The effect of education based on the theory of planned behavior to prevent the consumption of fast food in a population of teenagers

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Abstract

Background Considering the increasing prevalence of fast food consumption among teenagers, providing the necessary training and self-awareness is the best solution for institutionalizing the prevention of fast food consumption by this group. Therefore, this issue should be taken seriously, as should the implementation of educational interventions to prevent the consumption of fast food. The theory of planned behavior (TPB) is one of the various health education styles and methods that works well. However, given that a number of local data points are crucial in establishing the efficacy of the model employed, this study looks into the impact of TPB-based education in preventing fast food intake among teenagers.

Methods A total of 180 male students, ages 15 to 18, participated in this quasi-experimental study in Shiraz, Iran. Cluster sampling was used in the study, and participants were randomly assigned to two groups: the experimental group ($n=90$) and the control group ($n=90$). A theory-based questionnaire was used to gather data, and both the control and experimental groups had to complete it before and three months after the intervention. The data were examined using paired t, independent t, and chi-square statistical tests after being entered into SPSS-24.

Results The results of the independent t-test showed that there was no significant difference between the two study groups before the intervention in terms of knowledge ($P=0.14$), attitude ($P=0.57$), subjective norms ($P=0.94$), perceived behavioral control ($P=0.81$), behavioral intention ($P=0.42$), or behavior ($P=0.25$). However, following the intervention, there was a significant difference between the two groups with regard to the noted variables ($P=0.001$). Furthermore, the McNemar test results demonstrated that the experimental group's consumption of fast food varied significantly before and after the intervention ($P=0.001$), but not in the control group ($P=0.07$).

Conclusion The study's findings demonstrated that TPB-based treatments are successful in helping male students change their habits of consuming fewer amounts of fast food. This study demonstrated that the instructional

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techniques employed improved the fast food consumption behavior of the intervention group as well as the TPB's structure (attitude, subjective norms, behavioral intention, and perceived behavioral intention).

Keywords Fast food, Educational intervention, Theory of planned behavior, Adolescents

Introduction

The change in lifestyle has been one of the achievements of modernity that urban society has suffered, and one of the changes in lifestyle is a shift in eating habits [1–3]. A clear example is the prevalence of fast food among families and members of society. Fast foods, products of industrial society, are particularly liked by young people and can become addictive [4]. Due to their fast preparation and availability in most cities, fast foods often lead to frequent consumption. Additionally, word-of-mouth advertisements among teenagers and media influence create a positive attitude towards fast food consumption, leading to reduced self-control and increased consumption [5].

Iran has seen significant changes in food consumption patterns in recent years. Surveys indicate that about 47.4% of urban individuals aged 18 and older consumed fast food in the month before a 2013 census, with some consuming it more than five times a month [6]. Nutritional risk factors related to chronic diseases develop in early childhood and adolescence [7, 8]. Therefore, the eating habits of children and teenagers are crucial as these behaviors can continue throughout life. Adolescence is a golden opportunity to implement effective health interventions [9].

Health promotion programs for teenagers are among the most cost-effective as improving their health guarantees the well-being of current and future generations [10]. This age group is valuable because teenagers are at the best age to learn healthy living skills, forming behaviors that affect health in adulthood [11]. Although adolescents have lower mortality rates compared to younger and older groups, their behaviors significantly impact future disease burdens [12]. Thus, ensuring the best possible health for this group should be a priority for development programs. Most adolescents are students exposed to age-specific risks, and promoting health awareness and positive behaviors can mitigate these risks [13–14].

Educational interventions based on health patterns, such as the Theory of Planned Behavior (TPB), can improve health in this group and prevent fast food consumption. The TPB, proposed by Ajzen and Fishbein, is widely used to determine attitudes and beliefs related to food choices [15]. The TPB's components—attitude, subjective norms, and perceived behavioral control—accurately predict behavior [16]. An individual's intention to perform a behavior is determined by their attitude towards the behavior, their perception of social pressures, and their perceived ease or difficulty in performing the behavior [17].

