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Development and Psychometric Properties of a Tool Related to the Adoption of Desirable Behaviors in the Consumption of Sugar-Sweetened Beverages in Children Based on the Social Cognitive Theory

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Abstract:

Background: Consumption of sugar-sweetened beverages is associated with chronic diseases such as diabetes and cardiovascular disorders and other severe negative health consequences and is one of the challenging issues in the field of nutrition in today's societies. This study was conducted with the aim of designing a psychometric questionnaire in relation to the consumption behavior of sugar-sweetened drinks in children.

Methods: In this cross-sectional research, 607 students were selected and included in the study by multi-stage cluster sampling from the first-year secondary schools covered by the Urmia Department of Education. Waltz's method was used to design the questionnaire, and based on a targeted review of the literature and questionnaires related to nutrition behavior, an initial questionnaire with 51 items was designed. After confirming the face and content validity of the questionnaire by 15 members of the expert panel, construct validity steps were performed using exploratory factor analysis. Finally, the internal reliability of the questionnaire was determined by calculating Cronbach's alpha.

Results: The first version of the questionnaire was designed with 51 items and all the items were retained in the psychometric process during content validity. The content validity index and ratio were calculated to be higher than 0.79 and 0.6, respectively. Based on the exploratory factor analysis, the number of items in the questionnaire remained at 51, and the dimensions of the questionnaire were categorized into 6 factors: perceived barriers, self-efficacy, self-regulation, social support, preventive behaviors, and reinforcing behaviors, with a predictive power of 56,261 and in repeating the exploratory factor analysis for items with a different nature from other factors, 3 separate factors were identified: the physical health dimension of outcome expectations, negative outcome expectations, and positive outcome expectations with a predictive power of 54.667. The internal reliability of the questionnaire items was accepted and confirmed with Cronbach's alpha coefficient above 0.70.

Conclusion: The final questionnaire with 51 items has the ability to be used by various researchers due to the strength of the factorial structure and suitable psychometric properties.

Keywords: Psychometrics, Consumption of sugar-sweetened beverages, Questionnaire, Students.

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1. INTRODUCTION

Consumption of sugary drinks has increased dramatically over the past decades and has become a health problem among children and adolescents around the world [1, 2]. Sugar-sweetened beverages include beverages with minimal nutritional value, such as carbonated and processed carbonated beverages, sports drinks, energy drinks, coffee, sweet tea, fruit drinks, and sweetened water. Sugar-sweetened beverages are also a major source of added sugar to children's diets [3, 4]. During the day, 80% of adolescents and 63% of adults consume these drinks at least once a day [5]. Sugar-sweetened beverages provide about 203 kcal of energy received during the day from the diet, which is equivalent to 9% of the energy a person needs during the day [6]. These figures are too much for the energy intake of free sugar, according to the World Health Organization, which should include less than 5% of the body's total energy intake [7]. Research shows that consuming beverages is not as satisfying as comprehensive foods and does not change the energy intake of other meals, which leads to a higher total energy intake [8, 9]. Researchers evaluating the burden of diseases associated with the consumption of sugary drinks have stated that 8.5 million years of life lost as a result of premature or expired death with disability and 184,000 deaths worldwide are the result of the consumption of these drinks, most of which often occurs in low- and middle-income countries with a significant mortality rate [10]. People who drink more than 2 cups a day of sugary drinks have an average 21% increased risk of death, 31% risk of death from cardiovascular disease and 16% % from cancer compared to consumers of less than one cup per month of sweetened beverages [11]. Consumption of sugary drinks is also associated with increased adverse health consequences such as poor nutritional intake and increased risk of tooth decay, weight gain, type 2 diabetes, kidney disease, liver disease and other adverse medical and psychological consequences [12-15]. The average consumption of beverages sweetened with sugar in Iranian children is estimated to be 38.5 ± 75ml per day [16]. This amount of consumption of sweet drinks by children in western and northwestern cities of Iran has been reported daily at 3.87 glasses [17] and 2.95 glasses [18]. Several studies have attempted to elucidate the factors influencing the consumption of sugary drinks in children. It is a factor of family behaviors that has shown a positive correlation with the consumption of these drinks by parents and children [19-22]. This correlation indicates the structure of observational learning in social cognition theory [23]. Another factor influencing the consumption of sugary drinks with sugar is behavioral facilitators, which is one of the structures of social cognition theory [23, 24]. It seems that environmental conditions in which sugary drinks are available and consumed more at home facilitate the consumption of these drinks [25]. Eating place is another environmental condition that promotes the consumption of sugary drinks; for example, as the frequency of eating out increases, so does the consumption of sugary drinks [26]. In order to develop effective strategies to reduce the consumption of sugar-sweetened beverages in adolescents, systematic identification of the determinants of sugar-sweetened beverage consumption is needed [27]. These determinants may be demographic variables (*e.g.*, education, socioeconomic status), environmental (*e.g.*, availability of sugary drinks, and psychological (*e.g.*, attitudes, beliefs, motivation). Therefore, researchers have turned to behavioral theories to guide research in identifying these determinants of sugar-sweetened beverage consumption and, most importantly, identifying the processes by which these factors interact and behave. The fact is that they are able to identify important determinants of behavior and, with adequate research on the population and behavior of interest, create important goals for interventions aimed at influencing behavior [28]. One of these theories is social cognitive theory, which is used to improve diet in young people [29]. Albert Bandura's social cognitive theory, while expressing predictors and effective principles in the formation of behavior, knowledge structures, outcome expectations, outcome values, self-efficacy, social support, self-regulation and situational perception as the most important determinants and patterns iIntroduces the design of educational interventions [30]. Also, many perceived barriers at the individual, social and environmental levels to the proper management of the consumption of these drinks have been mentioned, which need attention and solutions [31]. Evaluating educational interventions using the above theory requires the use of a valid tool based on indigenous culture that is appropriate to the demographic characteristics and social values of the target population. This article is part of an extensive study on training to prevent excessive consumption behaviors. Considering that the educational intervention of this research is based on the structures of social cognitive theory, the basic variables discussed in this research are the same structures and concepts of the mentioned model that have been presented by the designers of that model. In order to gather information and measure each of the theoretical variables, it is natural that the research team needed the necessary tools to achieve this goal. However, a tool with the mentioned characteristics and in accordance with the characteristics of the target population has not been designed before in Iran. Therefore, the main purpose of this study is to design a native tool appropriate to cultural and social characteristics and with appropriate validity and reliability to measure the structures of social cognitive theory in the field of preventing behaviors from consuming sugary drinks in students.

