

Likelihood of healthy eating among adolescents based on the health belief model

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(Received: April 12, 2019; revised manuscript received: May 20, 2019; accepted: June 6, 2019)

Introduction: Maintaining appropriate eating habits is one of the key components of good health. It is especially difficult during adolescence, a critical period in life because of the increased autonomy and the intention to take risks. Investigating the theoretical background of adolescents' eating behaviour is therefore a worthwhile line of research. We applied the widely used health belief model to explore adolescents' likelihood of healthy eating. *Materials and methods:* A sample of adolescents (Szeged, Hungary; $N = 400$, age = 14–19 years; mean age = 16.01 years, $SD = 1.18$ years; 37% males) participated in the study. Data were collected through online, self-administered/anonymous questionnaires. Based on bidirectional correlations of the variables, we used a path analysis to examine relationships between elements of a modified health belief model. *Results:* Our modified model showed the direct impacts of cues to action, benefits, barriers, and self-efficacy, and the indirect impacts of perceived severity and susceptibility-via-cues-to-action on the likelihood of healthy eating. *Discussion and conclusions:* Elements of the health belief model play a decisive role in estimating adolescents' healthy eating behaviour. We suggest that the model can serve as a useful theoretical background in planning and evaluating prevention programs to reduce obesity and promote healthy eating.

Keywords: adolescence, health belief model, healthy eating behaviour

INTRODUCTION

It is now settled science that lifestyle factors such as physical activity and nutrition contribute to morbidity and mortality to a great extent [1]. Poor nutrition can result in obesity [2] and diseases, such as cardiovascular disorders, strokes, or diabetes [3–5]. Eating habits conducive to maintaining health and preventing several chronic diseases are essential [6], and identifying factors that play a role in the adoption of healthy eating habits is particularly relevant.

Adolescence is a sensitive life period in terms of nutrition [7]. This is because during adolescence a child's lifestyle usually changes in drastic ways due to increased autonomy from the parents and the impact of peers on behavioural decisions. This change may also result in the taking up of risky behaviours such as a decrease in physical activity [8], experimentation with substance use [9], or unhealthy eating habits [10]. Although, in childhood, parents set the guidelines for their children's dietary habits, adolescents often prefer to make their own food choices. Helping them maintain or adopt a healthy diet in this frame of nutritional socialization is nevertheless essential, as a variety of eating disorders [10] become more common in this age group worldwide [11]. Being overweight in puberty may also predict adult obesity, which is one of the major public health problems around the world [12, 13].

Healthy eating habits are influenced by a lot of factors, and several investigators have proposed models in an attempt to identify them and their interactions. Practically, these models may help nutritionist achieve significant behavioural changes as a result of their intervention [14]. One of them is the health belief model (HBM), which is widely used in the study of health-related behaviours, such as physical activity [15], weight management [16], self-care behaviour [17], smoking [18], or healthy eating [19]. This model, based on expectancy – value theory, was developed in the 1950's [20]. It postulates that individuals are more likely to adopt healthy behaviours if they feel they are in danger of getting a disease, based on their assumptions about the severity of the disease and their own susceptibility. They also consider the barriers and benefits of the planned preventive behaviour. Cues to action and demographic characteristics may also moderate the effects of these elements of the model. Finally, self-efficacy has been added to the model, defined as the individuals' perception that they are able to perform the planned behaviour [21, 22].

In terms of nutritional behaviour, several studies have reported on the effectiveness of the HBM [23–25]. Results show that, among adults, the perceived susceptibility to

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health problems for not having healthy eating habits, and the perceived benefits of having them, can positively affect eating behaviour, whereas the perceived barriers to healthy eating can affect it negatively [23]. The role of the perceived barriers seems to be similar among college students. Lower perceived barriers and higher self-efficacy related to healthy nutrition result in a more balanced diet [26]. As most studies are focused on adults, much less is known about adolescents. It has been shown, however, that among female adolescents, perceived health threats, self-efficacy, and cues to action are related to the intention of reducing weight [27]. Furthermore, adolescents with a food allergy report greater adherence to self-care behaviours, including eating habits, when they perceive greater severity and fewer barriers [28].

