Examining an Integrative Model of Physical Activity and Healthy Eating Self-Perceptions and Behaviors Among Adolescents

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Abstract

Purpose: This study tested a comprehensive model of physical activity and healthy eating behavior.

Methods: A sample of older adolescents (boys n = 206, girls n = 326) volunteered to complete a scientifically supported questionnaire assessing physical activity and healthy eating perceptions of competence, values, and behaviors once during class time.

Results: Confirmatory factor analysis suggested the data fit the model well. Tests of group differences supported factorial invariance, and revealed higher physical activity perceptions of competence, value, and behavior as well as lower healthy diet value and behavior for adolescent boys compared with girls. Perceptions of competence for healthy diet were also higher among boys. Path modeling demonstrated a good model fit, whereby behavior-specific perceptions of competence and values were significant correlates of physical activity for the total sample and subsamples of boys and girls ($R^2 = .41–.53$). Perceptions of competence and values were also significant correlates of healthy diet for the total sample ($R^2 = .34$) and boys ($R^2 = .42$). Subjective values were significant correlates of healthy diet for girls ($R^2 = .30$). Structural invariance suggested that the models were not significantly different for adolescent boys and girls.

Conclusions: These results demonstrate the saliency of the comprehensive model in understanding physical activity and healthy eating behaviors among older adolescents. Further tests of the model are needed to advance theory exploring both physical activity and healthy eating behaviors, and to inform intervention strategies targeting adolescent health. © 2008 Society for Adolescent Medicine.

Keywords: Youth; Health; Expectancy-value model; Competence; Subjective value

Physical inactivity and unhealthy dietary behaviors are significant predictors of illness and disability in North America, and represent strong threats to public health across the lifespan [1]. Adolescence is a critical period for the adoption of health behavior because it establishes activity- and diet-related lifestyle habits and attitudes that may track into adulthood. In spite of some difficulty identifying and understanding the primary factors contributing to physical activity and eating behaviors throughout adolescence [2,3], the determinants and mechanisms associated with engagement in these behaviors are possibly related. According to Baranowski [2], the behavioral science components of physical activity and eating are similar, and advances in measurement, understanding of correlates, and the development of interventions need to be supported using complementary and interactive theoretically driven methods.

Various participation motivation frameworks have been used with youth samples to better understand factors that influence engagement in physical activity and eating behaviors. Many theories and conceptual approaches emphasize domain-specific competence beliefs, as well as enjoyment and interest, as key determinants of adolescent physical activity [4,5] and eating [6–8] behaviors. Given that self-perceptions of competence and values are integral correlates...
of health-promoting behaviors, a comprehensive look at
these factors within a nomological network would be of
substantive and pragmatic interest. The expectancy-value
(EV) model provides a template on which integral self-
perceptions can be linked to health behaviors.

The EV model suggests that behavior-specific percep-
tions of competence and values are integral to motivation
and behavior and are influenced by a number of cognitive,
affective, social, cultural, and perceptual factors [9]. The
theory is unique in that it considers four related but distinct
factors of subjective value: interest value (enjoyment an
individual gains from engaging in a behavior), attainment
value (importance of doing well and engaging in a behav-
ior), utility value (usefulness of a task or behavior to one’s
sense of self and future goals), and relative costs (negative
components of engaging in a behavior, including financial,
time, opportunity, and effort costs). To date, relative costs
have been difficult model within the EV framework, and
researchers have suggested focusing on the other subjective
values [9,10]. There is limited research using the EV model
to explore adolescent health behaviors. However, the devel-
opmental and achievement underpinnings suggest that this
motivation-based perspective may offer new insight into the
exploration of a comprehensive health behavior model. Be-
fore testing multiple complex tenets of the EV model, it is
important to determine whether the integral relationships
linking perceptions of competence and values to physical
activity and healthy eating behaviors hold. Once the central
components have been supported, the more distal relation-
ships proposed in the model can be tested.