2. METHODS

The current cross-sectional psychometric study was conducted with the aim of evaluating the framework of social cognitive theory in order to provide a valid, reliable and appropriate tool to analyze the behavior of sugar-sweetened beverages using the path analysis method in the adolescents of Urmia city in 2020. The research population includes male and female students (13 to 15

years old) covered by the schools of the 1st and 2nd districts of Urmia. Sampling was a multi-stage cluster, in such a way that the list of first Junior high schools was extracted from the first and second education districts of Urmia city, and 12 schools were randomly selected from each district (24 schools in total) using the cluster sampling method. Then, according to the number of students studying in three levels: the first, second and third grades of the first Junior high school of those schools, the students were selected and entered the study in a simple random manner with equal chance to enter the study.

The criteria for entering the samples into the study are: 1- Submission of a written consent letter from the students' parents and school principals for the students' participation in study 2- Not suffering from metabolic diseases that require a special diet. The exclusion criteria are those who gave incomplete answers to the questions or were not willing to continue the study for any reason.

In this study, the sample size was considered to be 607 people according to the number of items in the questionnaire (51) and to ensure the adequacy of the studied sample, the Kaiser-Meyer-Olkin (KMO) test was performed [32].

Questionnaire designing steps: In this study, questionnaire design and psychometrics were carried out according to Waltz's method [33] and in 4 steps: 1- Defining the concept of sugar-sweetened beverages by reviewing books and articles 2- Designing questionnaire items using sources available in Iran and Other countries. 3- Determining the validity of the questionnaire. 4- Determining the reliability of the questionnaire.

The first stage: In this concept, sugar-sweetened beverages and environmental, behavioral, and psychological factors of the consumption of beverages in the individual were obtained. In order to achieve a theoretical definition of the desired concept and to identify the effective factors in the consumption of sugar-sweetened beverages from the point of view of experts, as well as to review related scientific texts [34-39] using various databases such as Google Scholar, Proquest, Pub Med, ISI Web of Sciences, Scopus, Sciencedirect, and related books were used. Search in English using the keywords; sugar-sweetened beverages, preventive factors, social cognitive theory, nutrition, children, *etc*.