Studies have shown the effectiveness of the TPB in preventing fast food consumption. Sheikh Ahmadi et al. (2019) found that a TPB-based educational intervention prevented fast food consumption among Iranian high school girls [18]. Shetto et al. (2022) demonstrated the TPB's efficacy in altering Bangladeshi teens' eating habits [19]. This study focuses on male teenagers due to notable gender-specific differences in dietary habits, social pressures, and responsiveness to educational interventions. Understanding these differences is crucial for designing targeted and effective health programs. Additionally, targeting a single gender allows for more controlled and specific insights, helping to identify the unique factors that influence dietary behavior in male teenagers.

There are notable gender-specific differences in dietary habits, social pressures, and responsiveness to educational interventions, especially among male students. Understanding these differences is crucial for designing targeted and effective health programs. Additionally, targeting a single gender allows for more controlled and specific insights. Considering the, extensive change dietary habits worldwide, its consequences on future generations, the need and gap for health education in this field, and the susceptibility of teenagers in consuming fast food, especially male students, the current study examines the impact of a TPB-based educational intervention designed to discourage fast food consumption among male students in Shiraz, Iran, in 2022.

Methods

Study design

This quasi-experimental study was conducted in 2022–23 academic year, from August to May, on a population of boys aged 15–18 years old in their schools in Shiraz City. The sample included first- and second-year boys in Shiraz City who met the inclusion criteria. The inclusion criteria for the age group of 15–18 years old were consent to participate in the study and willingness to participate in subsidized educational classes, and the exclusion criteria were unwillingness to cooperate and participate in the study.

Sample size and sampling

A 10% drop rate, an 80% test power, and a 0.95% confidence level were computed for each group of 90 individuals in order to estimate the sample size, taking into account the average comparison formula in two

communities as well as the findings of the study conducted by Vahdaninia et al. [20]. The formula used for calculating the sample size was the average comparison formula in two communities, using SPSS version 24.

$$n = \frac{2\left(\sigma^2\right)\left(Z_{\frac{\alpha}{2}} + Z_{\beta}\right)}{(\mu 1 - \mu 2)^2}$$

Where:

- n is the sample size per group.
- σ^2 is the population variance.
- $Z_{\alpha/2}$ is the critical value of the normal distribution at α/2.
- Z_{β} is the critical value of the normal distribution at β.
- μ_1 and μ_2 are the expected means of the two groups.

The first stage of sampling involved collecting samples from each of Shiraz City's four districts—North, South, East, and West. As a result, the schools in these four districts were grouped together, and eventually, four schools—one from each district—were chosen at random. In the second phase, 45 children were chosen at random from each school, with two schools serving as the intervention group and two schools as the control group.

Ethical considerations

Ethical approval was obtained from the Human Research Ethics Committee at the Shiraz University of Medical Sciences with the ethical code "IR.SUMS.SCHEANUT. REC.1401.097." Informed consent was obtained from all the participants. For the students involved, informed consent from a parent and/or legal guardian was obtained in the study. All methods were carried out in accordance with the Declaration of Helsinki. There was an emphasis on maintaining privacy by keeping and delivering the information accurately without mentioning the names of the participants. The participants were given the right to leave the interview at any time, and they were promised access to the study results.

Data gathering tools

To collect information from a questionnaire containing personal information of people and a questionnaire made by the researcher based on the TPB and food frequency form. The demographic information questionnaire included demographic characteristics such as age, the occupational and educational status of parents, and whether or not they were living with them.

The elements of knowledge (11 questions in the form of yes/no choices), attitude (10 questions on a Likert scale from completely disagree with a score of 1 to completely agree with a score of 5), subjective norms (4 questions on a Likert scale ranging from completely disagree with a score of 1 to completely agree), perceived behavioral control (4 questions on a Likert scale ranging from completely disagree with a score of 1 to completely agree), behavioral intention (3 questions on a Likert scale from completely disagree point 1 to completely agree point), and behavior (8 questions scored on a Likert scale from completely disagree).