It is also important to explore gender differences in the
motivation for and engagement in health-related behaviors
and related determinants. Consistently, adolescent boys are
more likely to engage in physical activity and report greater
perceptions of competence, interest, and enjoyment com-
pared with girls [4]. Boys also report less healthy eating
choices, less fruit and vegetable consumption, and overall
more negative attitudes to eat healthy compared with girls
[6,8]. Although an understanding of mean-level gender dif-
f erences is important, it is also critical to determine whether
relationships among constructs are comparable across gen-
der. Based on the EV perspective, gender differences are not
expected to translate into differences in relationships among
the variables.

Direct tests of the EV model relationships would enable
advancement of theory exploring both physical activity and
healthy eating behaviors, and ultimately foster empirically
based judgments about the use of the model to guide inter-
vention strategies for adolescent health. Therefore, the pur-
pose of this study was to test a comprehensive EV model of
physical activity and healthy eating behavior with a sample
of older adolescents. The primary objectives included: (1)
examining perceptions of competence and values as corre-
lates of adolescent’s leisure-time physical activity and
healthy eating behavior; (2) testing the factorial invariance
of the model for adolescent boys and girls; (3) exploring
mean-level gender differences in reports of perceptions of
competence, values, and physical activity and eating behav-
ior; and (4) testing gender differences in the pattern of
relationships among the main EV model constructs. Once
these objectives were met, body mass index was explored as
an independent direct influence of physical activity and
healthy eating. It was hypothesized that perceptions of com-
petence and subjective values would be strong predictors of
adolescent health behavior. Also, the constructs and pattern
of relationships in the comprehensive model of physical
activity and eating behavior would be similar for boys and
girls; however, boys would report higher perceptions of
physical activity competence, values, and behavior, whereas
girls would report higher perceptions of healthy eating com-
petence beliefs, values, and behavior. Finally, it was hy-
pothesized that BMI would have little impact on physical
activity yet would significantly influence healthy eating.

Methods

Participants and procedures

Behavioral research ethics board approvals from the uni-
versity and secondary school districts were obtained. The
data were collected in Vancouver, British Columbia, Can-
ada. Approval from six (among 18 contacted) school prin-
cipals and teachers was granted and preceded in-class pre-
sentations introducing the study. Following the study
introduction to all classes in Grades 10–12, information
packages for parents and students were distributed. A min-
imum of 7 days later, secondary school students 15–18
years of age who provided parental consent and participant
assent (211 boys and 329 girls) participated by completing
a questionnaire once during class time.

Measures

Participant characteristics. For descriptive purposes, physi-
cal characteristics were assessed with questions on height
(in meters) and weight (in kilograms) that were used to
calculate body mass index (BMI; kg/m²). BMI was used as
a manifest variable in the final statistical models. Adoles-
cents were also asked to identify their age and ethnicity for
descriptive purposes.

Perceptions of competence. The Perceived Competence
Scales for Participating in Regular Physical Activity (PCSPA)
and for Healthy Eating (PCSHE) were used to assess global
perceptions of competence [11]. The physical activity mea-
sure was modified where “exercising regularly” was substi-
tuted with “participating in regular physical activity.” Also,
the response anchors for both measures were modified to
reflect how often participants felt confident in their abilities
to participate in regular physical activity/eat a healthy diet
rather than how true the statement was to them. (These
Subjective values. Interest, attainment, and utility values were assessed using the Self- and Task-Perception Questionnaire [12,13]. The six items were modified to represent physical activity and healthy eating behaviors rather than the academic-based items on the original scale. Examples of subjective value items include the following: interest: In general, I find [participating in physical activity/maintaining a healthy diet] (1 = very important; 7 = not at all valuable); attainment: For me, being able to [participate in regular physical activity/maintain a healthy diet] is (1 = very valuable; 7 = very important); and utility: I find [participating in physical activity/maintaining a healthy diet] (1 = very valuable; 7 = very important). Although conceptual distinctions among values can be made, it has been suggested that a good fit to the overall EV model is to construct a latent variable that is analogous to a global value construct [14]. For this study, interest, attainment, and utility values were identified as indicators of a subjective value latent factor.

