.98	4.03	26.18 (3.62)	-2.52	6.41
Number	-	5.06 (1.42)	-1.76	2.53	5.14 (1.32)	-1.97	3.76	4.99 (1.50)	-1.60	1.69
Best Friend										
RM	.84	23.21 (6.24)	-1.22	.54	23.05 (6.09)	-1.10	.29	23.36 (6.38)	-1.34	.12
ES	.74	21.57 (6.21)	-.68	-.71	20.37 (6.26)	-.37	-1.13	22.72 (5.94)	-1.04	.13
Number	-	4.37 (1.66)	-.89	-.12	4.46 (1.69)	-1.08	.23	4.27 (1.63)	-.72	-.39
Competence	.88	25.67 (4.67)	-2.56	6.71	25.93 (4.17)	-2.79	9.08	25.42 (5.09)	-2.37	5.14
Interest	.88	12.44 (2.80)	-2.01	3.34	12.53 (2.70)	-2.13	4.08	12.36 (2.89)	-1.92	2.79

Attainment	.61	12.35 (2.78)	-1.93	3.29	12.18 (2.95)	-1.81	2.76	12.50 (2.61)	-2.04	3.87
Utility	.85	12.65 (2.75)	-2.48	5.81	12.55 (2.81)	-2.40	5.42	12.75 (2.69)	-2.57	6.33
Costs	.63	9.71 (5.70)	.65	-.40	9.62 (5.71)	.71	-.35	9.80 (5.69)	.60	-.42
GS-Importance	-	2.85 (1.03)	-.02	.03	2.92 (.99)	-.13	.29	2.79 (1.07)	.08	-.13
GS-Ability	-	2.92 (1.03)	.03	-.01	2.92 (1.02)	.08	.08	2.92 (1.04)	-.00	-.08

[a] RM=role modeled behaviour; ES=emotional support; Number=number of family members/peers engaged in the behaviour; GS-Importance=gender-stereotype for importance of behaviour; GS-Ability=gender-stereotype for ability of behaviour; Interest, Attainment, Utility, Costs=subjective values.

[b] Scale reliabilities are Cronbach's alpha coefficients

4.6.1.1. Multivariate and univariate analyses of variance. Multivariate analysis of variance and follow-up univariate analyses were conducted to examine gender differences on the non-smoking behaviour constructs. The main effect for gender was significant, Wilks' lambda=.93, $F(12,844)=5.56$. Girls reported higher scores for best friend emotional support, $F(1,855)=31.94$, $\eta^2=.04$ compared to boys. There were no other significant differences on the smoking variables. Chi-square tests were conducted to examine gender differences on the smoking frequency items. There were no significant differences on the frequency of boys and girls who had smoked 100 or more cigarettes, smoked in the last 30 days, or frequencies on the calculated NON-SMOKING variable. There were significantly more girls who reported having smoked a whole cigarette compared to boys, $\chi^2\,(1, N=857)=4.20, p = .04$. To maintain consistency in the reporting of results, further analyses were conducted separately for boys and girls.

4.6.1.2. Correlations. Spearman Rho correlation coefficients are presented in Table 4.13 for the total sample, and Table 4.14 for boys (top of matrix) and girls (bottom of matrix). Differences in the interrelationships for boys and girls are indicated by boldface type. As a general observation, most of the relationships among no trial and non-smoking behaviours and competence and values were higher for girls. Additionally, number of family members who do not smoke was significantly related to a number of constructs for girls, and not for boys.

Table 4.13.

Spearman Rho Correlation Coefficients for BMI and Smoking-Specific Significant Other Influences, Gender Stereotypes, Competence, Values, and Behaviour for the Total Sample (N=857).

Variables[a]	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. BMI	-														
2. No Trial	-.12*	-													
3. Non-smoker	-.04	.39*	-												
4. Competence	-.02	.48*	.26*	-											
5. Interest	-.01	.54*	.33*	.55*	-										
6. Personal Imp.	-.03	.42*	.23*	.49*	.46*	-									
7. Cost	-.01	-.19*	-.24*	-.21*	-.24*	-.14*	-								
8. BF ES	-.07	.28*	.20*	.32*	.34*	.45*	-.11*	-							
9. BF RM	-.08*	.37*	.20*	.35*	.40*	.48*	-.15*	.69*	-						
10. NP	-.09*	.43*	.27*	.33*	.39*	.35*	-.17*	.33*	.47*	-					
11. PA ES	-.03	.19*	.19*	.28*	.24*	.37*	-.10*	.39*	.27*	.14*	-				

12. PA RM	-.07*	.20*	.14*	.23*	.16*	.30*	-.04	.24*	.26*	.24*	.38*	-			
13. NF	-.10*	.17*	.17*	.16*	.13*	.10*	-.10*	.10*	.12*	.23*	.10*	.52*	-		
14. GS Imp.	.01	.01	-.01	-.03	.03	-.07*	-.01	-.07	-.06	.03	-.06	-.03	.01	-	
15. GS Ability	.04	-.08*	-.08*	-.03	-.07	-.06	.04	-.03	-.06	.06	-.01	-.03	.06	.38*	-

* p <.05

[a] BMI=Body mass index; No Trial=Never smoked a whole cigarette; Non-smoking = not smoker in last 30 days and smoked < 100 cigarettes; Subjective values = Interest, Personal Importance, Cost; BF ES = Best friend emotional support; BF RM=best friend role modeled behaviour; NP=number of peers who don't smoke; PA ES=Parent emotional support; PA RM=Parent role modeled behaviour; NF=number of family members who don't smoke; GS Imp.=gender-stereotype for importance of not smoking; GS Ability=gender-stereotype for ability of not smoking.

Table 4.14.

Spearman Rho Correlation Coefficients for BMI and Smoking-Specific Significant Other Influences, Gender Stereotypes, Competence, Values, and Behaviour for Boys (n=419; top) and Girls (n=438; bottom)

Variables[a]	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. BMI	-	-.16*	-.10*	-.03	-.02	-.04	.01	-.05	-.06	-.16*	-.06	-.07	-.10*	-.04	-.04
2. No Trial	-.11*	-	.43*	.41*	.46*	.36*	-.15*	.24*	.32*	-.40*	.21*	.17*	.01	.01	**-.10***
3. Non-smoking	.02	.36*	-	.23*	.34*	.20*	-.25*	.14*	.16*	.27*	.20*	.14*	.13*	-.07	**-.14***
4. Competence	-.03	.54*	.29*	-	.54*	.42*	-.17*	.28*	.31*	.32*	.26*	.22*	.08	-.01	.00
5. Interest	-.01	.60*	.32*	.56*	-	.41*	-.24*	.32*	.41*	.38*	.27*	.16*	.02	.03	-.03
6. Personal imp.	-.02	.49*	.25*	.56*	.52*	-	-.07	.43*	.49*	.30*	.37*	.35*	.05	-.07	-.07
7. Cost	-.02	-.23*	-.23*	-.24*	-.24*	**-.21***	-	-.06	-.12*	-.17*	-.03	-.02	.07	.03	.05
8. BF ES	-.05	.34*	.24*	.36*	.38*	.45*	**-.16***	-	.68*	.31*	.41*	.26*	.08	-.04	-.04
9. BF RM	-.10*	.41*	.23*	.39*	.40*	.47*	-.17*	.71*	-	.46*	.34*	.27*	.06	-.02	**-.01**
10. NP	-.04	-.45*	.28*	.34*	.40*	.41*	-.17*	.40*	.49*	-	.17*	.25*	.12*	-.01	-.06
11. PA ES	.01	.20*	.18*	.30*	.21*	.36*	**-.18***	.34*	.19*	.12*	-	.39*	.08	-.07	-.04

12. PA RM	-.07	.23*	.13*	.24*	.15*	.25*	-.06	.21*	.26*	.25*	.37*	-	.49*	-.07	-.03
13. NF	-.12*	-.32*	.20*	**.22***	.24*	**.16***	**-.12***	**.14***	**.18***	.33*	**.13***	.55*	-	**.02**	-.04
14. GS Imp.	.03	-.01	.06	.05	.02	-.06	.01	-.07	-.09*	-.07	-.04	.01	**-.02**	-	.32*
15. GS Ability	**.11***	-.07	-.02	-.05	-.09	-.05	.03	-.02	**-.10***	-.06	**.02**	-.04	-.08	.43*	-

* $p < .05$

[a] BMI=Body mass index; No Trial=Never smoked a whole cigarette; Non-smoking = not smoker in last 30 days and smoked < 100 cigarettes; Subjective values = Interest, Personal Importance, Cost; BF ES = Best friend emotional support; BF RM=best friend role modeled behaviour; NP=number of peers who don't smoke; PA ES=Parent emotional support; PA RM=Parent role modeled behaviour; NF=number of family members who don't smoke; GS Imp.=gender-stereotype for importance of not smoking; GS Ability=gender-stereotype for ability of not smoking.

4.6.2. Main Analyses

Sequential logistic regression analyses were conducted to examine parent and best friend emotional support, role modeled behaviour, number of family and friends who smoke, competence, and values for not smoking as predictors of non-smoking behaviour. Preliminary analyses were conducted for parent and best friend influence variables to determine which of the significant other influence variables were independent predictors in the models. Additional preliminary analyses examined competence and interest, personal importance, and cost values as predictors of smoking behaviour. The results of these preliminary model analyses informed the final predictors entered into the models in order to ensure the most parsimonious results.

4.6.2.1. Significant others' influence and non-smoking behaviour. For the models predicting NO TRIAL smoking behaviour and including best friend variables, emotional support was not a significant predictor for boys and girls. Number of peers who are non-smokers was a significant predictor. Role-modeled behaviour was also a significant predictor in the model for girls. The model chi-squares were significant, and accurately classified 27% boys and 50 % of the girls who had tried a whole cigarette and 96% of the cases who had never smoked a whole cigarette. The Nagelkerke R^2 of .28 and .40 was observed for boys and girls, respectively.

For models including parent influence variables, emotional support was a significant predictor for boys and girls, and number of family members who smoke was a significant predictor for girls. The model chi-squares were significant, accurately classified 2% boys and 19 % of the girls who had tried a whole cigarette and 97-99% of the cases who had never smoked a whole cigarette, and demonstrated Nagelkerke R^2 of .06 and .20 for boys and girls, respectively.

The model chi-squares were significant in the models predicting NON-SMOKING. Best friend variables did not accurately classify any boys who smoked but accurately classified 100% of the non-smokers. For girls, close to 30% of the smokers and 100% of the non-smokers were accurately classified by best friend items. Nagelkerke R^2 values were .32 for boys and .51 for girls. Parent items did not classify any boys who smoked and accurately classified 13.3% of the girls who smoked. Close to 100% of the non-smokers were correctly classified. Nagelkerke R^2 values were .11 for boys and .31 for girls.

4.6.2.2. Competence, values, and non-smoking behaviour. Entering competence and values as predictors of NO TRIAL revealed only competence and interest value as significant predictors in the models for boys and girls. The model chi-square values were significant, 43.3% boys and 64% girls who have tried a whole cigarette and 97% of individuals who have not tried a whole cigarette were correctly classified, with Nagelkerke R^2 values of .42 for boys and .56 for girls. For NON SMOKING, interest and cost values were significant predictors for boys, with competence, interest, and cost values significant predictors for girls. The model chi-square values were significant, 43% boys and 46.7% girls who were smokers (i.e., tried a whole cigarette and smoked more than 100 cigarettes) and 99% of individuals who were not smokers were correctly classified, with Nagelkerke R^2 values of .65 for boys and .63 for girls.

Summary of preliminary analyses. The number of non-smoker peers, and parent emotional support were significant predictors of non-smoking behaviours for boys, and were subsequently entered into the final models. Additionally, competence and interest value were significant predictors of NO TRIAL, and interest and cost values were significant predictors of NON SMOKING. For girls, best friend role-modeled behaviour, number of non-smoker peers, parent emotional support, and number of family members who don't smoke were significant predictors of non-smoking behaviours, and were subsequently entered into the final models. Additionally, competence and interest value were significant predictors of NO TRIAL, and competence, interest and cost values were significant predictors of NON SMOKING.

4.6.2.3. Mediation models. Sequential logistic regressions were conducted for NO TRIAL and NON-SMOKING separately for boys and girls and included the significant predictors from the preliminary analyses. For girls, it was observed that the number of friends who were non-smokers, as well as number of family members who don't smoke and best friend role-modeled behaviour had an effect on NO TRIAL even when the effects of the covariates were taken into account. For boys, number of friends who were non-smokers had an effect on NO TRIAL even when the effects of the covariates were taken into account. Based on the results in Tables 4.15 and 4.16 (for boys and girls, respectively), excluding significant other influence variables in model 2 weakened the classification of trial smokers, and decreased the model chi-squares and the Naglekerke R^2 values. The model chi-squares were significantly different (boys: $\Delta\chi^2(2)=22.18, p<.01$); girls: $\Delta\chi^2(4)=46.08, p<.01$). The results of the complete model

(model 1) revealed that number of friends who did no smoke was a significant predictor for boys (OR=1.53) and girls (OR=1.37). Best friend role-modeled behaviour (OR=1.11) and number of family members who do not smoke (OR=1.34) were also significant predictors in the models for girls. Also, for girls who reported higher competence and higher interest in not smoking, the odds in favor of never having tried a cigarette were 1.1-1.5 times higher than for individuals who reported lower competence and interest in not smoking. For boys who reported higher interest in not smoking, the odds in favor of never having tried a cigarette were 1.4 times higher than for individuals who reported lower interest in not smoking. See Figures 4.12 and 4.13 for a depiction of the odds ratios for NO TRIAL in the final models for boys and girls, respectively.

Table 4.15.

Logistic Regression Predicting NO TRIAL for Boys (n=419).

	Model 1			Model 2		
Variable	β (S.E.)	Wald Statistic	Odds Ratio (95% C.I.)	β	Wald Statistic	Odds Ratio (95% C.I.)
Number peers	.43 (.09)	21.75*	1.53 (1.28-1.84)	-	-	-
Parent ES	.01 (.05)	.02	1.00 (.92-1.09)	-	-	-
Competence	.07 (.04)	3.36	1.08 (1.00-1.16)	.38 (.06)	44.76*	1.47 (1.31-1.65)
Interest Value	.32 (.06)	28.58*	1.38 (1.22-1.56)	.10 (.04)	6.95*	1.10 (1.03-1.19)
Model χ^2[df]		126.50[4]*			104.32[2]*	
Classification						
No Trial		96.6%			96.6%	
Trial		43.3%			38.8%	
Total		88.1%			87.4%	
Nagelkerke R^2		.45			.38	

* $p < .05$

Table 4.16.

*Logistic Regression Predicting NO TRIAL for Girls (n=438), * p < .05*

	Model 1			Model 2		
Variable	ß (S.E.)	Wald Statistic	Odds Ratio (95% C.I.)	ß	Wald Statistic	Odds Ratio (95% C.I.)
Best Friend RMB	.10 (.03)	12.98*	1.11 (1.05-1.16)	-	-	-
Number peers	.31 (.13)	5.84*	1.37 (1.06-1.76)	-	-	-
Parent ES	.01 (.05)	.08	1.01 (.92-1.12)	-	-	-
Number Family	.29 (.12)	6.39*	1.34 (1.07-1.68)	-	-	-
Competence	.10 (.04)	5.32*	1.11 (1.02-1.20)	.45 (.06)	52.05*	1.57 (1.39-1.77)
Interest Value	.39 (.07)	36.16*	1.48 (1.30-1.62)	.14 (.04)	16.77*	1.15 (1.08-1.24)
Model χ^2[df]		228.60[6]*			182.52[2]*	
Classification						
No Trial		95.9%			96.2%	
Trial		67.0%			60.6%	
Total		89.7%			88.6%	
Nagelkerke R^2		.63			.53	

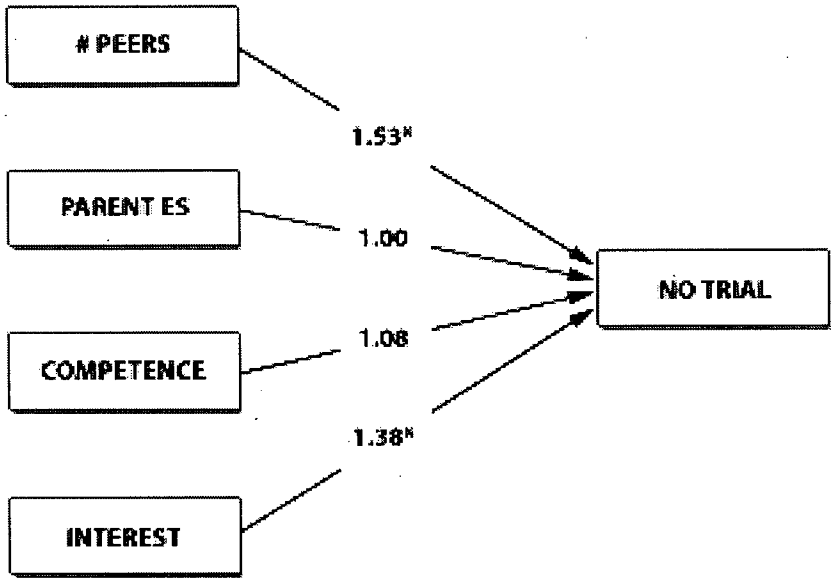

Figure 4.12. Logistic regression predicting NO TRIAL significant other influences, perceptions of competence, and subjective values for adolescent boys (n=419). Coefficients are odds ratios; * p <.05.

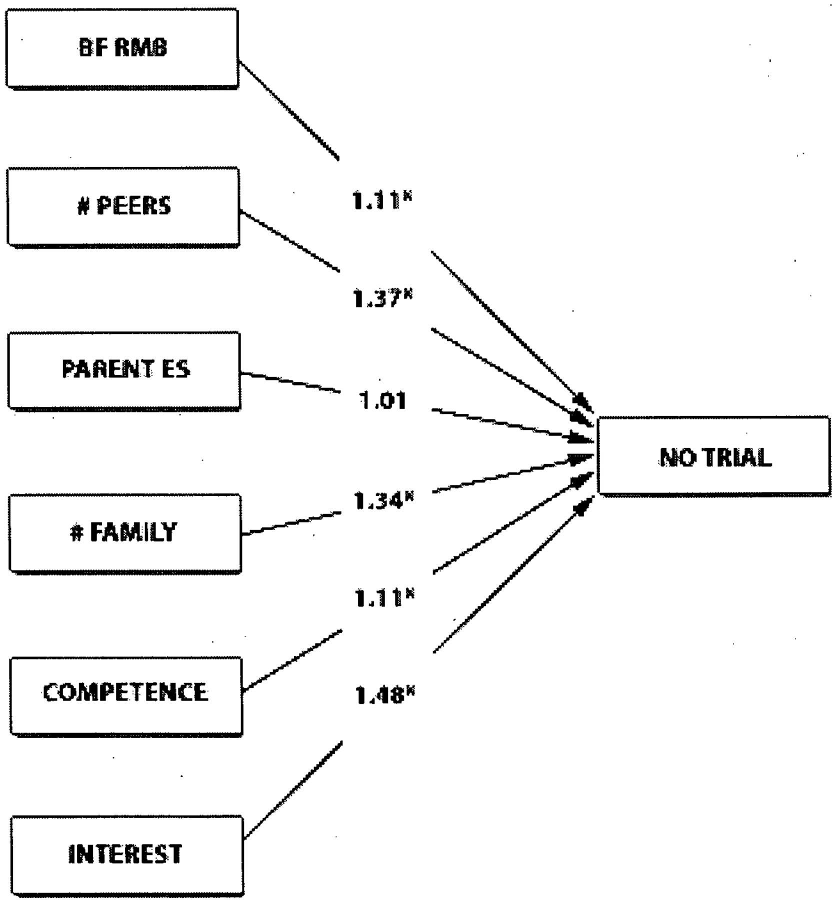

Figure 4.13. Logistic regression predicting NO TRIAL from significant other influences, perceptions of competence, and subjective values for adolescent girls (n=438). Coefficients are odds ratios; * p <.05.

Sequential logistic regression was also conducted to examine the effects of significant other influence, competence and values on NON-SMOKING behaviour (i.e., individuals have not smoked in the last 30 days and smoked less than 100 cigarettes). For boys (see Table 4.17), the change in the models was not significant ($\Delta\chi^2(3)=6.76$, $p>.05$), implying that best friend and parent influences were completely mediated by the values (competence was not a significant predictor in the preliminary models and was not included in the final models). Examining the final model (model2), interest value (OR=1.7) and cost value (OR=.76; for interpretation $e^x= e^{B} =e^{.28}=1.32$) were significant predictors of NON-SMOKING. For girls (see Table 4.18), the difference in the models was not significant ($\Delta\chi^2(4)=9.22$, $p>.05$), again implying complete mediation. Competence (OR=1.13) and interest (OR=1.44) and cost (OR=.85; for interpretation $e^x= e^{B} =e^{.16}=1.17$) values were significant predictors of NON-SMOKING in the model. The only gender difference in the models was the entry and emergence of competence as a significant predictor for girls, with slightly higher effect sizes for boys. See Figures 4.14 and 4.15 for a depiction of the odds ratios for NON-SMOKING in the final models for boys and girls, respectively.