These questions were designed as two options about knowledge (yes or no) and five options (totally agree to totally disagree, scoring from 5 to 1). The range of scores for knowledge was 11–22, attitude 10–50, subjective norm 4–20, perceived behavioral control 4–20, behavioral intention 3–15, and behavior 8–40. A higher average for each component was indicative of a better situation in relation to the habit of avoiding fast food consumption.

Validity and reliability of the tool

At this point, the intended questionnaire's validity was established. The questionnaire's validity was assessed using both quantitative and qualitative methods. Twelve experts (not part of the study team) in the disciplines of epidemiology, doctors, and health education and promotion (8 people) used the questionnaire for the face validity and qualitative portion. Two coefficients of content validity ratio and content validity index were utilized to quantitatively verify the validity of the quantitative portion of the validity.

The board of experts, consisting of 12 experts, calculated the content validity ratio by evaluating the designed questionnaire using three spectrums: "the item is necessary, the item is useful, but "review," it is not necessary, or there is no need." Using the Lawshe table index, each item was found to be larger (0.56 for 12 people), and the questions related to each item were deemed necessary and important for further analysis.

Internal consistency methods were used to measure the reliability of the tool in the present study. In this study, in order to determine the internal correlation of different parts of the tool, the questionnaire was distributed among 30 people who were eligible to enter the study, and after analysis with SPSS version 24 software, the alpha coefficient Cronbach's was determined for the constructs of the asked-proceed model and for the entire questionnaire. Cronbach's alpha was 0.76 for knowledge, 0.86 for attitude, 00.81 for subjective norms, 0.82 for behavioral intention, 0.74 for behavior, and 0.82 for the whole questionnaire.

Food frequency form

The standard food consumption frequency form contains 147 food items, including various food groups (fats, proteins, hydrocarbons, fruits and vegetables, dairy

products, and grains), and the average food consumption in the past year is determined from it. In this study, a nutritionist assisted in creating 12 ready meal (common fast food) items for the questionnaire, using fast food-related columns. These items are prepared from fast food restaurants and include a variety of burgers, hot dogs, sausages, pizzas, pies, and calzones, as well as meat dumplings, fried chicken, fish and mushrooms, fried shrimp, fried potatoes, and various types of doner and fillet steaks. The form includes columns for non-consumption, daily, weekly, monthly, and annual consumption, along with a record of the amount consumed over time. The average consumption share of each food item was determined at the beginning of the column, and the students filled these columns according to the average consumption share. From the analysis of this form, the amount and frequency of consumption of each food were converted into weekly and yearly. The review of food consumption frequency questionnaires identified ready-made foods as "low consumption: less than once a week," "moderate use: 1 to 2 times a week," and "heavy use: more than 2 times a week" on an ordinal scale.

Data collection procedure

Author response: First, a researcher-made questionnaire based on the TPB was handed to the participants to understand their strengths and weaknesses. Then, based on these results, the intervention was designed. The educational intervention ultimately included six sessions, each lasting 50 to 60 min and utilizing three different teaching modalities (lecture, question-and-answer group discussion). The details of the training sessions are presented in Table 1. The data was then completed once more and compared with the pre-educational intervention data three months following the educational intervention. Six in-person sessions lasting between fifty and sixty minutes each conducted the educational intervention over the course of two months, with one training session per week.

Data analysis

The data were first tested for normality using the Kolmogorov-Smirnov test to ensure they met the assumptions for parametric testing. Descriptive statistics, including frequency indices, mean, and standard deviation, were used to summarize the data. The primary analysis involved comparing the experimental and control groups using independent t-tests, chi-square tests, and McNemar's tests.

