



Effect of Training Program on Snack Consumption in Elementary School Girls: Application of the BASNEF Model

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ABSTRACT

Aims Many non-communicable diseases such as diabetes, osteoporosis, and high blood pressure are related to unhealthy eating habits and patterns formed in childhood and the teenage period. This study investigated the effect of a training program based on the BASNEF model on snack consumption in elementary school girls in the second period.

Materials & Methods This quasi-experimental study was conducted on 200 elementary school girls in Saveh, Iran, in 2019. Samples were selected by random sampling method and randomly assigned into two experimental and control groups (100 people in each group). The data collection tool was a researcher-made questionnaire, including demographic characteristics, BASNEF model constructs that were completed before, and 3 months after the experimental and control groups' educational intervention. The training program was performed in 3 sessions of education for students, one session for parents, and one session for principals, deputies, teachers, and school buffet officials. Data were analyzed by SPSS 24 software using Chi-square, paired, and independent t-tests.

Findings Results showed that before the intervention, there was no significant difference between the experimental and control groups in terms of attitude, enabling factors, subjective norms, intention, and snack consumption behaviors ($p > 0.05$). After the intervention, the mean score of attitude, subjective norms, enabling factors, intention, and healthy and unhealthy snack consumption behaviors in the experimental group were significantly higher than the control group ($p < 0.001$).

Conclusion Educational intervention based on the BASNEF model has effectively increased the consumption of healthy snacks and reduced the consumption of unhealthy snacks in elementary school girls.

Keywords Educational Intervention; BASNEF Model; Snack; Elementary Students

CITATION LINKS

- [1] In-depth assessment of snacking behaviour in unmarried ... [2] Qualitative and quantitative dietary assessment ... [3] 40-year trends in meal and snack eating behaviors ... [4] Models of safe nutrition of children and adolescents ... [5] Assessment of the situation and the cause of junk ... [6] Effect of a healthy nutrition education program ... [7] What should be taught in secondary schools nutrition ... [8] Breakfast and Snack status among the ... [9] Interventions to improve adolescent nutrition ... [10] Factors influencing food choices: Perception ... [11] Study of snack pattern and some factors ... [12] Factors behind healthy snack consumption ... [13] Evaluation of nutrition education program ... [14] Relationship between junk foods intake ... [15] Snacks and beverage consumption pattern ... [16] High school intervention for influenza biology ... [17] Health behavior and health education ... [18] Understanding behaviour: The key to successful ... [19] The effect of an educational program ... [20] Effect of an educational program based ... [21] Factors Influencing Oral Health Behavior ... [22] Effect of an educational intervention ... [23] Psychological and sociodemographic ... [24] Impact of a pilot school-based nutrition ... [25] The effect of educational intervention on ... [26] Determining the effect of parent education ... [27] Effects of health education based on health belief ... [28] The effect of theory planned behavior ... [29] The impact of education on the basis of ... [30] The evaluation of effects of educational ... [31] Understanding choice of milk and bread ... [32] Predictors of intention to eat 2.5 cups ... [33] The effect of educational program based on ... [34] Effects of a nutrition education intervention designed ... [35] Effect of school-based intervention on diet in high school ... [36] Effectiveness of snack-centered nutrition education ...

Introduction

Adolescence is a transient period in the life cycle that affects physical, social, and growth changes. The World Health Organization (WHO) defines adolescence as between 10 and 19 years old. In this period, rapid growth and dramatic physical changes increase the demand for nutrients and energy [1]. Research has shown that adolescents often have poor eating habits and are at high risk for nutritional problems such as for overweight and obesity, iron deficiency anemia, and micronutrient deficiencies. A combination of these factors makes adolescence a nutritionally vulnerable period [2].

Snacks are defined as the food consumed between main meals and are a major source of calories. This is about 40% of the total calories [3, 4]. Around noon, students, even those who eat breakfast, feel hungry and lose their concentration. Therefore, a proper snack at this time can increase students' concentration and learning [5]. Various studies have shown that proper snack consumption has a role in increasing students' learning ability and improving their academic status [6, 7]. Therefore, it is necessary to provide healthy snacks to students. These include simple, fresh fruits, fresh vegetables, natural juices, nuts (walnuts, pistachios, peanuts, hazelnuts, etc.), and simple biscuits [8]. But changes in eating patterns over the last few decades have led to the replacement of junk food with nutritious snacks [9]. Complications of unhealthy snacking in students have been fully established, such as dental caries, chronic disease, obesity, excessive weight loss, and lack of concentration and hyperactivity [10].