Table 4.17.

Logistic Regression Predicting NON-SMOKING for Boys (n=419).

	Model 1			Model 2		
Variable	*ß* (S.E.)	Wald Statistic	Odds Ratio (95% C.I.)	*ß*	Wald Statistic	Odds Ratio (95% C.I.)
Best Friend RMB	-.11 (.07)	2.93	.89 (.79-1.02)	-	-	-
Number peers	.56 (.27)	4.34*	1.76 (1.03-3.00)	-	-	-
Parent ES	.11 (.12)	.74	1.11 (.87-1.41)	-	-	-
Interest Value	.50 (.13)	14.90*	1.65 (1.28-2.13)	.52 (.11)	23.24*	1.67 (1.36-2.07)
Cost Value	-.22 (.09)	5.94*	.80 (.67-.96)	-.28 (.08)	12.72*	.76 (1.30-1.91)
Model χ^2[df]		77.72[5]*			70.96[2]*	
Classification						
No Trial		98.8%			99.3%	
Trial		57.1%			42.9%	
Total		97.4%			97.4%	
Nagelkerke R^2		.67			.61	

* $p < .05$

Table 4.18.

Logistic Regression Predicting NON-SMOKING for Girls (n=438).

	Model 1			Model 2		
Variable	β (S.E.)	Wald Statistic	Odds Ratio (95% C.I.)	β	Wald Statistic	Odds Ratio (95% C.I.)
Best Friend RMB	.09 (.06)	2.65	1.09 (.98-1.23)	-	-	-
Number peers	.37 (.33)	1.27	1.45 (.76-2.77)	-	-	-
Parent ES	-.01 (.07)	.01	.99 (.87-1.14)	-	-	-
Number Family	.20 (.20)	1.07	1.22 (.84-1.79)	-	-	-
Competence	.06 (.07)	.83	1.06 (.93-1.21)	.12 (.06)	4.53*	1.13 (1.01-1.26)
Interest Value	.33 (.15)	5.03*	1.38 (1.04-1.84)	.36 (.11)	10.92*	1.44 (1.16-1.78)
Cost Value	-.17 (.08)	4.13*	.85 (.72-.99)	-.16 (.07)	5.20*	.85 (.74-.98)
Model χ^2[df]		82.32[7]*			73.10[3]	
Classification						
No Trial		98.8%			99.3%	
Trial		46.7%			46.7%	

Total	97.0%	97.5%
Nagelkerke R^2	.66	.60

* $p < .05$

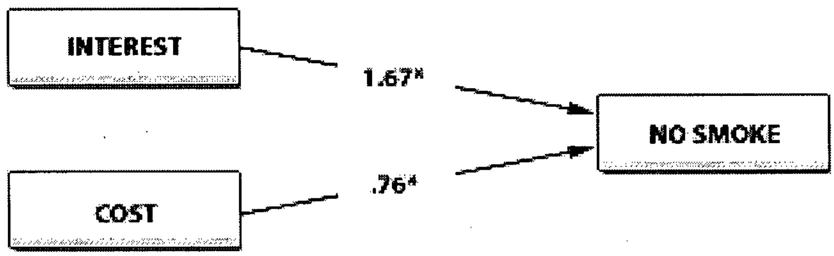

Figure 4.14. Logistic regression predicting NON-SMOKING from competence and subjective values for adolescent boys (n=419). Coefficients are odds ratios; * p <.05.

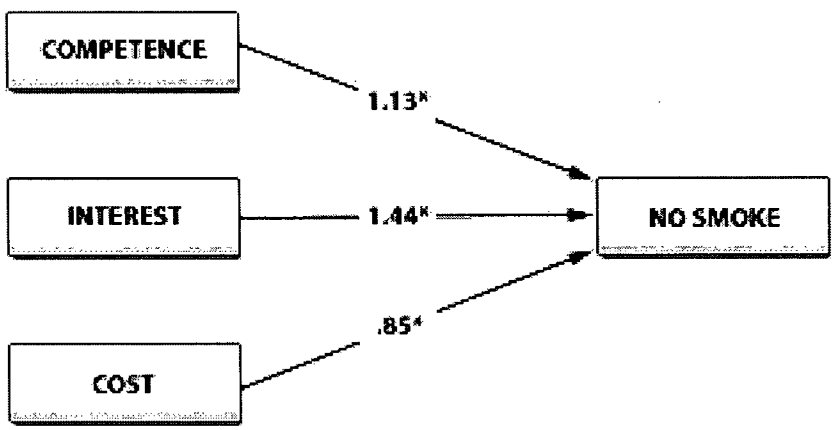

Figure 4.15. Logistic regression predicting NON-SMOKING from competence and subjective values for adolescent girls (n=438). Coefficients are odds ratios; * p <.05.

4.6.3. Summary of Key Findings for Non-smoking Behaviour

The constructs examining smoking behaviour were skewed and kurtosed as a result of a predominantly non-smoking sample. Spearman Rho correlation coefficients indicated that a number of moderate significant relationships emerged among the expectancy-value constructs. There was a pattern of different relationships between boys and girls. In preliminary analyses, it was evident that the models were also different for boys and girls. There were also unique predictors in the models examining no trial and non-smoking behaviours. In the final analyses, number of peers who do not smoke and interest value were significant predictors of no trial for boys and girls. The model also identified best friend role-modeled behaviour, number of family members who smoke, and competence beliefs as significant predictors for girls. These results indicated partial mediation models. For the models predicting non-smoking behaviour, complete mediation was evident for boys and girls. Interest and cost values were significant predictors in the models, with competence also entered as a predictor of non-smoking behaviour for girls.

These results show partial support for the expectancy-value theory when examining no trial smoking behaviour, and full support of the theory when examining non-smoking behaviour.

4.7. General Summary for Study 2

The purpose of the second study was to further identify possible mean level and covariant gender differences, examine the main relationships in the expectancy-value model, and to look at the links between the adolescent's perceptions of parent and peer influence and health behaviours.

Using structural equation modeling techniques, it is observed that the data partially supports the hypothesized models for physical activity and eating behaviour. The model fit indices indicate good fit, and little evidence of differences between boys and girls are observed in the measurement models. The path analyses indicated that moderate variance in competence and value was accounted for by the adolescents' perceptions of parent and best friend influence. For boys and girls, the relationship between best friend influence and physical activity is partially mediated by perceptions of competence, with strong direct effects also observed. Subjective value does not mediate the relationship between best friend and physical activity for boys, and is a weak mediator of the relationship for girls. For boys and girls, the relationship between parent influence and physical activity is also strongly mediated by competence. Again, subjective value is not a mediator of the relationship for boys, and a weak mediator for girls. These findings suggest that physical activity value is not an important construct in understanding physical activity behaviour, especially for boys. Perceptions of best friend influence and competence are salient in understanding physical activity behaviours of adolescents. The expectancy-model tenets are only partially supported for physical activity behaviour.

For boys and girls, the relationships between best friend and parent influence and eating behaviour are mediated by competence and value, with value emerging as a stronger mediator in the relationships. There are no direct effects of best friend or parent on eating behaviour when competence and value are accounted for in the models. As such, the expectancy-value model tenets are supported, implying that perceptions of competence and value associated with engaging in a healthy diet are integral to understanding eating behaviour.

Examining the logistic regression models, adolescents' perceptions of significant other influences have significant direct effects on NO TRIAL, along with competence (for girls) and interest. For boys and girls, the effects of significant other influences on NON SMOKING are completely mediated by competence and values. It appears that best friend/peer influences influence whether an adolescent will try a whole cigarette, but has little to no effect on smoking behaviour. In all models, interest value was the strongest individual covariate of non-smoking behaviour. The results reveal small effect sizes in the prediction of non-smoking behaviour.

Overall, the expectancy-value models accounted for 41-44% of the variance in physical activity behaviour, 49-59% of the variance in eating behaviour, and 38-73% of the variance in non-smoking behaviour for adolescents. Differences in the standardized parameter estimates, prediction equations, and significant predictors were evident for boys and girls.

4.7.1. Significant other influence, competence, and value

Based on the expectancy-value model tenets, it was hypothesized that the effects of perceptions of parent and best friend influences on physical activity, eating, and non-smoking behaviours would be mediated by competence and value. In the first part of the model, perceptions of parent and peer influence significantly predict moderate variance in perceptions of competence and value for both physical activity and eating behaviour. These findings suggest that the more peers and family members engaged in physical activity and healthy eating behaviours, coupled with the adolescents' perceptions of positive role-modeled behaviour and emotional support from significant others, the greater their own perceptions of competence and value associated with physical activity and maintaining a healthy diet. For physical activity, these effects are stronger for best friend influence. Parents have a stronger effect on healthy diet competence and value for boys, and on healthy diet competence for girls. The influence of best friend was stronger on healthy diet value for girls. Based on the age of the adolescent sample (15-18 years), these findings partially support developmental perspectives. For instance, Harter (1999) suggests that as children move into adolescence their frame of reference and mechanism of influence shifts from parents to peers. Therefore, peers, and in particular best friends, should have stronger effects on perceptions and behaviour compared to parents, as evidenced in the current findings. Additionally, adolescents are more likely to spend time with their best friend and thus will have more opportunity to be influenced by them (Harter, 1999; Noller, 1994).

The study findings support evidence that parents are sources of physical activity competence and value beliefs for children and young adolescents (i.e., Horn & Amorose, 1998; Kimiecik & Horn, 1998; Welk et al., 2003; Weiss & Ferrer-Caja, 2002). The findings also support evidence that close friendship and friendship quality emerge as strong correlates of physical activity value (i.e, enjoyment, intrinsic motivation) and competence for adolescents (Smith, 1999, 2003; Weiss et al., 1996; Weiss & Stuntz, 2004). Based on this study, best friend and parent emotional support, role-modeled behaviour, and the number of peers/family engaged in physical activity are mechanisms integral to understanding the adolescents' perceptions of competence and value for physical activity.

For eating behaviour, parents played a strong role in the prediction of competence for all adolescents, and value for boys. In the eating behaviour literature, relationships between significant others and dietary habits are not often examined, and even less frequently examined are the mechanisms by which significant others affect eating behaviour and related perceptions of competence and value. According to developmental perspectives, it would seem reasonable that peers would have a stronger effect on perceptions of competence and value, and subsequently eating behaviour. However, it appears that older adolescents' perceptions of competence and value are influenced more strongly by their perceptions of parent influence, and these relationships are different for boys and girls.

The effect of adolescents' perceptions of parent influence on competence is likely a result of the continual and frequent meals that are consumed around parents until mid-late adolescence (Noller, 1994). As a result of the food choices that are made available from parents, coupled with the role-modeled behaviour and support for following a healthy diet, children and adolescents tend to adopt perceptions and behaviour similar to their parents (i.e., Woodward, Boon, Cumming, Ball, Williams, & Hornsby, 1996). It has also been reported that children whose parents restricted what they ate were more likely to eat lower fat diets during adolescence (DeBourdeauhuij, 1997), thus indirectly alluding to the role of parents in developing adolescents' perceptions of competence. Since the majority of adolescents are still living at home, parent/guardians continue to have some control over their eating behaviour. It is possible that by the developmental period of young adulthood, parents would play a reduced role in affecting competence and value associated with eating behaviours.

Unfortunately, with the distribution of the non-smoking data, the relationships between significant other influences and competence and values were restricted to Spearman correlation coefficients. Linear regression was not feasible due to the high skewness and kurtosis values, and logistic regression necessitated dichotomizing the competence and value variables. Since the central tendency scores were all clustered at the median, dichotomizing the variables was not considered appropriate since the classifications of individuals would have been compromised. Correlation coefficients suggest among the variables suggest that best friend and parent role-modeled behaviour and emotional support, and number of peers who do not smoke, were all low-moderately related to competence, interest value, and personal importance value. Best friend role-modeled behaviour and number of non-smoking peers were also weakly related to cost value for boys, and all significant other influence variables except parent role-modeled behaviour were significantly related to cost value for girls.

To summarize, the adolescents' perceptions of both parents and best friend influence predict competence and value for physical activity and eating behaviours, and are low to moderately related to non-smoking behaviour. These relationships support the proposed subordinate links presented in the expectancy-value model.

4.7.2. Main Tenets of the Expectancy-Value Theory

There is evidence to support the expectancy-value model propositions for physical activity, eating, and non-smoking behaviours.

4.7.2.1. Physical activity. Examining the covariance between competence and physical activity, and between value and physical activity, it is clear that these constructs are strongly related, and the strength of the relationships are stronger than for best friend and parent influence and physical activity. Examining the path analyses, competence and value predicts physical activity behaviour for girls. Competence is the only independent predictor of physical activity for boys. The findings suggest partial mediation models, with indirect effects emerging as stronger effects than direct effects with competence as the mediator. With subjective value as the mediator, the direct effects are stronger than the indirect effects. Adolescents' perceptions of best friend influence have strong direct effects on physical activity, with the majority of the effects of perceptions of parent influence being mediated through competence, and competence emerging as a strong predictor of physical activity.

The role of competence as a strong predictor of youth physical activity is well-documented (see Weiss & Ferrer-Caja (2002) and Weiss & Williams (2004) for reviews). The unique findings from this study include the influence of best friend and parent as sources of subjective value beliefs, and the minimal role that subjective value plays in the prediction of physical activity. Based on the results of this study, subjective value is likely redundant in the model for boys, and also in the model for girls when the direct effects of best friend influence are accounted for in the prediction of physical activity.

Based on developmental propositions and empirical findings, it appears that boys either value physical activity because they feel competent, or report perceptions of competence because they highly value physical activity. Developmentally, perceptions of competence become more accurate during adolescence (Eccles & Wigfield, 2002; Harter, 1999; Horn, 2004; Wigfield, 1994), which may imply the former relationship. These relationships can be completely understood with more advanced research methodologies and statistical analyses. Nonetheless, the results suggest that subjective value is possibly redundant in the prediction of physical activity for boys. For girls, the high relationship between competence and value suggest that one or the other latent variable is redundant. However, the parameter estimate linking subjective value and physical activity was significant in the mediation model, and small indirect effects were noted in the relationships among significant other influence, subjective value, and physical activity. When the direct effects of best friend influence were included in the model, subjective value was no longer a significant predictor of physical activity for girls. These findings suggest that perceptions of best friend's influence are stronger agents of affect than girls' own valuing of physical activity. Independent of their own interest, enjoyment, and usefulness associated with physical activity, perceptions of best friend role-modeled behaviour, emotional support, and the number of peers engaged in physical activity seem to reflect reported physical activity behaviour for girls.

4.7.2.2. Eating behaviour. The first part of the model demonstrated that perceptions of parent and best friend influence were significant predictors of healthy diet competence and value. The main relationships in the model were also supported, with strong covariances between value and eating behaviour and between competence and eating behaviour for boys and girls. Unlike the models for physical activity, competence and value perceptions did not appear to be redundant in the analyses, despite moderate-strong covariance. When the path models were examined, competence and value were significant strong predictors of eating behaviour. Full mediation was suggested by the findings of strong indirect effects between significant other influences, competence, subjective value, and eating behaviour. Based on these results, the main EV model tenets were supported as a model for adolescent eating behaviour.

There is limited evidence to support the role of competence and value as predictors of eating behaviour (Backman et al., 2002; Baranowski et al., 1999; Granner, Sargent, Calderon, Hussey, Evans, & Watkins, 2004). This study demonstrates that competence and value act as mediators in the relationships between adolescents' perceptions of best friend and parent influence, and eating behaviour. As such, theoretically proposed relationships are supported and there is strong evidence for the use of the expectancy-value model as a framework to examine eating behaviours. The models predicting 49-59% of the variance in eating behaviour are substantially more informative than previously noted. According to Baranowski et al. (1999), most research studies examining dietary behaviour either fail to report the strength of prediction (i.e., R^2) or predict at best 30% of the variance. Often, researchers employ the theory of planned behaviour, social-cognitive theory, stages of change model, and the health belief model to examine eating behaviour. The expectancy-value model, which broaches on some of the key elements from these theories and models, appears to be a beneficial framework that presents promise to understanding the integral factors involved in understanding adolescent eating behaviour.

There is also limited evidence to suggest significant others have a direct influence on eating behaviour of adolescents (see Baranowski et al., 1999). Using a variety of frameworks and empirical methods, the research shows weak to moderate effects. Based on the findings in this study, the effects of significant others are predominantly mediated by competence and subjective value, and result in strong effects in the prediction of healthy eating behaviour. Further research is encouraged to examine adolescent eating behaviour using the EV model. The difference in the strength of the relationships in the models for boys and girls also warrants further investigation.

4.7.2.3. Non-smoking behaviour. Based on the findings, adolescents' perceptions of parent and best friend role-modeled behaviour, emotional support, and number of significant others who are non-smokers have direct and differential effects on non-trial and non-smoking behaviour when the effects of competence and values are controlled. Some evidence of mediation emerged from the analyses. These results seem to suggest that significant others (predominantly best friend/peers) influence whether an adolescent has tried a whole cigarette, but do not affect continual smoking/non-smoking behaviour. For individuals who are non-smokers, their own perceptions of competence and value are strongly linked to their behaviour.

Often, researchers interested in social influences associated with adolescent tobacco use report that best friend and peer group influences are strongly linked to smoking behaviour (i.e. Duncan & Tildesley, 1995; Kobus, 2003). Family influence has also been reported as having direct effects on smoking behaviour (i.e. Avenevoli & Merikangas, 2003; Duncan & Tildesley, 1995). However, the mechanism of influence is often not examined beyond the traditional notion of peer pressure and number of friends/family who use tobacco. Based on this study, the number of friends who do not smoke and best friend role-modeled behaviour are two ways friends influence non-smoking behaviour. Number of family members who do not smoke and parent emotional support are also important links to adolescents' non-smoking behaviour, and have significant effects on girls behaviour. These influences are directly related to non -trial behaviour (i.e., adolescents who have never tried a whole cigarette), but the effects of best friend/peer and parent/family are mediated by competence and values on the influence of non-smoking behaviour.

There is limited research evidence of the indirect role that significant others have on smoking behaviour. Using the EV model as a framework enabled the identification of possible mediators for trial and smoking behaviour, suggesting that enhancing adolescents' perceptions of competence and value for not smoking may have positive effects on future behaviour.

4.7.3. Gender differences

Mean differences in the study variables and differences in the relationships among constructs were examined for the health behaviours.

4.7.3.1. Mean-level differences in manifest variables. For the most part, the findings of significant gender differences are supported in the literature. The observation that girls reported greater perceptions of parental role-modeled behaviour and emotional support for physical activity compared to boys was unique. Unfortunately, the majority of studies examining parent influence on children and adolescents' physical activity inconsistently report mean-level gender differences on subscales and often fail to examine the possible moderating effects of gender on the relationships among parent socialization, support, and physical activity (i.e., Brustad, 1993; 1996; Kimiecik et al., 1993; 1996; Kimiecik & Horn, 1998; Welk et al., 2003). In the previous studies, the sample sizes likely precluded further analyses. Nonetheless, the limited research consistently reports that parents provide more physical activity–related support to boys (i.e., Eccles & Harold, 1991; Fredricks & Eccles, 2002). One explanation for the discrepant findings is that the majority of research on mean level differences has been concentrated on children and younger adolescents. It is possible that older adolescent boys' level of interest and engagement in physical activity has reached a state of autonomy and therefore their perception of their parent's influence is diminished. Whereas for girls, they may continue seek and/or receive role-modeled behaviour and emotional support from others, including their parents, which could subsequently enhance their perceptions of this influence. In the social support literature, girls are more likely to report emotional support compared to boys (Tamres, Janicki, & Helgeson, 2002). Another difference between this study and a variety of others is the focus on the adolescent's perceptions of parent's influence rather than the parent's own reports of their behaviour and beliefs. However, it has been suggested that the adolescent's perceptions of parental influence are stronger predictors of their competence, value, and behaviour (i.e., Fredricks & Eccles, 2002) thus lending credence to the study findings.

4.7.3.2. Relationships among manifest and latent variables. Despite the mean level differences on a variety of constructs in the study, the gender differences in the relationships among manifest variables and covariance among latent variables have a greater influence on the implications of the study findings.