Independent t-tests were used to compare the means of continuous variables (knowledge, attitude, subjective norms, perceived behavioral control, behavioral intention, and behavior) between the experimental and control groups before and after the intervention. Chi-square

Table 1 The educational intervention program was as follows;

Meeting	Purpose	Topic	Duration	Teaching method	Instructor
1st session	Improving the level of knowledge and attitude towards the complications of fast food consumption	Getting to know the group members with each other Statement of goals Familiarity with all types of fast food; Determining the level of students' knowledge and their attitude towards the complications of fast food	60 min	Speech and question and answer	Nutritionist and researcher
2nd session	Introduction of the TPB and the structure of subjective norms	Helping to identify the right and wrong norms about fast food consumption, strengthening the right norms and eliminating wrong norms	60 min	Lecture, group discussion and question and answer	Psychologist and researcher
3rd session	Teaching based on the model, introducing behavior control and behavior intention	Definition of behavioral intention to prevent fast food consumption, strengthening strategies to encourage behavioral intention, factors that strengthen behavioral intention to prevent fast food consumption	60 min	Educational video and poster	Nutritionist and researcher
4th and 5th session	Education based on the behavior introduction model	Expressing the behaviors of preventing fast food consumption or limiting it to once a week, correcting the deficiencies, strengthening the correct ones.	60 min	Group discussion	Researcher
6th session	Review and summary	Reviewing the previous materials and summarizing and final evaluation	60 min	Speech	Researcher

Table 2 Comparison of frequency distribution of primary variables of study participants according to two groups

Variable		Experimental group (%)	Control group (%)	*P*-value
Age		15.74 ± 2.47	15.90 ± 2.45	0.06**
Mother's education	Elementary or secondary school	8 (8.88)	10 (11.11)	0.84*
	High school diploma	61 (67.79)	64 (71.11)	
	University degree	21 (23.33)	16 (17.77)	
Father's education	Elementary or secondary school	15 (16.66)	20 (22.22)	0.95*
	High school diploma	60 (66.66)	58 (64.44)	
	University degree	15 (16.66)	12 (13.33)	
Mother's occupation	Housewife	15 (16.66)	12 (13.33)	0.97*
	Employee or self-employed	75 (83.33)	78 (86.66)	
Father's occupation	Employee	18 (20)	12 (13.33)	0.74*
	Self-employed	68 (75.55)	75 (83.33)	
	Unemployed	4 (4.44)	3 (3.33)	
Living with	Mother and father	78 (86.66)	85 (94.44)	0.27*
	Father	1 (1.11)	0	
	Mother	9 (10)	4 (4.44)	
	Acquaintances	2 (2.22)	1 (1.11)	

* Chi-square test

** Independent t-test

Table 3 Comparison of TPB constructs before and after the intervention in the two studied groups

Variable	Before intervention		*P*-value*	After intervention		*P*-value*
	Experimental	Control		Experimental	Control	
	M ± SD	M ± SD		M ± SD	M ± SD	
Knowledge	13.15 ± 2.41	12.15 ± 2.41	0.14	17.21 ± 2.22	11.21 ± 2.22	0.001
Attitude	27.81 ± 6.71	27.16 ± 6.71	0.57	37.51 ± 3.25	26.51 ± 3.25	0.001
Subjective norms	11.03 ± 3.25	11.21 ± 3.25	0.94	15.19 ± 4.47	11.09 ± 3.47	0.001
Perceived behavioral control	12.65 ± 2.61	12.06 ± 2.24	0.81	15.16 ± 2.21	12.87 ± 2.01	0.001
Behavioral intention	8.12 ± 4.65	8.67 ± 4.65	0.42	11.25 ± 4.61	9.01 ± 3.61	0.001
Behavior	18.12 ± 4.29	18.12 ± 2.29	0.25	24.25 ± 5.61	18.25 ± 4.07	0.001

*Independent t-test

tests were employed to analyze categorical variables (for demographic characteristics such as parents' occupation and education status, and living with parents).