The main goal of this study was to test the HBM in a sample of Hungarian adolescents. We supposed that the HBM might be a useful tool to explore the likelihood of healthy eating behaviour in adolescence, assuming that some elements of the model are less relevant for adolescents (e.g., perceived susceptibility, due to their age-specific feeling of invulnerability [29]). Thus, we decided to set up a hypothetical path model after testing the bidirectional correlations between the variables of the original construct.

MATERIALS AND METHODS

A total of 440 adolescents (aged between 14 and 19 years; mean age = 16.01 years, $SD = 1.18$ years; 37% males) from different high schools in Szeged, Hungary, participated in our 2018 study. Ethical approval by an Institutional Review Board was provided by the University of Szeged's Department of Education. The completion of an online questionnaire was self-administered, voluntary, and anonymous. Students needed approximately 15–20 min to complete the questionnaire.

Based on the HBM, the likelihood of healthy eating served as our dependent variable, whereas perceived severity and susceptibility, cues to action, barriers and benefits, and self-efficacy were applied as further elements of the model.

"Likelihood of healthy eating" was measured using three items [19] using a 7-point rating scale for the responses: (1) "I intend to eat a nutritious diet most of the time in the next two weeks" (extremely unlikely ... extremely likely); (2) "In the course of the next two-week period, how often will you make good food choices?" [never ... every meal]; (3) "In the course of the next two-week period, how often will you make bad food choices?" (never ... every meal]. The scale was reliable with a Cronbach's α of .76.

"Perceived severity" was measured using seven items [19] beginning with a statement: "Due to my unhealthy eating behaviour I am afraid that during my life ... (1) I will miss more than two months of school or work; (2) I will have long-lasting effects; (3) I will be bed-ridden for a long time; (4) I will have medical expenses; (5) I will harm my career; (6) My social relationships will suffer; (7) I will hurt my family life." Response opportunities varied from 1 (*do not*

agree at all) to 7 (*I totally agree*). Cronbach's α value with the current sample was .89.

"Perceived susceptibility" was measured using five items starting with "How high do you think is your risk of ... (1) getting seriously ill; (2) becoming hypertensive; (3) getting high cholesterol level; (4) getting cancer; (5) having diabetes ... , ... during your life, if you do not eat healthily?" This scale was based on the work of Renner and Schwarzer [30] and that of Deshpande, Basil, and Basil [19] to get an overall index of the students' risk perception. Participants could answer on a rating scale between 1 (*extremely unlikely*) and 7 (*extremely likely*). Cronbach's α reliability coefficient was .85.

"Cues to action," as the action variable, were measured using three items [19] beginning with "I would pay more attention to the quality of my food choices ... (1) if I read information in the mass media (news stories, ads, and other programs); (2) if it is recommended by a doctor; (3) if friends or family members suggested it." The responses were measured on a 7-point Likert scale ranging between 1 (*I do not agree at all*) and 7 (*I totally agree*). The value of Cronbach's α was .65.

"Benefits of healthy eating" were measured using five items [19]. Students were asked to complete: "For me to eat a nutritious diet most of the time in the next 2-week period would be ... and then indicate as (1) harmful/beneficial, (2) unpleasant/pleasant, (3) bad/good, (4) worthless/valuable, (5) unenjoyable/enjoyable." Each pair of adjectives was accompanied by a 7-point scale. The overall scale was reliable with a Cronbach's α of .88.

"Barriers to healthy eating" were measured using three items [19]: (1) "I don't like the taste of most foods that are high in nutrients;" (2) "I think it would take too much time to change my diet most of the time in the next two-week period to include more foods high in nutrients;" (3) "Over the next 2 weeks, I think it would be too hard to change my diet to include more foods high in nutrients." Response options were between 1 (*I do not agree at all*) and 7 (*I totally agree*). Cronbach's α was .78.

"Self-efficacy to eat healthily" was detected using two items [19]: (1) "If I tried, I am confident that I could maintain a diet high in nutritional value most of the time in the next two-week period;" (2) "If I wanted to, I feel that I would be able to follow a diet high in nutritional value most of the time in the next two-week period." The answers varied on a scale between 1 (*I do not agree at all*) and 7 (*I totally agree*). Cronbach's α was .78.