Studies in different parts of the world have reported the consumption of unhealthy snacks among students. In a Polish study, crisps were found to be the most common unhealthy snack among students [3]. In another study conducted in the United States, the most used snacks among American adolescents were candy, carbonated and sweet drinks, and high-salt snacks [4].

Abedi *et al.* in a study on urban areas reported consuming snacks such as cheese puff (20.3%), crisps (25.8%), carbonated drinks (22.2%), chocolate, and sweets (30.8%) as snacks, which showed the high consumption of such snacks among students [11]. A school is a good place for nutrition education, given that children and adolescents spend almost half of their time in school, as well as the presence of several million students in Iranian schools and the special position of the school as a Student gathering center and the role of teachers and parents [12, 13].

Schools can be a good environment for many children to have access to promoting healthy eating habits and healthy lifestyle behaviors through classroom-based nutrition education, modeling healthy behaviors, and providing nutritious foods [4]. Implementing

nutritional education programs in schools has been recognized as an effective method for establishing positive nutritional attitudes, changing and modifying eating habits [14, 15].

Due to the prevalence of unhealthy snack consumption among adolescents and school-age students, awareness of this group has been very effective and effective through health education programs [16]. On the other hand, the effectiveness of health education programs depends on the effectiveness of these programs, which depends on the correct use of theories and models of behavior change [17].

Different models are used to change behavior. Behavior change model that is potentially suitable for nutrition education programs. BASNEF Model was introduced in 1993 for the first time by combining the components of two models of Theory of Reasoned Action and the PRECEDE section of the PRECEDE-PROCEED model [18].

According to this model, the person's intention is the most important determinant of a person's behavior that leads to a behavior. The intention is a combination of a person's attitude toward behaving (attitude toward proper eating behavior) and subjective norms (advising family and friends or key people to have a proper eating behavior). The individual's attitude is a combination of beliefs about the results of performing a behavior (the results of correct and appropriate nutritional behavior and evaluating the results of correct and appropriate nutritional behavior). Subjective norms are also a combination of normative belief and motivation to comply. One of the important constructs of this model is enabling factors. A person may want to do the recommended behavior, but due to lack of skills (lack of skills in choosing healthy foods, lack of resources needed to perform the recommended behavior, lack of money to buy recommended foods, or due to obstacles to the desired behavior) cannot perform the desired behavior and eventually the person becomes discouraged from performing the behavior [18].

Based on the study results, the BASNEF model's use has a positive effect on the improvement of the desired behaviors [19-23].

Given that in this study, our goal is to improve snack consumption in students, and given that children and adolescents are vulnerable due to their specific age, knowing the nutritional status of students leads to better planning in education and health policy. Proper nutrition is an important factor in learning and will lead to academic growth and increase the return on educational investment and, ultimately, national productivity. This study aimed to evaluate an educational intervention's effectiveness based on the BASNEF model on snack consumption in elementary school girls in the second period.

Materials and Methods

This research is a quasi-experimental study with a pre-test-post-test design and control group introduced in 2019. The study population was female elementary school students (fifth and sixth grade) in Saveh, Iran. The sample size was 90 people according to another study [19], confidence level 95% and the power 80%, and the maximum acceptable difference (effect size) 2 points, and the standard deviation 17.9 in each group considering about 10% probability of falling, the minimum sample was considered with 100 people in each group (200 in total). The sampling method was a two-stage cluster so that according to the education department's classification of schools, which are divided into three categories (privileged, semi-privileged, and low-privileged), two schools were selected from each level at random. A total of 6 schools were selected. Out of 6 selected schools, three schools (1 privileged school, one semi-privileged school, and one low privileged school) were randomly assigned to the experimental group, and three schools (1 privileged school, one semi-privileged school, and one low privileged school) were placed in the control group. The selected schools were geographically at a reasonable distance from each other. Then one classroom was selected from each school. There was an average of 38 students in each class, 229 students, all of whom were satisfied with their participation in the study. Inclusion criteria include not having mental and physical illnesses and consent to participate in the study. Exclusion criteria also included the student's continuous absence in training sessions (absence of more than one session in educational interventions), unwillingness to continue participating in the study, students' unavailability when completing the questionnaire.