Physical activity. A number of differences in significance and strength of relationships among the physical activity manifest variables were noted, however few significant differences in the covariances among the latent variables were observed between boys and girls. In the original gender invariance procedures, the factor covariance equality constraints are tenable, suggesting no differences in the interrelations among the latent variables. Despite findings of significant metric variance across genders in the measurement model for physical activity, it was deemed appropriate to assume that the models were invariant given the model fit statistics, theoretical limitations, and observations of the standardized parameters.

Contrarily, the finding of metric invariance not holding may imply that the structure of the EV model for physical activity may not be invariant for boys and girls, and should not be taken for granted. Statistically, there are differences in selective factor loadings, variance and covariances, and errors/uniquenesses that may warrant further attention. These differences suggest possible variation in the way boys and girls responded to the questions, differences in the meaning of the factor scores, and variation in the factor structures. The significant difference in the variance of the subjective value latent variable may in fact partially explain some of the differences in the relationships and parameter estimates in the model. Pragmatically, the use of sequential independent testing of models that was conducted to examine partial invariance may be problematic. Therefore, it is accepted that an alternative series of tests could lead to different results and the findings should be verified with cross-validation. In conclusion, gender invariance at the level appropriate for the research questions in this study (configural and metric invariance) is tenable, but further examination of these findings is warranted.

Finally, looking at the model parameters and prediction, it is evident that parent and best friend influences make similar contributions to competence and subjective value for boys and girls. In the mediation models, similar variance in physical activity is accounted for, and similar strengths in the paths between competence and physical activity are noted. Subjective value makes an independent contribution to understanding physical activity for girls, with these effects being eliminated when direct effects of best friend and parent are introduced in the model. Parent influence has a direct effect in the model for girls and not for boys.

Eating behaviour. For eating behaviour, slightly different findings emerge. Again, there are a number of differences in the relationships among the manifest variables. There are also significant differences in the covariances among the latent variables in the models for boys and girls. Upon observation, the covariances among all parent, best friend, competence, value, and eating behaviour latent factors are higher for boys compared to girls, but are consistently significant for both genders. The sequential tests of gender invariance suggest that several of these relationships in the models are significantly different. These findings highlight the importance of moving beyond mean level differences on manifest variables. Girls report higher scores on the majority of the eating behaviour variables; however the strength of the relationships for the latent variables are stronger for boys. Observing the relationships among the variables provides better understanding of the meaning associated with the constructs.

The stronger links between parent influence and eating-related competence, values, and behaviour for boys was interesting. Contrarily, best friend influence was a stronger predictor of value for girls. It is commonly reported that females place higher importance on dietary behaviours compared to males (Page & Fox, 1997). The value associated with healthy eating is often linked to body image and perceptions of appearance for girls, and frequently espoused within peer groups and between best friends. Girls are likely to discuss diet strategies for weight management, and are more likely to understand the health benefits associated with dietary choices. This is primarily because of the likelihood of them turning to dieting behaviours for weight management (Harter, 1999; Page & Fox, 1997; Sabiston et al., 2003). Contrarily, boys are less likely to report, acknowledge, or understand the importance of healthy eating behaviour (George & Krondl, 1983), and may avoid discussing healthy dietary choices around peers for fear of appearing effeminate (Monge-Rojas et al., 2005). Boys also report using physical activity as a means for weight control instead of healthy eating (McCreary & Sasse, 2000), thus indirectly inferring the lower value placed on eating behaviours. Therefore, the finding that best friend influence predicts subjective value for girls and more weakly for boys is unsurprising.

Examining the path estimates and prediction of eating behaviour, both competence and value are important predictors of eating behaviour, with subjective value having a stronger effect for boys. The models account for similar variance in eating behaviour. When the direct effects of parent and best friend are introduced in the model, they have minimally stronger effects for boys than girls.

Non-smoking behaviour. For non-smoking behaviour, the Spearman Rho correlation coefficients reveal that there are some differences in the relationships among manifest variables for boys and girls. Parent influence and number of family members who do not smoke are related to girls' trial and smoking behaviour and often not related to boys' behaviour. Also, the relationship between number of family members and peers who do not smoke is moderate in strength for girls, and only weakly significant for boys. In a recent study examining the role of parental smoking in the selection of friendships, adolescents with smoking parents were most likely to become affiliated with smoking friends (Engels, Vitaro, Blokland, de Kemp, & Scholte, 2004). The current study indirectly confirms this finding, however highlights possible gender differences in the relationship. More research is necessary in order to determine if and why girls are more influenced by family and parental smoking beliefs and behaviours compared to boys.

The results of sequential logistic regressions suggest that significant other influences have differing relationships with and unique prediction of non-smoking behaviour, and these differences are inconsistent for boys and girls. The number of peers who do not smoke and interest in not smoking are significant independent predictors of never smoking a whole cigarette for boys. In addition to these predictors, best friend role-modeled behaviour, number of family who do not smoke, and perceptions of competence were also predictive of not having tried a whole cigarette for girls. For non-smoking behaviour, significant other influences were completely mediated by competence and interest and cost values for girls, and interest and cost values for boys. Based on these results, it appears that perceptions of best friend's behaviour, coupled with the number of peers and family who don't smoke, seem to have a positive direct effect on girls' not having smoked a whole cigarette (trial behaviour). For boys, the influence of the peer group has a significant direct effect on trial behaviour.

These findings are in line with selective reports that girls may be more influenced by their best friend than would boys but may not be any more susceptible to influence from peer groups (see Berndt & Keefe, 1995; Urberg et al., 1997). The problem is that most research examining peer influence has either not examined sex-based differences or has reported few differences (i.e., Flay, Hu, Siddiqui, Day, Hedeker, Petraitis et al., 1994; Graham, Marks, & Hansen, 1991). One explanation for the finding that best friend beliefs and behaviours are stronger for girls could be related to Hartup's (1996) suggestion that girls appear to value close friendships more, tend to report more intimacy and closeness in their relationships compared to boys, and as a result are expectedly more influenced by their close friends.

Furthermore, the finding that 'number of family members who do not smoke' is also a significant predictor of girls' trial behaviour may have partial substantiation in the literature. According to Flay and colleagues (1994), the impact of parental smoking on adolescent smoking likely depends on the stage of tobacco use (e.g. from experimentation to regular use) as well as the adolescent's age and developmental stage. This suggestion highlights the possibility of different influences based on different level of smoking behaviour and developmental stage/ age, which is supported by the current findings. However, what is missing is an understanding of gender as a moderator of these relationships. It is important to examine whether boys and girls really do differ in the way they are influenced about smoking behaviour. It is possible that boys and girls in this study are at different developmental stages since girls have likely passed through puberty and boys may still be experiencing the effects, but this is just speculative. Further research should focus on these possible links and potential explanations for sex differences in the smoking behaviour models.

Smoking behaviour is infrequently examined using frameworks with hypothesized relationships, and gender differences are often not reported beyond mean-level and proportion/frequency differences. This study demonstrates the usefulness of employing a motivation model to examine non-smoking behaviour. One of the biggest limitations in this study was the large discrepancy in smoking behaviour among adolescents. The use of structural equation modeling techniques was not feasible as a result of the distribution of smoking behaviour, although the sample characteristics for smoking frequency are representative of British Columbia's youth smoking rates. Despite this, the EV model was effective in predicting a large portion of variance in no trial and non-smoking behaviour and highlighting differences in the models for boys and girls.

The gender differences suggest that smoking behaviour should not be examined as an outcome without considering and examining differences between boys and girls beyond preliminary analyses. Based on these findings, there were few correlational and mean-level differences on the variables, however gender differences in the prediction of smoking behaviour emerged in the sequential logistic regressions.

4.7.4. *Study 2 Conclusions*

The main tenets of the expectancy-value model were tested for health-promoting behaviours for adolescent boys and girls. Partial support for the model was observed for physical activity, full support for the model was observed for eating behaviour, and partial support was observed with non-smoking behaviour. The models differed in predictive power and independent correlates across the sexes. To address the secondary hypotheses, there was little difference in the simple structures of the models for boys and girls, which was an expected outcome. There were also expected mean-level and covariant differences in the health behaviour models for boys and girls.

CHAPTER V

5.1. Discussion

This research sought to test Eccles' (1983) expectancy-value model for health behaviours in an adolescent sample. First, physical activity, healthy eating, and non-smoking behaviours showed only weak interrrelationships, suggesting that these varaibles should be examined separately in research studies. Second, the models were unique in the predictive power and independent predictors for physical activity, healthy eating, and non-smoking behaviours. Third, the covariances among the main behaviour-specific constructs represented in the expectancy-value theory were gender-specific. Most importantly, the relationships in the models demonstrated consistent, yet partial, support for the expectancy-value theory. Based on the results, it is possible that accounting for developmental shifts in motivation-based models is necessary, and gender-specific models might benefit further inquiry into adolescents' health-promoting behaviours.

5.1.1. Comparisons Between Studies

There were a number of similarities and differences in the findings from the first and second studies that need to be highlighted. Comparison between studies allows for support for some of the findings, and emphasizes discrepancies in the results that require further attention. These comparisons are observational since statistical comparisons between the studies have not been conducted.

5.1.1.1. Predicting Physical activity. The means and overall distribution of all measured variables were similar in both studies, with slightly higher mean values on perceptions of competence, values, and activity observed in the first study. The bivariate relationships among the main constructs were also similar in both studies. The measurement models demonstrate similar fit statistics, with the covariances between competence and value higher in study 2, the relationship between value and physical activity higher in study 1, and the covariance between competence and physical activity higher in study 2 for boys and study 1 for girls.

Examining the path models and predictive equations across studies, there were some notable differences. First, there were differences in the prediction of competence and value when the distal relationships in the models were examined. In study 1, the physical self accounted for 49-55% of the variance in competence and 54-65% of the variance in value. In the second study, significant other influences accounted for much less variance in competence (19-24%) and value (26-28%). Based on these comparisons, the physical self is a stronger source of perceptions of competence and values than significant other role-modeled behaviour and emotional support.

There were also differences across the studies in the strength of prediction of physical activity and in the identified significant predictors. The models in first study accounted for 45-57% of the variance in physical activity. For boys, subjective value emerged as the strong significant predictor. For girls, both competence and value were significant predictors. The model in the second study accounted for 41-44% of the variance in physical activity. For boys, competence emerged as a significant strong predictor. For girls, competence had strong effects on physical activity and value showed weak but significant effects.

Finally, there were differences in the unique effects afforded by the physical self (first study) and significant other influences (second study) when competence and value were controlled in the analyses. In the first study, the indirect effects accounted for 75-80% of the total effects in the models for boys and girls. The direct effect of physical self on physical activity was weak for boys and girls, suggesting that the majority of the effects of physical self were mediated by competence and value. In the second study, the indirect effects accounted for 56-75% of the total effects in the models for boys and girls. There was a moderate direct effect of best friend influence on physical activity for boys, and low-to-moderate direct effects of both best friend and parent influence on physical activity for girls. Based on these findings, significant other influences provided unique explanation to understanding physical activity beyond the contribution of competence and value.

The main difference in the physical activity models across studies for boys is that value was significant in the first study whereas competence was a significant predictor in the second study. However, as previously stated, independent of the path coefficients in the models, the relationships among the manifest and latent variables for competence, subjective value, and physical activity were strong in both studies. With this in mind, it is likely that statistical differences in the paths and predictive equations were overshadowing the empirical findings that competence and subjective value were both strongly linked to one another and to physical activity.

The findings of the current study can also be a result of limited power to detect effects, and inflated Type II errors as a result of the small sample size, in particular for boys. When the total sample models are examined, both competence and subjective value make meaningful independent contributions to understanding physical activity. It is also possible that competence and value are redundant and the findings are a result of a measurement artifact. Strong relationship between the latent competence and value factors could result in the path between competence and activity failing to reach significance in the model for boys. Ideally, in analyses using structural equation techniques, the latent factors would be weakly or not at all correlated. Similar strong relationships have been reported in previous studies. For example, in one study tracking sport-related competence and values across the elementary years, researchers reported relationships of r=.35-.57 in the first grade and upwards of r=.64 -.74 in the sixth grade (Wigfield, Eccles, Yoon, Harold, Arbreton, Freedman-Doan, et al., 1997). Another study examining children's perceptions of competence and values in sport reported correlations of r=.54-.58 in the first wave of data collection and relationships of r=.74-.78 three years later (Fredricks & Eccles, 2002). In these studies, analyses were not contingent on the relationships among the variables. Many studies have also not reported the relationships among the constructs (i.e., Eccles et al., 1993; Jacobs et al., 2002), and a few studies show evidence of weak relationships between competence and values associated with sport (Cox & Whaley, 2004; Ebbeck & Stuart, 1993). For physical activity, a number of study findings have suggested moderate relationships between similar competence and value constructs (i.e., Brustad, 1996; Kimiecik & Horn, 1998). Based on this research evidence, the high correlations observed in this study are supported elsewhere, and may infer redundancies in structural models when both competence and value are examined.

Conceptually, it is possible that by the time adolescents are 15-18 years of age, they value the behaviours in which they feel competent. In general, it is theoretically proposed that individuals value domains in which they feel competent (Harter, 1999). In fact, longitudinal studies by Eccles and colleagues would suggest that this is a likely outcome. Observing the trajectories of change and relationships among the competence and values in their models with children and young adolescents in academic and sport domains, it is clear that competence and value are independent constructs in early years and become highly related over time (Eccles, Wigfield et al., 1993; Jacobs et al., 2002; Wigfield et al., 1997). If these results could be extrapolated beyond the preadolescent and early adolescent years, the lines representing competence and value would likely merge. Therefore, further research with older adolescents is necessary to examine the possible redundancy of investigating competence and value for physical activity.

5.1.1.2. Predicting eating behaviour. The means and distribution of the manifest variables were similar between the studies, with slightly lower mean values for the variables in study 2. The interrelationships among the main manifest constructs were higher in second study compared to the first study. Similar patterns of gender differences were present, with girls reporting higher means on the values and eating behaviour compared to boys. In the first study, boys reported higher competence beliefs; however, there was not a significant difference between boys and girls in the second study. The sequential tests of invariance showed that boys and girls did not differ in the pattern of latent factors and the factor structures for both studies, implying the minimum level of invariance is tenable.

The measurement models indicated better fitting models for the second study. The covariance between value and eating behaviour was higher in the second study, as was the covariance between competence and eating behaviour and between competence and value. Significant other influences (study 2) and physical self (study 1) accounted for low-to-moderate variance (19-26%) in perceptions of competence. Significant other influences accounted for moderate variance in subjective value in study 2, with stronger effects noticeable for adolescent boys (46%) compared to girls (25%). In study 1, the physical self accounted for low variance (12-14%) in value for adolescent boys and girls. This finding suggests that significant other influences are stronger sources of competence and value for healthy eating compared to physical self-perceptions.

Finally, the path models showed moderate-to-high (49-59%) variance in eating behaviour is accounted for in the second study, with low-to-moderate variance (29-43%) accounted for in the first study. Partial mediation is supported in the first study model for girls, yet full mediation is evident in the study 1 model for boys, and for the models in the second study. Parent influence had little direct effect on eating behaviour in the model for girls. These findings suggest that there are little differences in the unique explanation of eating behaviour when competence and value are accounted for in the models.

5.1.1.3. Predicting non-smoking behaviour. The means and distributions of the variables were similar for study 1 and 2, and comparable frequencies of smokers and non-smokers were observed in the samples. There were also similar nonparametric relationships among the smoking perceptions and behaviour constructs. The analyses testing the expectancy-value tenets showed similar strengths in non-smoking model prediction across the studies. In the models examining whether adolescents had ever tried a whole cigarette (no trial), study 2 predicted more variance compared to study 1.

The majority of this difference was attributable to the direct effects of significant other influence. In study 1, the analyses predicting non-smoking behaviour demonstrated mediation models. For adolescent boys and girls, mediation was also evident in the second study predicting non-smoking behaviour, and partial mediation was tenable for the model examining no trial smoking behaviour.

In both studies, competence and interest were strong predictors for girls' no trial and non-smoking behaviour. For boys, competence (for no trial and non-smoking) and personal importance (for non-smoking) were significant predictors in the first study models. Competence was not a significant predictor in the second study models, but interest is a strong predictor in the models. These differences in the models for boys may be attributable to the high correlation between competence and interest constructs. As a result of this relationship, it is possible that, statistically, one construct does not emerge as a significant predictor in one model but then emerges in the second model. The strong relationship suggests a congruency between competence and value.

5.1.2. Gender Differences

The mean-level sex differences observed in the studies are well-documented in the literature. Researchers interested in physical activity among youth have repeatedly found that boys report greater perceptions of competence, are more interested in and enjoy physical activity, and more frequently engage in activity compared to girls (Crocker et al., 2000; Eccles & Harold, 1991; Hagger et al., 1998; Jacobs & Eccles, 1992; Marsh et al., 1994; Sallis et al., 2000). For eating behaviour, research has suggested that boys report less healthy dietary choices (including fruit and vegetable consumption, soft drinks, fat intake), and have more negative attitudes towards healthy eating compared to girls (Backman et al., 2002; Granner et al., 2004). Studies investigating smoking behaviour have been primarily correlational in nature, and have often demonstrated little differences in smoking-related variables between boys and girls (Flay et al., 1994; Urberg et al., 1997). In cross-sectional studies examining dietary and smoking behaviour, often boys and girls are not separated in analyses, or not often examined simultaneously, due to inconsistent and non-significant gender differences. The power to detect any differences in smoking behaviour itself was limited in this study due to the low numbers of self-report smokers. Based on the results of this study, researchers interested in advancing the understanding of eating behaviour should consider examining sex as a moderator in the relationships.

In all the models predicting health-promoting behaviours, differences between adolescent boys and girls emerged in the pattern and strength of relationships, covariances, and parameter estimates. Unfortunately, identifying the origins of these sex differences is difficult. Researchers often attempt to explain the differences by recognizing biological and/or socialization disparities, and individual differences have also been identified. Gender-role stereotypes have been implicated, with much less support for theories of identification and gender intensification (Fredricks & Eccles, 2002; Jacobs et al., 2002). In this study, behaviour-specific gender stereotypes were examined as possible factors to explain health behaviour, but were only weakly related to behaviour and showed little differences between boys and girls. Without person-centered and longitudinal designs, it is difficult, if not controversial, to identify the source of the sex differences that emerged in this study. Person-centered approaches consider how individuals differ in their profiles across variables, and tend to reveal diverse patterns of relationships between the individual and the contexts or outcomes (Bartko & Eccles, 2003). Where variable-centered approaches report relationships among social-cognitive constructs and health behaviours across adolescents, person-centered approaches distinguish among individuals or groups who are similar in their perceptions, beliefs and motivation (Bartko & Eccles, 2003). Using person-centered approaches enables the examination of profiles of adolescent engagement in health behaviours by highlighting patterns that may be contingent on sex differences. This proposition, in addition to the use of longitudinal designs that could follow sex-based differences in engagement in health behaviours, is important for further research focused on understanding health behaviour motivation during adolescence. Nonetheless, the contribution of this study is to highlight differences between adolescent boys and girls do exist in the models for physical activity, healthy eating, and non-smoking behaviours, and should not be overlooked or avoided from analyses examining health-promoting behaviours.

5.1.3. Synthesis and Implications of the Findings

The expectancy-value theory was differentially supported as a framework to test physical activity, healthy eating, and non-smoking behaviours, with unique sex-based differences emerging from the data. Based on the finding of weak relationships across the health behaviours, the expectancy-value theory cannot be used to understand the health behaviours concomitantly. However, with some delimitations and possible theoretical, developmental, and sex-based considerations and modifications, the EV model may have functional and differential relevance to understanding health behaviours. The dynamic nature of health behaviour motivation and engagement makes it difficult to conclude the relevance of the EV model for different developmental stages beyond middle-older adolescence. With a synthesis of the existing literature and the findings from this research, there are a number of methodological, conceptual, and practical implications.

5.1.3.1. Methodological and Conceptual Implications. Testing the EV model as a framework to understand physical activity, healthy eating, and non-smoking behaviours provided a unique perspective to the prediction of health behaviours. The results highlight some methodological and conceptual benefits associated with the use of the EV model, and also allude to a number of possible modification and further considerations.

Physical activity. In both studies, the EV model provided a framework to explain moderate effects in physical activity behaviour among adolescents. However, some of the findings in the studies suggest that modifications to the model may be beneficial. First, incorporating direct effects of adolescents' perceptions of significant other influence in the expectancy-value model of physical activity behaviour is suggested. With the low to moderate effects observed, the role of significant other (parent and best friend) influences as sources of competence beliefs should also remain in the model. Other sources of competence beliefs, such as coaches, teammates, teachers, and siblings should also be examined as contributors in the models, since they have been implicated in past research (Horn, 2004; Horn & Amorose, 1998; Weiss & Williams, 2004). The differences in the strength of the relationships for boys and girls warrant further study; however, they should not be taken for granted in motivation-based models.