Second stage: In this stage, questions related to the questionnaire were designed based on the existing questionnaires related to the topic of the present study, including the questionnaire related to sugar-sweetened beverages and nutrition in relation to social cognitive theory. The initial version of the questionnaire included 51 items.

Third step: After preparing the questions, two methods of face validity and content validity and construct validity were used to check and determine the validity of the items. To determine the validity of the questionnaire, the face validity method (qualitative and quantitative), the content validity method (Qualitative and quantitative method) and the construct validity method (Factor analysis) were used. In the qualitative face validity, a panel of 15 experienced experts, including health education specialists (7 people), epidemiologicists (3 people), nutritionists (3 people) and specialists in preventive and social medicine (2 people) was included to find the level of difficulty, the degree of inadequacy, and ambiguity in expressions and word meanings. It was done and their points of view were included in the form of minor changes in the questionnaire. In quantitative face validity for each of the 51 primary questions, a five-point Likert scale; Scores 1 (not important), 2 (little importance), 3 (moderate importance), 4 (relatively important) and 5 (important) were prepared and given to 20 students of the target group. Then, using the formula, the effect of the face validity item was calculated according to the following formula.

(Item Impact Score=Frequency (%)×Importance)

"Frequency" in the formula was the number of patients who rated the item 4 or 5, while "Importance" was the mean score of the item on the 1–5 rating scale. If the impact score is equal to or more than 1.5, the item is considered suitable for further analysis.

To quantitatively evaluate content validity and to ensure that the most important and correct content is selected, the content validity ratio (CVR) was used, and to ensure that the instrument questions were designed in the best way to measure the content, the content validity index was used. To quantitatively evaluate content validity and to ensure that the most important and correct content is selected, the content validity ratio (CVR) was used, and to ensure that the instrument questions were designed in the best way to measure the content, the content validity index was used. In order to perform the content validity ratio, the 15 members of the above-mentioned expert panel were asked to assign one of the three options "not necessary", "useful but not necessary", or "necessary" to each questionnaire item. CVR was accepted using the following formula and values higher than 0.49 based on the table (Lawshe). Formula 1. The method used to calculate the quantitative Content Validity Ratio

$$\mathrm{CVR}=\frac{(\mathrm{ne}-\mathrm{n}/2)}{\mathrm{n}/2}$$

n=The total number of experts

ne =The number of experts who have checked option 3"necessary"

In order to calculate the CVI of the questionnaire, the 15 members of the expert panel were asked to rate the three criteria of "relevance", "simplicity" and " clarity" for each of the 51 questions based on a four-part Likert scale (for example, 1: not relevant, 2: somewhat relevant) to express their opinion. Related, 3: related and 4: completely related) comment. For this purpose, the CVI score was calculated by the sum of the agreeable scores for each item that scored 3rd and 4th (the highest score) on the total number of voters. In this study, it was calculated using the Content Validity Index (CVI) formula.

Acceptance of items based on CVI score was higher than 0.79.

Formula 2. The method used to calculate the quantitative Content Validity Index

$$CVI = \frac{\Sigma_N^1 CVR}{retained\ number}$$

In order to determine the validity of the construct, exploratory factor analysis was used. Exploratory factor analysis was performed using Principal Component Analysis and Varimax rotation.

Before performing the analysis of factors, the following hypotheses were observed: 1- KMO sampling adequacy index should be at least 0.6. 2- The result of Bartlett's test is statistically significant. 3- The factor load of each question in the factor matrix and the rotated matrix should be at least 0.3. 4- Each factor belongs to more than one question. 5- Each of the factors should have sufficient credibility.

Fourth step: In this step, in order to determine the reliability of the questions, the internal reliability of the tool was examined. Cronbach's alpha was used to determine the internal consistency of the questionnaire. Data was analysed using spss software version 25.

3. RESULT

The results of quantitative face validity (Impact score) showed that out of a total of 51 questions, all questions had a score higher than 1.5.; therefore, all questions were saved. The results of the content validity index (CVI) showed that all the questions of the measurement tool had a score higher than 0.79 and, therefore, were recognized as appropriate and retained. The results of the content validity ratio (CVR) showed that the values obtained for all the questions were greater than the value of the Laushe table (0.49) and all the designed questions remained (Table **1**).

Table 1. The content validity of the questionnaire by the content validity ratio and the content validity index.