The McNemar test was used to examine changes in fast food consumption within each group before and after the intervention. Additionally, covariates were considered in the final analysis to control for potential confounding factors. These covariates included age, parents' educational status, and parents' occupational status. Analysis of covariance (ANCOVA) was performed to adjust for these covariates, ensuring that the observed effects of the intervention were not influenced by these variables. All statistical analyses were performed using SPSS version 24, and a significance level of 0.05 was used for all tests.

Results

Table 2 displays the demographic data of the participants. The chi-square test revealed no statistically significant difference between the experimental and control groups on the occupations of the mother (*P*=0.97), father (*P*=0.74), mother (*P*=0.84), and father (*P*=0.95), as well as living with parents (*P*=0.27). Table 2 shows that the

t-test did not reveal a statistically significant difference in age between the experimental and control groups (*P*=0.06).

Behavioral intention (*P*=0.42) and behavior (*P*=0.25) did not differ significantly between the two study groups prior to the intervention, according to the results of the independent t-test. However, following the intervention, there was a significant difference between the two groups regarding knowledge, attitude, subjective norm, perceived behavioral control, behavioral intention, and behavior (*P*=0.001) (Table 3).

The findings of the McNemar test indicated that there was no significant difference between the experimental group's pre- and post-intervention fast food consumption (*P*=0.07) and the control group's pre- and post-intervention educational intervention (*P*=0.001) (Table 4).

Discussion

The present study was conducted on 180 first- and second-year high school boys in Shiraz to determine the effect of education based on the TPB on the reduction of fast food consumption. In the present study, education

Table 4 Comparison of fast food consumption before and after the intervention in the experimental and control groups

Variable		Before intervention		After intervention		P-value*
		Number	%	Number	%	
Experimental group	Consuming fast food	80	88.88	34	37.77	0.001
	Not consuming fast food	10	11.11	56	62.22	
Control group	Consuming fast food	75	83.33	70	77.77	0.07
	Not consuming fast food	15	16.66	20	22.22	

*McNemar

led to a decrease in fast food consumption in the experimental group compared to the control group. In this study, the amount of fast food consumption in students was calculated by food frequency, and giving training to the intervention group, in addition to identifying the types of foods classified in the fast food group, also led to a reduction in the consumption of these foods, which can be related to the educational intervention to some extent. Education has a significant impact on the students' learnability, especially at this age when they are seeking validation and understanding correct patterns. Therefore, we can conclude that education can enhance this group's attitude, indicating that interventions aimed at teenagers should prioritize their needs. This finding is consistent with the study of Davis et al. (2023) [21], the study of Sajjad et al. (2023) [22], and the study of Teshome et al. (2023) [23].

In this study, after the education, we witnessed an increase in knowledge in the experimental group compared to the control group. Training based on the TPB for two months has likely been a key factor in improving knowledge. Similarly, participating in this program likely enhances students' knowledge and skills, enabling them to comprehend the issues associated with fast food consumption and develop strategies to manage and avoid it. This finding is in line with the results of the studies of Martínez-Rodríguez et al. (2023) [24], Yao et al. (2023) [25], Jena et al. (2023) [26], and the study of Hlophe et al. (2023) [27].

In this study, the experimental group's attitude significantly improved following the intervention when compared to the control group. The given training may have contributed to the experimental group's increased attitude. In general, the TPB is a cognitive model that evaluates how people respond to a health-threatening factor, resulting in an increase in their attitude. In the current study, teaching students resulted in an improvement in their attitude towards fast food consumption. This finding was consistent with the results of studies by Femyliati et al. (2023) [28]. In this study, the researcher stated that the presence of certain foods on the menu can lead to temptation and encourage individuals to choose them. However, this can be mitigated by providing education and encouraging individuals to avoid certain foods [28]. In addition, the studies conducted by Satria et al. (2023)

[29] and Kavanagh et al. (2023) [30] were consistent with the results of the present study.