It is also possible that the relationship between perceptions of competence and subjective values is redundant for understanding older adolescents' physical activity behaviours. Based on the present cross-sectional research, it may be that this relationship between competence and value becomes redundant for boys at an earlier stage than it does for girls, which could have positive emotional outcomes for boys. The constructs appear to make independent meaningful contributions to understanding girls' physical activity behaviour. Furthermore, the strong relationships among the subjective value manifest variables (interest, attainment, and utility values), which led to the creation of a latent variable in this research, may also be resultant of the older adolescent sample.

The results from the studies examining physical activity partially support the expectancy-value tenets. The findings from the current studies are also consistent with some of the main relationships purported in Harter's mediation model of global self-esteem and with Welk and colleagues' (2003) model of parent influence. In Harter's model, self-worth is a mediator of the relationship between perceptions of competence (in areas of importance) and motivation and behaviour. Self-worth is also a mediator of the relationship between significant other influence and behaviour, and is a source of affect, which also directly influences motivation and behaviour. Weiss and Ferrer-Caja (2002) modified Harter's model slightly to propose that significant adults and peers have a direct effect on perceptions of competence in the physical domain. The findings from this study, suggesting that (i) there were strong covariances among competence, value, and physical self-concept; and (ii) significant others (primarily peers) directly influence physical activity behaviour would support some of the independent propositions of the global self-worth model specific to the physical domain.

Second, the current findings are consistent with Welk, Wood, and Morss' (2003) model of parent influence on children's physical activity behaviour. Despite their conceptualization of the model with parental influence, it is theoretically and conceptually possible that similar effects are observed for peers as children develop and move into adolescence. Specifically, Welk and colleagues suggest that parent influence, defined as role modeling, social influence, and social support, indirectly affect attraction to physical activity (which is similar to some aspects of subjective value in Eccles EV model) and perceptions of competence, which in turn influence physical activity. They also propose a direct effect between parent influence and physical activity. The findings of this study support the tenets of this model, and also lend further credence to the role of best friend and peer influence. Nonetheless, a combination of the theoretical indirect propositions alluded to in the EV model and the direct effects proposed by the parental influence model (Welk et al., 2003) were supported with a sample of older adolescents. To date, very few motivation models directly account for the effects of best friend/peer influences. It is more common to see models of parental influence, however recent recommendations by Smith (2003), coupled with the findings here, suggest that a model incorporating the direct effects of peers is warranted.

Eating behaviour. The expectancy-value model provided a functional framework to examine healthy eating behaviour among adolescents. Despite some evidence of misspecification in the measurement models and differences in the models across the studies for girls, competence and value were the main predictors of eating behaviour. The effect sizes for the models were higher than previously reported, and the relationships among the constructs clearly supported the tenets of the EV model.

In spite of the unique simultaneous contribution of both competence and value in the eating behaviour models, the high covariance between competence and value suggests the possible redundancy of the constructs. One consideration is that eating behaviour itself has a "developmental curve". During childhood and adolescence, parents/ guardians are the main provider of dietary choices. However, during mid-late adolescence, independence begins to emerge, with boys and girls making their own decisions on what to eat and when. They are introduced to foods they may not get at home, which possibly necessitate the development of novel competence beliefs and negotiating healthy eating values. Therefore, during the developmental phase of the current sample, perceptions of competence and value may be strongly related because they are contingent on the beliefs and behaviours set out in the home. Nevertheless, as adolescents begin to experience independent eating choices, this competence-value relationship may fluctuate.

Using the EV model as a framework, eating behaviour should be investigated longitudinally to determine if there are changes in competence and value during adolescence and into early adulthood. Furthermore, the definition of what "healthy eating" means may differ as a result of developmental and transitional stages. This operationalization requires further investigation, because it could differentiate the competence-value relationship. Further research is necessary to examine other constructs in the model and their role in predicting healthy eating among adolescents. Further use of the EV model may be beneficial since it was a strong predictive model compared to previously reported findings using other prominent motivation frameworks (i.e., health belief model, social cognitive theory, theory of planned behaviour, and the transtheoretical model; see Baranowski et al., 1999).

Non-smoking behaviour. The expectancy-value model provides a viable framework to understand smoking behaviour, with some differences in the significant predictors noted for boys and girls. One concern that is apparent in the data is the strong relationships among the subjective values, and between perceptions of competence and values. These relationships may partially explain some of the unique predictors that emerged in the models, and likely the reason why competence perceptions were not significant in the smoking models for boys in the second study. As with the physical activity and eating behaviour models, it could be that the high correlation between these constructs suggests congruency and possible redundancy. However, it is possible that with a normally distributed sample of individuals at varying stages of smoking behaviour, there would be meaningful differentiation between competence and values.

Most theoretically-based studies examining smoking behaviour have concentrated on smoking cessation as an outcome, rather than non-smoking behaviour. In these studies, the theory of planned behaviour and social-cognitive theory have been used with varying rates of success of prediction. According to MacDonald et al. (2003), the most effective interventions for changing smoking behaviour have been based in cognitive-behavioural and motivation enhancement perspectives. The researchers define these perspectives in line with the general tenets of the expectancy-value model, whereby increasing efficacy expectations and clarifying smoker's reasons and desires for change have led to successful intervention programs. Therefore, there is evidence that motivation-based models are beneficial to examining and understanding smoking-related behaviours. Based on the present program of research, the EV model provides a unique perspective to examining non-smoking behaviour. One modification to the model would suggest that significant others directly influence non-smoking behaviour, and this relationship is dependent on the smoking stage.

General observations. In addition to the methodological and conceptual implications that are specific to the health behaviours, the findings from this program of research highlight the general importance of models that propose developmental differences in the interrelationships among constructs. To date, Eccles, Wigfield, and colleagues have elaborated on the differentiation of competence and subjective value beliefs, and the sub-values within subjective value, throughout childhood and early adolescence (Eccles & Wigfield, 2002; Eccles, Wigfield et al., 1993; Wigfield, 1994; Wigfield & Eccles, 1992). However, it is possible that these differentiations become redundant in later adolescence, as the boys and girls value realms in which they are competent, have perceptions of competence in domains that they value, and are interested, enjoy, and find useful these domains of high regard and high competence.

One focus that could help to understand and/or differentiate these relationships is the incorporation of the cost value, which may differentiate the competence and value relationship for adolescents. For example, what do older adolescents do if they cannot afford to take part in physical activity or make healthy food choices, despite their competence and value perceptions? What if they do not have the time or the available resources? What about the social costs associated with not smoking? This developmental period is at the cusp of independence, and the costs associated with behaviour may be more informative than at any other time. Unfortunately, the conceptualization and measurement of cost value is still in its infancy, and requires rigorous testing and implementation to accurately examine the possible effects of cost values on the expectancy-value model.

Examining adolescents' goals and goal orientations as possible moderators of the relationship between competence and values may also further differentiate the role of the constructs in understanding behaviour. In their summaries of motivation theories, both Eccles and Wigfield (2002) and Weiss and Williams (2004) highlight the importance of goals. The expectancy-value model proposes that short and long-term goals are sources of competence and values, and the covariances among these factors may partially explain differences in behaviour. Further research is warranted to add the construct of health-related goals and the functions of these goals to determine if the relationship between competence and value is contingent on this aspect of the model.

Finally, competence and value beliefs may be differentiated if the adolescent's cultural milieu is considered in the model as a moderator of the relationship. It is possible that ethnic origins and cultural responsibilities, in addition to family socio-economic status, may influence adolescents' beliefs about the value associated with health behaviours. For instance, Asian cultures have been traditionally considered to be collectivist in nature, whereby the needs and interests of larger groups (such as the family) take precedence over the beliefs and behaviours of individual members (Triandis, 1995). This collectivist nature may influence value beliefs about health behaviours. One study examined cultural family obligations and the impact on Chinese adolescents' daily activities, such as academic and social demands (Fuligni, Yip, & Tseng, 2002). The researchers found that academic demands were more easily balanced with family obligations than social demands, with girls reporting more conflict between demands compared to boys. The moderate proportion of cultural representations in the current studies, coupled with research findings suggesting family obligation discriminates between beliefs and behaviours, highlights the possible conceptual implications of looking at culture as a moderator of the model relationships. In particular, the strong relationships between competence and value beliefs may be influenced by the adolescents' cultural milieu. In a multicultural geographic location such as Vancouver, British Columbia, it cannot be overlooked that differing family demographics and cultural stereotypes exist.

5.1.3.2. Practical Implications. In the two studies conducted, it was clear that the interest, attainment, and utility values were highly related to one another and to perceptions of competence for each of the health behaviours. In spite of the possible redundancy of these constructs in the analyses, there are affective and emotional implications associated with having congruency between values and competence. Drawing on the propositions of (James, 1892) and current theoretical perspectives of Harter (1999), it is suggested that adolescents try to maintain self-esteem. Therefore, they will lower the value they attach to particular activities and behaviours if they lack the confidence in these areas. It is also suggested that boys and girls will disidentify with behaviours and tasks in which they are stereotyped as less competent (Eccles et al., 1999). By disidentifying on these behaviours, individuals will lower the value they attach to them, and experience less positive emotion and affect when engaging in them.

The behaviours then become unrelated to their self-esteem. Broaching on these theoretical propositions, individuals who report congruency between their values and perceptions of competence on health behaviours may experience more positive affect and emotions, and consequently experience higher self-esteem compared to individuals who report inconsistent competence and value beliefs. This observation requires further research.

There are also behavioural implications associated with the current findings. Researchers suggest that if individuals are competent in activities and behaviours that are important to them, they are more likely to engage in the behaviour, persist in face of obstacles and barriers, challenge themselves, and exert more effort (Eccles et al., 1998; Harter, 1999; Weiss & Williams, 2004). Therefore, adolescents who report high positive congruency between their perceptions of competence and values associated with health-promoting behaviours are more likely to continue their involvement over time. The reverse is also true, whereby adolescents who report high negative congruence (low perceptions of competence and low values) are less likely to engage in the behaviour that might otherwise be beneficial to them.

Based on the results in this research, practitioners should focus on enhancing the development of strong competence beliefs for physical activity and healthy eating behaviours. Even if subjective value and competence are unique constructs, it appears that by enhancing perceptions of one will ultimately result in increased perceptions of the other. For non-smoking behaviour, it is recommended that interest and importance values are targeted in intervention studies. For the reasons mentioned above, if strong perceptions of interest and importance are developed, competence associated with not smoking is likely, and subsequent prevention of tobacco use is possible.

On a pragmatic note, physical activity, healthy eating, and non-smoking behaviours are not related in the current studies, but are still important independent predictors of health and illness (Katzmarzyk & Janssen, 2004). Based on the findings, many adolescents are not engaging in adequate physical activity to obtain health benefits, they are not maintaining healthy diets that would otherwise provide health benefits, and they continue to experiment with tobacco use. As such, many adolescents are perpetuating 6 out of the top 7 risk factors for illness and disease (Ezzati et al., 2003), and may impose significant burden on the health care system in Canada over their lifespan (Katzmarzyk & Janssen, 2004). Developing intervention strategies that can help enhance physical activity participation, increase healthy eating behaviours, and decrease tobacco use among adolescents are warranted.

A final practical note hinges on the findings that the health behaviours are only weakly related. These results do not support Health Canada's (www.phac-aspc.gc.ca/ph-sp/phdd/) recommendations for a chronic disease model linking physical activity, diet, and tobacco use. The weak relationships among health behaviours that emerged in the current studies suggest that efforts to enhance physical activity, healthy eating, and non-smoking behaviours should be independently focused. These results are similar to the findings from longitudinal analyses where physical activity and dietary restraint were not related (Crocker et al., in press), and dietary restraint and smoking behaviours showed weak correlations (Crocker et al., 2001) with sub-samples of adolescent girls. Taking these results into account, practitioners should continue to develop and implement effective interventions that target each of the health behaviours separately, yet concomitantly, in health programs. These suggestions have been supported and argued elsewhere, primarily as they relate to diet and physical activity. For instance, Baranowski (2004) suggests that physical activity and diet behaviours share many features that can be effectively targeted simultaneously. The main drawback of this claim is that it is based on a summary of similar yet separate analyses examining the behaviours, rather than integrated approaches whereby the relationship between physical activity and diet is explored. According to Bauman and Craig (2005), separate implementation of physical activity and diet intervention strategies is necessary since there are different effector agencies with no inherent overlap of partnerships. Based on the results of the current studies, effective interventions and policies would be best suited as targeting physical activity and diet (and tobacco use) separately.

To date, successful interventions focused on health behaviours have been based on ecological approaches in which the environment, coupled with adolescents' beliefs and behaviours, have been targeted (e.g., Bauman & Craig, 2005; e.g., Jago & Baranowski, 2004; MacDonald et al., 2003; McKenzie, Sallis, Prochaska, Conway, Marshall, & Rosengard, 2004; Sallis, Bauman, & Pratt, 1998). Based on the current findings, strategies to influence population health status would be most effective by addressing a broad range of health determinants (i.e., perceptions of competence, values, physical self, parent and peer influences, and even gender) in a comprehensive and interrelated way, while focused on health behaviours *independently*. It is suggested that researchers continue to base intervention strategies on research outcomes, and that researchers and practitioners collaborate together to ensure the best implementation of intervention strategies. In turn, intervention studies will ideally inform theoretical models and subsequently advance research examining health behaviours.

5.1.4. Strengths of this research

In addition to providing conceptual and statistical support for the expectancy-value model with physical activity, eating, and non-smoking behaviours, there are a number of additional strengths associated with this research. The first study demonstrates that the concept of the physical self can be integrated into a motivation model. This finding provides support for Fox' s (1998) recommendation that the physical self may be better understood as part of a motivation framework. Furthermore, preliminary analyses revealed that specific self-perceptions were more strongly linked to health behaviours compared to global physical self-worth and global self-esteem. This finding supports the multidimensional structure of self esteem (Fox, 1998; Marsh, 1997).

As a result of the studies, it becomes apparent that both physical self-perceptions and significant other influences are sources of perceptions of competence and subjective values. This finding is particularly distinctive in providing an understanding of the subjective value construct as it relates to health behaviours, since little is known about the sources of value beliefs in the physical domain. These results also provide support for the literature demonstrating that significant adults and peers are salient sources of adolescents' competence beliefs (Horn & Amorose, 1998; Weiss & Ferrer-Caja, 2002).

The finding of strong direct effects of significant other influences, and in particular best friends, on physical activity and non-smoking behaviours provides support for recent recommendations suggesting peer influences are integral to understanding behaviour (Smith, 2003). Also, the differential effects that parents and best friends have on health behaviours is unique, supports developmental perspectives (Harter, 1999), and highlights the necessity of including both in motivation frameworks.

This study adds to the work of Eccles and colleagues because it allows for the examination of behaviour that is not restricted to the academic domain, or to organized sport participation. Also, this type of methodology has allowed for the advancement of the understanding of expectancy-value tenets beyond simple trajectory and correlational analyses that have been commonly reported in the past. The findings from this program of research suggest that general physical activity, healthy eating, and non-smoking behaviours can be understood with a motivation-based theoretical framework. The benefits of grounding this type of research in a model is that it can be replicated, justified, and logically explained with more reliability than typical empirical studies. Also, with the theoretical fidelity demonstrated in this research (e.g. not making post-hoc model modifications), the chance of making Type II errors were controlled.

Finally, the fact that the EV model provided a good fit to the observed data, with little evidence of differences for boys and girls at the measurement level, is encouraging. This finding suggests that the differences between boys and girls were not related to the way the constructs were measured. The moderate effect sizes in the results also supports the use of the model in the prediction of health behaviours. With further research protocols, and the consideration of possible theoretically based and statistically suggestive modifications, the expectancy-value model provides a plausible framework to continue to examine the relationships among and constructs related to health behaviours.

5.1.5. Limitations of the research

In addition to inherent limitations pertaining to self-report and cross-sectional designs, there were several methodological limitations associated with this research. The first limitation is the possible measurement constraints of examining cost value. Eccles and colleagues have suggested that cost value includes time, effort, discomfort, alternatives, finances, and lack of support. Perhaps it would be appropriate to effectively measure cost value as a multidimensional construct, or to choose and target one dimension of cost that is most useful to the research questions. The current problem is that the EV model does not assume a multidimensional cost value, and therefore does not suggest which cost dimensions are integral to motivated behaviour. Additional research should attempt to examine these relationships. Furthermore, the questions should also be clear to the adolescent that the costs are specific to them. For instance, items requesting responses on financial costs should be specifically addressing the adolescent's costs rather than the financial constraints imposed on their parents or guardians.

In the first study, another measurement limitation was revealed with the use of the Leisure Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985). There were several individuals who over-reported their activity and were subsequently excluded from the analyses. Problems associated with the use of the LTEQ measure with youth samples have been reported (Scerpella, Tuladhar, & Kanaley, 2002). However, support for the measure with adolescents has also been reported (Kowalski et al., 1997; Sallis et al., 1993). During the first study implementation, it was apparent that providing an example would benefit the completion of the scale. In the second study, an example was provided and the distribution of responses on the first part of the LTEQ was improved. Future research should therefore not avoid the use of the LTEQ with youth samples, but modifications to the instrument instructions and providing an example are warranted.

In the first study, the Physical Self-Description Questionnaire was chosen as a measure of physical self-concept. A limited number of self-perception subscales were used due to their inherent universal links to a variety of behaviours rather than specific to physical activity. This was important so that the models for physical activity, eating, and non-smoking behaviours would be similarly conceptualized. However, the physical self was not well represented as a single latent variable in the structural equation modeling analyses. It is possible that the appearance and body fat subscales should be represented by a separate latent variable to endurance and strength perceptions, and that the physical self is actually a two (or more) factor structure.

Another limitation is that the direction of effects cannot be inferred. This is a cross-sectional analysis supporting the main tenets of the expectancy-value model, however it is likely that values and competence also influence physical self-perceptions, and that the behavioural outcomes impact perceptions of competence, value, and the physical self. These possible cyclical relationships require more advanced longitudinal studies and statistical analysis procedures.

In addition to accounting for the direction of effects, longitudinal studies would also contribute to the understanding of the periods of engagement and non-engagement of health behaviours during adolescence. Using longitudinal approaches, researchers can examine trajectories of engagement whereby focusing on early initiators of health-related behaviour compared to late or never initiators, and adolescents who maintain or discontinue their engagement in such behaviours. Several cross-sectional studies have been conducted to explore the reasons or influences of initiating, maintaining, and/or discontinuing physical activity, healthy eating (or dietary strategies), and tobacco use during adolescence (see Baranowski et al., 1999; Flay et al., 1998; Weiss & Williams, 2004 for some discussion of the stages of health behaviour motivation). It is evident that the factors related to the different stages of engagement/non-engagement may be unique, and longitudinal research could best explore these differences. As such, transitions among and between health behaviour motivation may be identified.

Finally, this research was conducted with two samples of adolescents, aged 15 to 18 years. The findings suggest some similarities and other differences in the interrelationships among manifest and latent factor constructs across samples. It is recommended that replication of the study findings should be examined with a similar adolescent sample to ensure that the pattern of covariances among expectancy-value constructs reported in this research reflect the true nature of the relationships. Cross-validation techniques are also warranted.

5.1.6. Future Research Recommendations

In addition to the suggested future research propositions presented in the limitations and implications sections, there are additional recommendations. First, research should test the expectancy-value model with middle to older adolescent samples to examine behaviour-specific efficacy expectations as well as competence beliefs to determine if the two constructs can be differentiated statistically. According to Eccles and Wigfield (2002), the constructs are theoretically distinct but children and young adolescents do not differentiate between the constructs.. These findings should be examined with an older adolescent sample, to determine when and if efficacy expectations and competence beliefs are regarded as distinct constructs.

It is also recommended that researchers interested in using the expectancy-value model to study behaviours in the physical domain investigate alternative measures of self-concept and, more specifically, self-schemata. According to Kenszierski (1988), self-schemata are domain-specific cognitive structures formed by past experiences that guide information processing and behaviour. Kendzierski and colleagues have developed measures of exercise and healthy eating self-schemata (Kendzierski, 1988; Kendzierski, Furr, & Schiavoni, 1998; Kendzierski & Sheffield, 2000; Kendzierski & Whitaker, 1997). It is possible that the conceptualization of self-schema, which is akin to identity in the expectancy-value model (Eccles & Wigfield, 2002), would be a strong but potentially unique predictor of competence and value beliefs in models examining health behaviours. The problem in the current research with physical self-concept is that the conceptualization of the construct and the way it is measured are still not consistent in the literature, and as a result the measure tends to link strongly to physical competence beliefs. Perhaps looking at self-schemata would allow researchers to better separate the construct from measures of competence and values. Along this line of inquiry, it is recommended that further research be conducted to examine the possibility of a "health" self-concept, which may be distinct from physical self-concept that is currently examined. The difficulty in using physical self-concept as a construct to examine health behaviours is the inherent operationalization with direct links to physical activity, and the subsequent exclusion of other health-related behaviours.