Statistical analyses were conducted using IBM SPSS Statistics (version 22.0 for Windows) [31]. Values of $p < .05$ were considered statistically significant. We summarized the item scores (inverse scores were used for negative statements) to calculate the total scores. First, we used Pearson's correlations to explore the relationships between the variables and to specify a hypothetical path model. Second, we tested this model for maximum likelihood using SPSS AMOS, version 24 [32] to detect which variables are related to the likelihood of healthy eating. We also affirmed an acceptable fit: root mean square errors of approximation (RMSEA) < 0.05 ; comparative fit index (CFI) ≥ 0.90 , and standardized root mean square residual (SRMR) < 0.05 [33].

RESULTS

By calculating correlation coefficients, we found several intercorrelations (Table 1). Perceived severity and perceived susceptibility were positively correlated with each other ($r = .44, p < .01$), and they had a relationship with cues to action ($r = .19, p < .01$ in both cases). Benefits and barriers were negatively correlated with each other ($r = -.36, p < .01$). Benefits was also related to cues to action ($r = .32, p < .01$), to self-efficacy ($r = .51, p < .01$), and to likelihood of healthy eating ($r = .57, p < .01$). Barriers had a negative association with self-efficacy ($r = -.40, p < .01$) and with the likelihood of healthy eating ($r = -.54, p < .01$). Finally, self-efficacy was positively related to the likelihood of eating healthily ($r = .64, p < .01$).

Based on these findings, we constructed a hypothetical model (Figure 1). We excluded all the relationships with an $r < .30$, that is, perceived susceptibility and severity. We supposed direct and indirect relationships. First, we assumed that benefits, barriers, and self-efficacy, as individual beliefs of the HBM would directly impact the likelihood of healthy eating. Second, we also assumed direct relationships between the likelihood of healthy eating and cues to action, as action variable of the HBM. Finally, based on the results of Pearson’s correlations, we hypothesized direct relationships between benefits and cues to action, benefits and self-efficacy, and barriers and self-efficacy. After conducting the path analysis, not all the model’s fit values were acceptable (RMSEA = 0.10, CFI = 0.98, SRMR = 0.03). We therefore

modified the original hypothetical model by adding perceived severity and susceptibility variables, supposing a significant role of risk perception, despite the lower value of the correlation coefficient (Figure 2).

The resulting model’s fit indices were acceptable with RMSEA = 0.05, CFI = 0.99, and SRMR = 0.04 (Figure 3). Cues to action ($\beta = 0.15, p < .001$), benefits ($\beta = 0.23, p < .001$), barriers ($\beta = -0.31, p < .001$), and self-efficacy ($\beta = 0.37, p < .001$) directly influenced likelihood of healthy eating. Perceived severity ($\beta = 0.13, p = .01$) and perceived susceptibility ($\beta = 0.13, p = .009$) had an indirect influence on likelihood of healthy eating via cues to action. Similarly, benefits via cues to action ($\beta = 0.32, p < .001$) and self-efficacy ($\beta = 0.42, p < .001$) indirectly affected the likelihood of healthy eating. Moreover, barriers also had an indirect effect on likelihood of healthy eating via self-efficacy ($\beta = -0.25, p < .001$). Taking all these together, 58% of the total variation in likelihood of healthy eating was explained by this set of predictors based on the HBM model.

DISCUSSION

Our goal was to test the HBM in order to examine how its elements are related to the likelihood adolescents’ healthy eating. Since earlier studies [27, 28] did not give comprehensive results about the operation of the HBM in adolescents’ eating behaviour, we based our hypothetical model on bidirectional correlations between elements of the HBM.

Table 1. Correlations between the variables of the path analysis

	1	2	3	4	5	6
1. Perceived severity	–					
2. Perceived susceptibility	.44**	–				
3. Cues to action	.19**	.19**	–			
4. Benefits	.01	.03	.32**	–		
5. Barriers	.10	.12	-.03	-.36**	–	
6. Efficacy	-.04	-.02	.24**	.51**	-.40**	–
7. Likelihood of healthy eating	.02	.00	.32**	.57**	-.54**	.64**

Note. ** $p < .01$.