The data collection tool consisted of two parts. The first part of the questionnaire included demographic information (parent education, mother's job, and BMI). The second part was a researcher-made questionnaire based on the BASNEF model's constructs, including attitudes (10 questions) with a 5-point Likert scale from strongly agree with the score 5 to disagree with the score one strongly. Subjective norms (8 questions) were measured on a Likert scale with five strongly agreeable options with a score of 5 to disagree with a score of 1 strongly. Enabling factors (11 questions) were measured with a three-option scale, yes, no, somewhat. For the "yes" option, a score of 2, the "somewhat" option, a score of 1, and the "no" option, a score of 0 were considered. Behavioral intention (9 questions) was measured on a Likert scale with five strongly agreeable options with a score of 5 to disagree with a score of 1 strongly. Behavior (12 questions), which was part of the snack behavior, which according to researchers, children and adolescents use more in primary school age, which includes (homemade snacks, nuts, dates, and

raisins, dried biscuits, fruits and vegetables, crisps, a cheese puff, industrial juices, and soft drinks, sausage roll, pastilles and candies, stamps and plums) which were examined during the week. The behavior survey was based on a pre-designed table, and the number of snack times in the table was determined from 0 to 7 times a week, which was completed two times before the training and three months after the educational intervention in the form of self-report. The questionnaire items were designed to be researcher-made using a sample of similar questionnaires in the field of BASNEF model [22, 23], the opinion of health and nutrition education experts and female students who were divided into two groups, the first group was the habit of consuming, they had healthy meals and the second group used to eat unhealthy snacks. Then the following steps were taken to determine the validity and reliability of the questionnaire: The method of determining qualitative face validity was used to determine the relevance and relevance of questions, ambiguity and inaccurate perceptions, and the difficulty of understanding the concepts in the questionnaire. In this way, 30 female students who had similar conditions to the respondents answered the questionnaire questions during the interview and expressed their corrective opinions, and the ambiguous terms and expressions reported by them were corrected (5 questions were edited at this stage). Quantity content validity was examined in person and by correspondence using the opinions of 10 experienced professors from health education and two experienced professors in nutrition. They were measured and approved by calculating two indices Content Validity Ratio (0.87) and Content Validity Index (0.58). To measure the internal stability (reliability) of the questionnaire, a study was conducted on 30 students who were similar to the target population in terms of demographic characteristics. Based on the results of this pilot study, Cronbach's alpha coefficient for attitudes (0.76), subjective norms (0.74), enabling factors (0.81), behavioral intention (0.73), and Healthy and unhealthy snack consumption behavior (0.84) was obtained.

The ethics committee approved the ethical Permission of Islamic Azad University, Science and Research Branch of Tehran. To comply with ethical considerations, justifying the people studied and gaining their opinion, the objectives, importance, and necessity of conducting the research project were explained to the participants, and they were assured that the information would remain confidential. Before the educational intervention, the mentioned questionnaires were completed in both experimental and control groups. Then, based on the pre-test results, the experimental group's educational intervention was performed in the form of 5 training sessions through lectures, questions and answers,

group discussions, practical demonstrations, and film screenings [17]. The average duration of training sessions was 50 minutes (Table 1). Questionnaires were completed three months after the educational intervention in both experimental and control groups.

The data were analyzed by SPSS 24 using Chi-square, paired, and independent t-tests. The significance level was considered 0.05.