It is also recommended that future research studies examine which parent is providing role-modeled behaviour and emotional support. The objectives of this research were fulfilled with a general understanding of parental/guardian influence. There might be differential influences on health behaviours from mothers and fathers, and it would be important to understand these differences. In knowing which parent is providing support and acting as a role model, researchers should examine sex differences in the health behaviour models. Having a better understanding of how parents and best friends support adolescents would provide a more comprehensive examination of the mechanisms of influence, and would better inform intervention efforts.

Longitudinal research would benefit the understanding of health behaviours and the possible sex-based differences in the models. As recommended by Eccles and colleagues (1999), unless the pattern of change in self-concept, significant other influences, competence, and values of boys and girls is examined, it is possible to incorrectly attribute the differences in the constructs to gender-related issues rather than to the more general developmental issues linked to adolescence. Longitudinal research would enable researchers to apply developmental perspectives to examine proposed differences in the socialization of boys and girls, which may help explain the differences in relationships among the main constructs in the expectancy-value model. Longitudinal research could identify possible developmental cycles associated with health behaviours. It is likely that the relationships among the main constructs examined in this research change with developmental changes that occur during adolescence, but this proposition requires further research.

As evidenced in the current research and recommended by prominent researchers in the field, future research studies testing models need to account for differences between boys and girls beyond mean-level differences in the constructs.

Some researchers have suggested that self-perception analyses be conducted by sex, because even if the factor structure is consistent for boys and girls, it doesn't rule out the possibility that the relationships with other variables are sensitive to sex (Crocker et al., 2000; Fox, 1998; Marsh, 1997). This was evident in the current research, and future studies testing the expectancy-value model should consider differences in the models for boys and girls. It is also likely that differences in cultural milieu need to be accounted for in theoretical models, but further research examining this contention is necessary. The EV model suggests that cultural milieu impacts significant others' beliefs and behaviours, which subsequently impacts perceptions of competence and subjective values. These relationships need to be tested.

Finally, future research testing and comparing the distinctiveness of the expectancy-value model (Eccles, 1983), Harter's (1987) mediation model of global self-worth, and Welk and colleagues (2003) model of significant other influences could provide greater knowledge of health behaviour motivation. To date, the direction of effects pertaining to the main constructs in these models (e.g. significant other influence, self-concept/self-worth, perceptions of competence, values, and behaviour) are not clear. The predictive power of these models should be examined for their applicability to and explanation of health behaviours.

Along these lines of inquiry, future research should also attempt to test the comprehensive expectancy-value model. On a conceptual level, the EV model appears to be in line with broader ecological perspectives. Ecological models incorporate both intra-individual (personal beliefs and behaviours) and extra-individual (environmental topography, social and cultural context, policies) influences that may impact individuals' health behaviours (Kelly, 1990). A synergy between these intra- and extra-individual factors is thought to exert influence on behaviour beyond the singular influence of the individual or the environment alone (Kelly, 1990). These interdependent constituents exist at a number of levels within multidimensional, hierarchical, multilevel ecological models. Ecological models are thought to be important in advancing the knowledge of health behaviour motivation (i.e., Spence & Lee, 2003).

With a specific focus on parent and child relationships and behaviour, many ecological perspectives are including family, neighborhood, community, school, and peer factors as additional contexts for consideration. Using the EV model as a baseline, these factors could be examined as peripheral mechanisms of influence on health behaviour. Within a multilevel perspective, family variables would be most proximal to the adolescent's behaviour (as portrayed in the EV model), which would be nested in the neighborhood. The socioeconomic circumstances of the family and the psychological characteristics of the parents interact themselves, and interact with the neighborhood and community (Sameroff, Peck, & Eccles, 2004). These interactions provide support and stress on family functioning. Additional interactive contexts during adolescence include the peer and school contexts, which are nested in the neighborhood (Sameroff et al., 2004). Future research would benefit from an ecological perspective to health behaviour engagement. A greater understanding of these multilevel and multidimensional constituents, and the mechanisms on which they influence health behaviour, is warranted.

5.1.7. Concluding Remarks

In summary, new considerations for the relationships between parent and best friend influence, competence, value, and adolescent physical activity behaviour should involve direct links and the possible exclusion of subjective value. The models examining non-smoking behaviour should also include direct effects of significant other influence. Healthy eating behaviour is best understood with competence and value beliefs as mediators in the relationships between the physical self and eating behaviour, and between significant other influence and eating behaviour. Differences in the models for adolescent boys and girls warrant further research and conceptualization of the relationships. Both sex and developmental differences should also not be taken for granted in the models used to examine physical activity, healthy eating, and non-smoking behaviours. Finally, the uniqueness of these model differences may be behaviour-specific. This finding suggests that the quest for a comprehensive integrative model of health behaviour may be difficult at best, if not futile. However, employing theoretical frameworks such as the expectancy-value model to simultaneously examine health behaviours helps to advance the understanding of adolescents' physical activity, healthy eating, and non-smoking behaviours.

In summary, and to echo the words of (Sallis, 1994), continued research is necessary to examine adolescents' motivation and engagement in health behaviours. Understanding the many factors that influence physical activity, healthy eating, and non-smoking behaviours may help improve the effectiveness of health promotion intervention programs. The findings from this study, coupled with research recommendations, suggest that the effectiveness of programs should be maximized when participants have confidence in their ability to engage in health behaviours, when this confidence is nurtured by a supportive environment, when adolescents enjoy the behaviours they have chosen and find them personally important and useful, and when they receive encouragement and emotional support from significant adults and peers for these behaviours.

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Appendices

APPENDIX A

Study 1 Behavioural Research Ethics Board Certificate of Approval

APPENDIX B

Study 1 Secondary School District Board Approvals to Conduct Research

APPENDIX C

Study 1 Initial Contact Letter

APPENDIX D

Study 1 Parent/Guardian Consent Form

- You consent / Do not consent to your son/daughter's participation in this study (**Please circle one)**

Print Name (participant):______________________

Print Name (parent/guardian):______________________

Signature (parent/guardian):______________________ **Date:** ________________

Signature (Co-investigator):______________________ **Date:** ________________

***You may return this back page to the researcher and keep the other pages for your records.**

APPENDIX E

Study 1 Participant Assent Form

You assent/ do not assent to participate in this study **(please circle one)**

Print Name (participant):______________________

Signature (participant):______________________ **Date:** ________________

Signature (Co-investigator):__________________ **Date:** ________________

***You may return this back page to the researcher and keep the other pages for your records.**

APPENDIX F

Study 1 Questionnaire

PART A. Physical Self-Description Questionnaire

In this section you will be asked to think about yourself physically. Answer each sentence quickly as you feel now. Please do not leave any sentences blank.

There are six possible answers for each questions – "True", "False", and four others in between. There are six numbers next to each sentence, one for each of the answers. The answers are written at the top of the numbers. Choose your answer to a sentence and put a circle around the number under the answer you choose. DO NOT say your answer out loud or talk about it with anyone else.

If you want to change any answers you have marked you should cross out the circle and put a new circle around another number on the same line. You should have only one answer circled for each sentence. Do not leave out any sentences, even if you are not sure what number to circle. There are no right or wrong answers, just answer how you feel right now, using the scale below.

False	Mostly False	More false than true	More true than false	Mostly true	True
1	2	3	4	5	6

1.	When I get sick I feel so bad that I cannot even get out of bed.	1	2	3	4	5	6
2.	I am too fat.	1	2	3	4	5	6
3.	I am satisfied with the kind of person I am physically.	1	2	3	4	5	6
4.	I am attractive for my age.	1	2	3	4	5	6
5.	I am a physically strong person.	1	2	3	4	5	6
6.	I can run a long way without stopping	1	2	3	4	5	6
7.	Overall, most things I do turn out well.	1	2	3	4	5	6
8.	I usually catch whatever illness (flu, virus, cold, etc.) is going around.	1	2	3	4	5	6
9.	My waist is too large.	1	2	3	4	5	6
10.	Physically, I am happy with myself.	1	2	3	4	5	6

False	Mostly False	More false than true	More true than false	Mostly true	True
1	2	3	4	5	6

11.	I have a nice looking face.	1	2	3	4	5	6
12.	I have a lot of power in my body.	1	2	3	4	5	6
13.	I would do well in a test of physical endurance and stamina	1	2	3	4	5	6
14.	I don't have much to be proud of.	1	2	3	4	5	6
15.	I am sick so often that I cannot do all the things I want to do.	1	2	3	4	5	6
16.	I have too much fat on my body.	1	2	3	4	5	6
17.	I feel good about the way I look and what I can do physically.	1	2	3	4	5	6
18.	I'm better looking than most of my friends.	1	2	3	4	5	6
19.	I am stronger than most people my age.	1	2	3	4	5	6
20.	I could jog 5 kilometers without stopping.	1	2	3	4	5	6
21.	I feel that my life is not very useful.	1	2	3	4	5	6
22.	I hardly ever get sick or ill.	1	2	3	4	5	6
23.	I am overweight.	1	2	3	4	5	6
24.	Physically I feel good about myself.	1	2	3	4	5	6
25.	I am ugly.	1	2	3	4	5	6
26.	I am weak and have no muscles.	1	2	3	4	5	6
27.	I think I could run a long way without getting tired.	1	2	3	4	5	6

False	Mostly False	More false than true	More true than false	Mostly true	True
1	2	3	4	5	6

28.	Overall, I'm no good.	1	2	3	4	5	6
29.	I get sick a lot.	1	2	3	4	5	6
30.	My stomach is too big.	1	2	3	4	5	6
31.	I feel good about who I am and what I can do physically.	1	2	3	4	5	6
32.	I am good looking.	1	2	3	4	5	6
33.	I would do well in a test of strength.	1	2	3	4	5	6
34.	I can be physically active for a long period of time without getting tired.	1	2	3	4	5	6
35.	Most things I do, I do well.	1	2	3	4	5	6
36.	When I get sick it takes me a long time to get better.	1	2	3	4	5	6
37.	Other people think that I am fat.	1	2	3	4	5	6
38.	I feel good about who I am physically.	1	2	3	4	5	6
39.	Nobody thinks that I am good looking.	1	2	3	4	5	6
40.	I am good at lifting heavy objects.	1	2	3	4	5	6
41.	I am good at endurance activities like distance running, aerobics, bicycling, swimming, or cross-country skiing.	1	2	3	4	5	6

42.	Overall, I have a lot to be proud of.	1	2	3	4	5	6
43.	I have to go to the doctor because of illness more than most people my age.	1	2	3	4	5	6
44.	Overall, I'm a failure.	1	2	3	4	5	6

False	Mostly False	More false than true	More true than false	Mostly true	True
1	2	3	4	5	6

45.	I usually stay healthy even when my friends get sick.	1	2	3	4	5	6
46.	Nothing I do ever seems to turn out right.	1	2	3	4	5	6

PART B. Please list any SHORT TERM goals that you have that relate to your health. These goals should include any desires you may have to change or maintain your weight, body shape, exercise, eating, and smoking habits over the next FEW WEEKS/MONTH:

For example: "In the next few weeks/month, my goal is to: eat more vegetables"

In the next few weeks/month, my goal is to:
In the next few weeks/month, my goal is to:
In the next few weeks/month, my goal is to:
In the next few weeks/month, my goal is to:
In the next few weeks/month, my goal is to:

PART C. Competence beliefs

Confidence in Not Smoking

Please indicate how often each statement is true for you, assuming that you were intending either to permanently quit smoking now or to remain permanently abstinent from smoking. Use the following scale:

Not at all true **Somewhat true** **Very true**

1 **2** **3** **4** **5** **6** **7**

C1. I feel confident in my ability to not smoke.	1 2 3 4 5 6 7
C2. I now feel capable of not smoking.	1 2 3 4 5 6 7
C3. I am able to not smoke.	1 2 3 4 5 6 7
C4. I am able to meet the challenge of not smoking.	1 2 3 4 5 6 7

Confidence in Maintaining a Healthy Diet

Please indicate how often each statement is true for you, assuming that you were intending either to permanently improve your diet now or to maintain a healthy diet. Use the following scale:

Not at all true **Somewhat true** **Very true**

1 **2** **3** **4** **5** **6** **7**

C5. I feel confident in my ability to maintain a healthy diet.	1 2 3 4 5 6 7
C6. I now feel capable of maintaining a healthy diet.	1 2 3 4 5 6 7
C7. I am able to maintain a healthy diet.	1 2 3 4 5 6 7
C8. I am able to meet the challenge of maintaining a healthy diet.	1 2 3 4 5 6 7

Confidence in Regular Physical Activity

Please indicate indicate how often each statement is true for you, assuming that you were intending either to begin now a permanent regimen of exercising regularly or to permanently maintain your regular exercise regimen. Use the following scale:

Not at all true			Somewhat true			Very true
1	2	3	4	5	6	7

C9. I feel confident in my ability to exercise regularly.	1 2 3 4 5 6 7
C10. I now feel capable of exercise regularly.	1 2 3 4 5 6 7
C11. I am able to exercise regularly.	1 2 3 4 5 6 7
C12. I am able to meet the challenge of exercise regularly.	1 2 3 4 5 6 7

PART D. Please read the following sentences about physical activity, eating a healthy diet, and smoking and complete the sentences with your answer, using the scales below each sentence. Pay attention to the wording of the scales. If you need to change your answer, please put an "X" over the circle and choose another answer by circling a new number.

PHYSICAL ACTIVITY

D1. In general, I find participating in physical activity:

Very Boring **Very Interesting**

1 2 3 4 5 6 7

D2. How much do you like participating in physical activity?

Not at all **Very much**

1 2 3 4 5 6 7

D3. For me, being able to participate in physical activity is:

Not at all important						**Very important**
1	**2**	**3**	**4**	**5**	**6**	**7**

D4. In general, how much effort do you put into physical activity?

No effort at all						**Lots of effort**
1	**2**	**3**	**4**	**5**	**6**	**7**

D5. In general, how useful is physical activity to you?

Not at all useful						**Very useful**
1	**2**	**3**	**4**	**5**	**6**	**7**

D6. I find participating in physical activity:

Not at all valuable						**Very valuable**
1	**2**	**3**	**4**	**5**	**6**	**7**

D7.

a. Participating in regular physical activity takes:

No time			**Some time**			**A lot of time**
1	**2**	**3**	**4**	**5**	**6**	**7**

b. Participating in regular physical activity requires:

No money			**Some money**			**A lot of money**
1	**2**	**3**	**4**	**5**	**6**	**7**

c. Participating in regular physical activity interferes with other activities:

Never			**Sometimes**			**Always**
1	**2**	**3**	**4**	**5**	**6**	**7**

d. Participating in regular physical activity results in physical discomfort:

Not at all			**Somewhat**			**A lot**
1	**2**	**3**	**4**	**5**	**6**	**7**

f. ________ of my friends and family members participate in regular physical activity:

None			**Some**			**All**
1	**2**	**3**	**4**	**5**	**6**	**7**

SMOKING BEHAVIOUR

D8. In general, I find smoking:

Very Boring						**Very Interesting**
1	**2**	**3**	**4**	**5**	**6**	**7**

D9. How much do you like smoking?

Not at all						**Very much**
1	**2**	**3**	**4**	**5**	**6**	**7**

D10. For me, *not* smoking is:

Not at all important						**Very important**
1	**2**	**3**	**4**	**5**	**6**	**7**

D11. In general, how much effort do you put into *not* smoking?

No effort at all						**Lots of effort**
1	2	3	4	5	6	7

D12. In general, how useful is *not* smoking to you?

Not at all useful						**Very useful**
1	2	3	4	5	6	7

D13. I find *not* smoking:

Not at all valuable						**Very valuable**
1	2	3	4	5	6	7

D14.

a. Smoking cigarettes takes up:

No time			**Some time**			**A lot of time**
1	2	3	4	5	6	7

b. Smoking cigarettes requires:

No money			**Some money**			**A lot of money**
1	2	3	4	5	6	7

c. Smoking cigarettes interferes with other activities:

Not at all			**Sometimes**			**A lot**
1	2	3	4	5	6	7

d. Smoking cigarettes results in physical discomfort:

Not a lot			Somewhat			A lot
1	**2**	**3**	**4**	**5**	**6**	**7**

e. Cigarette smokers are viewed negatively by others:

Not at all			Sometimes			A lot
1	**2**	**3**	**4**	**5**	**6**	**7**

f. ________ of my friends and family members smoke cigarettes:

None			Some			All
1	**2**	**3**	**4**	**5**	**6**	**7**

<u>HEALTHY DIET</u>

D15. In general, I find eating a healthy diet:

Very Boring						Very Interesting
1	**2**	**3**	**4**	**5**	**6**	**7**

D16. How much do you like eating a healthy diet?

Not at all						Very much
1	**2**	**3**	**4**	**5**	**6**	**7**

D18. For me, being able to eat a healthy diet is (not at all important – very important)

Not at all important						Very important
1	**2**	**3**	**4**	**5**	**6**	**7**

D19. In general, how much effort do you put into eating a healthy diet?

No effort at all						**Lots of effort**
1	**2**	**3**	**4**	**5**	**6**	**7**

D20. In general, how useful is eating a healthy diet to you?

Not at all useful						**Very useful**
1	**2**	**3**	**4**	**5**	**6**	**7**

D21. I find eating a healthy diet:

Not at all valuable						**Very valuable**
1	**2**	**3**	**4**	**5**	**6**	**7**

D22.

a. Choosing and preparing healthy foods takes:

No time			**Some time**			**A lot of time**
1	**2**	**3**	**4**	**5**	**6**	**7**

b. Following a healthy diet requires:

No money			**Some money**			**A lot of money**
1	**2**	**3**	**4**	**5**	**6**	**7**

c. Following a healthy diet interferes with other activities:

Not at all			**Sometimes**			**A lot**
1	**2**	**3**	**4**	**5**	**6**	**7**

d. Following a healthy diet results in physical discomfort:

Not at all			Somewhat			A lot
1	2	3	4	5	6	7

e. Following a healthy diet requires eating foods that are enjoyable:

Never			Sometimes			Always
1	2	3	4	5	6	7

f. ________ of my friends and family members follow a healthy diet:

None			Some			All
1	2	3	4	5	6	7

PART F. Physical activity

Godin Leisure-Time Exercise Questionnaire

E1. During a typical **7-Day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your free time (write on each line the appropriate number).

Times Per Week

a) STRENUOUS EXERCISE
(HEART BEATS RAPIDLY) __________
(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

b) MODERATE EXERCISE
(NOT EXHAUSTING) __________
(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

c) MILD EXERCISE
(MINIMAL EFFORT) __________
(e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking)

E2. During a typical **7-Day period** (a week), in your leisure time, how often do you engage in any regular activity **long enough to work up a sweat** (heart beats rapidly)? Please check one answer.

☐ OFTEN
☐ SOMETIMES
☐ NEVER/RARELY

E3. Are you currently enrolled in physical education at your school? ☐ Yes ☐ No

PART F. Healthy Diet

The Adolescent Food Habits Checklist

Please complete the following statements about your own eating habits. You are asked to answer "true" if the statement describes you, and "false" if the statement does not describe your eating habits. Some statements also have a "Not applicable (N/A)", which you will answer if the statement does not describe something you normally do. Please circle the answer that best describes you. If you want to change your answer, please put an "X" through the original answer and then choose a new response.

F1. If I am having lunch away from home, I often choose a low-fat option.

T – True

F – False

N/A – I never have lunch away from home

F2. I usually avoid eating fried foods.

T – True

F – False

F3. I usually eat a dessert if there is one available.

T – True

F – False

F4. I make sure I eat at least one serving of fruit a day.

T – True

F – False

F5. I try to keep my overall fat intake down.

T – True

F – False

F6. If I am buying chips, I often choose a low-fat brand.

T – True

F – False

N/A – I never buy chips

F7. I avoid eating lots of sausages and burgers.

T – True

F – False

N/A – I never eat sausages or burgers

F8. I often buy pastries and cakes.

T – True

F – False

F9. I keep my overall sugar intake down.

T – True

F – False

F10. I make sure I eat at least one serving of vegetables or salad a day.

T – True

F – False

F11. If I am having a dessert at home, I try to have something low in fat.

T – True

F – False

N/A – I don't eat desserts

F12. I rarely eat take-out meals.

T – True

F – False

F13. I try to ensure I eat plenty of fruit and vegetables.