Physical activity behavior. The Leisure-Time Exercise Questionnaire [15] is a reliable and valid measure of adolescent physical activity [16]. The first item on the scale (LTEQ1) assessed the quantity of weekly strenuous, moderate, and light activity that occurred outside of regular physical education classes. A total score was calculated by multiplying the weekly frequencies of strenuous, moderate, and light activities by 9, 5, and 3, respectively, for a total metabolic equivalent (MET) intensity value. The second item on the scale (LTEQ2) asked for the frequency of regular activity (1 = often; 3 = never/rarely) in a typical 7-day period that results in a rapid heartbeat and sweating.

Healthy eating behavior. Adolescents’ eating behavior was assessed using the Adolescent Food Habits Checklist [17]. The AFHC instrument was designed specifically for adolescents and focuses on areas of the diet that have been consistently linked to chronic illness (i.e., fat and fiber, simple sugars, and fruit and vegetable intake). 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 behaviors were given a value of 1 and the final score was adjusted for the “not applicable” and missing responses using the formula: AFHC = number of healthy responses × (23/number of items completed). For this study, item parcels composed of randomly selected items were created to account for the dichotomous items, and deemed appropriate since the underlying factor structure is unidimensional [18]. Item parceling is advantageous over using the original items because estimating large numbers of items usually results in spurious correlations and solutions from item-level data are less likely to yield stable solutions than solutions from parcels of items [19]. Preliminary analyses revealed moderate-high correlations among the item parcels ($r = .55–.65$), and skewness and kurtosis values less than $±1.0$. The parcels were used as indicators of an eating behavior latent variable.

Data analyses

Structural equation modeling (LISREL 8.5) using maximum likelihood estimation was performed to examine the hypothesis that behavior-specific competence and value perceptions were strong correlates of physical activity and healthy eating. Analyses included confirmatory analyses of the measurement models, sequential covariance analyses to test invariance of the factor structures and latent means for adolescent boys and girls, and structural modeling of the hypothesized relationships among perceptions of competence, value, and physical activity/eating behavior factors. Structural invariance was also tested to determine if the path coefficients were similar across gender. Once the theoretically driven models were tested, BMI was included in the model to explore the direct effects on physical activity and healthy eating. In the EV model, personal characteristics are proposed to have primarily indirect effects on behavior; however BMI influences on health behaviors may have practical implications that should not be overlooked.

Model goodness of fit was assessed by the root-mean-square error of approximation (RMSEA), comparative fit index (CFI), and nonnormed fit index (NNFI) [20,21]. Also, differences in $\chi^2$ based on change in degrees of freedom were used to assess whether nested models were better-fitting models compared with baseline models for all invariance testing.

Results

Data screening and preliminary analyses

In the initial data screening, five males and three females were missing substantial data and were removed from further analyses. Cronbach’s $\alpha$ coefficients for internal consistencies indicated acceptable reliability ($\alpha = .82–.94$) on all scales. The final sample (206 boys and 326 girls) had a mean age of 16.17 years, and identified themselves as: Caucasian (45%), Asian (34%), South Asian (5.7%), South East Asian (3.7%), Hispanic (2.0%), Aboriginal (1.7%), West Asian/Middle East (1.3%), black (0.4%), and other/mixed (1.9%). Based on established standards for height-to-weight ratios [22], 15.4% ($n = 82$) adolescents were
classified as underweight, 72.4% (n = 386) females and males were healthy weight, 9.8% (n = 52) were overweight, and 2.4% (n = 13) adolescents were classified as obese. Means and standard deviations for the main study variables are presented in Table 1, along with Pearson correlation coefficients among the integral EV model constructs.

**Main analyses**

**Confirmatory factor analyses.** The hypothesized measurement model for physical activity and eating behavior is depicted in Figure 1. Measurement models were examined for the total sample and for adolescent males and females separately. Findings revealed all factor loadings were relatively high (>0.60) and significant, with low standard errors (<0.05). The measurement error associated with the ob-

![Figure 1. Overall measurement model illustrating the relationships among the six latent variables tested using maximum likelihood confirmatory factor analysis. HD = healthy diet; HDPC = healthy diet perceptions of competence; HDSV = healthy diet subjective value; PA = physical activity behavior; PAPC = physical activity perceptions of competence; PAUT = physical activity utility value.](image-url)

Table 1  
Pearson correlation coefficients for adolescent boys (n = 206; top) and girls (n = 327; bottom), and means and standard deviations (SD) for competence beliefs, values, and health behaviors.  