Following the intervention, we found that the experimental group's subjective norms were higher than those of the control group. The subjective norms appear to have increased as a result of the educational intervention and the application of TPB tactics in the classroom. The reasons for the effect of education on the increase of subjective norms can be attributed to the impressionability of the students in the teenage years. The attractiveness of the materials presented to the students indicated that the educational program improved their attitudes by identifying positive norms about fast food, which in turn led to a decrease in their fast food consumption. This finding is in line with the results of Lavelle et al.'s (2023) studies [31], Liu et al.'s [32], and İnci et al.'s (2023) studies [33].

In this investigation, following the educational program, the model-based educational intervention resulted in a significant increase in behavioral intention and behavior of the experimental group compared to the control group. The type of educational intervention could potentially account for the observed increase in average behavior and behavioral intention. On the other hand, given that the study's participants were teenagers who dedicate a significant amount of time to their education, it's understandable that they engaged in the training sessions and applied the acquired knowledge to enhance their behavior. This finding is consistent with the results of Osei et al. (2023) [34], Mast et al.'s study (2023) [35], and Slater et al.'s study (2023) [36].

Finally, it's important to note that children and teenagers with various problems currently have access to a variety of treatment approaches and programs. Most of these interventions include individual counseling, family therapy, and group therapy. Adolescent self-education stands out among these treatments due to its significant contribution to the social, emotional, interpersonal, economic, and cultural dimensions of many disorders. Adolescent therapy experimental studies have demonstrated the effectiveness of this approach in treating eating problems, anxiety issues, hyperactivity, reducing fast food consumption, and other daily problems in children and adolescents, suggesting a focus on addressing these issues directly.

Conclusion

The study's findings demonstrated that TPB-based treatments are successful in helping male students change their habits of consuming fewer amounts of fast food. This study demonstrated how the application of instructional methodologies improved the TPB's structures (attitude, subjective norms, behavioral intention, and regulated behavioral intention), as well as the intervention group's fast consumption habits. The findings of this study may be helpful to students and their families. Organizations involved in education, education-related institutions, schools, universities, healthcare facilities, and nutrition clinics may also use these findings to plan and develop interventions aimed at preventing students from consuming fast food.

Author contributions
TR, SA, SMK, ZS, AK and AKHJ assisted in conceptualization and design of the study, oversaw data collection, conducted data analysis and drafted the manuscript. AKHJ and SA conceptualized and designed the study, assisted in data analysis and reviewed the manuscript. TR, SA, SMK, ZS, AK and AKHJ assisted in study conceptualization and reviewed the manuscript. All authors read and approved the final manuscript.

Data availability
The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.Competing interests.

Declarations

Consent for publication
Not Applicable.

Competing interests
The authors declare no competing interests.