Items	Question	CVI	CVR
I expect that by reducing the consumption of sugar-sweetened beverages:			
Q1	I will have to spend a lot of time to find a healthy drink.	1	1
Q2	I will not be overweight and obese.	0/86	0/86
Q3	I will have healthier teeth.	1	1
Q4	I will be less likely to get cancer and cardiovascular diseases.	1	0/86
Q5	I will have a fit body and an attractive appearance.	0/93	0/86
Q6	I will have a long life.	1	1
Q7	I will have more energy.	0/93	0/86
Q8	I will get useful nutrients for my body.	1	1
Q9	I will feel healthy and refreshed.	0/86	0/73
Q10	I will have to change my favorite foods.	0/93	0/86
Q11	The food I eat will not taste good.	0/93	0/73
Q12	My friends will not want to eat with me.	1	0/86
Q 13	I can set a goal for my healthy eating and make a plan to achieve it	1	0/86
Q 14	I know how to evaluate the amount of consumption of various drinks	0/93	0/73
Q 15	I enjoy tracking my eating pattern.	1	0/73
Q 16	I enjoy choosing healthy drinks that are good for my health.	1	1
Q 17	I am able to make good decisions about what I eat.	1	1
Q 18	I am able to make changes in my unhealthy eating habits	1	0/86
Q 19	I am able to choose healthy drinks with low energy density from unhealthy drinks with high energy density.	0/93	0/73
Q 20	When I have a goal for healthy eating, I can follow the principles to achieve that goal.	1	0/86
Q 21	Reminding yourself that drinking enough water is very important for good health.	1	0/86
Q 22	I avoid going to restaurants and fast foods that serve sugary drinks with high energy density.	1	0/73
Q 23	I can reduce the amount of sugar-sweetened beverages to once a day.	1	1
Q 24	I am confident in my ability to choose healthy drinks over unhealthy ones.	1	1
Q 25	I can resist the urge of my friends to consume sweetened drinks when I want to eat with friends.	0/93	0/73
Q 26	I'm sure I can encourage myself to drink water and sugar-free drinks.	0/93	0/86
Q 27	I can influence my parents' decisions to buy healthy drinks for consumption at home.	1	1
Q 28	It is easy for me to resist the consumption of soft drinks and sugary drinks despite their availability in stores and at school.	1	0/86
Q 29	The cheap price and large size of sugary drinks can't tempt me to consume them.	1	0/73
Q 30	It is easy for me to choose a healthy and sugar-free drink in the school store and stores near the school.	1	1
Q 31	My family and friends avoid drinking soft drinks and sugar-sweetened beverages.	0/93	0/86
Q 32	My family and friends try to drink about 6-8 glasses of water or healthy, sugar-free drinks every day	1	1
Q 33	My family and friends have told me that they plan to cut back on energy drinks and sugar-sweetened beverages.	0/93	1
Q 34	I have friends who help me replace sugary drinks with water and sugar-free drinks.	0/93	0/73

(Table 1) contd.....

Items	Question	CVI	CVR
Q 35	My family's advice makes me use water instead of sugary drinks.	0/86	0/86
Q 36	The recommendations of my teachers make me use water instead of sugary drinks.	0/93	0/86
I can't cut back on sugar-sweetened beverages for the following reasons:			
Q 37	I have easy access to it at school.	1	0/86
Q 38	sugar-sweetened beverages are the most common drinks available in the home refrigerator.	0/93	0/86
Q 39	Sugar-sweetened beverages are served with most meals at home.	1	1
Q 40	I don't know which drinks are healthy and suitable to replace sweetened drinks.	1	0/86
Q 41	Healthier drinks don't have the right and attractive taste.	0/93	1
Q 42	I don't like the taste of milk and water as a substitute for sweet drinks.	1	1
Q 43	Sweet drinks quickly reduce my feeling of hunger.	1	1
Q 44	I don't have knowledge about which drinks are suitable and low in sugar.	0/86	0/73
Q 45	I don't like the taste of sugar-free drinks.	1	1
Q 46	I tried to replace the consumption of sweet drinks with healthy drinks such as milk and low-calorie drinks.	1	1
Q 47	I have encouraged people with high consumption of sugary drinks to reduce their consumption.	0/86	0/73
Q 48	During the last month, I have answered “no” to the compliments of friends to consume sweetened drinks.	0/93	0/86
Q 49	I have taken steps to get more information about the excessive consumption of sugary drinks and its harms.	1	0/6
Q 50	I have avoided being in environments that serve sweet drinks, such as fast food.	0/93	0/73
Q 51	Until now, when a person next to me consumes a sweetened drink, I have mentioned the side effects of consuming these drinks to him.	1	0/86