Table 1) Summary of educational sessions in the experimental group

Sessions	Objectives	A summary of topics and activities
1	To increase awareness of the benefits of the importance of nutrition in adolescence	- Instructional booklet was given to the students
2	To increase positive attitude toward healthy snack consumption	- Group discussion regarding various effects of healthy snacks - Broadcast an educational film on the effectiveness of a healthy snack
3	To increase negative attitude toward unhealthy snack consumption	- Group discussion regarding various effects of unhealthy snacks
4	To increase enabling factors of healthy snack consumption	- Group discussion on the obstacles to consumption healthy snack - The participants were instructed on ways of overcoming barriers of healthy snack consumption - Instructional booklet was given to the students
5	To increase subjective norms that encourage healthy snack consumption	- Educate students' parents about the types of healthy and unhealthy snacks - Educate teachers and the buffet manager about the types of healthy and unhealthy snacks

Findings

The results of the chi-square test showed that there was no significant difference between mothers' education (p=0.08), fathers' education (p=0.12), mother's job (p=0.11), and BMI (p=0.06) in two groups (Table 2).

According to the result, no statistically significant differences were found in the mean±SD scores of BASNEF model constructs between experimental and control groups before the intervention (p>0.05). Nevertheless, after the educational intervention, subjective norm, enabling factors, behavioral intention, healthy snack behavior mean scores significantly increased, and unhealthy snack behavior score decreased in the experimental group (p<0.05), while in most constructs except the attitude in the control group no significant change was observed (p>0.05; Table 3).

Table 2) Comparison of background variables in experimental and control groups (N=100 in each group)

Variable	Group	
	Control N (%)	Experimental N (%)
Father's education		
Illiterate	13 (13)	10 (10)
Middle school	13 (13)	12 (12)
Diploma	20 (20)	23 (23)
Collegiate	54 (54)	55 (55)
Mother's education		
Illiterate	20 (20)	10 (10)
Middle school	16 (16)	11 (11)
Diploma	20 (20)	23 (23)
Collegiate	44 (44)	56 (56)
Mother's job		
Housewife	89 (89)	85 (85)
Employed	11 (11)	15 (15)
BMI (kg/m²)		
<19.99	23 (23)	17 (17)
20-24.99	53 (53)	64 (64)
25-29.99	13 (13)	12 (12)
>30	11 (11)	7 (7)

Table 3) Comparison of Mean±SD scores of BASNEF model and healthy and unhealthy snack consumption behavior, before and three months after intervention in experimental and control groups

Variables	Before intervention	Three months after the intervention	p-value
Attitude			
Experimental group	32.6± 8.3	39.6±4.3	0.082*
Control group	34.4±3.9	35.3±1.9	0.040*
p-value	0.156**	0.021**	-
Subjective norms			
Experimental group	22.5±2.4	28.3±6.7	0.023*
Control group	22.4±6.2	23.4±5.8	0.069*
p-value	0.081**	0.028**	-
Enabling factors			
Experimental group	15.5±4.5	18.8±7.4	<0.001*
Control group	16.4±9.5	16.3±3.5	0.087*
p-value	0.497**	<0.001**	-
Intention			
Experimental group	27.6±3.1	39.2±7.1	<0.001*
Control group	29.5±2.4	30.7±4.2	0.191*
p-value	0.062**	0.006**	-
Healthy snack consumption			
Experimental group	4.5±2.3	8.2±3.2	<0.001*
Control group	5.7±7.7	6.3±9.6	0.415*
p-value	0.362**	<0.001**	-
Unhealthy snack consumption			
Experimental group	6.1±2.1	3.3±7.1	<0.001*
Control group	4.9±3.2	4.8±1.7	0.418*
p-value	0.127**	0.027**	-

* Paired t-test, ** Independent t-test

Discussion

In general, adolescence is considered the most important period of each person's life. Therefore, this study aimed to investigate the effect of educational intervention on snack consumption in elementary school girls in the second year using the BASNEF model as a theoretical framework.