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References
1. Ufholz K, Werner JJ. Social and Demographic Correlates of Fast Food Consumption: a review of recent findings in the United States and Worldwide. Curr Cardiovasc Risk Rep. 2023;11:1–1.
2. Jahangir A, Jabeen M, Rufarakh A, Zia K. Relationship between Teenager's junk food obsession and body image. Lighthouse J Social Sci. 2023;2(2):1–11.
3. Arslan N, Aslan Ceylan J, Hatipoğlu A. The relationship of fast food consumption with sociodemographic factors, body mass index and dietary habits among university students. Nutr Food Sci. 2023;53(1):112–23.
4. Parvin S, Kabir R, Parsa AD, Sivasubramanian M. An investigation into the Fast-Food Consumption Habits of Public Health and Nursing Students at the University of Sunderland in London, UK. Volume 15. Libyan International Medical University Journal; 2023.
5. Jaganathan R, Sugathan S, Ravindran R, Rosli N, Azmi NA, Ibrahim NB, Zaini MZ, Kamaruddin MK. Fast Food Consumption among High School Students in Ipoh. Malaysian J Med Health Sci. 2023;19.
6. Central Bank of Iran (General management of economicstatistics). Results of household budget survey in urban Area s of Iran for year 2015. Tehran: Central Bank of the Islamic Republic of Iran; 2016 [Cited 2019, 12 May]. https://www.cbi.ir/simplelist/1600.aspx
7. Abrahamsson SS, Bütikofer A, Karbownik K. Swallow this: Childhood and adolescent exposure to Fast Food Restaurants, BMI, and cognitive ability. National Bureau of Economic Research; 2023, 15.
8. da Silva NR, de Camargo MB, Dos Vaz JS, Correa MB, Matijasevich A, da Silva dos Santos I, Cascaes AM. Ultra-processed food consumption and dental caries in adolescents from the 2004 Pelotas Birth Cohort study. Commun Dent Oral Epidemiol. 2023.
9. Abd Razak NF, Ismail LM, Tukiran NA, Ahmad NA. Awareness level on fast food selection factors among catering students. Online J TVET Practitioners. 2023;8(1):99–106.
10. Askari Majdabadi H, Montazeri A, Khalajabadi Farahani F, Nedjat S, Solhi M. Exploration of factors promoting and inhibiting fast food consumption among adolescents. J Qualitative Res Health Sci. 2020;8(3):233–46.
11. Mahmoodabad SS, Asadpoor M, Lotfabad MM. Predictors of fast-food consumption based on the Prototype/Willingness Model in Students of Public Health School, Rafsanjan City, Iran. J Tolooebehdasht. 2019 Nov 25.
12. saeidi A, Jalilian M, mahaki B. Effectiveness of educational program based on transtheoretical model on physical activity stage of change in high school students of sharableh city. J Title 2022;5(1).
13. khani F, Sadeghian HA, ghaneian M T, Mirhosseini SA, jambarsang S. The correlation of Green School indicators with Life Quality of life of female students in First Level of High Schools in Yazd City in 2021 – 2020. TB. 2023;21(5):80–94.
14. adabi L, barakat G, Bahmaei L. Providing a model for improving the quality of education in high schools in Ahvaz City using the grounded method. TB. 2023;21(5):106–23.
15. Didarloo A, Khalili S, Aghapour AA, Moghaddam-Tabrizi F, Mousavi SM. Determining intention, fast food consumption and their related factors among university students by using a behavior change theory. BMC Public Health. 2022;22(1):314.
16. Khani Jeihooni A, Layeghiasl M, Yari A, Rakhshani T. The effect of educational intervention based on the theory of planned behavior on improving physical and nutrition status of obese and overweight women. BMC Womens Health. 2022;22(1):13.
17. Archila-Godínez JC, Chen H, Klinestiver L, Rosa L, Barrett T, Henley SC, Feng Y. An evaluation of a virtual food safety program for low-income families: applying the theory of planned behavior. Foods. 2022;11(3):355.
18. Shaikh-Ahmadi SS, Bahmani A, Teymouri P, Gheibi F. Effect of education based on the theory of planned behavior on the use of fast foods in students of girls' vocational schools. J Educ Community Health. 2019;6(3):153–9.
19. Shetu SN. Application of theory of planned behavior (TPB) on fast-food consumption preferences among generation Z in Dhaka City, Bangladesh: an empirical study. J Foodserv Bus Res 2022:1–36.
20. Vahdaninia V, Vahdaninia Z, Baghernezhad Baghernezhad Hesary F. The Effect of Education on Fast Food Consumption Behavior in Primary School students in Birjand. MCS. 2020;7(2):149–58.
21. Davis B, Pechmann C. When students patronize fast-food restaurants near School: the effects of Identification with the Student Community, Social Activity spaces and Social Liability interventions. Int J Environ Res Public Health. 2023;20(5):4511.
22. Sajjad M, Bhatti A, Hill B, Al-Omari B. Using the theory of planned behavior to predict factors influencing fast-food consumption among college students. BMC Public Health. 2023;23(1):987.
23. Teshome GB, Haileslassie HA, Shand P, Lin Y, Lieffers JR, Henry C. Pulse-Based Nutrition Education Intervention among High School students to Enhance Knowledge, attitudes, and practices: pilot for a formative survey study. JMIR Formative Res. 2023;7:e45908.