<table>
<thead>
<tr>
<th>Variable</th>
<th>PAPC</th>
<th>PAIN</th>
<th>PAAT</th>
<th>PAUT</th>
<th>LTEQ1</th>
<th>LTEQ2</th>
<th>HDPC</th>
<th>HDIN</th>
<th>HDAT</th>
<th>HDUT</th>
<th>AFHC</th>
<th>BMI</th>
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<td>Boys</td>
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<tr>
<td>Mean (SD)</td>
<td>23.03 (5.14)</td>
<td>12.07 (2.24)</td>
<td>11.87 (2.25)</td>
<td>11.87 (2.25)</td>
<td>12.18 (2.33)</td>
<td>12.18 (2.33)</td>
<td>11.87 (2.25)</td>
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<td>11.87 (2.25)</td>
<td>11.87 (2.25)</td>
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<td>Girls</td>
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<tr>
<td>Mean (SD)</td>
<td>20.11 (5.73)</td>
<td>10.91 (2.09)</td>
<td>10.91 (2.09)</td>
<td>10.91 (2.09)</td>
<td>10.91 (2.09)</td>
<td>10.91 (2.09)</td>
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</table>

Figure 1. Overall measurement model illustrating the relationships among the six latent variables tested using maximum likelihood confirmatory factor analysis. HD = healthy diet; HDPC = healthy diet perceptions of competence; HDSV = healthy diet subjective value; PA = physical activity behavior; PAPC = physical activity perceptions of competence; PAUT = physical activity utility value.
The goodness of fit (Table 2, Models 2a–2f). The minimum factor structure since the equality constraints did not change RMSEA, CFI, and NNFI fit indices [20,21]. Little or no test of difference between nested models, in addition to fitting measurement models (Table 2, Model 1). The factors were moderate to strong. Fit statistics show good healthy diet attainment value items. The correlations among emerging between the physical activity attainment and served variables demonstrated moderate random error in the ability of the items to assess the latent constructs. All but one of the intererror correlations among parallel items were statistically significant, with the nonsignificant relationship emerging between the physical activity attainment and healthy diet attainment value items. The correlations among all perceptions of competence, value, and behavior latent factors were moderate to strong. Fit statistics show good fitting measurement models (Table 2, Model 1). The measurement models served as a baseline model for tests of group invariance and for the structural model.

Group invariance. Invariance of the measurement models for adolescent boys and girls was tested using a stepwise procedure [21]. Equality constraints were set during a succession of analyses focusing on the factor structure (Model 2a), loadings (Model 2b), variances (Model 2c), and covariances (Model 2d), residuals (Model 2e), and finally correlated errors (Model 2a). Invariance was evaluated by a $\chi^2$ test of difference between nested models, in addition to RMSEA, CFI, and NNFI fit indices [20,21]. Little or no change in goodness of fit with the additional of model restrictions supports invariance of the factor structure for gender. A nonsignificant test of invariant factor loadings is the minimum level required to demonstrate a nondifference in simultaneous group analyses [23].

Results revealed adequate support for invariance of the factor structure since the equality constraints did not change the goodness of fit (Table 2, Models 2a–2f). The minimum level of invariance was supported since there was not a significant difference between the baseline model and the model with constrained factor loadings (Model 2a).