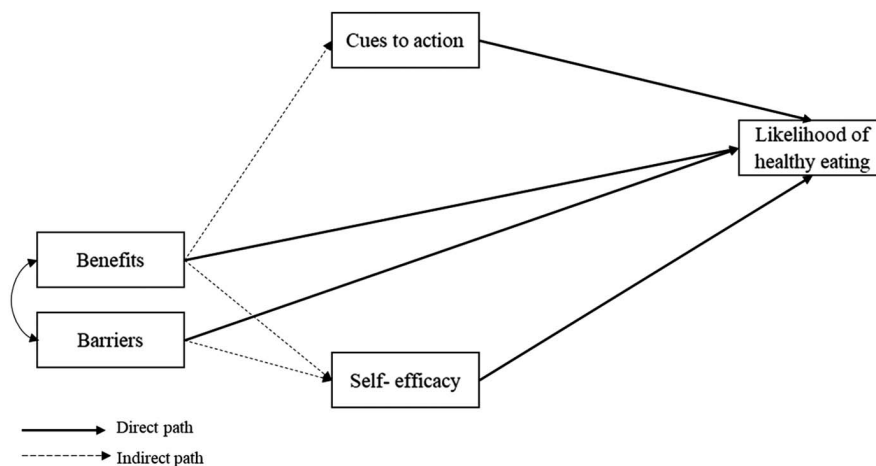


Figure 1. The hypothetical model of likelihood of healthy eating

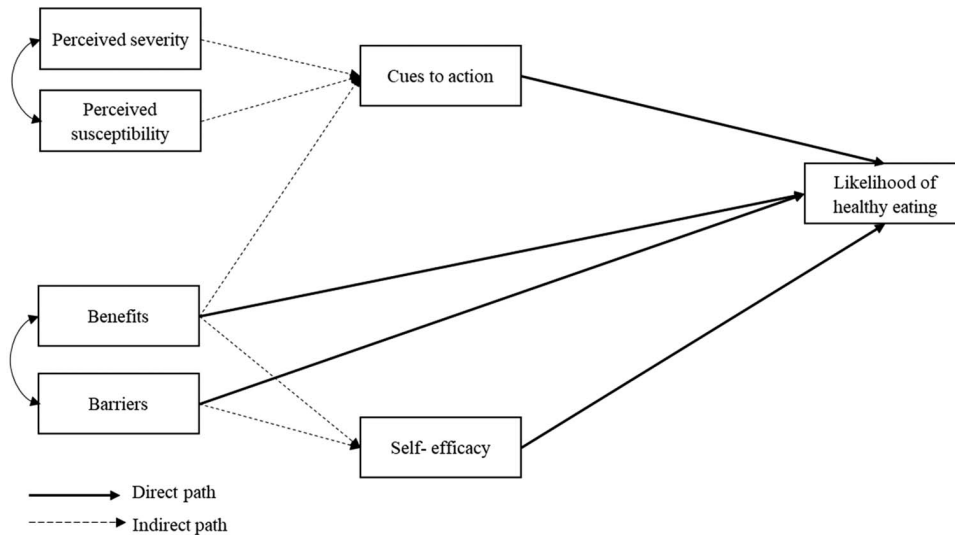


Figure 2. The modified hypothetical model of likelihood of healthy eating

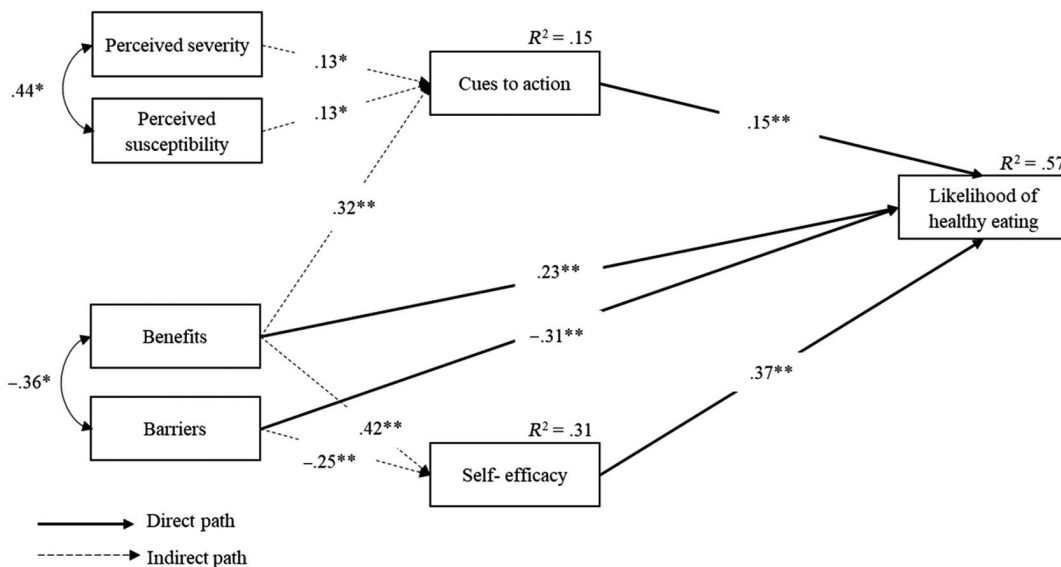


Figure 3. The final model with significant paths and explained variance. * $p < .01$. ** $p < .001$

Our results showed that the likelihood of healthy eating was directly related to barriers, benefits, self-efficacy, and cues to action. In terms of benefits and barriers, our findings suggest that when adolescents can identify the benefits of healthy eating and identify and overcome its barriers, they will more likely have an engagement with healthy nutrition. The results of other studies have also shown the positive effect of knowing the benefits of healthy eating and the negative effect of its barriers [23, 26]. As for self-efficacy, it can contribute to adolescents' feeling of confidence about their eating more healthily, as other studies have shown [26, 34]. Our findings, similar to Park's, suggest that cues to action may also have an important role in collecting information about healthy eating [27].

We detected indirect relationships in our model as well. Perceived severity and perceived susceptibility were directly related to cues to action and indirectly to the likelihood of healthy eating. This refers to that perceived threat, such as

risk perception, detected by adolescents in terms of healthy eating may have an impact on their efforts to eat healthily. Other studies have shown a direct relationship between behaviour and perceived threat [23, 34]. As we mentioned earlier, however, risk perception can be modified in adolescence by unrealistic optimism and perceived invulnerability [29].

Barriers and benefits were directly related to self-efficacy, and this may suggest that expected positive and negative effects of healthy eating can impact the trust in one's ability to act. Finally, benefits had a positive relationship with cues to action, meaning that perceived benefits can have an impact on strategies to activate healthy eating behaviour.

Overall, we can conclude that (a) perceived benefits, barriers, self-efficacy, and cues to action play a decisive role in estimating adolescents' healthy eating behaviour, and that (b) perceived severity and susceptibility as risk perception