24. Martínez-Rodríguez A, Vidal-Martínez L, Martínez-Olcina M, Miralles-Amorós L, Sánchez-Sáez JA, Ramos-Campo DJ, Sánchez-Sánchez J, Martínez-Amorós N, Cheikh-Moussa K, Asencio-Mas N, Andreu-Caravaca L. Study the Effect of an Innovative Educational Program Promoting Healthy Food Habits on Eating Disorders, Mediterranean Diet Adherence and Body Composition in University Students. InHealthcare 2023;11(7);965. MDPI.

25. Yao L. Investigation of the Association between Adolescents' Attitudes and Food Preferences with Their Eating Behaviors: Inspiration from the FLASHE Study (Doctoral dissertation, Duke University).

26. Jena S, Parida J, Panda A, Behera SS, Pradhan A, Patra PK, Pati S, Kaur H, Acharya SK. Knowledge, practices and influencing factors defining unhealthy food behavior among adolescents in India: a scoping review. Front Psychol. 2023;14:1161319.

27. Hlophe N. The association between nutrition education and knowledge of food high in added sugar, salt, and saturated fat in college students.

28. Femyliati R, Fikri AM, Andriani E. The Effect of Nutrition Education through social media on Nutritional Knowledge and Menu Selection in Food Delivery Application. Amerta Nutr. 2023;7(2).

29. Satria RD, Nandiyanto AB. Education of dietary habit and drinking water quality to increase body immunity for elementary school. ASEAN J Agric Food Eng. 2023;2(1):25–32.

30. Kavanagh R, Wujiw G, Keaver L. a Systematic Literature Review of Interventions Aimed to Improve Dietary Intake and/or Nutrition Knowledge in Higher Education Students.

31. Lavelle MA, Knopp M, Gunther CW, Hopkins LC. Youth and peer Mentor Led interventions to improve Biometric-, Nutrition, Physical Activity, and psychosocial-related outcomes in children and adolescents: a systematic review. Nutrients. 2023;15(12):2658.

32. Liu KS, Chen JY, Sun KS, Tsang JP, Ip P, Lam CL. Family facilitators of, barriers to and strategies for healthy eating among Chinese adolescents: qualitative interviews with parent–adolescent dyads. Nutrients. 2023;15(3):651.

33. İnci FH, Kartal A, Çınar İÖ, Koştu N, Aslan GK. The Effect of Cox's Interaction Model-based Nutrition Education Program on Health Perception, Dietary Self-Efficacy, Dietary Pattern, and Diet behaviors of Children. Ethiop J Health Dev. 2023;37(1).

34. Osei AN, Djekic-Ivankovic M, Larson CP, Agbemafle I, Agbozo F, Protocol. Effect of school-based nutrition interventions among primary school children in sub-saharan Africa: a systematic review protocol. BMJ Open. 2023;13(4).

35. Mast A, Peña A, Bolch CA, Shaibi G, Vander Wyst KB. Sex differences in response to lifestyle intervention among children and adolescents: systematic review and meta-analysis. Obesity. 2023;31(3):665–92.

36. Slater J, Pilli B, Hinds A, Katz A, Urquia ML, Sanguins J, Green C, Cidro J, Chateau D, Nickel N. Food behaviours and Health Indicators in Manitoba adolescents and Relation to the healthy eating index. Int J Environ Res Public Health. 2023;20(3):2007.

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