Invariance of latent means. To explore latent mean gender differences, it was necessary to specify a model with invariant factor loadings and invariant item intercepts across groups, and to fix the factor intercepts of one group (girls) to zero [21]. A review of the goodness-of-fit statistics for the invariant factor loading and intercept model revealed that the data fitted the model well (Table 2, Model 3). Differences in latent factor means were identified by examining the t-values in the Kappa matrix (LISREL output), along with standardized effect sizes calculated using the following equation from sample data: $d = |\kappa_1 - \kappa_2| / \hat{d}^{1/2}$, where $\kappa_1, \kappa_2$ are sample latent variable means for each group and $\hat{d}$ is a within-groups pooled variance estimate for latent variable scores. A value for $\hat{d}$ was determined by $\hat{d} = ((n_1 \cdot \phi_1) + (n_2 \cdot \phi_2)) / (n_1 + n_2)$, where $\phi_1$ and $\phi_2$ are estimated variances from the latent variables, and $n_1$ and $n_2$ are the group sample sizes [24]. With two groups and the use of reliable instruments, these effect sizes can be interpreted based on social science guidelines of $d = .2, .5,$ and .8 equating to small, medium, and large effect sizes, respectively [24]. Adolescent boys had significantly higher perceptions of competence ($t = 6.07, d = .55$), value ($t = 4.47, d = .48$), physical activity ($t = 4.58, d = .51$), and healthy eating perceptions of competence ($t = 4.18, d = .38$) and lower healthy eating value ($t = -3.50, d = .36$) and eating behavior ($t = -4.97, d = .49$) compared with girls. These results partially supported the hypothesis of gender differences for all factors with the exception of healthy eating perceptions of competence.

Path models. The models were a good fit to the data (Table 2, Model 4). Findings demonstrated that behavior-specific perceptions of competence and value were significant correlates of adolescent physical activity and healthy eating, with the exception of the link between perceptions of competence and healthy eating for boys. The models accounted for 41% (boys) to 53% (girls) of the variance in adolescent physical activity and 30% (girls) to 42% (boys) of the variance in healthy eating behavior.

Structural group invariance. Significant gender differences on path coefficients in the model were explored using tests of structural group invariance. The baseline model (Table 2, Model 5a) shows all paths free to be estimated for both groups. This model was compared with a fully constrained model where all paths were set equal (Table 2, Model 5b). Based on the $\chi^2$ difference ($\Delta\chi^2 = 5.66$) for 4 degrees of freedom, the structural paths were not significantly different for boys and girls. These findings defend the hypothesis of no gender differences in the model relationships, and provide further support for the EV model.

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>RMSEA</th>
<th>CFI</th>
<th>NNFI</th>
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<tbody>
<tr>
<td>Model 1: Measurement model</td>
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<tr>
<td>Total sample</td>
<td>356.55</td>
<td>148</td>
<td>.052</td>
<td>.97</td>
<td>.96</td>
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<tr>
<td>Girls</td>
<td>286.12</td>
<td>148</td>
<td>.054</td>
<td>.96</td>
<td>.96</td>
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<tr>
<td>Boys</td>
<td>226.71</td>
<td>148</td>
<td>.051</td>
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<td>.96</td>
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<td>Model 2: Group invariance</td>
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<tr>
<td>2a. Baseline</td>
<td>512.83</td>
<td>296</td>
<td>.053</td>
<td>.97</td>
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<tr>
<td>2b. FL</td>
<td>526.49</td>
<td>310</td>
<td>.051</td>
<td>.97</td>
<td>.96</td>
</tr>
<tr>
<td>2c. FL+FV</td>
<td>563.91</td>
<td>316</td>
<td>.054</td>
<td>.97</td>
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<tr>
<td>2d. FL+FV+FC</td>
<td>587.51</td>
<td>331</td>
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<td>2e. FL+FV+FC+U</td>
<td>674.54</td>
<td>351</td>
<td>.059</td>
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<td>2f. FL+FV+FC+U+CU</td>
<td>691.62</td>
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<td>Model 3 – Latent Means</td>
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<td>3. FL+II+LM</td>
<td>564.71</td>
<td>324</td>
<td>.053</td>
<td>.96</td>
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<td>Model 4: Path model</td>
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<tr>
<td>Total sample</td>
<td>367.57</td>
<td>152</td>
<td>.052</td>
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<tr>
<td>Girls</td>
<td>295.27</td>
<td>152</td>
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<tr>
<td>Boys</td>
<td>233.44</td>
<td>152</td>
<td>.051</td>
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<tr>
<td>Model 5: Structural invariance</td>
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<tr>
<td>5a. Baseline model</td>
<td>558.19</td>
<td>318</td>
<td>.053</td>
<td>.97</td>
<td>.96</td>
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<tr>
<td>5b. Fully constrained model</td>
<td>552.53</td>
<td>314</td>
<td>.053</td>
<td>.97</td>
<td>.96</td>
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</tbody>
</table>