T – True

F – False

F14. I often eat sweet snacks between meals.

T – True

F – False

F15. I usually eat at least one serving of vegetables (excluding potatoes) or salad with my evening meal.

T – True

F – False

F16. When I am buying a soft drink, I usually choose a diet drink.

T – True

F – False

N/A – I never buy soft drinks

F17. When I put butter or margarine on bread, I usually spread it thinly.

T – True

F – False

N/A - I never have butter or margarine on bread.

F18. If I have a packed lunch, I usually include some chocolate and/or cookies.

T – True

F – False

N/A – I never have a packed lunch

F19. When I have a snack between meals, I often choose fruit.

T – True

F – False

N/A – I never eat snacks between meals

F20. If I am having a dessert in a restaurant, I usually choose the healthiest one.

T – True

F – False

N/A – I never have desserts in restaurants

F21. I often have whipped cream on desserts.

T – True

F – False

N/A – I don't eat desserts

F22. I eat at least three servings of fruit most days.

T – True

F – False

F23. I generally try to have a healthy diet.

T – True

F – False

PART G. Smoking Behaviour

Student Smoking Profile

These questions are about the smoking experiences and attitudes of students like yourself. Read each question carefully and answer as honestly as you can. Please put a check (√) or an "X" in the box beside the answer that describes you.

G1. Have you ever smoked a cigarette, even just a few puffs?

☐ - Yes

☐ - No

G2. Have you ever smoked a whole cigarette?

☐ - Yes

☐ - No

☐ – I have never smoked

G3. Have you ever smoked 100 or more whole cigarettes in your life?

☐ – Yes

☐ – No

☐ – I have never smoked

G4. Think about the last 30 days. Did you smoke a cigarette, even just a few puffs?

- ☐ - Every day
- ☐ - Almost every day
- ☐ - Some days
- ☐ -1 or 2 days
- ☐ - Not at all

G5. Think about the last 30 days. On the days that you smoked, how many cigarettes did you usually smoke?

- ☐ - I did not smoke at all
- ☐ - A few puffs in a day
- ☐ -1-2 cigarettes
- ☐ - 3-5 cigarettes
- ☐ - 6-10 cigarettes
- ☐ - 11-19 cigarettes
- ☐- 20 or more cigarettes

G6. Are you a smoker?

- ☐ – Yes
- ☐ – No

G7. If you are a smoker, at what age did you start smoking? __________ years

G8. If you are a smoker, what were the reasons why you started smoking?

1. ____________________________________
2. ____________________________________
3. ____________________________________

PART H. Self-report physical characteristics

H1. What is your gender (check one)? ☐ Male ☐ Female

H1a. How old are you? ________ years

H2. What is your current height in feet and inches? ________

H3. What is your current weight in pounds? ________

H4. What is your ideal weight in pounds? ________

H5. How would you describe yourself (please check one)?

☐ Very Underweight
☐ Somewhat Underweight
☐ Normal Weight
☐ Somewhat Overweight
☐ Very Overweight

H6. How would other people describe you (please check one)?

☐ Very Underweight
☐ Somewhat Underweight
☐ Normal Weight
☐ Somewhat Overweight
☐ Very Overweight

H7. How do you describe yourself in terms of your ethnic origin?
PLEASE CHECK **ALL** THAT APPLY:

☐ Chinese
☐ Native/Aboriginal
☐ Italian
☐ Korean
☐ Greek
☐ Irish
☐ Australian
☐ East Indian
☐ German
☐ Persian
☐ British
☐ Hispanic
☐ Portuguese
☐ Vietnamese
☐ Polish
☐ French
☐ Dutch
☐ Scottish
☐ Filipino
☐ Jewish
☐ Japanese

☐ Other ethnic or cultural group(s), please specify:________________
☐ *I do not belong to an ethnic or cultural group*

H8. What is your postal code? ________________

H9. What is your mother/female guardian's job?________________________

H10. What is your father/male guardian's job?________________________

Thank you for taking the time to complete this questionnaire.

APPENDIX G

Data screening results from study 1

Accuracy of input and missing data

Any individuals who recorded ages less than 15 years (1 case) and greater than 18 years (7 cases) were deleted from the data file. These ages were not representative of the subpopulation intended for study. Less than 4.5% of the data was missing for any one variable, so it was acceptable to keep all items (Tabachnick & Fidell, 2001). Due to potentially ambiguous wording on instructions for the subjective value section pertaining to physical activity, 27 values were missing, for a total of 4.2% missing data. The missing values were replaced with the scale means. Replacing the missing data with the group mean likely reduced the variances in the subjective values items for physical activity. All other missing values appeared randomly and were replaced with subscale median scores.

Univariate and multivariate outliers

Univariate outliers were identified as cases with very large (i.e., greater than 4.0) standardized residual scores (Stevens, 1996). There were 5 outliers on non-smoking perceived competence (NSPC), 3 outliers on physical activity personal importance (PAPI), 2 outlier cases on healthy diet personal importance (HDPI), 5 outliers on total physical activity in METS (LTEQ1), 19 outliers on smoking frequency (SSP4), 9 outliers on smoking quantity (SSP5), and 2 outliers on BMI. The outliers for NSPC had extremely low scores, which is indicative of having little competence in not smoking cigarettes. These cases were left in the data set. The outliers on SSP4 and SSP5 items are again indicative of smokers and are identified as outliers only due to the unequal dichotomy of the smoking variable. These individuals recorded that they smoked every day, and up to 20 or more cigarettes over the last 30 days. The other outlier scores are plausible and the cases are accurate representations of individuals who do not report physical activity and healthy diet as important to them. The LTEQ1 cases with extremely high scores are likely a measurement artifact. It appears that some adolescents did not understand the instructions, and likely recorded total minutes rather than number of 15-minute or more bouts of exercise. In addition to the univariate outliers, multivariate outliers were examined separately for the health behaviours. There were 13 multivariate outliers for the physical activity constructs, 16 outliers for eating behaviour constructs, and 28 multivariate outliers for the smoking behaviour variables. Despite the multiple outliers that were statistically identified, the mix of scores on the variables made conceptual sense and none of the multivariate outliers were removed from the data.

For univariate and multivariate outliers, analyses were conducted with the cases in and removed from the data to determine whether the cases make significant changes to the solutions and relationships. Several of the multivariate outlier score combinations make conceptual sense, and removing them from the data would alter the meaning of the findings. Univariate outliers were also identified in the main analyses, and were removed if deemed necessary based on standardized residual scores and leverage statistics.

Normality and linearity

Several scales had distributions that deviated from normality based on statistically significant skewness and kurtosis values (see Table 4.1, 4.2, and 4.3, for the total sample, boys, and girls respectively). However, with the sample size represented, the statistics may indicate deviations from normality that will not make a difference to the outcome of analyses (Tabachnik & Fidell, 2001). Frequency histograms and normal probability plots were examined for evidence of normalcy. LTEQ1 was significantly skewed, and logarithmic transformation improved the distribution. The transformed variable was subsequently used in all remaining analyses. The plots for the NSPC and the smoking items indicate nonnormality. Both square root and logarithmic function transformations were conducted, resulting in no improvements to the variable distributions. Another recommendation for severely skewed data is to dichotomize the variables with non-normal distributions (Tabachnick & Fidell, 2001). Unfortunately, dichotomizing the variables made little sense since the majority of the scores were clustered at the highest response options (i.e., the median, mode, and mean were all similar). Therefore, statistical analyses that are robust to non-normality (i.e., logistic regression) were used to examine smoking behaviour.

To examine multivariate normality, Mardia's coefficient was calculated using PRELIS. For physical activity ad physical self subscales, Mardia's coefficient was 1.31 for boys and 1.21 for girls. The normalized kurtosis values were 11.53 for boys and 13.23 girls, respectively. For eating behaviour measures, Mardia's coefficient was 1.17 and 1.11, and the normalized kurtosis coefficients were 6.76 and 6.09 for boys and girls respectively, again indicating multivariate normality. PRELIS was not used to examine smoking data.

Examination of bivariate scatterplots was performed to attend to the assumption of linearity. Despite evidence of heteroscedasticity in several of the scatterplots, linear relationships were identified by fairly oval-shaped curves. Transformation of the variables was not performed since the data will be examined in ungrouped format by gender and therefore heteroscedasticity is not a serious violation for further analyses

(Tabachnick & Fidell, 2001). Furthermore, logit logistic regression analyses are robust to heteroscedasticity. The Box-Tidwell Transformations did not reveal problems with linearity between the logit and the independents in the models for smoking variables.

Multicollinearity

Pearson and Spearman's Rho correlations were examined for extremely high coefficient s to examine the assumptions of multicollinearity. Physical self-worth and appearance perceptions were highly correlated (r=.64), physical activity interest and personal importance values were strongly related (r=.73), non-smoking perceived competence was highly correlated to the smoking frequency and quantity (SSP4 & SSP5) items (r=-.67 and -.69) and to non-smoking interest value (r=.67), and the smoking behaviour items demonstrated high correlations among the 'trial' smoking items (SSP 1, 2, and 3; r=.90), and among the smoking frequency and quantity items (r=.97). In addition to examining correlation coefficients, preliminary regression analyses were examined to identify multicollinearity issues for the health behaviours separately. For the physical activity constructs (including perceived competence, interest, attainment, utility, and cost values, physical self-perceptions, global self-esteem, and BMI), there was one condition index that was exceedingly high (53.48), Variance Inflation Factors (VIF) of 2.39 (body fat), 2.51 (strength), and 2.80 (GSE), six variance proportions greater than .50, and one dimension sharing two high variance proportions. When BMI was removed from the analysis, there was one condition index just greater than 30, six variance proportions over .50, and no dimension sharing the higher variance proportions. The VIF statistics were higher for endurance perceptions, and interest, attainment, and utility values, but not greater than 2.50.

Eating behaviour constructs, including the physical self-perceptions, global self-esteem, and BMI, were examined for multicollinearity. Again, when BMI was entered in the analysis there was evidence of potential collinearity issues based on a high condition index (50.30), however there were six variance proportions greater than .50 and no dimension sharing two high variance proportions. With BMI excluded from the analysis, there was one condition index around 30, lower Variance Inflation Factor values for the self-perceptions and global self-esteem, and no dimension sharing variance proportions greater than .50.

The smoking behaviour items were examined in a logistic regression analysis to examine multicollinearity. Standardized errors were examined for inflation between the models predicting NO TRIAL and NO SMOKE. Competence, values, self-perceptions, and GSE were entered in separate models to examine the logit coefficient standardized errors. There was evidence of multicollinearity issues between the attainment and utility value predictors in the logistic regression models. As a result of this finding, a composite value was created (by summing the total scores on the attainment and utility values) and labeled "Personal Importance". For all remaining smoking data analyses, this new value was used. Furthermore, in an attempt to reduce the possibility of multicollinearity in the smoking data, the final models presented included only independent variables that were significantly correlated to the dependent variable and significant in preliminary analyses (Pedhazur, 1997).

Instrument Psychometrics

The instrument reliability coefficients (Cronbach's alpha, SPSS 10.0) were calculated. The health, body fat, appearance, strength, and endurance subscales from the Physical Self-Description Questionnaire, all perceived competence scales, interest value, and the Adolescent Food Health Checklist had acceptable internal consistencies. Physical activity and eating cost value subscales had low internal consistencies. It was possible that the reliability of this subscale was influenced by the multidimensional nature of the items. (i.e., time, financial, and discomfort, support). Not only are these items conceptually different, but they also vary on the extent to which adolescents experience them. For instance, several adolescents commented on the fact that their parents financially support their physical activity/sport participation and purchase most of the food that they consumed. The inter-item correlations and bivariate scatterplots were examined and it was clear that a number of dimensions of cost were represented. However, with the small number of items for each dimension, coupled with the original research questions of the study, the cost value subscale was not used in further analyses. Difficulties in quantifying costs have been reported previously (Cox & Whaley, 2004; Eccles & Wigfield, 2002). One item from the Adolescent Food Habits Checklist ("I often put whipped cream on desserts") was excluded from further analyses, subsequently improving the scale reliability. The personal importance value subscale for smoking behaviour had a lower Cronbach's alpha coefficient. This is a composite score consisting of attainment and utility values and therefore a lower internal consistency was expected.

APPENDIX H

Relationships and Uniquenesses Among Physical Self-Perceptions, Physical Self-Worth, and Global Self-Esteem in Predicting Physical Activity Behaviour

Regression Analyses Predicting Behaviour from Physical Self-Perceptions, Physical Self-Worth, and Global Self-Esteem.

It was hypothesized that the physical self-perceptions would be stronger predictors of physical activity than physical self-worth and global self-esteem. To test this hypothesis, hierarchical multiple regressions were conducted (see Table A.1). For these analyses, only the second item on the Leisure Time Exercise Questionnaire (LTEQ2) was used as the dependent variable. In the first set of regressions, the physical self-perceptions were entered on Step 1, followed by physical self-worth (PSW) on Step 2, in order to examine the independent contribution of PSW beyond the physical self-perceptions on physical activity. PSW did not significantly contribute to the models for the total sample, boys, or girls. The second regression was conducted with physical activity as the dependent variable, and PSW entered on Step 1, followed by the physical self-perception variables entered on the second step. For the total sample, PSW accounted for 5.8% of the variance in physical activity, and the physical self-perceptions accounted for an additional 24.1% of the variance. For boys, PSE accounted for 4.8% of the variance in physical activity, and the physical self-perceptions accounted for an additional 23.1% of the variance. For girls, PSE accounted for 3.9% of the variance in physical activity, and the physical self-perceptions accounted for an additional 21.9% of the variance. In the final models, endurance and strength perceptions were independent predictors of physical activity. Collinearity statistics revealed a potential problem with the inclusion of physical self-worth. One dimension had two variance proportions greater than .50 (body fat and strength) and a condition index approaching 30. The Variance Inflation Factor for PSW was also an indicator of multicollinearity.

Table A.1.

Regression analysis examining Physical Self-Perceptions and Physical Self-Worth as Predictors of Physical Activity.

	Total Sample (N=540)			Male Adolescents (n=211)			Female Adolescents (n=329)		
	β	ΔR^2	R^2	β	ΔR^2	R^2	β	ΔR^2	R^2
Model 1									
Step 1		.30*	.30*		.28*	.28*		.26*	.26*
HEALTH	.01			.03			-.01		
BODY FAT	.04			.04			.010		
APPEARANCE	-.10*			-.13			-.06		
STRENGTH	.17*			.19*			.15*		
ENDURANCE	.44*			.44*			.42*		
Step 2		.00	.30*		.00	.29*		.00	.26*
HEALTH	.02			.05			.01		
BODY FAT	.07			.07			.04		
APPEARANCE	-.08			-.09			-.05		
STRENGTH	.20*			.22*			.17*		
ENDURANCE	.46*			.45*			.42*		
PSW	-.08			-.11			-.06		
Model 2									
Step 1		.05*	.05*		.05*	.05*		.04*	.04*
PSW	.22*			.22*			.20*		

Step 2		.24*	.29*		.24*	.29*		.22*	.26*
PSW	-.11			-.11			-.06		
HEALTH	.02			.05			.01		
BODY FAT	.07			.07			.04		
APPEARANCE	-.08			-.09			-.05		
STRENGTH	.20*			.22*			.17*		
ENDURANCE	.45*			.45*			.42*		

The regression models were repeated with the inclusion of GSE instead of PSW (see Table A.2). For the total sample, global self-esteem did not account for additional variance beyond the self-perceptions. When entered on the first step, GSE accounted for 4.7% of the variance in activity, with the self-perceptions adding 25% unique variance. For boys, global self-esteem did not contribute in the predictive models. For girls, global self-esteem accounted for 4.5% of the variance in physical activity on the first step, and the physical self-perceptions added 21.2% variance on the second step. GSE was not a significant individual predictor of physical activity, and did not account for additional variance when the physical self-perceptions were entered first. The collinearity statistics did not indicate any problems with the inclusion of the self-perceptions and GSE.

Table A.2.

Regression Analysis Examining Physical Self-Perceptions and Global Self-Esteem as Predictors of Physical Activity.

	Total Sample (N=540)			Male Adolescents (n=211)			Female Adolescents (n=329)		
	β	ΔR^2	R^2	β	ΔR^2	R^2	β	ΔR^2	R^2
Model 1									
Step 1		.30*	.30*		.28*	.28*		.26*	.26*
HEALTH	.01			.03			-.01		
BODY FAT	.04			.04			.01		
APPEARANCE	-.10*			-.13*			-.06		
STRENGTH	.17*			.19*			.15*		
ENDURANCE	.44*			.44*			.41*		
Step 2		.00	.30*		.00	.28*		.00	.26*
HEALTH	.01			.04			-.01		
BODY FAT	.04			.04			.01		
APPEARANCE	-.11*			-.12*			-.09		
STRENGTH	.17*			.19*			.14*		
ENDURANCE	.44*			.44*			.42*		
GSE	.03			-.03			.05		
Model 2									
Step 1		.05*	.05*		.04*	.04*		.05*	.05*
GSE	.22*			.20*			.21*		

Step 2		.25*	.30*		.24*	.28*		.21*	.26*
GSE	.03			-.03			.05		
HEALTH	.01			.04			-.01		
BODY FAT	.04			.04			.01		
APPEARANCE	-.11*			-.12*			-.09		
STRENGTH	.17*			.19*			.14*		
ENDURANCE	.44*			.44*			.42*		

As can be seen from the regression analyses presented in Tables A.1 and A.2, the physical self-perceptions are stronger predictors of physical activity behaviour compared to physical self-worth and global self-esteem for boys and girls. It is evident that strength and endurance perceptions are significantly linked to physical activity behaviour. As a result of these findings, the physical self-perceptions were included as main predictors of physical activity competence and values, and in the models examining physical activity behaviour based on the expectancy-value theory.

APPENDIX I

Relationships and Uniquenesses Among Physical Self-Perceptions, Physical Self-Worth, and Global Self-Esteem in Predicting Eating Behaviour

Relationships and uniquenesses among physical self-perceptions, physical self-worth, and global self-esteem in predicting eating behaviour.

Hierarchical multiple regressions were conducted to examine the unique contributions of the physical self-worth (PSW) and global self-esteem (GSE) constructs beyond the physical self-perception contributions on eating behaviour (see Table A.3). For the total sample, the physical self-perceptions accounted for a significant proportion of variance in the AFHC scores (R^2=.10), and PSW did not add to the model. When PSW was entered on the first step, it was not a significant predictor in the model. For boys, the physical self-perceptions accounted for a significant proportion of variance in the AFHC scores (R^2=.13), and PSE did not add to the model. When PSE was entered on the first step, only 2.6% of the variance in eating behaviour was accounted for, with an additional significant contribution (R^2=.11) from the physical self-perceptions. For girls, the physical self-perceptions accounted for a significant proportion of variance in the AFHC scores (R^2=.10), and PSE did not add to the model. When PSE was entered on the first step, it did not account for significant variance in eating behaviour. The physical self-perceptions significantly contributed to the model. Diagnostic indices revealed possible multicollinearity issues when the PSW was entered in the models predicting eating behaviour.

Table A.3.

Regression Analysis Examining Physical Self-Perceptions and Physical Self-Worth as Predictors of Eating Behaviour.

	Total Sample (*N*=540)			Male Adolescents (*n*=211)			Female Adolescents (*n*=329)		
	β	ΔR^2	R^2	β	ΔR^2	R^2	β	ΔR^2	R^2
Model 1									
Step 1		.10*	.10*		.13*	.13*		.10*	.10*
HEALTH	.12*			.15*			.11		
BODY FAT	-.31*			-.19*			-.25*		
APPEARANCE	.09			-.02			.06		
STRENGTH	.01			.11			.01		
ENDURANCE	.20*			.22*			.23*		
Step 2		.00	.11*		.01	.14*		.00	.10*
HEALTH	.11*			.14*			.10		
BODY FAT	-.35*			-.21*			-.27*		
APPEARANCE	.06			-.06			.05		
STRENGTH	-.01			.08			-.01		
ENDURANCE	.20*			.22*			.23*		
PSW	.09			.10			.06		
Model 2									
Step 1		.00	.00		.03*	.03*		.00	.00
PSW	.04			.16*			.04		

Step 2		.10*	.11*		.11*	.14*		.10*	.10*
PSW	.09			.10			.06		
HEALTH	.11*			.14*			.10		
BODY FAT	-.35*			-.21*			-.27*		
APPEARANCE	.06			-.06			.05		
STRENGTH	-.01			.08			-.01		
ENDURANCE	.20*			.22*			.23*		

A second set of analyses was conducted with global self esteem examined for unique effects. With the total sample, GSE significantly added an additional 3.1% of the variance in eating behaviour beyond the contribution of the physical self-perceptions. GSE was then entered on the first step, followed by the physical self-perceptions as predictors of AFHC scores. GSE, body fat perceptions, and endurance were significant predictors in the final model. See Table A.4. For boys, the physical self-perceptions accounted for 13% and GSE significantly added an additional 4.4% of the variance in eating behaviour. GSE was then entered on the first step, followed by the physical self-perceptions as predictors of AFHC scores. GSE, body fat perceptions, and endurance were significant predictors in the final model. For girls, the physical self-perceptions accounted for 9.6% and GSE significantly added an additional 1.7% of the variance in eating behaviour. GSE was then entered on the first step, followed by the physical self-perceptions as predictors of AFHC scores (R^2=.11). GSE, body fat perceptions, and endurance were significant predictors in the final model.