In this intervention, following the educational intervention's implementation, the average scores of the attitude, enabling factors, mental norms, behavioral intention, and healthy and unhealthy snack consumption behaviors in the intervention group increased significantly compared to before the intervention. These findings indicate that the educational intervention based on the BASNEF model has effectively increased the consumption of healthy snacks and reduced the consumption of unhealthy snacks in students. The present study's findings indicate the positive effect of educational intervention on changing students' attitudes toward healthy and unhealthy snacks. The effectiveness of health education interventions in changing students' attitudes toward snack consumption, including the negative consequences of unhealthy snack consumption and the positive outcome of healthy snack consumption, has also been confirmed in other studies [24-27]. Improving students' attitudes can be done by increasing students' awareness more than before and its impact on students' beliefs about the results of proper nutritional behavior, using different educational methods, establishing more appropriate communication and interaction through questions, and answers group discussions with people. In fact, after directly experiencing proper nutritional behaviors, positive beliefs about the behavior's consequences are reinforced and then acted as motivation to continue [22]. Diab *et al.*'s study pointed to health and nutrition education intervention and preparing healthy meals at school with friends and classmates on improving students' attitudes toward eating healthy snacks [24]. The present study results showed a significant increase in the mean score of abstract norms of students in the intervention group one month after the educational intervention. In this study, an attempt was made to provide the necessary support for healthy snack consumption behavior by involving the teaching staff and the person in charge of the school buffet, parents of students, and peer groups and friends. The study of Barati *et al.* [28], Peyman *et al.* [29], and Nazari *et al.* [30], in line with the present study, emphasized increasing the mean of subjective norms of the students in the intervention group after the educational intervention. Berg & Pawlak cited parents' important role in eating breakfast [31] and the intention to eat vegetables [32]. However, Yarmohammadi *et al.* reported that among subjective norms, friends have the greatest impact on healthy snack consumption [19].

This may be because mothers are usually primarily responsible for preparing snacks for their children, especially in elementary school. Therefore, considering the structural role of mental norms in snack consumption, it seems necessary to design educational interventions to improve snack consumption behavior, especially in adolescents whose friends influence. The present study results showed a significant increase in the mean score of

enabling factors of students in the intervention group 3 months after the educational intervention. Enabling factors are resources and skills that allow an individual's intention or desire to be put into action [33].

The present study results showed an increase in the score of enabling factors 3 months after the educational intervention, which is consistent with the results of Hazavehei *et al.* [33]. In this study, enabling factors to include holding educational classes, less access of students to unhealthy snacks in the school buffet, familiarizing students with how to prepare and provide some healthy snacks, holding a healthy snack festival at school, giving them educational pamphlets, and forming WhatsApp groups of students' parents with a nutrition expert which can be attributed to the increase in the average of enabling factors to the above factors. This is consistent with the results of the Yarmohammadi *et al.* study [19]. The present study results showed a significant increase in the mean score of students' behavioral intention in the intervention group two months after the educational intervention. Increasing the score of attitudes and subjective norms and enabling factors three months after the educational intervention increased the students' behavioral intention to eat a healthy snack and decreased the intention to eat an unhealthy snack. Yarmohammadi *et al.* [19] and Hazavehei *et al.* [33] studies are consistent with this result.

The present study results showed an increase in healthy snack consumption and a decrease in unhealthy snack consumption in students. When students have a positive attitude towards a healthy snack and a negative attitude towards an unhealthy snack and feel that they have the ability to do such behaviors, and environmental factors are at their disposal and on the other hand, encourage by effective subjective norms such as family members, school teachers, health educators, friends and classmates and nutritionists, the intention to behave in them has become more colorful. As a result, the consumption of healthy snacks, which in this study include (fruits and vegetables, homemade snacks, milk, nuts, dates and raisins, dry biscuits), has increased, and consumption of unhealthy snacks, which included (crisps, cheese puff, industrial juices, and soft drinks, sausage roll, pastilles and candies, donuts, stamps, and plums) was reduced. Studies by Fathi *et al.* [34] and Filipe Ferreira Costa *et al.* [35], and Ghaffari *et al.* [36] together with this study reported an improvement in snack consumption behavior in students after the educational intervention.

One of the limitations of this study is collecting data through a questionnaire and self-assessment by the subjects. It is suggested that future studies be conducted by direct observation and interview. According to the research results, parents and educational staff related to students, as well as ease of access to healthy food distribution centers at

school, increased the consumption of healthy snacks among students and reduced the consumption of unhealthy snacks among students.

Conclusion

BASNEF model-based educational intervention can increase the student's intention to eat a healthy snack and reduce unhealthy snack consumption by changing their positive attitude and facilitating the situation through enabling factors and involving effective subjective norms such as family, parents, and student-related teaching staff. This improves the snack consumption behavior of students.

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