Table 2. KMO and bartlett's test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.964
Bartlett’s Test of Sphericity	Approx. Chi-Square	**12118.311**
df		**741**
Sig.		**0**

Table 3. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	15.164	38.881	38.881	15.164	38.881	38.881	4.646	11.913	11.913
2	1.837	4.710	43.591	1.837	4.710	43.591	4.628	11.867	23.780
3	1.566	4.016	47.607	1.566	4.016	47.607	4.383	11.239	35.019
4	1.203	3.084	50.691	1.203	3.084	50.691	3.349	8.588	43.607
5	1.145	2.937	53.628	1.145	2.937	53.628	2.683	6.881	50.488
6	1.027	2.634	56.261	1.027	2.634	56.261	2.252	5.773	56.261

The results of exploratory factor analysis show that the KMO index of 0.964 indicates a sufficient sample size to perform factor analysis. Also, Bartlett's test of sphericity shows the appropriateness of factor analysis to identify the structure of the factor model at the level (P<0.001) and indicates discoverable relationships between the variables that were subjected to factor analysis (Table **2**). Another part of the results of the exploratory factor analysis included the initial eigenvalues, the eigenvalues of extractive factors without rotation and the eigenvalues of extractive factors with rotation (Table **3**). In this study, by setting the criterion of eigenvalues greater than 1, six factors with a predictive power of 56,261 were extracted and selected from the changes in the total factors of consumption of sugar-sweetened beverages.

Based on the results of factor analysis with varimax rotation, 6 components were extracted (Tables **3** and **4**). The first component with an eigenvalue of 15.164 included 9 items whose factor loading varied from a minimum of -0.466 to a maximum of -0.686. The second component, with an eigenvalue of 1.837, included 8 items whose factor loading varied from a minimum of 0.570 to a maximum of 0.646; and the third component, with an eigenvalue of 1.566, included 10 items with a factor load between 0.411 and 0.615 fluctuated; the fourth component with an eigenvalue of 1.203, included 6 items with a factor load between 0.452 and 0.688.

The fifth component fluctuated with an eigenvalue of 1.145 and 3 items with a minimum factor load of 0.761 and a maximum of 0.788. The sixth component fluctuated with an eigenvalue of 1.027 and 3 items with a minimum factor load of 0.528 and a maximum of 0.866. Therefore,

based on the results of the exploratory factor analysis conducted on 39 items, all items were confirmed and the factors affecting the consumption of sugar-sweetened beverages were included in 6 components. The first component with 9 items under the title of perceived obstacles, the second component with 8 items under the title of self-efficacy, the third component with 10 items under the title of self-regulation, the fourth component with 6 items under the title of social support, the fifth component with 3 items under the title of preventive behaviors and the sixth component with 3 items under the title of reinforcing behaviors were placed.

Table 4. Results of exploratory factor analysis of the subjects.

Component Name	Itmes	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Perceived barriers	**41**	-0.686	-	-	-	-	-
	39	-0.627	-	-	-	-	-
	43	-0.614	-	-	-	-	-
	45	-0.605	-	-	-	-	-
	40	-0.594	-	-	-	-	-
	42	-0.569	-	-	-	-	-
	38	-0.537	-	-	-	-	-
	37	-0.508	-	-	-	-	-
	44	-0.466	-	-	-	-	-
self-efficacy	**29**	-	0.646	-	-	-	-
	23	-	0.614	-	-	-	-
	28	-	0.612	-	-	-	-
	30	-	0.600	-	-	-	-
	27	-	0.576	-	-	-	-
	24	-	0.570	-	-	-	-
	25	-	0.563	-	-	-	-
	26	-	0.547	-	-	-	-
self regulation	**13**	-	-	0.615	-	-	-
	17	-	-	0.613	-	-	-
	15	-	-	0.604	-	-	-
	14	-	-	0.587	-	-	-
	21	-	-	0.571	-	-	-
	18	-	-	0.544	-	-	-
	20	-	-	0.521	-	-	-
	22	-	-	0.486	-	-	-
	16	-	-	0.475	-	-	-
	19	-	-	0.411	-	-	-
Perceived social support	**33**	-	-	-	0.688	-	-
	34	-	-	-	0.604	-	-
	32	-	-	-	0.553	-	-
	35	-	-	-	0.547	-	-
	36	-	-	-	0.502	-	-
	31	-	-	-	0.452	-	-
Preventive behaviors	**47**	-	-	-	-	0.788	-
	51	-	-	-	-	0.787	-
	49	-	-	-	-	0.761	-
Reinforcing behaviors (Avoid drinking sugary drinks)	**50**	-	-	-	-	-	0.866
	46	-	-	-	-	-	0.850
	48	-	-	-	-	-	0.528