Table A.4.

Regression Analysis Examining Physical Self-Perceptions and Global Self-Esteem as Predictors of Eating Behaviour

	Total Sample (N=540)			Male Adolescents (n=211)			Female Adolescents (n=329)		
	β	ΔR^2	R^2	β	ΔR^2	R^2	β	ΔR^2	R^2
Model 1									
Step 1		.10*	.10*		.13*	.13*		.10*	.10*
HEALTH	.12*			.15*			.11		
BODY FAT	-.31*			-.19*			-.25*		
APPEARANCE	.09			-.02			.06		
STRENGTH	.01			.11			.01		
ENDURANCE	.20*			.22*			.23*		
Step 2		.03*	.13*		.04*	.18*		.02*	.11*
HEALTH	.07			.09			.08		
BODY FAT	-.32*			-.22*			-.25*		
APPEARANCE	-.02			-.11			-.02		
STRENGTH	-.03			.04			-.02		
ENDURANCE	.19*			.22*			.22*		
GSE	.23*			.28*			.17*		
Model 2									
Step 1		.04*	.04*		.08*	.08*		.03*	.03*
GSE	.20*			.29*			.17*		

Step 2		.09*	.13*		.09*	.14*		.08*	.11*
GSE	.23*			.28*			.17*		
HEALTH	.07			.09			.08		
BODY FAT	-.32*			-.22*			-.25*		
APPEARANCE	-.02			-.11			-.02		
STRENGTH	-.03			.04			-.02		
ENDURANCE	.19*			.22*			.22*		

Based on the results presented in Tables A.3 and A.4, the physical self-perceptions are strong predictors of eating behaviour, and global self-esteem also helps to understand eating behaviour even when the self-perceptions are controlled. Despite this observation, the moderate-high correlation between GSE and the other self-perceptions warrants excluding global self-esteem from further analyses. Reviewing the findings, negative body fat perceptions (i.e., perceptions of fatness), positive endurance perceptions, and global self-esteem are significant independent predictors of eating behaviour. These variables appear to account for much more variance in eating behaviour for males compared to female adolescents.

APPENDIX J

Relationships and Uniquenesses Among Physical Self-Perceptions, Physical Self-Worth, and Global Self-Esteem in Predicting Non-Smoking Behaviour

Relationships and uniquenesses among physical self-perceptions, physical self-worth, and global self-esteem in predicting non-smoking behaviour.

Preliminary logistic regression analyses were performed to examine the independent effects of physical self-perceptions on smoking behaviour. These models were conducted separately for the total sample, boys, and girls due to the differences in the relationships among the variables. Only significant self-perceptions were included in the models. For the total sample, endurance self-perceptions, physical self-worth (PSW), and global self-esteem (GSE) were significantly related to NO SMOKE; appearance self-perceptions, PSW, and GSE were significantly related to NO TRIAL. For boys, only endurance perceptions and GSE were significantly related to NO SMOKE, with no other relationships emerging from the data. For girls, endurance self-perceptions, PSW, and GSE were related to NO TRIAL. Body fat and endurance self-perceptions, PSW, and GSE were related to NO SMOKE. The log likelihood difference was examined for significance, along with classification tables and the Nagelkerke R^2 for an indication of variance accounted for in the models and the strength of the prediction.

Sequential logistic regressions were conducted separately to examine the unique effects of GSE (model 1) and PSW (model 2). For the total sample, the regression statistics are presented in Table A.5 for NO TRIAL and Table A.6 for NO SMOKE. As can be seen in the tables, significant decreases in model chi-square were observed when global self-esteem was excluded from the models. Therefore, global self-esteem had an effect even when the effects of the physical self-perceptions were taken into account. Physical self-worth also had a unique effect on NO TRIAL, but the model chi-square difference was not significant for NO SMOKE. The models for NO SMOKE were not strong models, with classification of smokers being not much better than chance. For boys, a sequential logistic regression model was examined for NO SMOKE (see Table A.7). The significant difference in the model chi-square statistic indicated that global self-esteem was contributing uniquely to the prediction of NO SMOKE. For girls, the analyses predicting NO TRIAL indicated that GSE was not uniquely contributing to the model, as indicated by the nonsignificant chi-square difference. However, the full model was significant and accurately classified a greater number of individuals who had tried a cigarette. The partial model was not significant. Both the partial and full models were weak predictive models of trial smoking behaviour (See Table A.8). For NO SMOKE, similar results were observed. GSE did not contribute to the model, and both the full model and partial models were weak predictive models. The classification of individuals was not much better than chance (see Table A.9). Physical self-worth did not significantly account for unique variance in NO TRIAL and NO SMOKE, and the models resulted in dismal classification of individuals. These findings suggest that the physical self-perceptions (primarily endurance, appearance, and/or body fat in respective models) are significant, albeit weak, predictors of NO TRIAL and NO SMOKE. GSE contributed uniquely to the prediction of NO TRIAL and NO SMOKE for the total sample, and to non-smoking behaviour for boys. Physical self-worth contributed uniquely to the model for NO TRIAL for the total sample. Given the limited role that PSW played in the analyses, the construct was not included in the main analyses.

Table A.5.

Sequential Logistic Regression Examining NO TRIAL for Adolescents (N=540) for Model 1 (global self-esteem as independent) and Model 2 (physical self-worth as independent).

	$\chi2^{a}$	df	$\Delta\chi2^{b}$ (df)	*P*	R^{2c}	NO TRIAL Classification (%)	TRIAL Classification (%)	Total Classification (%)
				Model 1				
FM 1[d]	30.67*	2	-	-	.07	31.7	84.2	61.9
PM 1[e]	4.46*	1	26.21 (1)	<.05	.01	4.3	98.7	58.5
				Model 2				
FM 2[f]	20.57*	2	-	-	.05	27.4	84.5	60.2
PM 2[g]	4.46*	1	16.11	<.01	.01	4.3	98.7	58.3

[a] $\chi2$ = model chi-square; * $p < .05$

[b] $\Delta\chi2$ = Chi-square difference between the full model and the partial models

[c] R^2 = Nagelkerke R-square is a measure of effect size

[d] FM 1 = Full model 1 (appearance self-perceptions, global self-esteem)

[e] PM 1 = Partial model 1 (appearance self-perceptions)

[f] FM 2 = Full model 2 (appearance self-perceptions, physical self-worth)

[g] PM 2 = Partial model 2 (appearance self-perceptions)

Table A.6.

Sequential Logistic Regression Examining NO SMOKE for Adolescents (N=540) for Model 1 (Global Self-Esteem as Independent) and Model 2 (Physical Self-Worth as Independent).

	$\chi 2^{a}$	df	$\Delta\chi 2^{b}$	*P*	R^{2c}	NO TRIAL Classification (%)	TRIAL Classification (%)	Total Classification (%)
				Model 1				
FM 1[d]	17.28*	2	-	-	.06	0	99.8	84.4
PM 1[e]	9.16*	1	8.12	<.01	.01	0	100	84.6
				Model 2				
FM 2[f]	11.87*		-	-	.04	0	100	84.6
PM 2[g]	9.16*	1	2.71	n.s.	.03	0	100	84.6

[a] $\chi 2$ = model chi-square; * $p < .05$

[b] $\Delta\chi 2$ = Chi-square difference between the full model and the partial models

[c] R^2 = Nagelkerke R-square is a measure of effect size

[d] FM 1 = Full model 1 (endurance self-perceptions, global self-esteem)

[e] PM 1 = Partial model 1 (endurance self-perceptions)

[f] FM 2 = Full model 2 (endurance self-perceptions, physical self-worth)

[g] PM 2 = Partial model 2 (endurance self-perceptions)

Table A.7.

Sequential Logistic Regression Examining NO SMOKE for Boys (n=211) for Model 1 (Global Self-Esteem as Independent).

	$\chi 2^a$	df	$\Delta\chi 2^b$	P	R^{2c}	NO TRIAL Classification (%)	TRIAL Classification (%)	Total Classification (%)
FM[d]	9.28*	2	-	-	.07	2.9	100	84.4
PM[e]	4.09*	1	5.19	<.05	.03	0	100	83.9

[a] $\chi 2$ = model chi-square; * $p < .05$

[b] $\Delta\chi 2$ = Chi-square difference between the full model and the partial models

[c] R^2 = Nagelkerke R-square is a measure of effect size

[d] FM = Full Model (endurance self-perceptions, global self-esteem)

[e] PM = Partial Model (endurance self-perceptions)

Table A.8

Sequential Logistic Regression Examining NO TRIAL for Girls (n=329) for Model 1 (Global Self-Esteem as Independent) and Model 2 (Physical Self-Worth as Independent).

	$\chi2$[a]	df	$\Delta\chi2$[b] (df)	*P*	R^{2c}	NO TRIAL Classification (%)	TRIAL Classification (%)	Total Classification (%)
						Model 1		
FM 1[d]	6.29*	2	-	-	.03	27.6	86.4	60.5
PM 1[e]	3.39	1	2.90	n.s.	.01	14.5	90.8	57.1
						Model 2		
FM 2[f]	6.23	2	-	-	.03	25.5	82.6	57.4
PM 2[g]	3.39	1	2.84	n.s.	.01	14.5	90.8	57.1

[a] $\chi2$ = model chi-square; * $p < .05$

[b] $\Delta\chi2$ = Chi-square difference between the full model and the partial models

[c] R^2 = Nagelkerke R-square is a measure of effect size

[d] FM 1 = Full model 1 (endurance self-perceptions, global self-esteem)

[e] PM 1 = Partial model 1 (endurance self-perceptions)

[f] FM 2 = Full model 2 (endurance self-perceptions, physical self-worth)

[g] PM 2 = Partial model 2 (endurance self-perceptions)

Table A.9.

Sequential Logistic Regression Examining NO SMOKE for Girls (n=329) for Model 1 (Global Self-Esteem as Independent) and Model 2 (Physical Self-Worth as Independent).

	$\chi2$[a]	df	$\Delta\chi2$[b] (df)	*P*	R^{2c}	NO TRIAL Classification (%)	TRIAL Classification (%)	Total Classification (%)
				Model 1				
FM 1[d]	11.14*	3	-	-	.06	0	100	85.1
PM 1[e]	9.34*	2	1.80	n.s.	.05	0	100	85.1
				Model 2				
FM 2[f]	10.61*	3	-	-	.06	0	100	85.1
PM 2[g]	9.34*	2	1.80	n.s.	.05	0	100	85.1

[a] $\chi2$ = model chi-square; * $p < .05$

[b] $\Delta\chi2$ = Chi-square difference between the full model and the partial models

[c] R^2 = Nagelkerke R-square is a measure of effect size

[d] FM 1 = Full model 1 (body fat and endurance self-perceptions, global self-esteem)

[e] PM 1 = Partial model 1 (body fat and endurance self-perceptions)

[f] FM 2 = Full model 2 (body fat and endurance self-perceptions, physical self-worth)

[g] PM 2 = Partial model 2 (body fat and endurance self-perceptions)

APPENDIX K

Study 2 Behavioural Research Ethics Board Certificate of Approval

APPENDIX L

Study 2 Secondary School District Board Approvals to Conduct Research

SCHOOL DISTRICT NO. 34 (Abbotsford)
2790 Tims Street, Abbotsford, B.C. V2T 4M7

Robin Arden, Ed.D
Superintendent of Schools
604-859-4891 (Fax) 604-556-3435

October 1, 2004

Catherine M. Sabiston
School of Human Kinetics
University of British Columbia

Re: Request to conduct research

Dear Ms. Sabiston:

As requested, I am pleased to grant permission for the collection of data pertaining to your study of adolescents' reports of physical activity, non-smoking, and healthy eating behaviours, as well as their perceptions of their peer and parent/guardian engagement in these behaviours.

You may collect data at Abbotsford schools following the informed consent of voluntary participants. Please provide me with a copy of your study when completed.

Sincerely,

original signed

Robin Arden, Ed. D.
Superintendent

APPENDIX M

Study 2 Initial Contact Letter

School of Human Kinetics

Behavioural Sport Sciences Lab
Rm. 210, War Memorial Gym
6081 University Blvd.
Vancouver, BC V6T 1Z1

November 2004

Dear Principal,

I am writing to request your cooperation and support on a research project. The objective of this second phase of research is to examine the adolescents' reports of physical activity, non-smoking, and healthy eating behaviours, as well as their perceptions of their peer and parent/guardian engagement in these behaviours. The adolescent's competence in and value of these behaviours will be assessed. As part of my doctoral thesis, this research will serve to test an Education-based achievement motivation model as it applies to health behaviour of adolescents, will inform us about the prevalence of health behaviours, and direct possible implications from an education and health intervention focus. Possible gender differences in the choice of behaviour and perceptions of others' will also be examined.

My research is guided by Dr. Peter Crocker's work in the School of Human Kinetics at the University of British Columbia. This research is funded by graduate fellowships provided by the Michael Smith Foundation for Health Research, the Social Sciences and Humanities Research Council of Canada, and the Strategic Training Program in Tobacco Research division of the Canadian Institute for Health Research. This study has been approved by the respective Behavioural Ethics Committees at the University of British Columbia and the School Board.

It is important to understand the links between physical activity, healthy eating, and non-smoking behaviour among adolescents. These behaviours are all critical factors associated with obesity, cardiovascular diseases, strokes, and other physiological disease states. It is thought that adolescents' values, interest, and confidence in these particular health behaviours potentially influence the choice and engagement in these behaviours. Also, the adolescent's perceptions of their parent/guardian and peer competencies and values in physical activity, healthy eating, and non-smoking behaviours are also thought to be significant predictors of the adolescent's own health behaviours.

I am planning to use scientifically supported questionnaires to gather the data for this project. The questionnaires will be distributed by trained graduate student researchers in class, and will require approximately 30-40 minutes to complete. Only individuals who are 15 years and older will be asked to complete the questionnaires (i.e., senior-

APPENDIX N

Study 2 Parent/Guardian Letter of Information & Consent

Consent:
If you understand the purpose and procedures involved in this research study, and believe that your son/daughter can participate in the study, *your signature is not required.* This indicates

- That you have been informed of the objectives and procedures of this research study, as outlined above
- That your son/daughter is free to withdraw from this study at any time with absolutely no penalty. The decision to withdraw will NOT result in any loss of services or any other negative consequences with their school.
- That you have received a copy of this form for your records.

If you DO NOT give your son/daughter permission to participate in this research, please complete this page and ask that they return it to the researcher.

- You consent / Do not consent to your son/daughter's participation in this study (**Please circle one)**

Print Name (participant):____________________

Print Name (parent/guardian):____________________

Signature (parent/guardian):____________________ **Date:** __________

Signature (Co-investigator):____________________ **Date:** __________

***You may return this back page to the researcher and keep the other pages for your records.**

APPENDIX O

Study 2 Participant Consent Form

You consent/ do not consent   to participate in this study **(please circle one)**

Print Name (participant):____________________________

Signature (participant):____________________________ **Date:** ________________

Signature (Co-investigator):____________________ **Date:** ________________

***You may return this back page to the researcher and keep the other pages for your records.**

APPENDIX P

Study 2 Questionnaire

Section A: Physical Activity

GODIN LEISURE-TIME EXERCISE QUESTIONNAIRE

A1. During a typical **7-Day period** (a week), how many times on average do you do the following kinds of exercise for **more than 15 minutes** during your free time (write on each line the appropriate number):

For example: If you go running for 35 minutes 3 times in a week, and play basketball 1 time per week, you would record this activity as "4" under part (a)

	Times Per Week
d) **STRENUOUS EXERCISE (HEART BEATS RAPIDLY)** (e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, rollerbladding, vigorous swimming, vigorous long distance bicycling)	________
e) **MODERATE EXERCISE (NOT EXHAUSTING)** (e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)	________
f) **MILD EXERCISE (MINIMAL EFFORT)** (e.g., yoga, archery, bowling, horseshoes, golf, snow-mobiling, easy walking)	________

A2. During a typical **7-Day period** (a week), in your leisure time, how often do you engage in any regular activity **long enough to work up a sweat** (heart beats rapidly)? Do not include time spent in physical education/gym class. Please check one answer.

- ☐ OFTEN
- ☐ SOMETIMES
- ☐ NEVER/RARELY

What is (are) the most common physical activity(ies) you do? ____________________

____

A3. Are you currently enrolled in physical education at your school? ☐ Yes ☐ No

Physical activity is any activity that increases your heart rate and makes you get out of breath some of the time. Physical activity can be done in sports, playing with friends, or walking to school.

Some examples of **physical activity** are running, brisk walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball, football, & surfing.

Add up all the time you spend in physical activity each day (don't include physical education/gym class).

P1. **Over the <u>past 7 days</u>, on how many days were you physically active for a total of at least <u>60 minutes</u> per day?**

O	O	O	O	O	O	O	O
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**

P2. **Over a <u>typical or usual week</u>, on how many days are you physically active for a total of at least <u>60 minutes</u> per day?**

O	O	O	O	O	O	O	O
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**

COMPETENCE IN REGULAR PHYSICAL ACTIVITY

Please indicate how often each statement is true for you, assuming that you were intending either to begin a permanent regimen of exercising regularly or to permanently maintain your regular exercise regimen. Use the following scale, and the circle the number that corresponds to your answer:

Never 1 2 3 4 5 6 7 Always

A4. I feel confident in my ability to exercise regularly.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
A5. I have the skills necessary to exercise regularly.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
A6. I feel capable of exercising regularly.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
A7. I am good at exercising regularly	**1**	**2**	**3**	**4**	**5**	**6**	**7**
A8. I am able to exercise regularly.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
A9. I am able to learn new skills necessary to exercise regularly	**1**	**2**	**3**	**4**	**5**	**6**	**7**
A10. I am able to meet the challenge of exercising regularly.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

VALUE OF PHYSICAL ACTIVITY

Please read the following statements about physical activity and complete the sentences, using the scales below each sentence. Pay attention to the wording of the scales. Circle the NUMBER that corresponds to your answer. If you need to change your answer, please put an "X" over the circle and choose another answer.

A11. In general, do you find participating in physical activity:

Very Boring	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very Interesting [fun]**

A12. How much do you like participating in physical activity?

Not at all	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very much**

A13. For you, how important is being able to participate in physical activity?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

A14. Compared to any other health behaviour, how important is being able to participate in physical activity?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

A15. In general, how useful is physical activity to you?

Not at all useful	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very useful**

A16. How valuable is participating in physical activity to you?

Not at all valuable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very valuable**

A17.
a. Participating in regular physical activity takes up how much of your own time?

No time	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**A lot of time**

b. Participating in regular physical activity requires how much of your own money?

None of my own money	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**A lot of my own money**

c. How much effort does it take for you to participate in regular physical activity?

No effort at all	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**A lot of effort**

d. How difficult is it for you to participate in regular physical activity?

Not at all difficult	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very difficult**

e. How many of your friends participate in regular physical activity?

None of my friends	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of my friends**

f. How many of your family members participate in regular physical activity?

None of my family members	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of my family members**

SIGNIFICANT OTHERS' PHYSICAL ACTIVITY BEHAVIOUR

The following questions ask you to think about your friend and parent/guardian's physical activity behaviour. Your parent/guardian(s) is/are the people you live with and spend the most time with. Please respond to the questions about your friend thinking about your *best friend* only. This is the person you spend the most time with. Circle the NUMBER that corresponds to your answer.

BEST FRIEND

A18. How often does your *best friend* encourage you to participate in regular physical activity?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

A19. How important is it to your *best friend* that you participate in regular physical activity?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

A20. How often does your *best friend* support you in participating in regular physical activity?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

A21. How often does your *best friend* participate in regular physical activity?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

A22. How upset do you think your *best friend* would be if you did not participate in regular physical activity?

Not at all upset	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very upset**

A23. To your *best friend*, how important is participating in regular physical activity?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

A24. To your *best friend*, how useful is participating in regular physical activity?

Not at all useful	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very useful**

A25. How much does your *best friend* like participating in physical activity?