had an indirect impact on healthy eating behaviour in adolescence, not direct, as it was previously found in adulthood. The strength of this paper is our path model that demonstrates the interrelationship between elements of the HBM. However, we should also note some limitations. In this study, we examined only healthy eating behaviour, but unhealthy behaviour can also be an important focus of research. In addition, healthy eating behaviour was based on only self-evaluation, without more exact measurement tools such as the use of a diary during a specified time period. We must note here, however, that self-reporting is often used in studies of the HBM [15–19, 25–28]. Finally, some of the scales have lower reliability coefficients than we expected.

We believe these results confirm the usefulness of the HBM in estimating adolescents' healthy eating behaviour and can support further investigations. To get an overall picture, it would be necessary to explore the likelihood of unhealthy eating behaviour as well. Sociodemographic, psychological, and other factors should also be included in the following investigations.

CONCLUSIONS

We conclude that elements of the HBM indeed play an important role in examining healthy eating behaviour in adolescents. Our modified HBM model takes into account the limited function of risk perception among youngsters because of their sense of invulnerability [29]. An important message of our findings is that the HBM can be a useful tool for health professionals as a theoretical background in evaluating prevention programs to reduce obesity and promote healthy eating.

Authors' contribution: KSz and BP summarized the theoretical background of the paper. KSz collected data, performed the necessary analyses, summarized, and concluded the results of the study. BP supervised the final content.

Ethical approval: The Ethical Committee of Doctoral School of Education, University of Szeged, provided ethical approval for this study.

Conflicts of Interest/Funding: The authors declare no conflict of interest and no financial support was received for this study.

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