CFI = confirmatory fit index; CU = correlated uniquenesses; FC = factor covariances; FL = factor loadings; FV = factor variances; II = item intercepts; LM = latent means; NNFI = non-normed-fit index; RMSEA = root mean square error of approximation; U = uniquenesses.

* $p < .05$: $\chi^2$ difference between nested models.
Following evidence of support for the measurement and structural models, BMI was included in a final model (see Figure 2) to explore the independent direct impact on physical activity and eating behaviors. There were minimal changes in model fit (total sample: $\chi^2(166) = 390.65, p < .01$, RMSEA = .050, CFI = .97, NNFI = .96; boys: $\chi^2(166) = 241.75, p < .01$, RMSEA = .047, CFI = .97, NNFI = .96; and girls: $\chi^2(166) = 316.92, p < .01$, RMSEA = .053, CFI = .97, NNFI = .96), with the path between BMI and physical activity not reaching significance. BMI explained an additional 3%–4% of the variance in eating behavior for boys and the total sample, and 7% of the variance in girls’ eating behavior. Tests of model structural invariance showed no gender differences (baseline model: $\chi^2(353) = 596.70, p < .01$, RMSEA = .051, CFI = .96, NNFI = .96; fully constrained model: $\chi^2(347) = 590.69, p < .01$, RMSEA = .051, CFI = .96, NNFI = .96).

Discussion

The tenets of the EV model were supported with a sample of older adolescents, and provided an appropriate base to explore physical activity and healthy eating behaviors simultaneously. Until now, support for Eccles model has been observed with young adults and older adolescents in required physical education courses [25,26] and structured sport participation [10,27]. This is one of the first studies to confirm the salient relationships of the EV model with both leisure-time physical activity and healthy eating behavior. Furthermore, the inclusion of BMI as a correlate of health behaviors demonstrated a strong model and enhanced the variance accounted for in healthy eating.

The main hypothesis in this study was that competence and values would be strong correlates of health behaviors. The findings revealed subjective values were highly related to both physical activity and eating behaviors in all models. Perceptions of competence were strong influences on physical activity behavior, and healthy eating for the total sample and adolescent boys. These findings are both contradictory and supportive of previous research. With a focus on healthy diet, indirect links among competence beliefs, values, and children’s fruit and vegetable consumption have been reported [28,29]. However, these studies failed to explore these associations among boys and girls separately, and focused on much younger samples. Although the current study found that perceptions of competence had little impact on the healthy diet behaviors of adolescent girls, further research is necessary to understand the underlying reasons for this finding. In support of the current results, a lack of enjoyment (value) in eating fruits, vegetables and foods low in fat was consistently reported in a review of psychosocial correlates of dietary behavior [6]. The physical activity literature is similar, with a number of studies reporting strong associations between competence-based perceptions, values, and youth physical activity [4,30,31]. However, these studies have not included the simultaneous effects of perceptions of competence and values. The current findings demonstrate strong associative models for physical activity and healthy eating when values and perceptions of competence are examined. Thus it is important that clinical practitioners understand adolescents’ self-perceptions related to competence and the interest and importance they place on physical activity and healthy eating behaviors. Health promotion messages focused on adolescents should also highlight these integral elements of health behavior motivation while paying attention to gender differences.