Table 5. KMO and bartlett's test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**0.665**
Approx. Chi-Square	Bartlett’s Test of Sphericity	**2803.995**
df		**66**
Sig.		**0**

Table 6. Total variance explained.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.347	27.889	27.889	3.347	27.889	27.889	2.701	22.507	22.507
2	1.662	13.851	41.740	1.662	13.851	41.740	1.949	16.240	38.747
3	1.551	12.927	54.667	1.551	12.927	54.667	1.910	15.920	54.667

Table 7. Results of exploratory factor analysis of the subjects.

Component Name	Items	Factor 1	Factor 2	Factor 3
The physical health dimension of outcome expectations	3	0.847	-	-
	4	0.836	-	-
	2	0.765	-	-
	9	0.697	-	-
negative outcome expectation	1	-	0.904	-
	12	-	0.899	-
	11	-	0.350	-
	10	-	0.319	-
positive outcome expectation	8	-	-	0.897
	7	-	-	0.886
	5	-	-	0.328
	6	-	-	0.269

By examining the factor matrix, significant factor loadings were identified, and variables that did not have significant factor loadings on any of the factors were also determined. Arguing that all variables have even a small contribution to the results, the researcher decided to repeat the analysis of factor analysis separately based on the significant variables in order to eliminate the effects of the variables that did not have a significant factor load and the results were interpreted. By identifying the significant variables of each factor, a suitable name was determined according to the type of variables of each factor and their coefficients for the factors; the KMO index for the remaining variables is 0.665, which indicates a sufficient sample size to perform factor analysis. Also, Bartlett's test of sphericity shows the appropriateness of factor analysis to identify the structure of the factor model at the level ($P<0.001$) and indicated discoverable relationships between the variables that were subjected to separate factor analysis (Table **5**). Based on the results of factor analysis with Varimax rotation, 3 factors were extracted. The first factor with an eigenvalue of 3.347 included 4 items whose factor load varied from a minimum of 0.697 to a maximum of 0.847. The second factor, with an eigenvalue of 1.662 and the number of 4 items with a factor load between 0.319 and 0.904 and the third factor with an eigenvalue of 1.551, including 4 items with a factor load between 0.269 and 0.897 fluctuated; which were respectively named as factors of the physical health dimension of outcome expectation, negative outcome expectations, and positive outcome expectations (Tables **6** and **7**).

The reliability of the questionnaire was measured through Cronbach's alpha test method on 30 Junior high-school students who were similar to the studied population in terms of demographic characteristics. So that its value for the outcome expectations questions in the three considered dimensions was 0.71, self-efficacy 0.84, self-regulation 0.90, social support 0.85, perceived barriers 0.87, preventive behaviors 0.82 and the reliability of the tools were also confirmed.

4. DISCUSSION

This study provided a valid and reliable tool to identify the factors affecting the consumption of sugar-sweetened beverages in students. By knowing the effective factors in the consumption of these drinks, we can benefit from effective strategies and interventions in teenagers and try to make them more effective. It seems that the present study is one of the few studies that have been conducted on children and teenagers studying in schools, and its findings can be used in future research.

According to Table **2**, only 6 factors have acceptable eigenvalues; so that after rotation, these factors describe 11.9%, 11.8%, 11.2%, 8.5%, 6.8%, and 5.7% of the variance of the factors related to the consumption of sugar-sweetened beverages in children, and a total of 56 2% of the total variance of these variables is explained.

The results obtained in Table **3** show 6 important factors in this research. The variables related to the first factor are more related to the obstacles in the way of preventing and controlling the high consumption of sugar-sweetened beverages, which was named as perceived barriers.