Not at all	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very much**

PARENT(S)/GUARDIAN(S)

A26. How often do your *parent(s)/guardian(s)* encourage you to participate in regular physical activity?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

A27. How important is it to your *parent(s)/guardian(s)* that you participate in regular physical activity?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

A28. How often does/do your *parent(s)/guardian(s)* support you in participating in regular physical activity?

Never	1	2	3	4	5	6	7	**All of the time**

A29. How often does/do your *parent(s)/guardian(s)* participate in regular physical activity?

Never	1	2	3	4	5	6	7	**All of the time**

A30. How upset do you think your *parent(s)/guardian(s)* would be if you did not participate in regular physical activity?

Not at all upset	1	2	3	4	5	6	7	**Very upset**

A31. To your *parent(s)/guardian(s)*, how important is participating in regular physical activity?

Not at all important	1	2	3	4	5	6	7	**Very important**

A32. To your *parent(s)/guardian(s)*, how useful is participating in regular physical activity?

Not at all useful	1	2	3	4	5	6	7	**Very useful**

A33. How much do your *parent(s)/guardian(s)* like participating in physical activity?

Not at all	1	2	3	4	5	6	7	**Very much**

COMPARISON

A34. In general, how would you compare the importance of regular physical activity for boys and girls?

Girls find regular physical activity more important	1	2	3	4	5	**Boys find regular physical activity more important**

A35. In general, how would you compare the ability of regular physical activity for boys and girls?

Girls are much better at participating in regular physical activity	1	2	3	4	5	**Boys are much better at participating in regular physical activity**

Section B: Smoking Behaviour (Tobacoo Cigarettes)

STUDENT SMOKING PROFILE

These questions are about the smoking experiences and attitudes of students like yourself. Read each question carefully and answer as honestly as you can. Please put a check "√" or an "X" in the box beside the answer that describes you.

B1. Have you ever smoked a cigarette, even just a few puffs? ☐ Yes ☐ No	B2. Have you ever smoked a whole cigarette? ☐ Yes ☐ No ☐ I have never smoked
B3. About how many cigarettes have you smoked in your entire life? ☐ None ☐ A few puffs ☐ 1-5 cigarettes ☐ 6-15 cigarettes ☐ 16-25 cigarettes ☐ 26-99 cigarettes ☐ 100 or more cigarettes	B4. Think about the last 30 days. Did you smoke a cigarette, even just a few puffs? ☐ Every day ☐ Almost every day ☐ Some days ☐ 1 or 2 days ☐ Not at all
B5. Are you a smoker? ☐ Yes ☐ No	B6. Do you think that you will smoke cigarettes in the next 12 months? ☐ I definitely will not smoke cigarettes ☐ I probably will not smoke cigarettes ☐ I might or might not smoke cigarettes ☐ I probably will smoke cigarettes ☐ I definitely will smoke cigarettes

CONFIDENCE IN NOT SMOKING

Please indicate how often each statement is true for you, assuming that you were intending either to permanently quit smoking cigarettes now or to remain permanently abstinent from smoking cigarettes. Use the following scale, circle the NUMBER that best corresponds to your answer:

Never **1 2 3 4 5 6 7** **Always**

B7. I feel confident in my ability to not smoke.	**1 2 3 4 5 6 7**
B8. I am confident that I will not smoke a cigarette when I am at a party or social gathering.	**1 2 3 4 5 6 7**
B9. I feel capable of not smoking.	**1 2 3 4 5 6 7**
B10. I am capable of smoking cigarettes.	**1 2 3 4 5 6 7**
B11. I am able to not smoke cigarettes.	**1 2 3 4 5 6 7**
B12. I am confident in my ability to pass up a cigarette if it is offered to me	**1 2 3 4 5 6 7**
B13. I am able to meet the challenge of not smoking.	**1 2 3 4 5 6 7**

VALUES OF SMOKING/NON-SMOKING

Please read the following sentences about smoking/non-smoking and complete the sentences with your answer, using the scales below each sentence. Pay attention to the wording of the scales. Circle the NUMBER that corresponds to your answer.

B14. In general, do you think that smoking cigarettes would be (or is):

Very Boring **1 2 3 4 5 6 7** **Very Interesting [fun]**

B15. How much would you (or do you) like smoking cigarettes?

Not at all **1 2 3 4 5 6 7** **Very much**

B16. For you, how important is _not_ smoking cigarettes?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

B17. Compared to any other health behaviour, how important is being able to _not_ smoke cigarettes?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

B18. In general, how useful is _not_ smoking cigarettes to you?

Not at all useful	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very useful**

B19. How valuable is _not_ smoking cigarettes to you?

Not at all valuable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very valuable**

B20.
a. Smoking cigarettes would take up (or does take up) how much of your own time?

No time	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**A lot of time**

b. Smoking cigarettes would require (or does require) how much of your own money?

None of my own money	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**A lot of my own money**

c. How much effort does it take for you to _not_ smoke cigarettes?

No effort at all	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**A lot of effort**

d. How difficult is it for you to _not_ smoke cigarettes?

Not at all difficult	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very difficult**

e. How many of your friends smoke cigarettes?

None of my friends	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of my friends**

f. How many of your family members smoke cigarettes?

None of my family members	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of my family members**

SIGNIFICANT OTHERS' SMOKING/NON-SMOKING BEHAVIOUR

The following questions ask you to think about your friend and parent/guardian's smoking/non-smoking behaviour. Your parent/guardian(s) is/are the people you live with and spend the most time with. Please respond to the questions about your friend thinking about your best friend only. This is the person you spend the most time with.

BEST FRIEND

B21. How often does your *best friend* influence you to smoke cigarettes?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

B22. How important is it to your *best friend* that you do <u>not</u> smoke cigarettes?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

B23. How often does your *best friend* support you in <u>not</u> smoking cigarettes?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

B24. How often does your *best friend* smoke cigarettes?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

B25. How upset do you think your *best friend* would be (or is) if you started/continued smoking cigarettes?

Not at all upset	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very upset**

B26. To your *best friend*, how important is not smoking cigarettes?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

B27. To your *best friend*, how useful is not smoking cigarettes?

Not at all useful	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very useful**

B28. How much does your *best friend* like smoking cigarettes?

Not at all	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very much**

PARENT(S)/GUARDIAN(S)

B29. How often does/do your *parent(s)/guardian(s)* influence you to smoke cigarettes?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

B30. How important is it to your *parent(s)/guardian(s)* that you not smoke cigarettes?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

B31. How often does/do your *parent(s)/guardian(s)* support you in not smoking cigarettes?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

B32. How often does/do your *parent(s)/guardian(s)* smoke cigarettes?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

B33. How upset do you think your *parent(s)/guardian(s)* would be (or are) if you started/continued smoking
cigarettes?

Not at all upset	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very upset**

B34. To your *parent(s)/guardian(s)*, how important is <u>not</u> smoking cigarettes?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

B35. To your *parent(s)/guardian(s)*, how useful is <u>not</u> smoking cigarettes?

Not at all useful	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very useful**

B36. How much does/do your *parent(s)/guardian(s)* like smoking cigarettes?

Not at all	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very much**

COMPARISON

B37. In general, how would you compare the importance of <u>not</u> smoking cigarettes for boys and girls?

Girls find not smoking more important	**1**	**2**	**3**	**4**	**5**	**Boys find not smoking more important**

B38. In general, how would you compare the ability of <u>not</u> smoking cigarettes for boys and girls?

Girls are much better at not smoking	**1**	**2**	**3**	**4**	**5**	**Boys are much better at not smoking**

Section C: Eating Behaviour

ADOLESCENT FOOD HABITS CHECKLIST

Please mark the box that best describes your eating habits

1) If I am having lunch away from home/school, I choose a low-fat option. ☐ Always ☐ Sometimes ☐ Rarely ☐ Never ☐ I never have lunch away from home/school	**2) I avoid eating fried foods.** ☐ Always ☐ Sometimes ☐ Rarely ☐ Never
3) I eat a dessert if there is one available. ☐ Always ☐ Sometimes ☐ Rarely ☐ Never	**4) I make sure I eat at least one serving of fruit a day.** ☐ Always ☐ Sometimes ☐ Rarely ☐ Never
5) I try to keep my overall fat intake down. ☐ Always ☐ Sometimes ☐ Rarely ☐ Never	**6) If I am buying potato chips, I choose a low-fat brand.** ☐ Always ☐ Sometimes ☐ Rarely ☐ Never ☐ I never buy potato chips
7) I avoid eating fatty meats (sausages & burgers) ☐ Always ☐ Sometimes ☐ Rarely ☐ Never	**8) I buy pastries or cakes (junk food)** ☐ Always ☐ Sometimes ☐ Rarely ☐ Never

9) I try to keep my overall sugar intake down. ☐ Always ☐ Sometimes ☐ Rarely ☐ Never	**10) I make sure I eat at least one serving of vegetables or salad a day.** ☐ Always ☐ Sometimes ☐ Rarely ☐ Never
11) If I am having a dessert, I try to have something low in fat. ☐ Always ☐ Sometimes ☐ Rarely ☐ Never ☐ I don't eat desserts	**12) I eat take-out/fast food meals:** ☐ Always ☐ Sometimes ☐ Rarely ☐ Never
13) I try to ensure that I eat plenty of fruit and vegetables. ☐ Always ☐ Sometimes ☐ Rarely ☐ Never	**14) I eat sweet snacks between meals.** ☐ Always ☐ Sometimes ☐ Rarely ☐ Never
15) I eat at least one serving of vegetables (excluding potatoes) or salad with my evening meal. ☐ Always ☐ Sometimes ☐ Rarely ☐ Never	**16) When I am buying a soft drink, I choose a diet drink.** ☐ Always ☐ Sometimes ☐ Rarely ☐ Never ☐ I don't buy soft drinks
17)) If I have a packed lunch, I include some chocolate and/or cookies. ☐ Always ☐ Sometimes ☐ Rarely ☐ Never ☐ I never have a packed lunch	**18 When I have a snack between meals, I choose fruit.** ☐ Always ☐ Sometimes ☐ Rarely ☐ Never ☐ I never eat snacks between meals

19) I eat at least 3 servings of fruit most days ☐ Always ☐ Sometimes ☐ Rarely ☐ Never	**20) I try to have a healthy diet.** ☐ Always ☐ Sometimes ☐ Rarely ☐ Never

The next sections ask you to think about following/maintaining a healthy diet. This means following a diet that has a large variety of foods, and foods that are considered lower in sugar and fat.

COMPETENCE IN MAINTAINING A HEALTHY DIET

Please indicate how often each statement is true for you, assuming that you were intending either to permanently improve your diet now or to maintain a healthy diet. Use the following scale:

Never 1 2 3 4 5 6 7 Always

C24. I feel confident in my ability to maintain a healthy diet.	**1 2 3 4 5 6 7**
C25. I have the knowledge necessary to follow a healthy diet	**1 2 3 4 5 6 7**
C26. I feel capable of maintaining a healthy diet.	**1 2 3 4 5 6 7**
C27. I am good at choosing and consuming healthy food choices.	**1 2 3 4 5 6 7**
C28. I am able to maintain a healthy diet.	**1 2 3 4 5 6 7**
C29. I am able to pass up junk food if it is offered to me.	**1 2 3 4 5 6 7**
C30. I am able to meet the challenge of maintaining a healthy diet.	**1 2 3 4 5 6 7**

VALUE OF MAINTAINING A HEALTHY DIET

Please read the following sentences about maintaining a healthy diet and complete the sentences with your answer, using the scales below each sentence. Pay attention to the wording of the scales. If you need to change your answer, please put an "X" over the circle and choose another answer by circling a new number.

C31. In general, do you find eating a healthy diet:

Very Boring	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very Interesting [fun]**

C32. How much do you like eating a healthy diet?

Not at all	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very much**

C33. For you, how important is eating a healthy diet?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

C34. Compared to any other health behaviour, how important is being able to follow a healthy diet?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

C35. In general, how useful is eating a healthy diet to you?

Not at all useful	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very useful**

C36. How valuable is following a healthy diet to you?

Not at all valuable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very valuable**

C37
a. Choosing and preparing healthy foods takes how much of your own time?

No time	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**A lot of time**

b. Following a healthy diet requires how much of your own money?

None of my own money	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**A lot of my own money**

c. How much effort does it take for you to follow a healthy diet?

No effort at all	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**A lot of effort**

d. How difficult is it for you to maintain a healthy diet?

Not at all difficult	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very difficult**

e. How many of your friends follow a healthy diet?

None of my friends	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of my friends**

f. How many of your family members follow a healthy diet?

None of my family members	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of my family members**

SIGNIFICANT OTHERS' HEALTHY EATING

The following questions ask you to think about your friend and parent/guardian's eating behaviour. Your parent/guardian(s) is/are the people you live with and spend the most time with. Please respond to the questions about your friend thinking about your best friend only. This is the person you spend the most time with.

BEST FRIEND

C38. How often does your *best friend* encourage you to follow a healthy diet?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

C39. How important is it to your *best friend* that you follow a healthy diet?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

C40. How often does your *best friend* support you in following a healthy diet?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

C41. How often does your *best friend* follow a healthy diet?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

C42. How upset do you think your *best friend* would be if you did not follow a healthy diet?

Not at all upset	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very upset**

C43. To your *best friend*, how important is following a healthy diet?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

C44. To your *best friend*, how useful is following a healthy diet?

Not at all useful	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very useful**

C45. How much does your *best friend* like eating a healthy diet?

Not at all	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very much**

PARENT(S)/GUARDIAN(S)

C46. How often does/do your *parent(s)/guardian(s)* encourage you to follow a healthy diet?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

C47. How important is it to your *parent(s)/guardian(s)* that you follow a healthy diet?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

C48. How often does/do your *parent(s)/guardian(s)* support you in following a healthy diet?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

C49. How often does/do your *parent(s)/guardian(s)* follow a healthy diet?

Never	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**All of the time**

C50. How upset do you think your *parent(s)/guardian(s)* would be if you did not follow a healthy diet?

Not at all upset	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very upset**

C51. To your *parent(s)/guardian(s)*, how important is following a healthy diet?

Not at all important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very important**

C52. To your *parent(s)/guardian(s)*, how useful is following a healthy diet?

Not at all useful	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very useful**

C53. How much does/do your *parent(s)/guardian(s)* like eating a healthy diet?

Not at all	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very much**

COMPARISON

C54. In general, how would you compare the importance of being able to follow a healthy diet for boys
and girls?

Girls find maintaining a healthy diet more important	**1**	**2**	**3**	**4**	**5**	**Boys find maintaining a healthy diet more important**

C55. In general, how would you compare the ability of being able to follow a healthy diet for boys and girls?

Girls are much better at maintaining a healthy diet	**1**	**2**	**3**	**4**	**5**	**Boys are much better at maintaining a healthy diet**

Section D: Your Background

D1. What is your gender (check one)? ☐ Male ☐ Female

D1b. How old are you? _________years

D2. What is your current height in feet and inches? _________

D3. What is your current weight in pounds? __________

D4. What is your ideal weight in pounds? __________

D5. Based on these categories from the Canadian Census, how do you describe yourself? PLEASE CHECK **ALL** THAT APPLY:

- ☐ White/Caucasian
- ☐ Chinese
- ☐ Japanese
- ☐ Korean
- ☐ Aboriginal/First Nation (e.g., North American Indian, Metis, Inuit)
- ☐ Filipino
- ☐ South Asian (e.g., East Indian, Pakistani, Punjabi, Sri Lankan)
- ☐ South East Asian (e.g., Cambodian, Indonesian, Vietnamese)
- ☐ Black (e.g., African, Haitian, Jamaican, Somali)
- ☐ West Asian/Middle East (e.g., Afgani, Arab, Iranian)
- ☐ Other ethnic/cultural group, please specify: ________________________________

D6. What is your postal code? ________________

D7. What is your mother/female guardian's job?______________________________

D8a. Do you live with your mother/female guardian? ☐ Yes ☐ No

D9. What is your father/male guardian's job?__________________________________

D9a. Do you live with your father/male guardian? ☐ Yes ☐ No

Any comments you wish to add about anything on this survey?

THANK YOU FOR YOUR PARTICIPATION

APPENDIX Q

Alternate Non-Smoking Behaviour Analyses for NEVER SMOKER

Preliminary analyses

For NEVER SMOKER, best friend variables accurately classified close to 99% of the non-smokers, 6% of boys who smoked and 41% of girls who smoked. Nagelkerke R^2 values were .23 for boys and .50 for girls. Parent variables accurately classified close to 100% non-smokers and 16% girl smokers, and the Nagelkerke R^2 values were .08 for boys and .24 for girls.

In additional models, competence and interest, personal importance, and cost values were significant predictors for boys, with competence and interest value significant predictors for girls. The model chi-square values were significant, 59% boys and 61.4% girls who were smokers (i.e., had tried a whole cigarette and had smoked in the last 30 days) and 98% of individuals who were non-smokers were correctly classified, with Nagelkerke R^2 values of .63 for boys and .66 for girls.

Main analyses

Sequential logistic regression analyses were conducted for NEVER SMOKER, with the independents (significant other influence) and covariates (competence and values) entered in the first model, and the independents dropped for the second model. For boys (see Table A.10), number of peers who are non-smokers, and interest and personal importance values were significant predictors in the first model. When significant other influences were removed from the second model, the chi-square difference was not significant ($\Delta\chi^2(4)=8.28$, $p>.05$), and the model prediction was not reduced. Therefore, the effects of best friend role-modeled behaviour, number of peers who don't smoke, and parent emotional support is mediated by the expectancy-value constructs. In the final model (model 2), interest, personal importance, and cost values were significant predictors (odds ratios (OR)=1.12-1.7; where the OR for cost value was transformed into a positive relationship by taking the exponential log function (e^x), where $x=\beta$). These results suggest that, for boys, higher interest, personal importance, and lower costs associated with non-smoking behaviour are predictors of NEVER SMOKER. For girls, the difference in the models was significant ($\Delta\chi^2(4)=33.91$, $p<.01$), and the model prediction was reduced (see Table A.11). This implies that the influence of significant others is not mediated completely by competence and values. In particular, best friend role-modeled behaviour and number of non-smoking peers have direct effects on NEVER SMOKER when competence and interest value are controlled. The OR's of 1.1 to 1.5 suggest low effect sizes in the prediction of individual who have not smoked a whole cigarette and not smoked (even a few puffs) in the last 30 days.

Table A.10.

*Logistic Regression Predicting NEVER SMOKER for boys, * p < .05*

	Model 1			Model 2		
Variable	*ß* (S.E.)	Wald Statistic	Odds Ratio (95% C.I.)	*ß*	Wald Statistic	Odds Ratio (95% C.I.)
Number peers	.28 (.15)	3.66*	1.32 (1.01-1.77)	-	-	-
Parent ES	-.07 (.07)	.89	.94 (.81-1.08)	-	-	-
Competence	.08 (.05)	2.09	1.08 (.97-1.19)	.06 (.05)	1.54	1.06 (.97-1.17)
Interest Value	.55 (.09)	36.54*	1.72 (1.45-2.06)	.50 (.08)	37.34*	1.65 (1.40-1.94)
Personal Importance Value	.14 (.05)	6.46*	1.14 (1.03-1.27)	.12 (.04)	7.19*	1.12 (1.03-1.22)
Cost Value	-.09 (.05)	3.03	.92 (.83-1.01)	-.11 (.05)	5.66*	.90 (.82-.98)
Model χ^2[df]		129.80[7]*			121.52[3]	
Classification						
No Trial		98.4%			98.4%	
Trial		55.9%			50.0%	
Total		95.0%			94.5%	
Nagelkerke R^2		.62			.59	

Table A.11.

*Logistic Regression Predicting NEVER SMOKER for girls, * p < .05*

	Model 1			Model 2		
Variable	ß (S.E.)	Wald Statistic	Odds Ratio (95% C.I.)	ß	Wald Statistic	Odds Ratio (95% C.I.)
Best Friend RMB	.13 (.05)	7.52*	1.14 (1.04-1.25)	-	-	-
Number peers	.36 (.18)	3.89*	1.43 (1.02-2.05)	-	-	-
Parent ES	.03 (.06)	.21	1.03 (.90-1.16)	-	-	-
Number Family	.27 (.16)	2.82	1.30 (.96-1.77)	-	-	-
Competence	.08 (.05)	3.41*	1.09 (1.00-1.19)	.16 (.04)	20.07*	1.18 (1.10-1.26)
Interest Value	.41 (.09)	21.33*	1.50 (1.26-1.78)	.43 (.07)	36.59*	1.54 (1.33-1.76)
Model χ^2[df]		185.08[6]*			151.17[2]*	
Classification						
No Trial		98.0%			97.5%	
Trial		70.5%			54.5%	
Total		95.2%			93.2%	
Nagelkerke R^2		.73			.61	