The gender differences in latent means were expected, with the exception of boys reporting higher perceptions of competence for healthy eating. Boys report consistently higher physical activity perceptions of competence, value, and behavior compared with girls [4,32]. The importance of eating behavior to adolescent girls has also been reported [33]. Contrarily, boys are less likely to report, acknowledge, or understand the importance of healthy eating behavior [34], and may avoid discussing and acknowledging healthy dietary choices for fear of appearing effeminate [35]. The observation that boys reported higher perception of competence for healthy eating compared with girls could, in speculation, be explained by a more lenient definition of what “healthy eating” means. This would translate into boys feeling competent that they can achieve what they define healthy eating to be. Differences in the meaning of healthy diet have not been explored, however there is evidence to suggest gender differences in terms of sources and general understanding of nutrition knowledge and beliefs [36]. Negotiating the meaning of a healthy diet should be an important public health concern necessary to create a consistent domain for clinical practice and research efforts. In addition, practitioners need to focus on enhancing adolescent girls’ physical activity perceptions of competence, values, and behavior and healthy eating perceptions of competence, and increasing adolescent boys’ healthy eating values and behavior.

Based on the tenets of the EV model, boys are engaging in more physical activity compared with girls because they have higher perceptions of competence and value. This observation is consistent with previous research reporting constantly higher self-perceptions and physical activity behavior among adolescent boys [3,10,35], with these relationships extending into adulthood. For girls, the greater importance, interest, and usefulness associated with maintaining a healthy diet are critical to healthier eating behavior when compared with their male counterparts. Indirect support for this finding suggests that girls value eating behavior primarily because of the inherent links to appearance and body shape [37,38]. Therefore, the association between value and healthy eating behavior may be present for girls, irrespective of their perceptions of competence to maintain a healthy diet, because of strong perceived functional ben-
The direct effect of BMI on health behaviors was included in the final comprehensive health behavior model. BMI made no contribution to understanding physical activity, and had limited but significant impact on healthy eating behavior. The lack of relationship between BMI and adolescent physical activity has been reported previously [30]. Based on the EV model, it may be that BMI is indirectly linked to physical activity, with the effects mediated by significant other beliefs and behaviors, goal orientations, previous experiences, and affect [9]. Further exploration of this proposition is warranted. The influence of BMI on eating behavior was significant, where adolescents with higher BMI’s reported healthier eating habits. This finding provides some evidence that adolescents with higher height-to-weight ratios are making healthy nutritious decisions about their diet, which may be in response to having higher BMIs and actions taken to change body shape/size. Given this suggestion, it could be the underweight and healthy-weight adolescents that require interventions targeting nutritious eating habits. This is the group that may not follow a healthy diet because they do not need to change their body shape or weight, or that may be operating on the false assumptions that eating less nutritious foods may help them to gain weight, if desired. The nature of these possible relationships among differing BMI subgroups requires additional research attention, whereby longitudinal designs can follow the progression of BMI and health behavior habits such as diet and physical activity.
Despite the beneficial findings from this study, there are inherent limitations associated with self-report and cross-sectional research. First, the direction of effects cannot be inferred. This cross-sectional analysis supports the main tenets of the EV model; however, it is likely that the behavioral outcomes also impact perceptions of competence and values [36]. Another limitation is that the current study sampled adolescents from classes at various schools, and it is possible that there is a clustering of responses that have not been accounted for in the analyses. Also, this convenient sample of volunteer adolescents with parental consent limits generalizability and presents the possibility of selection bias. Finally, socioeconomic status and ethnicity may impact the likelihood of adolescents’ engagement in physical activity and healthy eating behaviors and were not accounted for in this study.

Despite these limitation, the results from this study coupled with theoretical and empirical approaches to motivated behavior, suggest combined competence and value beliefs may lead adolescents to participate in physical activity and to engage in healthy eating more frequently, and may result in greater engagement over time. Also, the EV model presents several other constructs that may help understand the complex relationships and gender differences during adolescence [9]. Significant others’ beliefs, values, and health behaviors are hypothesized to directly influence adolescents’ own perceptions of competence and value. Furthermore, gender-role and behavior-specific stereotypes, previous experiences, and goal orientations influence the main EV model constructs, whereas the adolescent’s cultural milieu, socioeconomic status, and other personal characteristics have indirect associations to behavior. Now that there is preliminary support that the main EV tenets hold in a comprehensive health behavior model, future research should explore these more distal theoretical relationships to foster greater understanding of adolescent physical activity and healthy diet behaviors.

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