The results shown in Table **3** show 6 important factors in this research. The variables related to the first factor are more related to the barriers in the way of preventing and controlling the high consumption of sugar-sweetened beverages, which was named as perceived barriers. The similar results from Kaitlyn *et al*.'s research, the unfavorable role of parents as a food model and food supply, the attractive taste of sweet drinks, easy access to these drinks at home, having extra money in the pocket for shopping as barriers to limiting the consumption of sugar-sweetened beverages in children were noted. Also in the social dimension, barriers such as serving these drinks at parties and special events such as holidays and birthdays, forcing others to match with siblings or friends by drinking these drinks and using these drinks as a reward are mentioned [21].

The variables related to the second factor associated with the confidence of the participants to control the consumption of sugar-sweetened beverages was named as self-efficacy. People's confidence in their abilities related to being able to choose their daily healthy foods, even if it is difficult, determines a person's success in achieving a healthy eating pattern, so based on the evidence, self-efficacy is related to a healthy eating pattern [40].

The variables related to the third factor are related to setting goals and creating plans for controlling the consumption of sugar-sweetened beverages. When a person sets goals and plans concrete plans, it becomes easier to perform that behavior, hence, it was named a self-regulation factor, which is close to the results of the research of Anderson *et al*. and Pelletier *et al*. In their research, it was found that the content of people's diet largely depends on self-regulation, that is, on setting goals, planning and monitoring what they eat or buy [40, 41].

The variables related to the fourth factor are related to the perceived support from family members, friends and other important people in people's lives, so it can be called the social support factor. In their study, like our study, Su *et al*. investigated the sources of social support of family, friends, peers, and teachers in relation to the consumption pattern of sugar-sweetened beverages, in which peers and friends are known as the main source of social support; which could influence and predict the consumption of these drinks [42].

The variables related to the fifth factor are related to the adoption of preventive behaviors from excessive consumption of sugar-sweetened beverages in children, so it was named under the preventive behaviors factor. The variables related to the sixth factor are related to factors influencing the adoption of nutritional behaviors in connection with compliance with standard criteria in the consumption of sweet drinks in children, hence, it was named under the reinforcing behaviors factor.

Due to the fact that some items in the vicinity of other items reduced the factor load of other items, the researcher had to repeat the factor analysis separately for the remaining items, the results of which include the identification of three factors with a predictive power of 54,667.

It should be noted that with a general view of these three factors, it can be said that all these three factors can be combined into one general factor called outcome expectation with the sub-factors of physical health dimension of outcome expectation, negative outcome expectation, and positive expected outcome. Outcome expectations refer to the value that a person places on the expected consequences as a result of adopting a behavior. Therefore, the higher the level of values, the more chance there is to perform the desired behavior [43]. In this study, having a good feeling, preference for taste and pleasure, satisfaction of family and friends, prevention of heart diseases, obesity, types of cancer and tooth decay, as well as saving time and money as the expected outcomes in connection with the adoption of desirable drinking behaviors was considered.

According to the findings of the research, it is suggested that the relationship between the effective factors in the consumption of sugar-sweetened beverages be considered in the field of nutritional health. The comparison of its results can be the basis for solving the gap in this sector. Regarding the limitations of the research, we can mention the partial cooperation of the students or the incomplete filling of the questionnaire. In other cases, we did not face any special restrictions.

CONCLUSION

The results of the present study showed that the designed questionnaire has desirable psychometric properties and has the necessary strength and validity to measure the factors influencing the adoption of desirable behaviors in the consumption of sugar-sweetened beverages in children. Also, this questionnaire can be used by different researchers in the country. On the other hand, the questionnaire is suitable for the Iranian culture and is easy and understandable to answer in different groups. It is recommended to use and psychometrically evaluate this questionnaire in different age groups and other strata of society.

AUTHOR'S CONTRIBUTION

It is hereby acknowledged that all authors have accepted responsibility for the manuscript's content and consented to its submission. They have meticulously reviewed all results and unanimously approved the final version of the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The Ethics Committee of Isfahan University of Medical Sciences approved the study protocol (IR.MUI. RESEARCH.REC.1399.213).

HUMAN AND ANIMAL RIGHTS

All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

CONSENT FOR PUBLICATION

Written consent letter was obtained from the legal guardians for the students' participation in the study.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The data and supportive information are available within the article.

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None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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